

phenomena, from the smallest domain of subnuclear particles to the largest domain of distant objects in the universe.

This breadth of interests is reflected in the type of work pursued by physicists. Some physicists are interested in research on problems that are at the frontiers of knowledge. Some apply this newly acquired knowledge to make practical advances. Still others use knowledge of physics as a basis for careers in teaching or administration.

COURSE DESCRIPTIONS

All undergraduate courses offered in the University are described on each subject page. The course numbering scheme is as follows: 100–199, primarily open to freshmen; 200–299, primarily open to sophomores; 300–399, primarily open to juniors; and 400–499, primarily open to seniors.

Figures in parenthesis before the course description indicate the Texas Common Course Number(s). Those figures identified with an asterisk should reference the Texas Common Course Numbering System (p. 1417) in this catalog for additional information.

The unit of credit is the semester hour, which involves one hour of theory or from two to four hours of practice per week for one semester of 15 weeks. Figures following the credit hours indicate the contact hours per week devoted to theory and practice, respectively. Theory includes recitations and lectures; practice includes work done in the laboratory, shop, drawing room, field or other. When courses are cross-listed, credit cannot be received for both courses. Any course may be withdrawn from the session offerings in case the number of registrations is too small to justify offering the course.

Field trips may be required for which departmental fees may be assessed to cover costs.

AALO - Arabic & Asian Language (AALO)

AALO 285 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Individual supervision of readings or assigned projects in an Asian Language, selected for each student individually; written or oral reports. **Prerequisite:** Approval of Arabic and Asian Language Office Director.

AALO 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified area of an Asian language. May be repeated for credit. **Prerequisite:** Approval of Arabic and Asian Language Office Director.

AALO 485 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Individual supervision of readings or assigned projects selected for each student individually; written or oral reports. **Prerequisite:** Approval of Arabic and Asian Language Office Director.

AALO 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified area of an Asian language. May be repeated for credit. **Prerequisite:** Approval of Arabic and Asian Language Office Director.

ACCT - Accounting (ACCT)

ACCT 200 Opportunities in Accounting

Credit 1. 1 Lecture Hour. Introduction to career paths in accounting and assessment aptitudes and interests with respect to these career paths. **Prerequisite:** Business honors, business administration, or accounting majors.

ACCT 209 Survey of Accounting Principles

Credits 3. 3 Lecture Hours. Accounting survey for non-business majors; non-technical accounting procedures, preparation and interpretation of financial statements and internal control. May not be used to satisfy degree requirements for majors in business. Business majors who choose to take this course must do so on a satisfactory/unsatisfactory basis.

ACCT 210 Survey of Managerial and Cost Accounting Principles

Credits 3. 3 Lecture Hours. A survey of managerial and cost accounting for non-business majors; accounting responsibility of the manager, job and process cost systems, budgeting, cost-volume-profit analysis for decision-making. May not be used to satisfy degree requirements for majors in business. Business majors who choose to take this course must do so on a satisfactory/unsatisfactory basis. **Prerequisite:** ACCT 209 or ACCT 229.

ACCT 229 Introductory Accounting

Credits 3. 3 Lecture Hours. (ACCT 2301, 2401) Introductory Accounting. Analysis, recording and reporting of business transactions; partnership and corporation accounting; analysis and use of financial statements. **Prerequisite:** Business, Agribusiness, and Maritime Business Administration majors; also taught at Galveston campus.

ACCT 230 Introductory Accounting

Credits 3. 3 Lecture Hours. (ACCT 2302, 2402) Introductory Accounting. Continuation of ACCT 229. Use of budgets; introduction to cost accounting; cost control techniques and methods of measuring performance. **Prerequisites:** ACCT 229; Business, Agribusiness, and Maritime Business Administration majors; also taught at Galveston campus.

ACCT 321 Professional Development Seminar

Credits 2. 2 Lecture Hours. Exposure to professional issues of professional accounting practice using a workshop format. **Prerequisite:** Admission to Professional Program.

ACCT 322 Professional Development Seminar – BBA

Credit 1. 1 Lecture Hour. Exposure to professional issues in the practice of accounting, including potential careers and employers. **Prerequisite:** Accounting major or approval of instructor.

ACCT 327 Financial Reporting I

Credits 3. 3 Lecture Hours. Study of theoretical basis for financial accounting concepts and principles related to financial reporting; emphasizing income measurement and accounting for assets. BBA accounting majors must earn a minimum grade of C for graduation. **Prerequisite:** Grade of C or higher in ACCT 229; admission to upper division in Mays Business School.

ACCT 328 Financial Reporting II

Credits 3. 3 Lecture Hours. Continued study of accounting concepts and principles related to reporting long-debt and owners' equity; including reporting issues of leases, retirement benefits, income taxes and international accounting standards. **Prerequisite:** ACCT 327 with a grade of C or better.

ACCT 329 Cost Management and Analysis

Credits 3. 3 Lecture Hours. Theory, concepts and methods relating to use of information and design of systems to aid managers in planning, controlling, decision making, evaluating performance and reporting financial results. **Prerequisite:** ACCT 315 or ACCT 327 with a grade of C or better.

ACCT 403 Energy Accounting

Credits 3. 3 Lecture Hours. Overview of the oil and gas industry and specialized financial accounting procedures associated with the industry; emphasis on accounting for exploration, development, production, depletion and amortization, joint operations, asset impairment and retirement obligation; includes reserve accounting/disclosure related to the above topics. **Prerequisite:** ACCT 327 with C or better.

ACCT 405 Income Tax

Credits 3. 3 Lecture Hours. Introduction to federal income tax legislation pertaining primarily to corporations and individuals. **Prerequisite:** ACCT 327 with a grade of C or better.

ACCT 407 Auditing

Credits 3. 3 Lecture Hours. Introduction to auditing theory and procedures pertaining to financial statements, in the context of both external auditing, by certified public accountants, and internal auditing; preparation of working papers. **Prerequisite:** ACCT 327 with a grade of C or better.

ACCT 408 Internal Auditing

Credits 3. 3 Lecture Hours. Reading and evaluation of current theory and procedures used by internal auditors; selected case studies; statistical methods of forming auditing judgment. **Prerequisite:** Grade of C or better in ACCT 427.

ACCT 410 Fraud Examination

Credits 3. 3 Lecture Hours. Principles and methodologies of detecting and deterring fraud using accounting, auditing, and investigative skills; includes skimming, larceny, misappropriations, fraudulent statements, interviewing witnesses and support for litigation. **Prerequisites:** ACCT 327 with a grade of C or better; junior or senior classification.

ACCT 421 Critical Communication Skills for Accountants

Credits 3. 3 Lecture Hours. Development of oral and written communication skills necessary for successful careers in public and corporate accounting. **Prerequisite:** ACCT 327 with a grade of C or better.

ACCT 427 Accounting and Financial Information Systems

Credits 3. 3 Lecture Hours. Overall data flow systems emphasizing financial data and computerized systems, for accounting majors; flow and logic concepts, developing meaningful control concepts and data reporting techniques. **Prerequisite:** ACCT 229 with a grade of C or better.

ACCT 430/IBUS 430 Global Immersion in Accounting

Credits 3. 3 Lecture Hours. Combination of classroom work in the spring and a field trip to the selected country in summer; introduction to international opportunities within the public accounting firms; meet with former students to gain a local and corporate view of business in the selected country. May be taken two times for credit. **Prerequisites:** ACCT 327 and approval of instructor. **Cross Listing:** IBUS 430/ACCT 430.

ACCT 445/IBUS 445 International Accounting

Credits 3. 3 Lecture Hours. Introduction and examination of accounting issues unique to multinational enterprises and international business activity; only ACCT 445/IBUS 445 sections count for the accounting coursework requirements for the CPA exam. **Prerequisites:** ACCT 315 or ACCT 327; FINC 341. **Cross Listing:** IBUS 445/ACCT 445.

ACCT 447/FINC 447 Financial Statement Analysis

Credits 3. 3 Lecture Hours. Development of an analytical approach to financial statements, integrating relevant finance and accounting concepts and principles; current topics in financial analysis. **Prerequisites:** Grade of C or better in ACCT 327 and FINC 341. **Cross Listing:** FINC 447/ACCT 447.

ACCT 450 Accounting Ethics

Credits 3. 3 Lecture Hours. Integration of ethical reasoning, objectivity, independence and other core values into the development of a professional accountant; critical analysis of the ethical lapses which have occurred in business and the accounting profession; exploring ways to integrate ethical behavior into professional life. **Prerequisites:** ACCT 427; junior or senior classification.

ACCT 484 Accounting Internship

Credits 0 to 3. 0 to 3 Other Hours. A directed internship in an organization to provide on-the-job training under the supervision of accounting professionals in organizational settings appropriate to the student's professional objectives. May be taken for credit up to three hours. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisites:** Accounting major or approval of department head.

ACCT 485 Directed Studies

Credits 1 to 3. 1 to 3 Other Hours. Directed study of selected problems in the area of accounting not covered in other courses. **Prerequisites:** Accounting major and approval of department head.

ACCT 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of accounting. May be repeated for credit. **Prerequisites:** Admission to upper division in Mays Business School and approval of instructor.

ACCT 491 Research

Credits 1 to 4. 1 to 4 Lecture Hours. Research conducted under the direction of an accounting faculty member in Mays Business School or a faculty member in the Office of Undergraduate Research. May be repeated one time for credit. **Prerequisites:** Junior or senior classification and approval of instructor.

AERO - Aerospace Engineering (AERO)

AERO 201 Introduction to Flight

Credits 3. 3 Lecture Hours. 1 Lab Hour. Standard atmosphere, basic aerodynamic theory, airfoil and wing descriptions, introduction to orbital mechanics, elementary aerospace vehicle performance, and experiential introduction to aerospace engineering. **Prerequisite:** Grade of C or better in ENGR 102 and PHYS 206; grade of C or better in ENGR 216/PHYS 216 or PHYS 216/ENGR 216; grade of C or better in MATH 251 or MATH 253 or concurrent enrollment; Aerospace Engineering majors only.

AERO 211 Aerospace Engineering Mechanics

Credits 3. 3 Lecture Hours. Fundamentals of Newtonian mechanics; static equilibrium of particles, system of particles and rigid bodies; free body diagrams; rectilinear and curvilinear motion of particles; linear momentum; angular momentum; friction; plane motion of rigid bodies; beams and trusses. **Prerequisites:** Grade of C or better in ENGR 102 and PHYS 206; grade of C or better in ENGR 216/PHYS 216 or PHYS 216/ENGR 216; grade of C or better in MATH 251 or MATH 253, or concurrent enrollment; Aerospace Engineering majors only.

AERO 212 Introduction to Aerothermodynamics

Credits 3. 3 Lecture Hours. 1 Lab Hour. Study of thermodynamic properties and processes, heat and work, first and second laws of thermodynamics, ideal cycles for power and refrigeration applications; emphasis on the Brayton jet-engine cycle. **Prerequisite:** Grade of C or better in CHEM 107 and CHEM 117, or CHEM 120; grade of C or better in MATH 251 or MATH 253, or concurrent enrollment; AERO majors.

AERO 214 Introduction to Aerospace Mechanics of Materials

Credits 3. 2 Lecture Hours. 2 Lab Hours. Fundamental concepts for deformable bodies (conservation of linear and angular momentum, kinematics and thermoelasticity); notions of stress and strain and illustrative examples for engineering applications; introduction to experimental methods and reporting, instrumentation and uncertainty analysis; measurement of elastic and thermal material properties.

Prerequisites: Grade of C or better in AERO 211; grade of C or better in MATH 308, or concurrent enrollment.

AERO 221 Analytical Methods for Aerospace Engineering

Credits 3. 3 Lecture Hours. 1 Lab Hour. Matrix operations, Gaussian elimination, linear transformations, coordinate transformations, eigenvalues, eigenvectors, diagonalization, including programming and computer implementation, applied to solid mechanics, fluid mechanics, dynamics and control of air and space vehicles. **Prerequisites:** Grade of C or better in ENGR 102, MATH 152, PHYS 206, and ENGR 216/PHYS 216 or PHYS 216/ENGR 216.

AERO 222 Introduction to Aerospace Computation

Credits 3. 2 Lecture Hours. 2 Lab Hours. Review of basic skills required for developing computer programs and introduction to more advanced concepts in scientific computing to solve aerospace engineering problems; numerical and analytical methods of solving engineering problems involving interpolation and extrapolation; function approximation; numerical differentiation; integration; solutions to linear and non-linear equations and systems of equations; eigenvalues and eigenvectors, numerical integration of differential equations with aerospace engineering applications. **Prerequisites:** Admitted to major degree sequence in aerospace engineering; grade of C or better in ENGR 102; grade of C or better in MATH 308 or concurrent enrollment.

AERO 285 Directed Studies

Credits 0 to 4. 0 Lecture Hours. 0 Lab Hours. 0 to 4 Other Hours. Directed study of special problems in aerospace engineering. **Prerequisites:** Freshman or sophomore classification, or approval of instructor. May be repeated for credit.

AERO 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified area of aerospace engineering. May be repeated for credit. **Prerequisite:** Approval of instructor.

AERO 291 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in aerospace engineering. May be taken three times. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

AERO 299 Mid-Curriculum Professional Development

Credits 0. 0 Other Hours. Participation in an approved high-impact learning practice; reflection on professional outcomes from engineering body of knowledge; documentation and self-assessment of learning experience at mid-curriculum point.

AERO 301 Theoretical Aerodynamics

Credits 3. 3 Lecture Hours. Conservation of mass and momentum; Reynolds transport theorem; fundamentals of incompressible flow, rotationality, potential flow, superposition, circulation, lift, thin airfoil theory, elliptic wing theory and induced drag. **Prerequisite:** Grade of C or better in AERO 201, AERO 212; grade of C or better in AERO 222 and MATH 308, or concurrent enrollment.

AERO 303 High Speed Aerodynamics

Credits 3. 3 Lecture Hours. Fundamentals of compressible flow; governing Euler equations; adiabatic and isentropic flow; normal and oblique shocks and expansion waves, moving shocks, shock interactions, wedge and cone flow; supersonic airfoils, exact and thin theory, choked flow and wind-tunnel design, two-dimensional gas dynamics, and method of characteristics. **Prerequisite:** Grade of C or better in AERO 301.

AERO 304 Aerospace Structural Analysis I

Credits 3. 3 Lecture Hours. Three-dimensional beam theory; applications of elasticity theory to beam extension and compression, bending, torsion and transverse shearing; combined loading; analysis of thin-walled structures; stress concentrations; analysis of stability of aerospace structures; elements of structural failure, buckling; structural design considerations. **Prerequisite:** Grade of C or better in AERO 214 and MATH 308; grade of C or better in AERO 222 or concurrent enrollment.

AERO 306 Aerospace Structural Analysis II

Credits 3. 3 Lecture Hours. Work and energy principles; analysis of indeterminate structures by classical virtual work and finite elements; introduction to elastic stability of columns; application of energy methods to determine stresses, strains and displacements in typical aerospace structures; design considerations in aerospace structures. **Prerequisite:** Grade of C or better in AERO 304.

AERO 307 Aerospace Engineering Laboratory

Credits 3. 2 Lecture Hours. 3 Lab Hours. Intermediate and advanced topics in instrumentation, signal conditioning, data acquisition analysis for aerospace-related measurements; emphasis on technical reporting and data presentation; measurements of materials strain, deformation, pressure, velocity and aerodynamic forces; experimental investigations of static and dynamic response of structures; use of nonintrusive optical techniques; uncertainty analysis; linear regression, Fourier transform and power spectra; tests for statistical significance; design of experiments. **Prerequisites:** Grade of C or better in ENGL 103 or ENGL 104; grade of C or better in AERO 222, AERO 301, AERO 304, AERO 310, ECEN 215, or concurrent enrollment.

AERO 310 Aerospace Dynamics

Credits 3. 3 Lecture Hours. Spatial kinematics; general motion of particles; Euler angles; Newton-Euler methods for translation and rotation of rigid bodies; work-energy and impulse momentum principles applied to aerospace systems; Linear theory of free dynamic response of single and multi-degree of freedom systems; frequency response of first and second order systems with instrumentation applications. **Prerequisite:** Grade of C or better in AERO 211 and MATH 308; grade of C or better in AERO 222 or concurrent enrollment.

AERO 321 Dynamics of Aerospace Vehicles

Credits 3. 3 Lecture Hours. Derivation of the nonlinear air and space vehicle dynamics equations; attitude representation with Euler angles and quaternions; forces and moments due to aerodynamics, thrust and gravity gradient; linearization; development of state-space models for aircraft and spacecraft; static and dynamic stability analysis for aircraft and satellites; spin and gravity gradient stabilization; stability derivatives; longitudinal and lateral modes and transfer functions for aircraft; aircraft flying qualities; elements of aircraft configuration design; response to control inputs. **Prerequisite:** Grade of C or better in AERO 301 and AERO 310.

AERO 351 Aerothermodynamics and Propulsion

Credits 3. 3 Lecture Hours. Aerothermodynamics of gases; laws of thermodynamics; equilibrium conditions; mixtures of gases; combustion and thermochemistry; compressible internal flows with friction, heat transfer and shock; turbojet cycle analysis and performance; chemical rockets. **Prerequisite:** Grade of C or better in AERO 303.

AERO 401 Aerospace Design Principles

Credits 3. 2 Lecture Hours. 3 Lab Hours. Study of systems engineering; project lifecycle; stakeholder, concept of operations (CONOPS) & requirements definition; cost assessment; risk management; trade studies; decomposition and design of an aerospace system; engineering ethics; technical communications. **Prerequisite:** Grade of C or better in AERO 306, AERO 307, AERO 321, and AERO 351, or concurrent enrollment.

AERO 402 Aerospace Systems Design

Credits 2. 6 Lab Hours. Continuation of AERO 401; detailed design; subsystem integration; realization of the system through prototyping, modeling, and/or simulation; verification and validation through experimentation and analysis; documentation and presentation of results. **Prerequisite:** Grade of C or better in AERO 306, AERO 307, AERO 321, AERO 351, and AERO 401.

AERO 404 Mechanics of Advanced Aerospace Structures

Credits 3. 3 Lecture Hours. Advanced analysis techniques for aerospace structures; material anisotropy, plasticity, fatigue and fracture; laminated materials; solution of plane elasticity, plate and multi-component structural configurations; buckling of beams and plates; application of finite element analysis. **Prerequisites:** Grade of C or better in AERO 304 and junior or senior classification.

AERO 405 Aerospace Structural Design

Credits 3. 3 Lecture Hours. Overall structural integrity of complete aerospace systems; structures subjected to critical loads; design considerations in aerospace structures. **Prerequisite:** Grade of C or better in AERO 306.

AERO 411 Applications of Fracture Mechanics to Aerospace Structures

Credits 3. 3 Lecture Hours. Foundations of linear elastic fracture mechanics of aerospace structure; calculation of stress intensity factors and energy release rates; crack growth under fatigue loading; ASTM standards for fracture testing; the role of fracture mechanics in the analysis and design of aerospace structures. **Prerequisite:** AERO 304 or equivalent with a grade of C or better.

AERO 413 Aerospace Materials Science

Credits 3. 3 Lecture Hours. Relationship between aerospace engineering material properties and microstructure; mechanical and thermal properties; environmental degradation; mechanical failure. **Prerequisite:** Grade of C or better in AERO 304.

AERO 414 Human Performance in Aerospace Environments

Credits 3. 3 Lecture Hours. Current physiological and psychological aspects affecting human performance during space missions using a quantitative approach and engineering methods. **Prerequisite:** Grade of C or better in AERO 321.

AERO 415 Computational Fluid Dynamics for Aerospace Applications

Credits 3. 3 Lecture Hours. Present methods for solving internal and external flow problems for inviscid and viscous compressible flow; Euler, Navier-Stokes and Large Eddy Simulation solvers, boundary conditions formulation, and basics of parallel processing. **Prerequisite:** Grade of C or better in AERO 303 and AERO 351.

AERO 417 Aerospace Propulsion

Credits 3. 3 Lecture Hours. Air breathing propulsion; design and analysis of inlets, compressors, combustors, turbines and nozzles; application to aeronautical and ground transportation. **Prerequisite:** Grade of C or better in AERO 351.

AERO 419 Chemical Rocket Propulsion

Credits 3. 3 Lecture Hours. Nozzles and heat transfer in rockets, liquid and solid propellant systems; combustion and combustion stability; flight performance including trajectories, multistaging and exchange rate curves; rocket testing. **Prerequisite:** Grade of C or better in AERO 351.

AERO 420 Aeroelasticity

Credits 3. 3 Lecture Hours. Classical analysis of fundamental aeroelastic phenomena with application to aerospace vehicles; flutter, divergence, control effectiveness. **Prerequisites:** Grade of C or better in AERO 303, AERO 306, and AERO 310.

AERO 422 Active Controls for Aerospace Vehicles

Credits 3. 3 Lecture Hours. Introduction to the Theory of Automatic Control specifically applied to aerospace vehicles; techniques for analysis and synthesis of linear control systems, stability criteria, systems response and performance criteria; design studies of active controls to improve aerospace vehicle performance. **Prerequisite:** Grade of C or better in AERO 321.

AERO 423 Orbital Mechanics

Credits 3. 3 Lecture Hours. Two-body problem, restricted three-body problem, orbital perturbations, orbital maneuvers, interplanetary trajectories, orbit determination and other selected topics. **Prerequisite:** Grade of C or better in AERO 310.

AERO 424 Spacecraft Attitude Dynamics and Control

Credits 3. 3 Lecture Hours. Introduces fundamental concepts of satellite attitude dynamics and control; includes derivations of environmental disturbances due to gravity gradient, aerodynamic, and solar radiation pressure; includes treatments of attitude control subsystems, such as thrusters, reaction wheels, CMGs, and magnetic torquers, and their designs. **Prerequisites:** Grade of C or better in AERO 321.

AERO 425 Flight Test Engineering

Credits 3. 2 Lecture Hours. 3 Lab Hours. Application of performance and stability and control theory to flight test measurements; standard atmosphere and airspeed equations for pilot-static system calibrations; flight test methods for evaluating performance, stability and control, and stall-spin characteristics; laboratory practice in planning and conducting small flight test project. **Prerequisite:** Grade of C or better in AERO 321.

AERO 426 Space System Design

Credits 3. 3 Lecture Hours. Introduces prevailing practices and processes used in modern space system design; applies knowledge in component engineering disciplines to a design challenge of interest to NASA or DoD; utilizes instruction in systematic methods of design and on dynamics of teamwork; when possible concludes with detailed design using an engineering design facility. **Prerequisites:** Grade of C or better in AERO 306, AERO 321, AERO 351.

AERO 428 Electromagnetic Sensing for Space-Borne Imaging

Credits 3. 3 Lecture Hours. Study IR and Visible range imaging systems to obtain high resolution imaging of objects from space; this area has numerous applications and areas of advanced development; following instruction in needed background on optics, telescopes, and interferometry, perform preliminary design of imaging system with a different imaging design offered each year. **Prerequisites:** Grade of C or better in AERO 306, AERO 321, AERO 351.

AERO 430 Numerical Simulation

Credits 3. 3 Lecture Hours. Numerical and analytical simulation of physical problems in sciences and engineering using applied methods; developing and using numerical techniques for physical problems described by nonlinear algebraic equations, ordinary and partial differential equations. **Prerequisite:** Grade of C or better in AERO 222 or MATH 417.

AERO 435 Aerothermochemistry

Credits 3. 3 Lecture Hours. Composition of chemically reacting gases (air and propellant); thermodynamic functions based on classical and quantum mechanical theories; calculation of gas temperatures; equilibrium, frozen and non-equilibrium flows through nozzles and shock waves. **Prerequisite:** Grade of C or better in AERO 303.

AERO 436/ISEN 432 Human Factors Engineering for Aerospace Designs

Credits 3. 3 Lecture Hours. Physiological and psychophysiological issues encountered in aviation and space environments and their effect on human cognitive and physical performance; survey methods for human workload and performance evaluations; apply human-systems design principles to an aerospace design project. **Prerequisites:** Junior or senior classification. **Cross Listing:** ISEN 432/AERO 436.

AERO 438/MEEN 407 Intuitive and Counter-Intuitive Mechanisms

Credits 3. 2 Lecture Hours. 2 Lab Hours. Spatial descriptions and transformations; forward and inverse kinematics of mechanical manipulators; manipulation; dexterity and manipulability; principles of manipulator-mechanism design; mobility; motion planning; control, reachability and complexity measures; workspace analysis. **Prerequisites:** Senior classification. **Cross Listing:** MEEN 407/AERO 438.

AERO 440 Cockpit Systems and Displays

Credits 3. 3 Lecture Hours. Design, development, and implementation of cockpit systems and multi-function displays; cockpit system requirements and specifications; human-machine interfaces, Flight Management Systems, navigation and guidance systems; 3-D real-time displays of weather, traffic, and terrain; characteristics and missions of air vehicles; project design and cost analysis. **Prerequisite:** Grade of C or better in AERO 321 or junior or senior classification in computer science.

AERO 445 Vehicle Management Systems

Credits 3. 3 Lecture Hours. Introduction to vehicle management systems for manned and unmanned air and space vehicles; system centric concepts, requirements definition, specifications, and architectures; reliability analysis, health monitoring, and mission management; SISO digital design of integrated flight control, propulsion control and structural control; introduction to vehicle autonomy; design and analysis methods, industrial examples. **Prerequisite:** Grade of C or better in AERO 422.

AERO 451 Human Spaceflight Operations

Credits 3. 3 Lecture Hours. Essential aspects of human spaceflight operations as performed by NASA; in-depth understanding of the state-of-the-art in spacecraft operations, including spacecraft systems, ground and launch operations, mission management and on-orbit activities such as science, robotics, spacewalking and human health maintenance; applications to future space systems. **Prerequisite:** Grade of C or better in AERO 310 or equivalent; senior classification.

AERO 452 Heat Transfer and Viscous Flows

Credits 3. 3 Lecture Hours. Navier-Stokes and boundary layer equations; exact and approximate solutions; laminar boundary layers; basic concepts of transition and turbulence; turbulent boundary layers; one and two dimensional heat transfer; methods for steady and transient heat conduction; thermal boundary layers; convection; radiation. **Prerequisite:** Grade of C or better in AERO 303 and AERO 351.

AERO 455 Helicopter Aerodynamics

Credits 3. 3 Lecture Hours. Hovering theory, hovering and vertical flight performance, factors affecting hovering and vertical flight performance, auto-rotation in vertical descent, concepts of blade motion and control, aerodynamics of forward flight, forward flight performance, operational envelope and introduction to conceptual design of helicopters. **Prerequisites:** Grade of C or better in AERO 222, AERO 301, and AERO 310.

AERO 472 Airfoil and Wing Design

Credits 3. 3 Lecture Hours. Subsonic airfoil design and analysis, subsonic wing design and analysis, swept and delta wings, vortex lift, transonic flow methods, viscous transonic phenomena, transonic airfoil and wing design, optimization and advanced topics such as supersonic panel methods. **Prerequisite:** Grade of C or better in AERO 303.

AERO 478 Low Temperature Plasma - Theory, Modeling, Applications

Credits 3. 3 Lecture Hours. Basic theory and fundamentals of low-temperature plasma, elements of plasma kinetic theory, equilibrium and non-equilibrium plasma, modeling approaches, plasma discharges. **Prerequisites:** Grade of C or better in AERO 303 and MATH 308.

AERO 481 Seminar

Credit 1. 1 Lecture Hour. Readings, reports, conferences and discussion. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisite:** Senior classification in aerospace engineering.

AERO 485 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Special problems in aerospace engineering assigned to individual students or groups. **Prerequisite:** Junior or senior classification or approval of instructor.

AERO 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified field of aerospace engineering. May be repeated for credit. **Prerequisite:** Approval of instructor.

AERO 491 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in aerospace engineering. May be repeated 3 times for credit. **Prerequisites:** Junior or senior classification and approval of instructor.

AERS - Aerospace Studies (AERS)

AERS 101 Air Force Heritage and Values I

Credit 1. 1 Lecture Hour. Introduction to the Department of the Air Force (DAF) and Air Force Reserve Officer Training Corps (AFROTC); overview of officership, officer opportunities and benefits, and DAF heritage and values and operations. **Prerequisites:** Concurrent enrollment in AERS 105.

AERS 102 Air Force Heritage and Values II

Credit 1. 1 Lecture Hour. Continuation of AERS 101; introduction to the Department of the Air Force (DAF) and Air Force Reserve Officer Training Corps (AFROTC); overview of officership, officer opportunities and benefits, and DAF heritage and values and operations. **Prerequisites:** AERS 101; concurrent enrollment in AERS 106.

AERS 105 AFROTC Leadership Lab I

Credit 1. 2 Lab Hours. Dynamic leadership development activities designed to prepare prospective Department of the Air Force second lieutenants and complement the AFROTC academics with experiential learning. May be taken six times for credit. Must be taken on a satisfactory/unsatisfactory basis.

AERS 106 AFROTC Leadership Lab II

Credit 1. 2 Lab Hours. Continuation of AERS 105; dynamic leadership development activities designed to prepare prospective Department of the Air Force second lieutenants and complement the AFROTC academics with experiential learning. May be taken four times for credit. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisites:** AERS 105.

AERS 201 Team and Leadership Fundamentals I

Credit 1. 1 Lecture Hour. Fundamental survey of leadership and team building through topics such as followership, listening, ethical decision-making, and conflict management. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisites:** Grade of C or better in AERS 102; concurrent enrollment in AERS 105; or approval of department head.

AERS 202 Team and Leadership Fundamentals II

Credit 1. 1 Lecture Hour. Continuation of AERS 201; fundamental survey of leadership and team building through topics such as followership, listening, ethical decision-making, and conflict management.

Prerequisites: Grade of C or better in AERS 201; concurrent enrollment in AERS 106 if seeking a military contract; or approval of department head.

AERS 303 Leading People and Effective Communication I

Credits 3. 3 Lecture Hours. In-depth look at leadership through topic-guided discussions and verbal communications in Department of the Air Force formats; leadership, management fundamentals, professional knowledge, Air Force personnel and evaluation systems, and leadership ethics with case studies of leadership and management situations as a means of demonstrating and exercising practical application of concepts.

Prerequisites: Grade of C or better in AERS 202; concurrent enrollment in AERS 105 if seeking a military contract; or approval of department head.

AERS 304 Leading People and Effective Communication II

Credits 3. 3 Lecture Hours. Continuation of AERS 303 with an in-depth look at leadership through topic-guided discussions and verbal communications in Department of the Air Force formats; leadership, management fundamentals, professional knowledge, Air Force personnel and evaluation systems, and leadership ethics with case studies of leadership and management situations as a means of demonstrating and exercising practical application of concepts. **Prerequisites:** Grade of C or better in AERS 303; concurrent enrollment in AERS 106 if seeking a military contract; or approval of department head.

AERS 403 National Security Affairs, Leadership Responsibilities, and Commissioning Preparation I

Credits 3. 3 Lecture Hours. Examination of the Constitution, national security processes, the military's role in society, and the military justice system; preparation for life as a second lieutenant in the Department of the Air Force. **Prerequisites:** Grade of C or better in AERS 304; concurrent enrollment in AERS 105 if seeking a military contract; or approval of department head.

AERS 404 National Security Affairs, Leadership Responsibilities, and Commissioning Preparation II

Credits 3. 3 Lecture Hours. Continuation of AERS 403; examination of the Constitution, national security processes, the military's role in society, and the military justice system; prepares students for life as a second lieutenant in the Department of the Air Force. **Prerequisites:** Grade of C or better in AERS 403; concurrent enrollment in AERS 106 if seeking a military contract; or approval of department head.

AERS 485 Directed Studies

Credits 1 to 3. 1 to 3 Other Hours. Directed study of problems in the field of aerospace studies. **Prerequisites:** Grade of C or better in AERS 404; Air Force ROTC Cadet; approval of department head.

AFST - Africana Studies (AFST)

AFST 201 Introduction to Africana Studies

Credits 3. 3 Lecture Hours. Introduction to the field of Africana Studies; interdisciplinary approach drawing from history, philosophy, sociology, political studies, literature and performance studies; explores the African foundational relationship to and connections with its diaspora populations; covers Africa, the United States, the Caribbean, Europe and South America; also taught at Qatar.

AFST 204/ENGL 204 Introduction to African-American Literature

Credits 3. 3 Lecture Hours. Introduction to the writings of African Americans from the 18th century to the present, emphasizing the major themes and traditions; ENGL-204 also taught at Galveston campus. **Cross Listing:** ENGL 204/AFST 204.

AFST 205/ENGL 205 Introduction to Africana Literature

Credits 3. 3 Lecture Hours. Works, literary movements and genres of authors of African descent in the Americas, Europe and Africa. **Cross Listing:** ENGL 205/AFST 205.

AFST 206/PBSI 206 Black Psychology

Credits 3. 3 Lecture Hours. Critical examination of psychological experience, theories, and methods from perspectives grounded in the "Black experience." **Cross Listing:** PBSI 206/AFST 206.

AFST 209/PBSI 209 Psychology of Culture and Diversity

Credits 3. 3 Lecture Hours. Introduction to various issues surrounding an increasingly interconnected and globalized world by critically examining the dynamic relationship between psychological processes and diverse (e.g., motivation, memory, self, prejudice) socio-cultural contexts. **Prerequisite:** PBSI 107. **Cross Listing:** PBSI 209/AFST 209.

AFST 225 Reframing Public Memory - Texas and the African American

Credits 3. 3 Lecture Hours. Exploration of the connections between Texas and the African American cultural lens and their impact on the understanding of memory and mythmaking; examination through class lectures, readings, viewings, visits, reaction/research papers, and individual projects of public memory and the creation, maintenance, promotion, contestation, erasure, and remaking of ideas of race, dispositions, behaviors, and histories in Texas and globally.

AFST 252/PHIL 252 Introduction to Hip-Hop Philosophy

Credits 3. 3 Lecture Hours. Introduction to philosophy by way of the major themes and subjects of Hip-Hop; critical advocacy of various philosophical ideals. **Cross Listing:** PHIL 252/AFST 252.

AFST 261/INTA 261 Contemporary Issues in the Global South

Credits 3. 3 Lecture Hours. Exploration of current political and cultural issues in the Global South. May be repeated once for credit. **Cross Listing:** INTA 261/AFST 261.

AFST 285 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Directed studies in the field of Africana Studies. May be taken two times for credit. **Prerequisite:** AFST 201; Freshman or sophomore classification; approval of instructor and director.

AFST 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in Africana Studies. May be repeated for credit.

AFST 291 Research

Credits 0 to 3. 0 to 3 Other Hours. Research conducted under the direction of a faculty member in Africana Studies. May be taken three times for credit. **Prerequisites:** AFST 201; freshman or sophomore classification; and approval of instructor.

AFST 300/HIST 300 Blacks in the United States, 1607-1877

Credits 3. 3 Lecture Hours. Blacks in the United States from the colonial period to 1877; the slave trade, slavery, free blacks and the impact of the Civil War and Reconstruction on blacks. **Prerequisite:** Junior or senior classification. **Cross Listing:** HIST 300/AFST 300.

AFST 301/HIST 301 Blacks in the United States Since 1877

Credits 3. 3 Lecture Hours. Blacks in the United States from the end of Reconstruction to the present; ideologies of black leaders, disfranchisement, lynching and the quest for equality in the 1950s and 1960s. **Prerequisite:** Junior or senior classification; HIST-301 also taught at Qatar campus. **Cross Listing:** HIST 301/AFST 301.

AFST 302 Gateway Course

Credits 3. 3 Lecture Hours. Gateway to a series of courses offered for the minor in Africana Studies; explores topics such as Afrocentrism, postcolonial studies, black cultural studies, black feminist theory for a close study of issues among African and African diaspora populations in Africa, the United States, Caribbean, Europe and South America.

AFST 303 Psychology of Women of Color

Credits 3. 3 Lecture Hours. Interdisciplinary theories to study the unique yet intersectional experiences of women from different racial groups, ethnicities, nationalities and cultural backgrounds; scholarly research from the diversity science field; contemporary topics that have developed in a global context; examination of complex issues, which affect women of color across the lifespan. **Prerequisites:** Grade of C or better in AFST 201, PBSI 107, or WGST 200, or approval of instructor. **Cross Listing:** PBSI 303 and WGST 303.

AFST 317/SOCI 317 Racial and Ethnic Relations

Credits 3. 3 Lecture Hours. Status of racial and ethnic groups such as Native Americans, African Americans, Latino Americans, Asian Americans, European Americans, and other groups in the political, economic, legal and social systems of the United States. **Prerequisite:** Junior or senior classification or approval of instructor. **Cross Listing:** SOCI 317/AFST 317.

AFST 323/SOCI 323 Sociology of African Americans

Credits 3. 3 Lecture Hours. Major elements of the Afro-American subculture in relation to white American society and its major social institutions. **Prerequisites:** SOCI 205. **Cross Listing:** SOCI 323/AFST 323.

AFST 324 Africana Social Sciences

Credits 3. 3 Lecture Hours. Exploration of a significant topic pertaining to Africa and/or its diaspora in the social sciences. **Prerequisite:** Junior or senior classification.

AFST 325 Africana Humanities

Credits 3. 3 Lecture Hours. Exploration of a significant topic pertaining to Africa and/or its Diaspora in the humanities and arts. **Prerequisite:** Junior or senior classification.

AFST 326 Africana Popular Culture

Credits 3. 3 Lecture Hours. Dynamics of popular culture and classic theories of society; popular and public cultural forms in context of globalization and the Africana Diaspora. **Prerequisite:** Junior or senior classification or approval of instructor.

AFST 327/MUSC 327 Popular Musics in the African Diaspora

Credits 3. 3 Lecture Hours. Examination of a range of popular musics from the twentieth century that have emerged in conjunction with the historical global spread of peoples and cultures from the African continent; technical knowledge about music is not required; focus on social and cultural contexts for popular music. **Prerequisite:** Junior or senior classification or approval of instructor. **Cross Listing:** MUSC 327/AFST 327.

AFST 329/ENGL 329 African-American Literature Pre-1930

Credits 3. 3 Lecture Hours. Major works of the African-American literary tradition from the 18th century to 1930 studied within cultural and historical context. **Prerequisites:** 3 credits of literature at 200-level or above. **Cross Listing:** ENGL 329/AFST 329.

AFST 338/COMM 338 Critical Race Discourse

Credits 3. 3 Lecture Hours. Critical analysis of communication and dialogue on race; causes and symptoms of structural racism; social/racial hierarchies as they influence and are influenced by communication and dialogue. **Prerequisites:** Junior or senior classification or approval of instructor. **Cross Listing:** COMM 338/AFST 338.

AFST 339/ENGL 339 African-American Literature Post-1930

Credits 3. 3 Lecture Hours. Major works of the African-American literary tradition from the 1930s to the present studied in their cultural and historical context. **Prerequisites:** 3 credits of literature at 200-level or above. **Cross Listing:** ENGL 339/AFST 339.

AFST 344/HIST 344 History of Africa to 1800

Credits 3. 3 Lecture Hours. Origins of humankind in Africa; development and spread of pastoralism, agriculture and iron-working; formation of states and empires; impact of Christianity and Islam; rise of international trade in gold, ivory and slaves; African diaspora. **Prerequisite:** Junior or senior classification. **Cross Listing:** HIST 344/AFST 344.

AFST 345/HIST 345 Modern Africa

Credits 3. 3 Lecture Hours. Survey of Africa since 1800; pre-colonial African states and societies; establishment and impact of European colonial rule; rise of nationalist movements; achievement of independence; problems of political stability and economic development in contemporary Africa; South Africa's apartheid regime and its opponents. **Prerequisite:** Junior or senior classification. **Cross Listing:** HIST 345/AFST 345.

AFST 346/HIST 346 History of South Africa

Credits 3. 3 Lecture Hours. Selected themes in the history of South Africa from the African Iron Age to the Apartheid regime; history of race relations in the 19th and 20th centuries and the rise of modern industrial state. **Prerequisite:** Junior or senior classification or approval of instructor. **Cross Listing:** HIST 346/AFST 346.

AFST 352/PHIL 352 Africana Philosophy

Credits 3. 3 Lecture Hours. Presentation of the seminal ideas of several influential Africana thinkers; recovery of the neglected traditions in which these thinkers locate themselves. **Prerequisite:** Junior or senior classification or approval of instructor. **Cross Listing:** PHIL 352/AFST 352.

AFST 353/PHIL 353 Radical Black Philosophies of Race and Racism

Credits 3. 3 Lecture Hours. Critical evaluation of white supremacy, colonialism and the modern construction of race; examination of the historical background for contemporary theories of race. **Prerequisite:** Junior or senior classification or approval of instructor. **Cross Listing:** PHIL 353/AFST 353.

AFST 357/HIST 357 Out of Africa: The Black Diaspora and the Modern World

Credits 3. 3 Lecture Hours. History and cultures of the peoples of the African Diaspora from the fourteenth through the nineteenth centuries; social, political, and economic impact on Africa, the Americas, Europe, and the Arab World; emphasis on race, gender, identity, and migration. **Prerequisite:** Junior or senior classification or approval of instructor. **Cross Listing:** HIST 357/AFST 357.

AFST 362/HIST 302 Women and War in the African Diaspora

Credits 3. 3 Lecture Hours. Case studies of women and war in the African diaspora in a wide historical and comparative context; social, economic, and cultural influence of war on women's lives; women as victims, combatants, and refugees; historical construction of race, ethnic and gender identity during times of conflict. **Prerequisite:** Junior or senior classification. **Cross Listing:** HIST 302.

AFST 377 Africana Women's History

Credits 3. 3 Lecture Hours. Black women's history from the precolonial era to the present; emphasis on the cultural, political, legal, economic, sexual, social, and religious factors that shaped their experiences across the African Diaspora and the world. **Prerequisites:** Junior or senior classification. **Cross Listing:** HIST 377 and WGST 377.

AFST 379/ENGL 379 Postcolonial Literatures

Credits 3. 3 Lecture Hours. Exploration of key terms, themes and debates within global literature written by colonized, occupied and diasporic peoples. **Prerequisites:** 3 credits of literature at the 200-level or above. **Cross Listing:** ENGL 379/AFST 379.

AFST 391 Africana Feminisms

Credits 3. 3 Lecture Hours. Exploration of a significant topic in feminist theory by and about women from Africa and/or its Diaspora, from various disciplinary perspectives and historical periods, and with application to societal debates and controversies. **Prerequisite:** Junior or senior classification.

AFST 393/ENGL 393 Studies in Africana Literature and Culture

Credits 3. 3 Lecture Hours. Literary movements, genres, groups of authors, topics or issues in the literature and culture of people of African descent. **Prerequisites:** 3 credits of literature at 200-level or above; junior or senior classification or approval of instructor. **Cross Listing:** ENGL 393/AFST 393.

AFST 398/FILM 398 Africana Cinema

Credits 3. 3 Lecture Hours. Overview of African cinema; historical survey of cinema from Africa and the African Diaspora; introducing films produced in several geographical regions and reflecting different filmmaking traditions. May be taken two times for credit. **Prerequisite:** Junior or senior classification or approval of instructor. **Cross Listing:** FILM 398/AFST 398.

AFST 400/GLST 400 Global Africa

Credits 3. 3 Lecture Hours. Exploration of African diaspora around the world; examination of the historic globality of Africa with a focus on Black artistic expression and its impact on global culture; investigation of Black cultures' interactions with music, literature, performing arts, visual arts, religions, and social movements. **Prerequisites:** Junior or senior classification or approval of instructor. **Cross Listing:** GLST 400/AFST 400.

AFST 401 Slavery in World History

Credits 3. 3 Lecture Hours. Comparative history of human slavery; slavery in the Ancient World, Asia, Africa; varieties of modern slavery in the New World since 1500; abolition of slavery and continuing forms of human bondage in the contemporary world. **Prerequisite:** Junior or senior classification. **Cross Listing:** ASIA 401 and HIST 401.

AFST 422 Race, Ethnicity, Crime and Justice

Credits 3. 3 Lecture Hours. Racial/ethnic disparities in criminal offending and victimization, as well as different experiences with law enforcement, judicial, and correctional agencies. **Prerequisites:** SOCI 220 or equivalent. **Cross Listing:** SOCI 422 and LMAS 422.

AFST 425/COMM 425 Communication and Black Freedom Dreams

Credits 3. 3 Lecture Hours. Examination of historical and contemporary communication practices of Black freedom activities, movements, and organizations in the United States and around the globe. **Prerequisite:** Junior or senior classification. **Cross Listing:** COMM 425/AFST 425.

AFST 430/RELS 430 African American Muslim Culture

Credits 3. 3 Lecture Hours. Exploration of popular culture and its impact on African American Muslims' intersectional identity formation and faith tradition through films, documentaries, readings, and lectures on and about Muslims emanating from enslaved narratives and the colonial period to the contemporary era. **Prerequisites:** Junior or senior classification, or approval of instructor. **Cross Listing:** RELS 430/AFST 430.

AFST 481 Seminar

Credits 3. 3 Lecture Hours. Comparative studies of slave societies in the modern world; history and analysis of African American feminism; comparative analyses of the social, political, and economic condition of African Americans and other African peoples of the diaspora. **Prerequisite:** AFST 302; junior or senior classification.

AFST 484 Internship

Credits 0 to 4. 0 to 4 Other Hours. Directed internship in a public or private organization to provide students with applied experience; opportunity to observe first hand issues and problems covered in Africana Studies courses; designed to enhance and clarify the student's career objectives. **Prerequisite:** Approval of instructor.

AFST 485 Directed Studies

Credits 0 to 3. 0 to 3 Other Hours. Selected fields of Africana Studies not covered in depth by other courses. Reports and extensive reading required. May be repeated for credit. **Prerequisite:** AFST 201; junior or senior classification; approval of instructor.

AFST 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in Africana Studies. May be repeated for credit.

AFST 491 Research

Credits 0 to 3. 0 to 3 Other Hours. Research conducted under the direction of a faculty member in Africana Studies. May be taken for a maximum of 18 hours credit. **Prerequisites:** AFST 201; junior or senior classification; and approval of instructor.

AGCJ - Ag Comm & Journalism (AGCJ)

AGCJ 105 Introduction to Agriculture and Life Sciences Communications

Credits 3. 3 Lecture Hours. Introduction to journalism and mass communication, its history, role in society, and unique role in agriculture; importance of journalism mass communication and the communication methods used in modern society; foundation for an understanding of agricultural news and information and how it is delivered to broad audiences. Only one of the following will satisfy the requirements for a degree: AGCJ 105 or JOUR 102.

AGCJ 281 Media Concepts in Agriculture and Life Sciences

Credits 3. 3 Lecture Hours. Preparation for the job and internship search process, practicing interview skills, and identification of the skills necessary to grow in and contribute to the agricultural communications and journalism profession; identification of challenges and opportunities facing professional agricultural communicators and journalists; identification and analysis of industry-wide issues; learning how to think critically about the news. **Prerequisite:** Grade of C or better in AGCJ 105 or concurrent enrollment.

AGCJ 285 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Directed study of selected issue in field of agricultural communications with emphasis on collection, synthesis and interpretation of information. **Prerequisite:** Approval of department advisor.

AGCJ 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Special topics in an identified area of agricultural development. May be repeated for credit. **Prerequisite:** Approval of department advisor.

AGCJ 291 Research

Credits 1 to 4. 1 to 4 Other Hours. Research conducted under the direction of faculty member in agricultural communications and journalism. May be repeated 2 times for credit. **Prerequisites:** Freshman or sophomore classification and approval of department advisor.

AGCJ 301 Media Production in Agriculture and Life Sciences

Credits 3. 3 Lecture Hours. Application of principles of media production in photography, videography, and podcasting within the context of agriculture and life sciences; exploration of pre-production planning and writing, production, post-production, camera techniques, equipment use, video editing and graphics, and sound editing; exploration of unique techniques used for media production in the complex fields of agriculture and life sciences. **Prerequisites:** Grade of C or better in AGCJ 105 and AGCJ 281.

AGCJ 306 Theory and Practice of Public Relations in Agriculture and Life Sciences

Credits 3. 3 Lecture Hours. Exploration of the unique relationships among agricultural stakeholders; topics include writing public relations objectives, strategies, tactics, and evaluation of public relations plans and strategies. **Prerequisites:** Grade of C or better in AGCJ 105 or concurrent enrollment.

AGCJ 307 Design for Agricultural Media

Credits 3. 2 Lecture Hours. 2 Lab Hours. Principles and practices of agricultural media design, including design and production of printed publications and graphics; computer assisted design and production of media pieces. Required for AGCJ majors and minors. **Prerequisite:** Junior or senior classification.

AGCJ 308 Agricultural Photography

Credits 3. 2 Lecture Hours. 2 Lab Hours. Develop knowledge of photography, editing software, and composition techniques used in the agricultural communications field; develop photography and photo editing skills to a satisfactory level as demonstrated by performance on assignments and exams. **Prerequisite:** Junior or senior classification.

AGCJ 309 Data Storytelling in Agriculture & Life Sciences Communications

Credits 3. 3 Lecture Hours. Data Storytelling in Agriculture & Life Sciences Communications. Fundamentals of effective data-driven storytelling; detection and articulation of the stories behind datasets; communication in visual, oral, and written contexts for various audiences and publics; use of data analysis, evaluation, and other tools to create media stories in the context of agricultural and life sciences.

Prerequisites: Grade of C or better in AGCJ 281 and AGCJ 311.

AGCJ 311 Introduction to Research in Agriculture and Life Sciences Communications

Credits 3. 3 Lecture Hours. Explanation of research and its ethics; development of research questions for audience, journalism and communications research; analysis of research designs and methods use of journalism, audience and communications research; topics include describing data collection methods and strategies, including interviews, observations, focus groups, surveys and content analyses; identification of research problems. **Prerequisites:** Grade of C or better in AGCJ 105 and AGCJ 281.

AGCJ 312 Editing in Agriculture and Life Sciences

Credits 3. 2 Lecture Hours. 2 Lab Hours. Principles and practices of editing for agricultural and technical audiences including improving and tightening copy; writing headlines, titles, and subheads; photo editing and captions, graphics and layout; print, broadcast, interactive and other media. **Prerequisites:** Grade of C or better in AGCJ 105; junior or senior classification.

AGCJ 313 Media Writing in Agriculture and Life Sciences I

Credits 3. 2 Lecture Hours. 2 Lab Hours. Newsgathering, writing, editing and ethics for all types of media used in agriculture and life sciences communications. **Prerequisites:** Grade of C or better in AGCJ 312.

AGCJ 314 Media Writing in Agriculture and Life Sciences II

Credits 3. 2 Lecture Hours. 2 Lab Hours. Examination of interpretative news gathering and writing for all types of media; basic media law and ethics, interviewing skills with assigned practice writing about agriculture; science and technology topics. **Prerequisites:** Grade of C or better in AGCJ 313; junior or senior classification.

AGCJ 355 Digital Storytelling in Agriculture and Life Sciences I

Credits 3. 3 Lecture Hours. Identification and pitching of digital story ideas in the agriculture and life sciences; recognition of technical and aesthetic aspects of visual design and storytelling that appeal to scientific and non-scientific audiences; design and creation of digital stories for dissemination through broadcast channels; composition of compelling and engaging stories for scientific and non-scientific audiences; management of digital storytelling projects. **Prerequisites:** Grade of C or better in AGCJ 301 and AGCJ 313.

AGCJ 366 Radio Broadcasting

Credits 3. 2 Lecture Hours. 2 Lab Hours. Survey of American broadcasting, development, and impact; influence on society, basic principles, mass communication theory, station operating programming, advertising, rating services, regulation, and censorship; in-depth analysis of current issues and developments. **Prerequisite:** Junior or senior classification.

AGCJ 404 Science Communications and Public Engagement in Agriculture and Life Sciences

Credits 3. 3 Lecture Hours. Integration of science communications experience in agriculture and life sciences research, education, and extension; overview of how to communicate effectively about science, technology, engineering, and math; application of the basics of science communication; examination of conducting science communication research and becoming an effective science influencer. **Prerequisite:** Grade of C or better in AGCJ 313 or approval of instructor.

AGCJ 405 Design and Publication in Agriculture and Life Sciences

Credits 3. 3 Lecture Hours. 0 Lab Hours. Examination of how to design, publish, and disseminate a print magazine; includes writing a journalism feature story for the print publication; designing and selling advertising for the publication. May be taken two times for credit. **Prerequisite:** Grade of C or better in AGCJ 312 and AGCJ 313.

AGCJ 406 Public Relations and Campaigns in Agriculture and Life Sciences

Credits 3. 3 Lecture Hours. Analysis of agricultural public relations campaign; topics include examination of public relations case studies and methods including writing public relations plans for agricultural entities, production of public relations components and evaluation of public relations objectives, strategies and tactics. **Prerequisites:** Grade of C or better in AGCJ 306 and AGCJ 313.

AGCJ 408 Advertising Copy and Design in Agriculture and Life Sciences

Credits 3. 2 Lecture Hours. 2 Lab Hours. Examination of creative aspects of advertising strategy, copywriting, typography and design in a variety of visual media; topics include learning to make and evaluate advertising.

Prerequisites: Grade of C or better in AGCJ 313.

AGCJ 410 Risk Communications in Science and Society

Credits 3. 3 Lecture Hours. Expansion of understanding of risk communications and public-focused risk communication related to environmental, agricultural and public health contexts; examination of how risk is defined, assessed, quantified, perceived, and communicated; application of best practices of risk communication to crisis and risk-related events. **Prerequisites:** Grade of C or better in AGCJ 306 and AGCJ 313.

AGCJ 411 Advanced Research in Agriculture and Life Sciences Communications

Credits 3. 3 Lecture Hours. Development of research hypothesis, questions, and variables for audience and communications research; implementation of qualitative and quantitative research designs; collection, analysis, visualization, and reporting of qualitative and quantitative data; participation in research activities to apply research methods and analyses guided by sociological, psychological, and anthropological theories. **Prerequisite:** Grade of C or better in AGCJ 311; junior or senior classification.

AGCJ 413 Emerging Media in Agriculture and Life Sciences

Credits 3. 3 Lecture Hours. Examination of the use of popular emerging media in agriculture to communicate; exploration of building and marketing a brand online; understanding the strategy behind the posts and other communications; creation of emerging media communications strategies for academic or business entities that may be implemented upon completion of course. **Prerequisite:** Grade of C or better in AGCJ 313; junior or senior classification.

AGCJ 455 Digital Storytelling in Agriculture and Life Sciences II

Credits 3. 3 Lecture Hours. Application of advanced storytelling, shooting, and editing techniques for digital storytelling within the context of agriculture and life sciences; building of visual narratives using a combination of still images, HD video, ambient audio, and natural voices that appeal to scientific and non-scientific audiences; application of the journalistic standards of truth, fairness and accuracy with the tools and techniques of digital storytelling to tell compelling stories in the agriculture and life sciences. **Prerequisites:** Grade of C or better in AGCJ 301 and AGCJ 355.

AGCJ 481 Seminar

Credits 3. 3 Other Hours. Identification of communication-related issues; examination of the effects of media on the dissemination of scientific information and consumers' behavioral change; write, design, create and distribute communications products; exposure to work in teams. **Prerequisites:** Grade of C or better in AGCJ 314; senior classification.

AGCJ 485 Directed Studies

Credits 1 to 4. 1 to 4 Lecture Hours. Directed individual study of selected problems in agricultural communications, communication methods and the communication profession with emphasis on collection, analysis and presentation of information. **Prerequisites:** Junior or senior classification; approval of department advisor.

AGCJ 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Special topics in an identified area of agricultural communications and journalism. May be repeated for credit. **Prerequisite:** Junior or senior classification.

AGCJ 491 Research

Credits 1 to 4. 1 to 4 Other Hours. Research conducted under the direction of faculty member in agricultural communications and journalism. May be repeated 3 times for credit. Registration in multiple sections of this course are possible within a given semester provided that the per semester credit hour limit is not exceeded. **Prerequisites:** Junior or senior classification and approval of department advisor.

AGCJ 494 Internship

Credits 1 to 6. 1 to 6 Other Hours. Supervised internship and independent study related to the student's professional interest. **Prerequisites:** Junior or senior classification; approval of department advisor.

AGEC - Agricultural Economics (AGEC)

AGEC 101 Concepts in Agricultural Economics - First Year Experience

Credits 0-1. 0-1 Lecture Hours. 0 Lab Hours. 0 Other Hours. Discussion-based designed to connect first-year AGECE and AGBL students with peers, faculty and staff while providing an overview of the experiential learning and high impact opportunities available in these majors; highlights key issues at Texas A&M University, in agriculture, and in the field of Agricultural Economics.

AGEC 105 Introduction to Agricultural Economics

Credits 3. 3 Lecture Hours. (AGRI 2317) Introduction to Agricultural Economics. Characteristics of our economic system and basic economic concepts; survey of the farm and ranch firm and its organization and management; structure and operation of the marketing system; functional and institutional aspects of agricultural finance; government farm programs.

AGEC 117 Critical Thinking and Decision Making in Agricultural Economics

Credit 1. 1 Other Hour. An introductory seminar in the Department of Agricultural Economics; emphasis on resources and opportunities available in the department; awareness and understanding of professional development; emphasis on writing as a critical communication skill. **Prerequisite:** AGECE 105, ECON 203, or grade of C or better in ECON 202; ENGL 103 or ENGL 104; Agricultural Economics and Agribusiness majors.

AGEC 216 Fundamentals of the AgriFood Sales Industry

Credit 1. 1 Lecture Hour. Fundamentals of professional business to business sales in AgriFood firms; opportunities to interact with successful salespeople in AgriFood firms; focus on career development, exploration of undergraduate internships in professional sales and identification of basic sales theories currently in use in AgriFood firms; learning to network extensively with AgriFood industry professionals and developing a mentor relationship.

AGEC 217 Fundamentals of Agricultural Economics Analysis

Credits 3. 2 Lecture Hours. 2 Lab Hours. Relates contemporary agribusiness issues to economic and financial management, illustrating their integration toward pragmatic applications in the agricultural industry; lab focuses on the integration of mathematics and economics with computer skills directed toward spreadsheets, databases, web pages, and communications software. **Prerequisites:** Grade of C or better in AGECE 105; grade of C or better in AGECE 117 or concurrent enrollment; grade of C or better in MATH 141 or MATH 168 or MATH 140; grade of C or better in MATH 142; sophomore or junior agricultural economics or agribusiness majors; or approval of department head.

AGEC 223 Establishing Agribusiness Entrepreneurship Networks I

Credit 1. 1 Lecture Hour. Introduction to successful entrepreneurs and other professionals, identifying suggested strategies and tactics in starting and sustaining viable rural and metropolitan business ventures; emphasis on importance of and how to develop relationships with a broad spectrum of mentors. **Prerequisite:** Freshman or sophomore classification.

AGEC 285 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Directed study of selected problems in agricultural economics. **Prerequisite:** AGECE 105 or concurrent enrollment; freshman or sophomore classification in agricultural economics, agribusiness, or approval of instructor and department head; 2.5 GPR in major, overall, and CBK courses, if applicable; see an academic advisor in Room 214 AGLS.

AGEC 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of agricultural economics. May be repeated for credit. **Prerequisites:** Freshman or sophomore classification and approval of department head.

AGEC 291 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in agricultural economics. May be repeated 3 times for credit. **Prerequisites:** Freshman or sophomore classification and approval of department head; see an academic advisor in Room 214 AGLS.

AGEC 314 Marketing Agricultural and Food Products

Credits 3. 3 Lecture Hours. Operations involved in movement of agricultural commodities from farmer to consumer via several intermediaries; functions involve buying, selling, transportation, storage, financing, grading, pricing and risk bearing; agricultural supply chain or value chain is studied in detail; marketing aspects of commodities and differentiated goods. **Prerequisites:** AGECE 105 or 3 hours of economics; and junior or senior classification.

AGEC 315 Food and Agricultural Sales

Credits 3. 3 Lecture Hours. Principles of professional sales techniques used in food and agricultural firms; develop a professional sales presentation; study current agribusiness industry professional salespersons. **Prerequisite:** Junior or senior classification.

AGEC 316 Building Customer Relationships in AgriFood Selling

Credits 3. 3 Lecture Hours. Use of emotional intelligence factors in developing business-to-business customer relationships for AgriFood, real estate, finance and other industrial products and services; developing customer relationships with regard to the unique aspects of technical products and services in these industries. **Prerequisite:** Grade of C or better in AGECE 315; junior or senior classification; approval of instructor.

AGEC 317 Economic Analysis for Agribusiness Management

Credits 3. 3 Lecture Hours. Quantitative methods used to address managerial problems, specifically calculus-based optimization, marginal analysis, elasticities, statistical and forecasting techniques, linear programming, and risk analysis; emphasis on theoretical aspects and applied analysis of managerial problems faced by agricultural firms. **Prerequisites:** AGECE 217; ECON 323; BUSN 203 for agribusiness majors or STAT 301, 302, or 303 for agricultural economics majors; junior or senior classification; agricultural economics, agribusiness majors only; or approval of department head.

AGEC 324 Agribusiness Entrepreneurship – Budgeting

Credits 3. 2 Lecture Hours. 2 Lab Hours. Case study approach to demonstrate a process for evaluating the economic feasibility of a single-enterprise rural or metropolitan business venture; relevant production, marketing and financing costs, in combination with capital ownership and overhead costs; computer spreadsheets including attention to deterministic sensitivity analyses; computer capabilities are essential. **Prerequisites:** Grade of C or better in AGECE 105 or ECON 202; grade of C or better in ACCT 209 or ACCT 229; junior or senior classification or approval of instructor.

AGEC 325 Principles of Farm and Ranch Management

Credits 3. 3 Lecture Hours. 0 Lab Hours. Agribusiness managerial decision making and analysis in different market environments; emphasis is on profit maximization; focuses on using computerized methods for evaluating management alternatives for farming and ranching problem situations. **Prerequisites:** AGECE 105 or ECON 202; junior or senior classification; knowledge of Excel.

AGEC 330 Financial Management in Agriculture

Credits 3. 3 Lecture Hours. Principles of financial management of farms, ranches, and other agribusiness firms; financial statements, financial statement analysis, time value of money, investment analysis, firm growth, risk management, credit analysis and best business management practices. **Prerequisites:** AGECE 105 or 3 hours of economics; ACCT 209 or ACCT 229; and junior or senior classification.

AGEC 340 Agribusiness Management

Credits 3. 3 Lecture Hours. Survey of management practices using case studies to evaluate management issues in agribusiness firms in the context of the four functions of management such as planning, organizing, leading and controlling; emphasis on best practices throughout the food marketing chain; examination of how businesses and business executives succeed; application of previously learned knowledge in making business decisions similar to those encountered in professional careers. **Prerequisites:** AGECE 105 or 3 hours of economics; and junior or senior classification.

AGEC 344 Food and Agricultural Law

Credits 3. 3 Lecture Hours. Legal principles relevant to the farm family and business; characteristics of legal decisions and rules on property rights, and fencing laws; analysis of global, national, state, and local legal issues in contracts, torts, water, pollution, and natural resources. **Prerequisite:** Junior or senior classification.

AGEC 350 Environmental and Natural Resource Economics

Credits 3. 3 Lecture Hours. Inspection of issues such as environmental degradation, population growth, recycling, water use and depletion, natural habitat protection, water and air pollution, acid deposition, fishery management, and global warming using economically derived principles and tools. **Prerequisite:** Junior or senior classification.

AGEC 401 Global Agri-Industries and Markets - Study Abroad

Credits 3. 3 Lecture Hours. Understanding agriindustries and markets; analysis of production; importing; exporting; provides classroom experience with an exposure to a variety of global cultures in an international setting. May be taken three times for credit. **Prerequisites:** AGECE 105 or 3 hours of economics; junior or senior classification or approval of department head.

AGEC 402 Survey of International Agricultural Economics: Study Abroad

Credits 3. 3 Lecture Hours. Examine, from an international setting, the shape of international agriculture; how culture, history, politics and geography in foreign countries affect the production and management of agricultural products; agricultural policy formation; countries' natural resources and competitive strategies; may be taken 3 times for credit. **Prerequisites:** AGECE 105 or 3 hours of economics; junior or senior classification or approval of department head.

AGEC 408 Economics of Foreign Intervention, Conflict and Development

Credits 3. 3 Lecture Hours. Economic models of conflict and development; dynamic socio-political models of conflict; conflict and vulnerable groups; quantitative techniques and methods in conflict and development research; interaction between poverty, natural resources and conflict in developing countries; role of multilateral, bilateral, and strategic stakeholders in conflict resolution and promotion of economic development. **Prerequisites:** AGECE 105 or ECON 202 or equivalent; ENGL 104; or approval of instructor.

AGEC 413 Agricultural Cooperatives

Credits 3. 3 Lecture Hours. Historical development and principles of cooperative associations in our economic system; organizational and operational aspects of cooperatives; legal considerations, financing, management, and member relations; and future role of cooperatives. **Prerequisites:** AGECE 105; AGECE 314; and junior or senior classification.

AGEC 414 Agribusiness and Food Market Analysis

Credits 3. 3 Lecture Hours. Application of economic and marketing principles to contemporary food and agribusiness marketing; practical marketing management for agribusiness firms; market analysis; and marketing strategy and planning as related to the emerging trends in the global food and agribusiness sector of the economy. **Prerequisites:** AGECE 317; MKTG 321; and junior or senior agribusiness majors only.

AGEC 415 Food and Agribusiness Strategic Market Planning

Credits 0 to 3. 0 to 3 Lecture Hours. Development of a market plan targeting the food and agribusiness market sector; market analysis; business propositions; action plans for executing the 4 P's (Product, Price, Place, Promotion); monitoring and measurement. **Prerequisites:** AGECE 314 or MKTG 321 or MKTG 409; AGECE 315; junior or senior classification or approval of instructor.

AGEC 416 Sales Management and Advanced Techniques in Professional Technical Selling for AgriFood Firms

Credits 3. 3 Lecture Hours. Principles and practices of sales management in food and agricultural firms; focus on business-to-business selling situations, theoretical and practical information about sales management for AgriFood firms; application of principles. **Prerequisites:** Grade of C or better in AGECE 216, AGECE 315, and AGECE 316.

AGEC 420 Food Security, Climate and Conflict

Credits 3. 3 Lecture Hours. Economic models of food production and consumption in conflict regimes; the micro-economics of violence; the dynamic relationships of climate and agricultural production; potential impacts of climate change on food and socio-political security; food security among insurgent groups; conflict resistant food systems; and the shifting relationships between poor and rich nations in relationship to climate, food and conflict. **Prerequisites:** AGECE 105 or ECON 202, junior or senior classification, or approval of instructor.

AGEC 422 Land Economics

Credits 3. 3 Lecture Hours. Economic, institutional, and physical factors involved in the use and control of natural resources; includes elements of introductory land economics as a discipline, economic foundations of land economics, institutional influences on land use, and the effects of public policy on land use. **Prerequisites:** AGECE 105 or 3 hours economics; and junior or senior classification.

AGEC 423 Establishing Agribusiness Entrepreneurship Networks II

Credit 1. 1 Lecture Hour. Engagement opportunities with successful agri/metropolitan entrepreneurs and other professionals, focusing on strategies and tactics for starting and sustaining viable rural and metropolitan business ventures; emphasis on importance of, and how to, develop relationships with a broad spectrum of mentors. **Prerequisites:** Junior or senior classification or approval of instructor. May not enroll in AGECE 223 and AGECE 423 during the same semester.

AGEC 424 Agribusiness Entrepreneurship – Economic Analysis

Credits 3. 2 Lecture Hours. 2 Lab Hours. Strategic planning regarding economic feasibility of a single-enterprise rural or metropolitan business venture; emphasis on processes for developing a comprehensive enterprise budget and construction and evaluation of risk management alternatives; exchanges with “real-world” entrepreneurs, financial experts and other management personnel; computer capabilities essential. **Prerequisites:** Grade of C or better in AGECE 105 or ECON 202; grade of C or better in ACCT 209 or ACCT 229; junior or senior classification or approval of instructor.

AGEC 425 Agribusiness Entrepreneurship – Financial Analysis

Credits 3. 2 Lecture Hours. 2 Lab Hours. Strategic planning regarding rural and metropolitan business ventures; emphasis on processes for developing comprehensive economics and financial prospectuses, including enterprise budgets, risk management planning, cash flow budgeting, net worth statements, income budgets, reconciliation statements and shock analysis; mentoring exchanges with “real-world” entrepreneurs, financial experts and other management personnel. **Prerequisites:** AGECE 424; and junior or senior classification.

AGEC 429 Agricultural Policy

Credits 3. 3 Lecture Hours. Analysis of the causes, nature, and effects of government participation in agriculture; and interrelationship of the American agriculture and agribusiness sector with the political and economic system, public administration, and interest group representation. **Prerequisites:** AGECE 105, ECON 202 or ECON 203; ENGL 103 or ENGL 104; and junior or senior classification.

AGEC 430 Macroeconomics of Agriculture

Credits 3. 3 Lecture Hours. Basic functioning of U.S. economy and relationship to agriculture; the differential effects of macroeconomic policy on disposable income, interest rates, unemployment, inflation and exchange rates; impact on agricultural commodity prices, farm input costs, net farm income, farmland values and key financial indicators. **Prerequisites:** AGECE 105 or 3 hours of economics; AGECE 317 or concurrent enrollment; AGECE 429; AGECE 330 or FINC 341 or FINC 409; and junior or senior classification.

AGEC 431 Cases in Agribusiness Finance

Credits 3. 3 Lecture Hours. Financial management of agribusiness firms; advanced topics in financial statement analysis, liquidity management, investment analysis, and capital structure illustrated through examination of agribusiness cases. **Prerequisites:** AGECE 317; AGECE 340; FINC 341; and junior or senior agribusiness majors only.

AGEC 432 Rural Real Estate and Financial Analysis

Credits 3. 3 Lecture Hours. Advanced topics in investment analysis; financial intermediation in agriculture; real estate markets and market analysis; and appraisal valuation. **Prerequisites:** AGECE 317 (waived for nonmajors); AGECE 330 or FINC 341 or FINC 409; AGECE 422; and junior or senior classification.

AGEC 434 Rural Financial Markets and Financial Planning

Credits 3. 3 Lecture Hours. Organization, structure, conduct and regulation of lending institutions serving commercial agriculture and rural borrowers; borrower financial statement analysis, business forecasting, investment analysis and loan application process; lender credit application underwriting standards, credit scoring and loan decision making process; agricultural loan portfolio analysis. **Prerequisites:** ACCT 209 or ACCT 229; ACCT 210 or ACCT 230; AGECE 330 or FINC 341 or FINC 409; junior or senior classification.

AGEC 440 Agribusiness Strategic Analysis

Credits 3. 3 Lecture Hours. Strategic management and economic principles for the agribusiness system; problem recognition and applied managerial/economic decision making with related considerations in marketing, production, or finance for agribusiness firms. **Prerequisites:** AGECE 317; AGECE 340; MGMT 363; and junior or senior agribusiness majors only.

AGEC 447 Food and Agricultural Price Analysis

Credits 3. 3 Lecture Hours. Factors influencing the level of food and agricultural prices; price trends and seasonal variation; methods of forecasting demands and prices; and futures trading. **Prerequisites:** AGECE 314; AGECE 317; and junior or senior classification.

AGEC 448 Agricultural Commodity Futures

Credits 3. 3 Lecture Hours. Activities of commodity futures exchanges; the mechanics of trading futures contracts; the use of futures trading for hedging and forward pricing; and options, basis behavior, and hedging strategies for selected commodities. **Prerequisites:** AGECE 105 or 3 hours of economics; AGECE 314; AGECE 317 or concurrent enrollment; and junior or senior classification; or approval of department head.

AGEC 452 International Trade and Agriculture

Credits 3. 3 Lecture Hours. Changing role of U.S. agriculture in a dynamic world economy; national and international policies and institutions affecting agriculture; and exchange rates, tariffs, and non-tariff barriers. **Prerequisites:** AGECE 105 or 3 hours of economics; and junior or senior classification.

AGEC 453 International Agribusiness Marketing

Credits 3. 3 Lecture Hours. Basic competencies in international marketing of agri-foods; and market entry, pricing, payment, finance, and promotion. **Prerequisites:** AGECE 105 or 3 hours of economics; and junior or senior classification.

AGEC 460 Cross-Cutting Issues in Agricultural Economics

Credits 0 to 3. 0 to 3 Lecture Hours. Examination of economic theory and its history; emphasis on the areas of agricultural business, finance, macroeconomics, management, marketing, microeconomics, quantitative analysis, resources, and economics policy; emphasis on the ability to properly analyze economic problems. **Prerequisites:** AGECE 317; AGECE 314 or MKTG 321 or MKTG 409; AGECE 330 or FINC 341 or FINC 409; AGECE 429; agricultural economics and agribusiness majors only; junior or senior classification or approval of instructor.

AGEC 481 Ethics in Agribusiness and Agricultural Economics

Credit 1. 1 Lecture Hour. Examination of the principals of ethical business behavior; context created through assigned readings, guest speakers from various law enforcement branches and private industry; written reports about personal experiences relative to this context; attention given to establishing personal principles for an ethical business career.

Prerequisites: AGECE 217; senior classification; agricultural economics or agribusiness majors only.

AGEC 484 Internship

Credits 0 to 6. 0 to 6 Other Hours. Supervised experience program conducted in the area of the student's interest in agricultural economics and agribusiness. May be taken two times. **Prerequisite:** See an advisor in Room 214 AGLS Building.

AGEC 485 Directed Studies

Credits 0 to 6. 0 to 6 Other Hours. Special problems not covered by other courses. Content will depend upon problem studied. **Prerequisite:** See an advisor in Room 214 AGLS Building.

AGEC 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of agricultural economics. May be repeated for credit. **Prerequisite:** Junior or senior classification.

AGEC 491 Research

Credits 0 to 6. 0 to 6 Other Hours. Research conducted under the direction of faculty member in agricultural economics. May be repeated 3 times for credit. Registration in multiple sections of this course are possible within a given semester provided that the per semester credit hour limit is not exceeded. **Prerequisites:** Junior or senior classification and approval of department head; see an advisor in Room 214 AGLS Building.

AGEC 495 International Agribusiness and Industry Practices

Credits 0 to 3. 0 to 3 Lecture Hours. Exposure to agribusiness operations in a international cross-cultural context and production operations, marketing and distribution of agriculture products from around the world; quantitative methods used for engaging in critical thinking about issues confronting the agribusiness industry. **Prerequisite:** AGECE 105 and junior classification.

AGLS - Ag & Life Sciences (AGLS)

AGLS 101 Modern Agricultural Systems and Renewable Natural Resources

Credit 1. 1 Lecture Hour. (AGRI 1131) Modern Agricultural Systems and Renewable Natural Resources. An introduction to modern agriculture and the natural, human and scientific resources upon which it depends. **Prerequisite:** Freshman or sophomore classification.

AGLS 125 Life Sciences Learning Community I

Credits 0-1. 0-1 Lecture Hours. Development of personal and professional competencies in the life sciences: learning styles, leadership skills, appreciation for the arts; ethics in science, problem solving skills, experimental design, data gathering and interpretation, introduction to life sciences literature, critical analysis skills, and the connectivity between life science disciplines. May be taken two times for credit. **Prerequisites:** Freshman classification and approval of instructor.

AGLS 225 Life Sciences Learning Community II

Credits 0 to 6. 0 to 6 Lecture Hours. Continuation of the development of personal and professional competencies in the life sciences: ethics in science, problem solving skills, experimental design, data gathering and interpretation, examination of life sciences literature, critical analysis skills, and the connectivity between life science disciplines. May be taken two times for credit. **Prerequisites:** Approval of instructor.

AGLS 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of agriculture and life science. May be repeated for credit. **Prerequisite:** Freshman or sophomore.

AGLS 292 Cooperative Education in Agriculture

Credits 2. 4 Other Hours. Educational work assignment by a student in the field of his or her career interest and course of study; supervision of the student by the cooperating employer and the instructor; a technical report, approved by the instructor, on a related subject area required. **Prerequisite:** Approval of the college coordinator of cooperative education.

AGLS 301 College of Agriculture and Life Sciences Study Abroad

Credits 1 to 18. 1 to 18 Other Hours. For students in approved programs abroad. May be repeated for credit. **Prerequisites:** Admission to approved program and approval of academic dean.

AGLS 392 Cooperative Education in Agriculture

Credits 2. 40 Other Hours. Educational work assignment by a student in the field of his or her career interest and course of study. Supervision of the student by the cooperating employer and the instructor; a technical report, approved by the instructor, on a related subject area required.

Prerequisite: AGLS 292.

AGLS 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of agricultural and life sciences.

AGLS 492 Cooperative Education in Agriculture and Natural Resource Policy

Credits 0 to 3. 0 to 3 Other Hours. Educational work assignment by a student in the field of his or her career interest and course of study; supervision of the student by the cooperating employer and the instructor; a technical report, approved by the instructor, on a related subject area required. **Prerequisites:** AGLS 392 or approval of Agricultural and Natural Resources Policy Internship Program staff.

AGSC - Agricultural Science (AGSC)

AGSC 285 Directed Studies

Credits 1 to 4. 1 to 4 Lecture Hours. Directed individual study of selected problems in agricultural science with emphasis on collection, analysis and presentation of information. May be repeated for credit. **Prerequisite:** Approval of instructor.

AGSC 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Special topics in an identified area of agricultural science. May be repeated for credit. **Prerequisite:** Approval of department head.

AGSC 291 Research

Credits 1 to 4. 1 to 4 Other Hours. Research conducted under the direction of faculty member in agricultural science. May be repeated 2 times for credit. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

AGSC 302 Teaching School-Based Agricultural Education & Clinical Professional Experience

Credits 4. 3 Lecture Hours. 3 Lab Hours. Teaching School-Based Agricultural Education & Clinical Professional Experience. Foundations of school-based agricultural education (SBAE) teaching; an overview of preparing teachers for a changing world including knowledge of learners, subject matter and teaching within the context of agricultural science; clinical field experience for teaching agricultural science in public schools of Texas. **Prerequisites:** Junior or senior classification.

AGSC 305 Management of Supervised Agricultural Experiences

Credits 3. 3 Lecture Hours. Overview of supervised agricultural experiences (SAEs) and content that can be used in the secondary agricultural science program; engagement in SAE programs; management practices for SAE projects including record keeping and student reports. **Prerequisite:** Junior or senior classification.

AGSC 363 Teaching Skills in Agricultural Metal Technology

Credits 3. 2 Lecture Hours. 2 Lab Hours. Instructional design using science, technology, engineering and math and computer aided design (CAD); teaching methods in agricultural metal technology and fabrication; metalworking skills, electric arc welding, oxyfuel torch and plasma arc.

Prerequisite: Junior or senior classification or approval of instructor.

AGSC 373 Managing Safety in the Agricultural Science Program

Credits 3. 2 Lecture Hours. 2 Lab Hours. Safety principles and procedures, methods of teaching and motivating students in agricultural mechanics; design for those preparing to teach agricultural science in Texas public schools. **Prerequisite:** Junior or senior classification; grade of C or better in AGSC 302.

AGSC 380 Workshop in Agricultural Science

Credits 1 to 4. 1 to 4 Other Hours. The study, understanding and solution of human-agricultural problems based on theory learned in the classroom, library, laboratory and fieldwork completed by individuals and teams. **Prerequisite:** Junior or senior classification.

AGSC 383 Teaching Agricultural Mechanics

Credits 3. 2 Lecture Hours. 3 Lab Hours. Methods of teaching and motivating students in agricultural mechanics; designed for students preparing to teach agricultural science in Texas public schools. **Prerequisite:** Grade of C or better in AGSC 302.

AGSC 402 Designing Instruction for Secondary Agricultural Science Programs

Credits 3. 2 Lecture Hours. 3 Lab Hours. Theory and practice in designing instruction for secondary agricultural science programs including effective planning and delivery methods; designed for students preparing to teach agricultural science in Texas public schools. **Prerequisite:** Grade of C or better in AGSC 302; grade of C or better or concurrent enrollment in AGSC 405, AGSC 373, AGSC 383, and INST 210.

AGSC 405 Facilitating Complete Secondary Agricultural Science Programs

Credits 3. 2 Lecture Hours. 3 Lab Hours. Theory and practice in facilitating secondary agricultural science programs: includes classroom instruction, supervised experience, and youth leadership development; designed for students preparing to teach agricultural science in Texas public schools. **Prerequisite:** Grade of C or better in AGSC 302; grade of C or better or concurrent enrollment in AGSC 402, AGSC 373, AGSC 383, and INST 210.

AGSC 425 Learner Centered Instruction in Agricultural Science

Credits 3. 3 Lecture Hours. Preparing curriculum materials for secondary agricultural science and adult education programs. **Prerequisites:** Grade of C or better in AGSC 402 and AGSC 405 and concurrent enrollment in AGSC 436, AGSC 481, and AGSC 484.

AGSC 436 Professional Teaching Internship in AGSC

Credits 6. 2 Lecture Hours. 12 Lab Hours. Planning for and teaching secondary agricultural science in selected high schools in Texas; includes 12 weeks of professional teaching experience under the guidance of a university supervisor and a cooperating teacher in the school. **Prerequisites:** Grade of C or better in AGSC 402 and AGSC 405 and concurrent enrollment in AGSC 425, AGSC 481, and AGSC 484.

AGSC 481 Seminar

Credit 1. 1 Lecture Hour. Review of current literature and research as related to program development in light of legislation and policies affecting education in agriculture. **Prerequisite:** Grade of C or better in AGSC 402 and AGSC 405.

AGSC 484 Field Experience

Credits 1 to 6. 1 to 6 Other Hours. An on-the-job supervised experience program conducted in the area of the student's specialization. **Prerequisites:** Grade of C or better in AGSC 402 and AGSC 405 and concurrent enrollment in AGSC 425, AGSC 436, and AGSC 481.

AGSC 485 Directed Studies

Credits 1 to 4. 1 to 4 Lecture Hours. Directed individual study of selected problems in agricultural science with emphasis on collection, analysis and presentation of information. May be repeated for credit. **Prerequisite:** Junior or senior classification; approval of instructor.

AGSC 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Special topics in an identified area of agricultural science. May be repeated for credit. **Prerequisite:** Approval of department head.

AGSC 491 Research

Credits 1 to 4. 1 to 4 Other Hours. Research conducted under the direction of faculty member in agricultural science. May be repeated 3 times for credit. Registration in multiple sections of this course are possible within a given semester provided that the per semester credit hour limit is not exceeded. **Prerequisites:** Junior or senior classification; approval of instructor.

AGSM - Agricultural Systems Mgmt (AGSM)

AGSM 105 The World Has a Drinking Problem - Global Water Scarcity

Credits 3. 3 Lecture Hours. Study of how drinking water maintains and improves human health, availability of fresh water throughout the world; includes how population changes, cultural influences, and political power affect quality, distribution and cost of water for children, rural communities and under-represented peoples.

AGSM 125 Introduction to Agricultural Systems Management

Credit 1. 2 Lab Hours. Introduction to technical management of agricultural systems using management projects presented by agricultural managers from industry; problem definition, information search, idea generation and development of management solutions. **Prerequisite:** Freshman or sophomore classification or approval of instructor; majors only.

AGSM 201 Agricultural Energy and Power Systems

Credits 3. 2 Lecture Hours. 2 Lab Hours. (AGRI 2301) Agricultural Energy and Power Systems. A study of the types of power and energy sources used in agricultural equipment and systems; management considerations for selecting, operating and maintaining internal combustion engines, electric equipment and motors, and renewables as power sources.

AGSM 284 Internship

Credits 0. 0 Lecture Hours. 0 Lab Hours. 0 Other Hours. No Credit. Practical experience working in a professional agricultural systems management setting. May be taken three times. **Prerequisite:** Freshman or sophomore classification; approval of the instructor.

AGSM 285 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Selected problems in any phase of agricultural systems management; credit and specific content dependent upon background, interest, ability and needs of student enrolled; individual consultations and reports required. **Prerequisites:** Freshman or sophomore classification; approval of department head.

AGSM 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of agricultural systems management. May be repeated for credit. **Prerequisite:** Approval of instructor.

AGSM 291 Research

Credits 0 to 3. 0 to 3 Other Hours. Research conducted under the direction of faculty member in agricultural systems management. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

AGSM 301 Systems Analysis in Agriculture

Credits 3. 3 Lecture Hours. Operations research and systems theory applied to management problems in food and agricultural industries; linear programming, queuing theory, simulation and critical path method; provides the knowledge and computer skills to better manage resources for the evolving agricultural industries. **Prerequisites:** Grade of C or better in MATH 140 or MATH 168 and MATH 142 or MATH 151.

AGSM 310 Agricultural Machinery Management

Credits 3. 2 Lecture Hours. 2 Lab Hours. Selection of a matched complement of power units and machines for farming operations; consider constraints such as crops, season, weather, personnel and capital; apply systems techniques such as linear programming, optimization, queuing theory and inventory models; utilize available software programs and learn to develop electronic spreadsheets and other customized software. **Prerequisites:** AGSM 201; grade of C or better in AGSM 301 or concurrent enrollment; grade of C or better in PHYS 201 or PHYS 206.

AGSM 315/FSTC 315 Food Process Engineering Technology

Credits 3. 2 Lecture Hours. 2 Lab Hours. Elementary mechanics, physical and thermal properties of food and processing materials, heat transfer, mass and energy balances, psychrometrics (properties of air), insulation. **Prerequisites:** Grade of C or better in PHYS 201 or PHYS 206, or approval of instructor. **Cross Listing:** FSTC 315/AGSM 315.

AGSM 325 Agri-Industrial Applications of Electricity

Credits 3. 2 Lecture Hours. 2 Lab Hours. Elements of electric current generation and transmission, applications of electric heating, lighting and power, wiring, motors, energy rates, meter reading, safety rules and regulations. **Prerequisite:** AGSM 201; AGSM majors or minors only.

AGSM 335 Water and Soil Management

Credits 3. 2 Lecture Hours. 3 Lab Hours. Elementary principles of surface and ground water supply, flood control, water distribution systems and irrigation systems; principles of drainage, soil conservation and erosion control; elementary surveying, chaining, leveling and mapping applied to agricultural and natural resource needs; illustrated by practical examples of terracing and farm pond design. **Prerequisite:** Grade of C or better in MATH 140 or MATH 168; grade of C or better in CHEM 107 and CHEM 117, or CHEM 119; or approval of instructor.

AGSM 337 Technology for Environmental and Natural Resource Engineering

Credits 3. 3 Lecture Hours. For the nonengineering student in the environmental and management sciences; concentrates on the application of technology for solving local environmental problems while considering global issues; reduction of water, air and hazardous waste pollutants; legislative issues and modeling. **Prerequisites:** Grade of C or better in MATH 140 or MATH 168 and MATH 142, or MATH 151 and MATH 152, or AGSM 301.

AGSM 360 Occupational Safety Management

Credits 3. 3 Lecture Hours. 0 Lab Hours. Safety considerations in the work environment, including safety mandates, safety mission, personal and business liability, fire, chemical, dust, machine noise, personal protective devices; design and implementation of safety programs. **Prerequisite:** Junior or senior classification.

AGSM 403 Processing and Storage of Agricultural Products

Credits 3. 2 Lecture Hours. 2 Lab Hours. Factors influencing the nature of biological materials and the preservation of quality throughout the harvesting, handling and processing system; a systems approach to cereal grains includes principles of drying, quality deterioration, storage, conveying and handling; processing of fiber crops. **Prerequisites:** AGSM 310 and AGSM 315/FSTC 315; or approval of instructor.

AGSM 411 Cotton Gin Management

Credits 3. 3 Lecture Hours. Principles of cotton operation, selection, maintenance, repair of machinery used in ginning; discussion of unit operations in ginning, determination of appropriate operating parameter; introduction to the industry, classification, textile processing; management of safety, labor, regulatory issues in gins and other processing facilities; economics of gin operation and machinery investment decisions. **Prerequisites:** Junior or senior classification or approval of instructor.

AGSM 417 Food Process Engineering Technology II

Credits 3. 3 Lecture Hours. Applications of basic engineering concepts to understand common unit operations in the food (and related) industry. **Prerequisites:** AGSM 315/FSTC 315 or FSTC 315/AGSM 315; approval of instructor.

AGSM 435 Irrigation Principles and Management

Credits 3. 2 Lecture Hours. 3 Lab Hours. Principles of irrigation and management for efficient use of water; soil-water-plant relationships; methods of application; power and labor requirements; automated systems and components. **Prerequisite:** Grade of C or better in MATH 140 or MATH 168; grade of C or better in CHEM 107 and CHEM 117 or CHEM 119.

AGSM 437 Landscape Irrigation

Credits 3. 3 Lecture Hours. Design, installation, operation, and management of landscape irrigation systems; includes principles of hydraulics such as friction losses and design pressure, customer service, site evaluation, and a final design project; fulfills the education requirements for obtaining a State of Texas Irrigation License. **Prerequisites:** Junior or senior classification or approval of instructor.

AGSM 439 Management of Agricultural Systems I

Credits 3. 3 Lecture Hours. Application of agricultural systems management principles in solving realistic problems faced by agribusiness managers; project selection from problems posed by biological and agricultural industrial consultants; project feasibility study and outline; management and application philosophy; teamwork and communication, economics; product liability and reliability; standards and codes; goal setting and time management. **Prerequisites:** ENGL 210, AGSM 310, AGSM 325, and AGSM 360; AGECE 330 or FINC 409 or concurrent enrollment; must be taken prior to AGSM 440; AGSM majors only.

AGSM 440 Management of Agricultural Systems II

Credits 3. 3 Lecture Hours. Management of agricultural systems through team solution of management problems posed by agribusiness managers, farmers, extension specialists and other industry consultants; application of management principles to give experience in solving realistic problems faced by agribusiness managers; critical evaluation of results by students, staff and consultants. **Prerequisite:** COMM 203; grade of C or better in AGSM 439; should be taken last spring semester prior to graduation.

AGSM 461 Geographic Information Systems for Resource Management

Credits 3. 2 Lecture Hours. 2 Lab Hours. Geographic Information Systems (GIS) approach to solving spatial problems and managing natural resources, including the acquisition, management, manipulation, analysis, and mapping of spatial and non-spatial databases; identification of natural and relevant features from various data sources; integration of relevant technologies and data; extensive use of GIS software to solve real-world problems. Only one of the following will satisfy the requirements for a degree: AGSM 461, ECCB 351, ECCB 651, BAEN 651, or RENR 651. **Prerequisites:** Junior or senior classification or approval of instructor. **Cross Listing:** ECCB 351 and RWFM 351.

AGSM 470 Agricultural Electronics and Control

Credits 3. 2 Lecture Hours. 2 Lab Hours. Technology of electronic systems in agricultural production and processing, sensors, actuators, and controllers, controller hardware and computer bases. **Prerequisite:** AGSM 325; or approval of instructor.

AGSM 473 Project Management for Agricultural Systems Technology

Credits 3. 3 Lecture Hours. Development of fundamental skill set in project management; basic knowledge of project management methods, tools and techniques; includes organization and life cycle, management processes, integration management, time management, cost management, quality management, communications management, risk management, procurement management, stakeholder management. **Prerequisites:** Grade of C or better in AGSM 301; senior classification.

AGSM 477 Air Pollution Control and Regulatory Compliance

Credits 3. 3 Lecture Hours. Overview of federal and state environmental regulations focusing on permitting requirements for agricultural operations; operation of air pollution abatement systems to include cyclones, bag filters, and scrubbers; dispersion modeling; National Ambient Air Quality Standards. **Prerequisite:** Grade of C or better in AGSM 301, or grade of C or better in MATH 140 and MATH 142, or equivalent.

AGSM 481 Seminar

Credit 1. 1 Lecture Hour. Professional development; ethics; career opportunities and topics of interest related to the practice of agricultural systems management. **Prerequisite:** Senior classification.

AGSM 484 Internship

Credits 0 to 6. 0 to 6 Other Hours. Practical experience working in a professional agricultural and/or food systems management setting. May be taken three times. **Prerequisites:** Junior or senior classification; approval of the instructor.

AGSM 485 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Selected problems in any phase of agricultural systems management; credit and specific content depend on background and interest of student; individual consultations and reports required. **Prerequisites:** Junior classification; approval of department head; 2.0 GPR.

AGSM 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Special topics in an identified area of agricultural systems management. May be repeated for credit.

AGSM 491 Research

Credits 0 to 3. 0 to 3 Lecture Hours. Research conducted under the direction of faculty member in agricultural systems management. May be repeated 2 times for credit. Registration in multiple sections of this course are possible within a given semester provided that the per semester credit hour limit is not exceeded. **Prerequisites:** Junior or senior classification and approval of instructor.

ALEC - Ag Leadrshp, Ed & Comm (ALEC)

ALEC 285 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Directed study of selected issue in field of agricultural leadership, education, and communications with emphasis on collection, synthesis and interpretation of information. May be taken four times for credit. **Prerequisite:** Approval of department advisor.

ALEC 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Special topics in an identified area of agricultural development. May be repeated for credit. **Prerequisite:** Approval of department advisor.

ALEC 291 Research

Credits 1 to 4. 1 to 4 Lecture Hours. Research conducted under the direction of faculty member in agricultural communications and journalism. May be taken two times for credit. **Prerequisites:** Freshman or sophomore classification and approval of department advisor.

ALEC 350 Global Agricultural Issues

Credits 3. 3 Lecture Hours. Review of global agricultural issues (products, environment, people, and culture) affecting international agricultural development; concepts and principles underlying the processes of teaching, research, and service opportunities in international agricultural development and education situations. **Prerequisites:** Junior or senior classification or approval of instructor.

ALEC 370 Principles of Positive Youth Development

Credits 3. 3 Lecture Hours. Fundamental concepts of youth development practices, programs, organizations and services; development of a critical understanding of the changing views of adolescence and youth culture; overview of youth development theories and principles of positive youth development; aspects of youth development programs; developmental outcomes associated with participation in youth development programs.

Prerequisite: Junior or senior classification.

ALEC 371 Skills and Techniques for Youth Development Professionals

Credits 3. 3 Lecture Hours. Development of skills for effective activity leadership to meet the needs of diverse youth populations; focus on applying experiential learning approaches, multiple activity styles, the role of intentionality, specificity, and application in activity selection, activity sequencing, and activity debriefing. **Prerequisite:** Junior or senior classification.

ALEC 372 Designing and Delivering Effective Youth Programs

Credits 3. 3 Lecture Hours. Comprehensive concepts of program design for youth programs; focuses on key programming issues; development of implementation plans; overview of equipment and facilities; focus on program flexibility, risk management and evaluation (formative and summative). **Prerequisites:** Junior or senior classification.

ALEC 375 Youth Development Programming in Sport and Physical Activities

Credits 3. 3 Lecture Hours. Role of community-based sports in developing healthy youth; ways in which sport programs can be designed to maximize physical, intellectual, emotional, and social outcomes; role of key adults and institutions in the delivery of youth sport experiences. **Prerequisites:** Junior or senior classification.

ALEC 377 Camp Management and Administration

Credits 3. 3 Lecture Hours. Structure and organization, administration and leadership, and challenges and opportunities facing professionals interested in careers in residential camping for youth. **Prerequisites:** Junior or senior classification.

ALEC 380 Workshop in Agricultural Leadership, Education, and Communications

Credits 1 to 4. 1 to 4 Lecture Hours. The study, understanding and solution of human-agricultural problems based on theory learned in the classroom, library, laboratory and fieldwork completed by individuals and teams. May be taken three times for credit. **Prerequisite:** Junior or senior classification.

ALEC 399 High-Impact Experience

Credits 0. 0 Lecture Hours. Participation in an approved high-impact learning practice; documentation and self-assessment of learning experience. **Prerequisites:** Junior or senior classification; or approval of instructor.

ALEC 412 Technology-Enhanced Instructional Design Strategies for Agriculture

Credits 3. 3 Lecture Hours. Techniques and applications of technology to enhance instruction of agricultural topics; instructional design principles, instructional strategies, technological tools; the design, development and delivery of technology-enhanced instruction for agriculture and the life sciences. Not intended for majors in education. **Prerequisite:** Junior or senior classification.

ALEC 425 Principles of Program Evaluation

Credits 3. 3 Lecture Hours. Evaluation principles applied to educational programs in agriculture and life science; basic understanding of skills in program evaluation processes, concepts, and theories; develop expertise needed to design and conduct evaluations of youth and adults in extension, community, and school-based programs. **Prerequisite:** Junior or senior classification.

ALEC 450 Global Social Justice Issues in Agriculture

Credits 3. 3 Lecture Hours. An in-depth evaluation of global social justice issues and leadership skills necessary to effectively solve and manage issues in agricultural development; topics include awareness, knowledge and understanding of teaching, research and service opportunities for those seeking careers in global social justice and agricultural leadership. **Prerequisite:** Junior or senior classification or approval of instructor.

ALEC 460 Applying International Development Theories in Agriculture

Credits 3. 2 Lecture Hours. 2 Lab Hours. Practical application of agricultural development theories (geographical, communal, societal, etc.) in real-world settings; high-impact learning, research skill development, international travel or participation in a service-learning project with an international organization. **Prerequisites:** Junior or senior classification or approval of instructor.

ALEC 472 Grant Writing and Program Evaluation for Youth Development Organizations

Credits 3. 3 Lecture Hours. Development of knowledge and skills to successfully write grant proposals and design program evaluation plans for youth development organizations; appropriate funding opportunities and considerations; grant guidelines; budget, timeline, and personnel; program evaluation plan development; evaluating grant proposals. **Prerequisites:** Grade of C or better in ALEC 370 or RPTS 370; or approval of instructor; junior or senior classification.

ALEC 473 Diversity, Equity, and Inclusion in Youth Development Organizations

Credits 3. 3 Lecture Hours. 0 Lab Hours. Understanding of youth diversity (e.g., ability and disability, socio-economic background, race, ethnicity, and cultural background, beliefs and religion, and gender characteristics); implementation of inclusive and equitable programming; development of cultural competencies. **Prerequisites:** Grade of C or better in ALEC 370.

ALEC 474 Positive Youth Development in the Age of Artificial Intelligence

Credits 3. 3 Lecture Hours. Understanding the intersection of positive youth development and artificial intelligence; exploration of data science and machine learning techniques and how they can be leveraged to support and enhance the well-being and potential of young people.

Prerequisites: Grade of C or better in ALEC 370; junior or senior classification.

ALEC 478 Youth Development Practice

Credits 3. 3 Lecture Hours. Application of youth development philosophy in community settings; principles and practices of community youth development and existing youth development models; local efforts related to community youth development. **Prerequisite:** Grade of C or better in ALEC 370 and ALEC 371 and junior or senior classification.

ALEC 485 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Directed individual study of selected problems in international agriculture leadership, education and communications. **Prerequisites:** Junior or senior classification; approval of department advisor.

ALEC 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Special topics in an identified area of international agriculture leadership, education, and communications. May be taken four times for credit. **Prerequisite:** Junior or senior classification.

ALEC 491 Research

Credits 1 to 4. 1 to 4 Lecture Hours. Research conducted under the direction of faculty member in international agricultural leadership, education, and communications. May be taken three times for credit. **Prerequisites:** Junior or senior classification; approval of department advisor.

ALEC 494 Internship

Credits 1 to 6. 1 to 6 Other Hours. Supervised internship and independent study related to the student's professional interest. May be taken six times for credit. **Prerequisites:** Junior or senior classification; approval of departmental advisor.

ALED - Ag Leadership & Dev (ALED)

ALED 125 Leadership Learning Community I

Credit 1. 1 Lecture Hour. Offered to students living in the Freshmen Leadership Living Learning Community; fundamentals of developing personal leadership while participating in co-curricular activities; emphasis on the relational model of leadership and global perspective building. **Prerequisites:** Freshman classification or approval of instructor; on-campus residence.

ALED 202 Introduction to Leadership

Credits 3. 3 Lecture Hours. Introduction to the academic and scholarly development of leadership theory and leadership models; investigation of leadership theory when applied to a specific context; development of a leadership definition as an inquiry investigation.

ALED 225 Leadership Learning Community II

Credit 1. 1 Lecture Hour. Offered to students living in the Freshmen Leadership Living Learning Community; fundamentals of peer mentoring while participating in co-curricular activities; emphasis on building supportive relationships on a college campus. **Prerequisites:** Freshman classification or approval of instructor; on-campus residence; ALED 125.

ALED 285 Directed Studies in Agricultural Leadership and Development

Credits 1 to 4. 1 to 4 Other Hours. Directed study of selected issue in agricultural leadership and development with emphasis on collection, synthesis and interpretation of information. **Prerequisite:** Approval of department advisor.

ALED 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Special topics in an identified area of agricultural development. May be repeated for credit. **Prerequisite:** Approval of department advisor.

ALED 291 Research

Credits 1 to 4. 1 to 4 Lecture Hours. Research conducted under the direction of faculty member in agricultural development. May be repeated 2 times for credit. Please see academic advisor in department. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

ALED 301 Personal Leadership Education

Credits 3. 3 Lecture Hours. Development, application and reflection of personal leadership capabilities through self-assessments and experiential learning activities; development of leadership identity through personal leadership inventories including strengths, personality type, values, vision and emotional intelligence. **Prerequisite:** ALED or USAL-LED major; junior, or senior classification; grade of C or better in ALED 202.

ALED 322 Cultural Leadership and Exploration for Society

Credits 3. 3 Lecture Hours. Social theories in terms of class, gender, race, ethnicity, and nationality; multidisciplinary approach to the study of leadership with a special emphasis on culture.

ALED 323 Leadership for a Multicultural World

Credits 3. 3 Lecture Hours. Principles of multicultural leadership; how to be an effective leader while understanding the self in terms of class, gender, race, ethnicity, and nationality; special emphasis on culture through experiential learning.

ALED 324 Leadership and Identity Development

Credits 3. 3 Lecture Hours. Identity development and leadership; dialogue about the implications of their multiple identities in the classroom organizations and in their careers; self-reflections concerning leadership development and active community-based service learning. **Prerequisites:** Junior or senior classification.

ALED 339 Agricultural Extension Philosophy and the Land-Grant Mission

Credits 3. 3 Lecture Hours. Philosophy of Cooperative Extension and roles within the land-grant system; history, organization, program areas and guiding principles; relationship with the teaching and research branches of the land-grant system. **Prerequisite:** Junior or senior classification or approval of instructor.

ALED 340 Survey of Leadership Theory

Credits 3. 3 Lecture Hours. Exploration of leadership as a scholarly discipline; critical analysis of and evolution of multiple leadership models and theories; synthesis of leadership theory through experiential learning; integration of course content with personal experiences. **Prerequisites:** ALED or USAL-LED major, junior or senior classification.

ALED 341 Team Learning

Credits 3. 3 Lecture Hours. Team development theory; emphasizes research on team member behaviors, team decision making models and positive conflict in team environments. **Prerequisites:** Grade of C or better in ALED 340; junior or senior classification.

ALED 344 Leadership of Volunteers

Credits 3. 3 Lecture Hours. Principles, theories, concepts, techniques and applications for leading volunteers in agriculture and life sciences nonprofit, governmental and community organizations. **Prerequisites:** Grade of C or better in ALED 340; junior or senior classification.

ALED 400 Public Leadership Development

Credits 3. 3 Lecture Hours. Major issues in the study of public leadership, development of leadership skills, and a field investigation done in conjunction with local public leaders. **Prerequisites:** Junior classification and approval of instructor.

ALED 401 Advanced Professional Leadership Development

Credits 3. 3 Lecture Hours. Investigation of the best practices of successful leaders representing various organizational contexts; merging of scholarly mastery of theory with practice. **Prerequisites:** Selection for ALED Leadership Fellows Program; grade of C or better in ALED 340 or ALED 301; junior or senior classification.

ALED 419 Followers and Followership

Credits 3. 3 Lecture Hours. Examination of the role of followers and followership; identification of follower motivations, followership styles, leader and follower dynamics, and characteristics of courageous followers. **Prerequisites:** Grade of C or better in ALED 340; junior or senior classification.

ALED 422 Cultural Pluralism in Agriculture

Credits 3. 3 Lecture Hours. Selected topics on the diversity of human resources in agriculture; emphasis on working in a multicultural society and developing a sensitivity toward different cultures; explores the interrelationships between the contributions of diverse individuals and the state, nation and global success of agriculture. **Prerequisite:** Junior or senior classification.

ALED 424 Applied Ethics in Leadership

Credits 3. 3 Lecture Hours. Exploration of ethical and moral theories and the application to multiple leadership contexts and situations. **Prerequisites:** Junior or senior classification.

ALED 426 Leading and Training Adult Learners

Credits 3. 3 Lecture Hours. Planning educational training programs, including leadership programs, to implement with an adult audience; includes needs assessment, instructional design, lesson plan development, evaluation and other items related to leading adults.

Prerequisites: Grade of C or better in ALED 340, junior or senior classification.

ALED 440 Leading Change

Credits 3. 3 Lecture Hours. Analysis of change models and theories and the leadership application on individual, organizational and societal changes. **Prerequisite:** Junior or senior classification; grade of C or better in ALED 202.

ALED 441 Agricultural Extension Organization and Methods

Credits 3. 3 Lecture Hours. Cooperative extension in agriculture and home economics; development, objectives, organization, program building and methods of teaching. **Prerequisite:** Junior or senior classification.

ALED 481 Seminar

Credits 3. 3 Lecture Hours. Individual and team approaches to the review of leadership concepts and their application; observation and discussion of current leadership trends and issues. **Prerequisites:** ALED or USAL-LED major; senior classification; grade of C or better in ALED 202, ALED 301, ALED 340, ALED 440, and ALED 424.

ALED 485 Directed Studies in Agricultural Leadership Development

Credits 1 to 4. 1 to 4 Other Hours. Directed individual study of selected problems in agricultural leadership and development with emphasis on collection, analysis and presentation of information. **Prerequisites:** Junior or senior classification and approval of instructor.

ALED 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Special topics in an identified area of agricultural development. May be repeated for credit. **Prerequisite:** Junior or senior classification.

ALED 491 Research

Credits 1 to 4. 1 to 4 Lecture Hours. Research conducted under the direction of faculty member in agricultural development. May be repeated 2 times for credit. Registration in multiple sections of this course are possible within a given semester provided that the per semester credit hour limit is not exceeded. Please see academic advisor in department. **Prerequisites:** Junior or senior classification; approval of instructor.

ALED 494 Internship

Credits 1 to 6. 1 to 6 Other Hours. Supervised internship and independent study related to student's professional interest. **Prerequisites:** Grade of C or better in ALED 301; junior or senior classification; 2.0 GPR; approval of instructor.

ANSC - Animal Science (ANSC)

ANSC 101 Introductory Seminar for Animal Science

Credit 1. 1 Lecture Hour. Orientation to programs and opportunities in the Department of Animal Science, to create an awareness of campus resources for financial aid and tutoring, to develop goals for college career and to initiate planning for internship and job opportunities.

ANSC 107 General Animal Science

Credits 3. 3 Lecture Hours. (AGRI 1319, 1419*) General Animal Science. General understanding of all aspects of the livestock industry; basic agriculture nomenclature of breeds, species and types of livestock; reproduction, nutrition, genetics, food safety, growth and development of beef cattle, sheep, horses, swine, dairy cattle and poultry; brief description of the companion animal industry.

ANSC 108 General Animal Science Laboratory

Credit 1. 2 Lab Hours. (AGRI 1119, AGRI 1419*) General Animal Science Laboratory. General overview of the beef cattle, dairy cattle, horse, sheep, swine and poultry industries; information on major breeds, anatomy, phenotypic and genotypic selection criteria and production practices for each species; major disciplines of the animal industry including breeding and genetics, nutrition, reproductive physiology and products; utilization of live animals, models and feedstuffs/equipment to enhance experiential learning approach. **Prerequisite:** Concurrent enrollment in ANSC 107.

ANSC 111 Animal Production Systems

Credits 3. 2 Lecture Hours. 2 Lab Hours. Transformative experiences related to beef cattle, dairy cattle, equine, sheep, swine, goats, companion animals, meats, food products and food safety; exposure to available animal science careers and potential areas of future/additional study. **Prerequisites:** Grade of C or better in ANSC 101 or AGLS 101, ANSC 107, and ANSC 108.

ANSC 113 Farm Animal Biosystems

Credits 2. 2 Lecture Hours. Information regarding the processes by which networks of cells are controlled and coordinated within the farm animal. **Prerequisites:** Grade of C or better in ANSC 107 and ANSC 108.

ANSC 117 Texas Barbecue

Credit 1. 1 Lecture Hour. Survey, demonstration and participation in preparation techniques of Texas barbecue; comparison of regional and international barbecue methods. **Prerequisite:** First year students.

ANSC 201 Introductory Equine Care and Use

Credits 2. 2 Lecture Hours. Survey of basic equine care and use; breeds of horses and their use; care and maintenance of equines including feeding, health care, housing and equipment.

ANSC 205 Animal Science Laboratory Preparation Methods

Credits 2. 1 Lecture Hour. 2 Lab Hours. . Study of basic animal production systems knowledge and effective pedagogical techniques to prepare animal science laboratories and animal handling methods; includes high-impact learning opportunity to allow the practice of pedagogical techniques learned in a controlled and supported environment.

Prerequisite: Grade of C or better in ANSC 107, ANSC 108, and ANSC 111.

ANSC 207 Art and Heritage of Livestock

Credits 3. 3 Lecture Hours. Using art as a venue to understand the legacy and heritage of livestock production and livestock's contribution to civilization and society; from man as hunter, agriculturalist, and finally, as industrialist; from cave paintings to Russell and Remington; history of the effects of painting, poetry, architecture and sculpture on agriculture.

ANSC 210 Companion Animal Science

Credits 3. 3 Lecture Hours. Types, care, physiology, common diseases and common treatments of companion animals (dogs, cats, exotic pets); careers including biomedical research; solutions for problems such as behavior and overpopulation.

ANSC 211 Equine Industry and Career Preparation

Credits 2. 2 Lecture Hours. Identify opportunities and skill sets required to pursue a career in the equine industry; development of resume, communication, professional etiquette and interview skills.

ANSC 215 Introduction to Livestock Evaluation

Credits 2. 1 Lecture Hour. 3 Lab Hours. (AGRI 2321) Introduction to Livestock Evaluation. Live market animal appraisal in relation to carcass and composition; criteria for selection of breeding livestock; techniques for preparation and delivery of oral reason.

ANSC 221 Equine Handling and Safety

Credits 3. 2 Lecture Hours. 2 Lab Hours. Working around horses safely and effectively; includes equine behavior, proper handling techniques, controlling movement of horses, health assessment and basic management. **Prerequisite:** ANSC 201.

ANSC 235 Animal Welfare Judging

Credits 2. 1 Lecture Hour. 3 Lab Hours. . Preparation for competition in Intercollegiate Animal Welfare Judging/Assessment competition; use of primary literature to strengthen knowledge of welfare issue present in the species chosen for competition scenario; required for participation on the Animal Welfare Judging Team. **Prerequisites:** ANSC 107.

ANSC 242 Growth and Development of Livestock

Credits 3. 2 Lecture Hours. 2 Lab Hours. Evaluation of slaughter livestock as related to growth and development, production efficiency, carcass value; selection of breeding animals based on performance, production records, visual appraisal; principles of growth biology; biotechnological tools used to manage growth and development. **Prerequisites:** ANSC 107 and ANSC 108.

ANSC 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an indented area of animal science. May be repeated for credit.

Prerequisite: Approval of instructor.

ANSC 291 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in animal science. May be repeated 2 times for credit. **Prerequisites:** Freshman or sophomore classification and approval of instructor; 2.0 GPR in major and overall.

ANSC 302 Basic Beef Cattle Production

Credits 3. 3 Lecture Hours. Fundamental concepts of beef management and production principles; service course recommended for non-animal science majors. **Prerequisites:** ANSC 107 and ANSC 108.

ANSC 303/NUTR 303 Principles of Animal Nutrition

Credits 3. 3 Lecture Hours. Scientific approach to nutritional roles of water, carbohydrates, proteins, lipids, minerals, vitamins, and other dietary components; emphasis on the comparative aspects of gastrointestinal tracts and on digestion, absorption, and metabolism of nutrients.

Prerequisites: CHEM 119 and a grade of C or better in ANSC 113, or CHEM 222, CHEM 227 or CHEM 257; junior classification or approval of instructor. **Cross Listing:** NUTR 303/ANSC 303.

ANSC 305 Animal Breeding

Credits 3. 2 Lecture Hours. 2 Lab Hours. A systems approach to selection and mating of livestock; gene frequency, heritability, relationship, inbreeding, linebreeding, heterosis, crossbreeding, direct and correlated response to selection, and use of pedigree, family, progeny testing and indices for selection. **Prerequisites:** Grade of C or better in ANSC 111 and ANSC 113; GENE 301; STAT 301, STAT 302, STAT 303, or ANSC 309; junior classification or approval of instructor.

ANSC 307 Meats

Credits 3. 2 Lecture Hours. 3 Lab Hours. Integrated studies of the meat animal processing sequence regarding the production of meat-type animals and the science and technology of their conversion to human food. **Prerequisites:** Grade of C or better in ANSC 113; junior classification or approval of instructor.

ANSC 309 Applied Animal Record Keeping

Credits 3. 2 Lecture Hours. 2 Lab Hours. Keeping, analyzing and interpreting records to make fully-informed decisions on a day-to-day basis for production and management scenarios; practical application unique to animal science and meat processing. **Prerequisite:** Junior or senior classification.

ANSC 311 Equine Behavior and Training

Credits 2. 1 Lecture Hour. 3 Lab Hours. Equine behavior and application of principles of psychology to training horses; systematic approaches to horse training emphasizing principles of learning; equipment and its use; stable management and preparation of horses for competition; separate laboratory sections for students with varying backgrounds. **Prerequisite:** Junior or senior classification.

ANSC 314 Wool Evaluation and Grading

Credits 2. 1 Lecture Hour. 3 Lab Hours. Evaluation of U.S.D.A. grades for wool and mohair; steps involved in processing raw wool into finished fabric; genetic and environmental factors affecting quality characteristics of wool and mohair; grading, evaluation and selection of fleeces for economic value; oral and written defense of judgments.

ANSC 315 Livestock Judging

Credits 2. 1 Lecture Hour. 3 Lab Hours. Selection and evaluation of beef cattle, swine, sheep and horses. Ability to present accurate, clear and concise oral and written reasons stressed. **Prerequisites:** ANSC 107 and ANSC 108; junior or senior classification.

ANSC 316 Equine Selection and Judging

Credits 2. 1 Lecture Hour. 3 Lab Hours. Detailed evaluation and comparison of horses; selection and critique of athleticism and performance in horses; industry trends addressed; oral and written defense of judgments also explained and expected; required for participation on the Horse Judging Team. **Prerequisite:** Junior or senior classification or approval of instructor.

ANSC 317 Meat Selection, Evaluation and Grading

Credits 2. 1 Lecture Hour. 3 Lab Hours. Selection and grading of carcasses and wholesale cuts of beef, pork and lamb; principles of evaluation included in carcass contests and progeny testing. **Prerequisites:** ANSC 107 and ANSC 108.

ANSC 318 Animal Feeds and Feeding

Credits 3. 2 Lecture Hours. 3 Lab Hours. Scientific approaches associated with precision feeding and diet formulation to match nutrient availabilities of feedstuffs with requirements of various classes of livestock species; emphasis on cost-effective feeding strategies to optimize animal productivity, and end-product quality and safety, while mitigating environmental impacts and enhancing animal health and welfare. **Prerequisite:** Grade of C or better in ANSC 111, ANSC 113 and ANSC 303/NUTR 303; junior classification or approval of instructor.

ANSC 320 Animal Nutrition and Feeding

Credits 3. 3 Lecture Hours. Nutritional functions of water, protein, carbohydrates, fats, minerals and vitamins and their digestion, absorption, use and excretion; energy, protein and forage feedstuff characteristics and processing; nutritional requirements, ration formulation and feeding methods for farm animals; general course for non-animal science majors. **Prerequisite:** Junior or senior classification or approval of instructor; restricted to students in the college of agriculture and life sciences.

ANSC 325 Advanced Livestock and Product Evaluation

Credits 2. 1 Lecture Hour. 3 Lab Hours. Advanced evaluation of cattle, swine, sheep and equine; products produced or associated with each species; advanced oral or written defense of judgments associated with changing trends in these industries. May be repeated three times for credit. **Prerequisite:** Junior or senior classification.

ANSC 326/FSTC 326 Food Bacteriology

Credits 3. 3 Lecture Hours. Microbiology of human foods and accessory substances; raw and processed foods; physical, chemical and biological phases of spoilage; standard industry techniques of inspection and control. **Prerequisite:** Junior or senior classification or approval of instructor. **Cross Listing:** FSTC 326/ANSC 326.

ANSC 327/FSTC 327 Food Bacteriology Lab

Credit 1. 3 Lab Hours. Laboratory to accompany ANSC 326/FSTC 326 or FSTC 326/ANSC 326. **Cross Listing:** FSTC 327/ANSC 327.

ANSC 333 Reproduction in Farm Animals

Credits 2. 2 Lecture Hours. Physiological principles of reproductive processes in cattle, sheep, swine, and horses including sperm and ova production, estrus, fertilization, gestation and parturition. **Prerequisites:** Grade of C or better in ANSC 113 or ANSC 303/NUTR 303.

ANSC 334 Reproduction in Farm Animals Laboratory

Credit 1. 0 Lecture Hours. 2 Lab Hours. . Laboratory techniques relevant to reproductive processes in cattle, sheep, swine, and horses including sperm and ova production, estrus, fertilization, gestation, and parturition. **Prerequisite:** Grade of C or better in ANSC 333 or concurrent enrollment.

ANSC 337 Meat Merchandising

Credits 2. 1 Lecture Hour. 3 Lab Hours. Steps of meat processing and merchandising of retail and foodservice; merchandising practices such as selection, identification, fabrication, pricing, packaging and distribution. **Prerequisites:** ANSC 307; junior or senior classification.

ANSC 360 System Dynamics for Animal Sciences

Credits 2. 2 Lecture Hours. . System dynamics modeling for the analysis of business policy and strategy; study of visualization of a business organization in terms of structures and policies that create dynamics and regulate performance; emphasis on animal production. **Prerequisite:** Grade of C or better in ANSC 303/NUTR 303 or ANSC 320, or approval of the instructor.

ANSC 380 Animal Science for Agricultural Science

Credits 3. 3 Lecture Hours. . Preparation to become agriculture, food and natural resources (AFNR) teachers with an opportunity for the expansion of knowledge of the primary livestock species; information relating to breeding and genetics, reproduction, physiology, nutrition, management systems, products and disease; a brief exploration of companion animals. **Prerequisite:** ANSC 107 and Agricultural Science major.

ANSC 399 Animal Science Experience

Credits 0. 0 Lecture Hours. Participation in an approved high-impact learning practice; reflection on professional outcomes from animal science body of knowledge; documentation and self-assessment of learning experience at mid and final curriculum points. **Prerequisite:** Junior or senior classification.

ANSC 404 Behavior and Management of Domestic Animals

Credits 4. 3 Lecture Hours. 2 Lab Hours. Application of behavior of cattle, horses, sheep, goats and swine to their management; basic principles, physiology of behavior, perception, training, predators, use of dogs in livestock production, stress and animal welfare. **Prerequisites:** Grade of C or better in ANSC 305, ANSC 307, ANSC 318 and ANSC 333; junior or senior classification or approval of instructor.

ANSC 406 Beef Cattle Production and Management

Credits 4. 3 Lecture Hours. 2 Lab Hours. Principles involved for profitable and sustainable, integrated beef cattle production as considered from the perspective of the U.S. cow-calf sector and from an overall systems-based approach. **Prerequisites:** Grade of C or better in ANSC 305, ANSC 307, ANSC 318, and ANSC 333; junior or senior classification or approval of instructor.

ANSC 408 Management of Stocker and Feedlot Cattle

Credits 4. 3 Lecture Hours. 2 Lab Hours. Basic principles involved in feeding, management, marketing and disease control of stocker and feeder cattle from weaning through slaughter for economical production of beef. **Prerequisites:** Grade of C or better in ANSC 305, ANSC 307, ANSC 318, and ANSC 333; STAT 301, STAT 302, STAT 303, or ANSC 309; junior or senior classification.

ANSC 411 Equine Nutrition and Health

Credits 3. 3 Lecture Hours. Designed to provide knowledge of nutrition and health in the horse; gastrointestinal anatomy, nutrient utilization, feeding management and nutritional requirements; metabolic diseases, infectious diseases, internal and external parasites, and herd health management. **Prerequisite:** Junior or senior classification.

ANSC 412 Swine Production and Management

Credits 4. 3 Lecture Hours. 2 Lab Hours. Basic principles and their practical application in efficient, economical pork production; all areas of production—breeding and selection, nutrition, housing and equipment, marketing, herd health and economic management. **Prerequisites:** Grade of C or better in ANSC 305, ANSC 307, ANSC 318, and ANSC 333; junior or senior classification or approval of instructor.

ANSC 414 Sheep and Goat Production and Management

Credits 4. 3 Lecture Hours. 2 Lab Hours. In-depth hands-on experiences related to sheep and goat production and management providing an advanced understanding of small ruminant production. **Prerequisites:** Grade of C or better in ANSC 305, ANSC 307, ANSC 318, and ANSC 333; junior or senior classification or approval of instructor.

ANSC 415 Brazil: Comparative Ruminant Production

Credits 3. 3 Lecture Hours. Contrast two scenarios of ruminant production in Brazil; the effects of globalization on the two different production systems. **Prerequisites:** ANSC 303/NUTR 303 or ANSC 320 or approval of instructor.

ANSC 418 Equine Exercise Physiology

Credits 3. 2 Lecture Hours. 2 Lab Hours. Changes within the systems of the horse resulting from the physical stresses of exercise, adaptations of systems in response to a training regimen; methodology for measuring improvement in physical condition; foundation for development of training programs for horses in moderate, intense or prolonged performance activities. **Prerequisites:** Junior or senior classification and approval of instructor.

ANSC 420 Equine Production and Management

Credits 4. 3 Lecture Hours. 2 Lab Hours. Application of biological and biotechnological principles and concepts in areas including genetics, breeding, nutrition, reproduction, immunology, parasitology, anatomy and exercise physiology to efficient production of horses for market; management of equine enterprises. **Prerequisite:** Grade of C or better in ANSC 305, ANSC 307, ANSC 318, and ANSC 333; junior or senior classification or approval of instructor.

ANSC 423 Issues in the Equine Industry

Credit 1. 1 Lecture Hour. Integration of cumulative knowledge acquired in the equine science curriculum to demonstrate critical thinking and communication skills to address critical issues in the equine industry. **Prerequisite:** Junior or senior classification; approval of instructor.

ANSC 429 Dairy Production Management

Credits 4. 3 Lecture Hours. 2 Lab Hours. Major principles for profitable and sustainable dairy production for a commercial dairy operation; provides hands-on experiences in dairy cattle management; develops critical thinking skills to make dairy cattle management decisions. **Prerequisite:** Grade of C or better in ANSC 305, ANSC 307, ANSC 318 and ANSC 333; junior or senior classification or approval of instructor.

ANSC 432 Equine Industry Tour

Credits 2. 2 Lecture Hours. All facets of the Texas Equine Industry, including breed associations, large events, breeding and production operations, large ranches, performance horse training barns, media, history, veterinary medicine, retail, sports medicine, and nutrition; network and gain a holistic perspective on the inner workings of the equine industry. **Prerequisites:** Junior or senior classification; approval of instructor.

ANSC 434 Animal Reproduction Management

Credits 4. 3 Lecture Hours. 2 Lab Hours. Available and emerging technologies including control of ovulation, artificial insemination, embryo manipulation and transfer, in vitro fertilization and animal cloning for managing reproduction of farm animals; hands-on sessions using available technologies including artificial insemination of cattle. **Prerequisites:** Grade of C or better in ANSC 305, ANSC 307, ANSC 318 and ANSC 333; junior or senior classification or approval of instructor.

ANSC 436 Texas Panhandle Beef Production Tour

Credits 2. 2 Lecture Hours. Facets of beef production from cow/calf operations to retail product; experiential knowledge of technologies and practices to enhance efficiency to enlighten students regarding the array of career opportunities in the beef production industry. **Prerequisites:** Junior or senior classification or approval of instructor.

ANSC 437 Marketing and Grading of Livestock and Meat

Credits 4. 3 Lecture Hours. 2 Lab Hours. Study of USDA livestock and carcass grades; understanding current market trends for beef, pork, lamb and goat; review of branded and certified programs; principles applied in contracting, breakeven determination, hedging, and grid or formula pricing. **Prerequisite:** Junior or senior classification or approval of instructor.

ANSC 439 Feedlot Risk Management

Credits 2. 2 Lecture Hours. Advanced study of livestock marketing techniques; cash sales, video sales, futures and options markets, forward contracting; problem solving in real-time livestock marketing situations; risk of ownership of hypothetical livestock operations. **Prerequisites:** junior or senior classification or approval of instructor.

ANSC 447 Advanced Meat Science and Technology

Credits 4. 3 Lecture Hours. 3 Lab Hours. Advanced basic and applied studies of meat science and/or technology utilizing the underlying physiological and structural components for conversion to human food; understanding the influence of pre- and post-harvest factors on meat quality, composition, color, packaging, sensory and preparation factors; applying scientific and business principles to manufacturing and process flow of commercial meat food products and demonstrating knowledge of these principles through development of meat products. **Prerequisites:** Grade of C or better in ANSC 305, ANSC 307, ANSC 318 and ANSC 333; GENE 301; STAT 301, 302, 303, or ANSC 309; junior or senior classification or approval of instructor.

ANSC 451 Current Issues in Animal Agriculture

Credits 4. 3 Lecture Hours. 2 Lab Hours. Preparation to project a professional image and the use of communication skills to describe animal agriculture; converse about the strengths and weaknesses of animal agriculture. **Prerequisites:** Junior or senior classification or approval of instructor.

ANSC 455 System Dynamics for Animal Science

Credits 2. 2 Lecture Hours. Exploration of system dynamics modeling emphasizing animal science; mapping of complex system structures; development and testing of computer-based models of animal science. **Prerequisites:** Grade of C or better in ANSC 303/NUTR 303 or ANSC 320, or approval of instructor.

ANSC 457/FSTC 457 Hazard Analysis and Critical Control Point System

Credits 3. 3 Lecture Hours. Hazard Analysis and Critical Control Point (HACCP) principles specifically related to meat and poultry; microbiological and process overviews; good manufacturing practices and standard operating procedures development. **Prerequisite:** FSTC 326/ANSC 326 or ANSC 326/FSTC 326, or approval of instructor. **Cross Listing:** FSTC 457/ANSC 457.

ANSC 467 Processed Meat Food Operations

Credits 3. 2 Lecture Hours. 2 Lab Hours. Application of scientific and business principles to manufacturing and process flow of commercial meat food products. **Prerequisites:** ANSC 307 or FSTC 307 or approval of department head.

ANSC 470/FSTC 470 Quality Assurance for the Food Industry

Credits 3. 3 Lecture Hours. Principles of food system process control including statistical process control (SPC) and the tools required to assure uniform communication and understanding of quality assurance systems. **Prerequisite:** Junior or senior classification. **Cross Listing:** FSTC 470/ANSC 470.

ANSC 481 Seminar

Credit 1. 1 Lecture Hour. Review of literature and research problems related to the livestock and food industries; preparation of a technical report including an oral presentation supported by a written technical paper. **Prerequisite:** Senior classification.

ANSC 484 Livestock Practicum

Credit 1. 2 Other Hours. Provides an opportunity to learn skills required in livestock production; planned for students who have had limited farm and ranch experience in one or more species. **Prerequisite:** Junior or senior classification in animal science or approval of instructor.

ANSC 485 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Directed individual study of selected problem in field of animal science. **Prerequisites:** Junior or senior classification; written approval of professor supervising the activity; 2.0 GPR in major and overall.

ANSC 487/FSTC 487 Sensory Evaluation of Foods

Credits 3. 2 Lecture Hours. 2 Lab Hours. Application of sensory science principles and practices to food systems including an understanding of discriminative, descriptive and consumer sensory techniques. **Prerequisites:** CHEM 222 or CHEM 228; junior or senior classification. **Cross Listing:** FSTC 487/ANSC 487.

ANSC 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 8 Lab Hours. Selected topics in an identified area of animal science. May be repeated for credit. **Prerequisite:** Junior or senior classification.

ANSC 491 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in animal science. May be repeated 3 times for credit. Registration in multiple sections of this course is possible within a given semester provided that the per semester credit hour limit is not exceeded. **Prerequisite:** Junior or senior classification and approval of instructor; 2.0 GPR in major and overall.

ANSC 494 Animal Science Internship

Credits 0 to 5. 0 to 5 Other Hours. Independent study and supervised field experience related to the student's professional interest. **Prerequisites:** Junior or senior classification or approval of instructor; 2.0 GPR in major and overall.

ANSC 495 International Agriculture and Animal Production

Credits 3. 3 Lecture Hours. Study of international agriculture and animal production in the world market; impact on foreign economies and culture; considerations of import and export marketing on products to and from the U.S. to provide students the exposure to international economies and cultures; study abroad. **Prerequisites:** Grade of C or better in ANSC 107 or approval of instructor.

ANSC 498 Animal Science Capstone

Credits 4. 4 Lecture Hours. Senior capstone project for students preparing to enter a career related to animal science or a professional school; individual projects based on a self-selected topic in animal science; includes a paper containing both translational and technical descriptions plus statements regarding the expected financial and social impacts of selected topic. **Prerequisites:** Grade of C or better in ANSC 303/NUTR 303, ANSC 307, ANSC 333, and ANSC 334; senior classification.

ANTH - Anthropology (ANTH)

ANTH 201 Introduction to Anthropology

Credits 3. 3 Lecture Hours. (ANTH 2346, HUMA 2323) Introduction to Anthropology. An introduction to the discipline of anthropology through the examination of its four sub-fields: archaeology, physical anthropology, sociocultural anthropology and linguistics; also taught at Qatar campus.

ANTH 202 Introduction to Archaeology

Credits 3. 3 Lecture Hours. (ANTH 2302) Introduction to Archaeology. An introduction to the study of the human past through the retrieval, analysis, and interpretation of material remains; also taught at Galveston campus.

ANTH 204 The Prehistoric World

Credits 3. 3 Lecture Hours. Exploration of the development of human societies and world prehistory from the beginnings of humanity more than two million years ago to emergence of complex civilizations.

ANTH 205 Peoples and Cultures of the World

Credits 3. 3 Lecture Hours. Survey of human cultures around the world using case studies of customs and cultural organization; case studies exemplifying contrasting types of cultures and societies.

ANTH 210 Social and Cultural Anthropology

Credits 3. 3 Lecture Hours. (ANTH 2351) Social and Cultural Anthropology. Evolution of cultures; differences, similarities and effects of material and non-material culture on economic, social and political organization; also taught at Galveston campus.

ANTH 222 Cross Cultural Competency

Credits 3. 3 Lecture Hours. Development of skills vital for effective engagement in an increasingly diverse and interconnected world; personal awareness of biases, attitudes, values, beliefs and ways of knowing; exploration of the impact of culture on our ability to think critically and communicate effectively.

ANTH 225 Introduction to Biological Anthropology

Credits 3. 3 Lecture Hours. (ANTH 2301, 2401*) Introduction to Biological Anthropology. Study of human biology including an examination of evolutionary processes acting on human populations; human genetics; non-human primate anatomy, classification and ecology of primates; the primate paleontological record, and human variation and adaptation. **Prerequisites:** Concurrent registration in ANTH 226 recommended; also taught at Galveston campus.

ANTH 226 Introduction to Biological Anthropology Laboratory

Credit 1. 3 Lab Hours. (ANTH 2101, 2401*) Introduction to Biological Anthropology Laboratory. Exploration of basic evolutionary principles through population genetics; hands-on exposure to the fossils of primate and human evolution along with opportunity to measure, compare, contrast and observe trends that have occurred throughout the Cenozoic era. **Prerequisites:** Concurrent registration in ANTH 225 is recommended; also taught at Galveston campus.

ANTH 229 Introduction to Folklore

Credits 3. 3 Lecture Hours. Study of folklore through selected examples of traditional cultures, their beliefs, customs and art forms such as: tales, folksongs, proverbs, riddles and material culture.

ANTH 285 Directed Studies

Credits 0 to 3. 0 to 3 Other Hours. For individual research in anthropology on subjects not included in established courses. May be taken two times for credit. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

ANTH 289 Special Topics In...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified area of anthropology. May be repeated for credit.

ANTH 291 Research

Credits 0 to 3. 0 to 3 Other Hours. Research conducted under the direction of a faculty member in Anthropology. May be taken two times for credit. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

ANTH 300 Cultural Change and Development

Credits 3. 3 Lecture Hours. Anthropological strategies for the study of cultural change and the implication of these strategies for the development of Western and non-Western societies.

ANTH 301 Indians of North America

Credits 3. 3 Lecture Hours. Native North American cultures from the Arctic to Mesoamerica; their origins, cultures prior to extensive acculturation and their contemporary situations.

ANTH 302 Archaeology of North America

Credits 3. 3 Lecture Hours. Overview of archaeology and prehistory of North America from the arrival of humankind through the development of agriculture to Euro-American contact. **Prerequisite:** ANTH 201, ANTH 202, ANTH 204, ANTH 205, or ANTH 210.

ANTH 304 Archaeology Roadshow

Credits 3. 3 Lecture Hours. Interdisciplinary field-trip in the archaeology and paleoecology of a specific region; high-impact learning experiences in a field setting. May be repeated two times for credit. **Prerequisites:** ANTH 201, ANTH 202, ANTH 204, ANTH 205, or ANTH 225; approval of instructor.

ANTH 305 Fundamentals of Anthropological Writing

Credit 1. 1 Lecture Hour. Basic types of writing expected of anthropology students; emphasis on the subject matter of an upper-division anthropology course in which the student is currently enrolled.

Prerequisites: Junior or senior classification and co-enrollment in another upper-division anthropology course (the "companion course").

ANTH 308 Archaeology of Mesoamerica

Credits 3. 3 Lecture Hours. Development of Indian civilizations in Mexico and Guatemala, including prehistory of the Olmec, Maya, Aztec and other regional cultures to the time of the Spanish conquest.

ANTH 312 Fossil Evidence of Human Evolution

Credits 3. 3 Lecture Hours. Detailed review of fossil antecedents of humans including theoretical implications for an understanding of human evolution. **Prerequisite:** ANTH 225 or approval of instructor.

ANTH 313 Historical Archaeology

Credits 3. 3 Lecture Hours. Use and methods of historical archaeology in locating, documenting, restoring and preserving our historical resources; also taught at Galveston campus.

ANTH 316 Nautical Archaeology

Credits 3. 3 Lecture Hours. Nautical Archaeology Underwater shipwrecks, sunken harbors, and other submerged evidence of human activities; relationship to cultural geography in general; problems of diving technology, surveying and preservation; relevance to modern problems. **Prerequisite:** Junior or senior classification; also taught at Galveston campus.

ANTH 317/RELS 317 Introduction to Biblical Archaeology

Credits 3. 3 Lecture Hours. Application of archaeology in biblical research; basic overview of the material cultures that are the setting for the biblical narratives. **Cross Listing:** RELS 317/ANTH 317.

ANTH 318 Nautical Archaeology of the Americas

Credits 3. 3 Lecture Hours. Seafaring in the Americas from the 16th to the 20th centuries based on shipwreck archaeology; ship construction, exploration, commerce, naval warfare and related activity; influence of seafaring on the cultures, economics and history of the Western Hemisphere; also taught at Galveston campus.

ANTH 323 Nautical Archaeology of the Mediterranean

Credits 3. 3 Lecture Hours. The archaeology of ancient seafaring in the Mediterranean from the Stone Age through the Roman Empire. **Prerequisite:** Junior or senior classification.

ANTH 324/MUSC 324 Music in World Cultures

Credits 3. 3 Lecture Hours. Examination of music from an ethnomusicological perspective focusing on musical performance and the complex interrelationship of music to culture, society and daily life; examination of music from a variety of cultures through a series of case studies. **Prerequisite:** Junior or senior classification or approval of instructor. **Cross Listing:** MUSC 324/ANTH 324.

ANTH 330 Field Research in Anthropology

Credits 1 to 9. 1 to 9 Other Hours. Training for students in formulating and solving anthropological problems through field research; problem oriented field research under supervision. **Prerequisites:** Grade of C or better in ANTH 201, ANTH 202, ANTH 204, ANTH 205, ANTH 210, or ANTH 225; approval by instructor.

ANTH 335 Cultures of Central Asia

Credits 3. 3 Lecture Hours. Study of anthropological research in Central Asia: ecological adaptations; colonialism and post-colonialism; ethnic politics and ethnic conflict; religion and identity; gender and family; globalization and modernization. **Prerequisite:** Junior or senior classification.

ANTH 340/RELS 340 Folklore and the Supernatural

Credits 3. 3 Lecture Hours. Traditional expressions of the supernatural such as superstition, belief tale and divination classified as folklore genres and their relationships to the cultures in which they develop; theories drawn from anthropology, folklore and related social sciences. **Prerequisite:** Junior or senior classification or approval of instructor. **Cross Listing:** RELS 340/ANTH 340.

ANTH 350 European Archaeology

Credits 3. 3 Lecture Hours. Overview of archaeology and prehistory of Europe from the evolution of the hominids to the development of agriculture and the rise of civilization; also taught at Galveston campus.

ANTH 351 Classical Archaeology

Credits 3. 3 Lecture Hours. Origins and spread of Western civilization through the material remains of Minoan, Mycenaean, Etruscan, and early Greek and Roman cultures. **Prerequisite:** Junior or senior classification or approval of instructor; Galveston campus.

ANTH 353/CLAS 353 Archaeology of Ancient Greece

Credits 3. 3 Lecture Hours. Archaeology of ancient Greece from the Stone Age until the ascent of Rome in the Hellenistic Period; remains of ancient Greek art (sculpture, mosaic, painting), architecture (temples, homes, civic structures), religion (figurines, votive offerings), and social history (coins, inscriptions). **Prerequisite:** Junior or senior classification. **Cross Listing:** CLAS 353/ANTH 353.

ANTH 354/CLAS 354 Archaeology of Ancient Italy

Credits 3. 3 Lecture Hours. Archaeology of ancient Italy from the Stone Age until the collapse of the Roman Empire in the fourth century; remains of ancient Etruscan and Roman art (sculpture, mosaic, painting), architecture (temples, homes, civic structures), religion (figurines, votive offerings), and social history (coins, inscriptions). **Prerequisite:** Junior or senior classification. **Cross Listing:** CLAS 354/ANTH 354.

ANTH 360 Ancient Civilizations of the World

Credits 3. 3 Lecture Hours. Explores recent discoveries and efforts by archaeologists to understand the rise and fall of states and civilizations that emerged in the Near East, Africa, India, Europe, China, Mesoamerica, and Peru between 3500 BCE and 1500 CE. **Prerequisite:** Junior or senior classification.

ANTH 370 Cultural Diversity and Ethics

Credits 3. 3 Lecture Hours. Examination of the cultural construction of ethical values and how cultural diversity, including beliefs, values and ways of doing business, impacts human technological innovation; focuses on developing a holistic, social-science mindset and application of critical thinking skills.

ANTH 382/HIST 382 Conflict Archaeology and Military History

Credits 3. 3 Lecture Hours. Military history; conflict archaeology; human conflict; diplomacy, ethics, and leadership in conflicts; warfare; modern global issues; public service. **Prerequisites:** Junior or senior classification or approval of instructor. **Cross Listing:** HIST 382/ANTH 382.

ANTH 401 Ice Age Humans in North America

Credits 3. 3 Lecture Hours. Archaeological, environmental and geological evidence related to the timing of human entry into the Americas and megafaunal extinctions at the end of the Pleistocene. **Prerequisite:** ANTH 202 or equivalent.

ANTH 402 Archaeological Artifact Conservation

Credits 4. 3 Lecture Hours. 3 Lab Hours. Analysis of the treatments for artifacts of clay, stone, glass, wood, shell, bone, fiber and metal from archaeological excavations or ethnographic, and historic collections presented in an integrated series of lectures and hands-on laboratory experience. **Prerequisite:** Junior or senior classification or approval of instructor.

ANTH 403/RELS 403 Anthropology of Religion

Credits 3. 3 Lecture Hours. Cross-cultural, theoretical analysis of religion as a cultural phenomenon; exploring the relationships between religion, culture, society and the individual; also taught at Galveston campus. **Cross Listing:** RELS 403/ANTH 403.

ANTH 404/WGST 404 Women and Culture

Credits 3. 3 Lecture Hours. Examines women's lives in evolutionary and cross-cultural perspective; women's roles in subsistence, politics, religion and economics in traditional cultures; women's roles in international development; the cultural and social construction of women's biology cross-culturally including circumcision, menstruation, pregnancy, childbirth and motherhood. **Prerequisite:** Junior or senior classification; approval of instructor. **Cross Listing:** WGST 404/ANTH 404.

ANTH 405 Introduction to the Primates

Credits 3. 3 Lecture Hours. Survey of nonhuman primates from ecological and evolutionary perspectives covering numerous topics including: taxonomy; primate evolution; behavioral observation; reproductive strategies; diet; and conservation. **Prerequisite:** Junior or senior classification.

ANTH 409 Science, Pseudoscience and Critical Thinking in Anthropology

Credits 3. 3 Lecture Hours. Close scrutiny of fantastic claims made across a broad spectrum of media regarding anthropology, biological anthropology and archaeology; distinction of science from pseudoscience; critical evaluation of scientific and pseudoscientific research; evaluation of media portrayal of science; development of critical thinking skills for skeptical investigation of extraordinary claims. **Prerequisite:** Junior or senior classification or approval of instructor; also taught at Galveston campus.

ANTH 410 Anthropological Theory

Credits 3. 3 Lecture Hours. A systematic examination of the basic principles of anthropology. **Prerequisite:** ANTH 210 or ANTH 205.

ANTH 412 Archaeological Theory

Credits 3. 3 Lecture Hours. History of scientific archaeological exploration; major theoretical paradigms and movements in archaeological theory; current trends in archaeology; intellectual developments from other disciplines that influenced archaeological thought. **Prerequisites:** Junior or senior classification, ANTH 202 or approval of instructor.

ANTH 415 Anthropological Writing

Credits 3. 3 Lecture Hours. Reading and discussion of the classic genres of anthropological literature; instruction in writing styles and techniques appropriate to each genre, followed by guided writing assignments. **Prerequisite:** Junior or senior classification.

ANTH 417/CLAS 417 Naval Warfare and Warships in Ancient Greece and Rome

Credits 3. 3 Lecture Hours. Extensive survey of Greek and Roman warships, naval warfare, naval strategy and tactics drawing upon archaeological evidence, literary documentation and iconographic material, from the Bronze Age (Ancient Egypt and the mythical Trojan War) to the Imperial Roman Navy. **Prerequisite:** Junior or senior classification. **Cross Listing:** CLAS 417/ANTH 417.

ANTH 418 Romans, Arabs, and Vikings-- Seafaring in the Mediterranean during the early Christian Era

Credits 3. 3 Lecture Hours. Examination of seafaring, maritime commerce, naval affairs, and shipbuilding in the Mediterranean from the late Roman Period until the fall of Constantinople in 1453. **Prerequisite:** Junior or senior classification.

ANTH 419 Indians of Texas

Credits 3. 3 Lecture Hours. Study of diverse native/immigrant Texas Indian lifeways/cultures from late pre-European to contemporary times; exploration of historical underpinnings, traditional cultures, especially land-use patterns; assessment of tribal relationships with colonial powers, U.S., and Texas governments as evidenced in ethnographic, ethnohistoric, and historical materials; application toward anthropological, archaeological, and human ecology research. **Prerequisites:** Junior or senior classification; ANTH 201, ANTH 202, ANTH 205, ANTH 210, ANTH 301, HIST 258, or HIST 308, or approval of instructor.

ANTH 420 Pirates, Privateers, and Sea Raiders

Credits 3. 3 Lecture Hours. History and archaeology of piracy, privateering, and sea raiding from ancient times in the Mediterranean, through the Viking Era in the Northern Atlantic, and the advent of piracy in the New World and Caribbean; sociology of contemporary piracy in Africa and the Indian Ocean; sensationalism of pirate legend and the cultural responses to the influences of the pirate phenomenon, both cinematographic and literary. **Prerequisites:** Junior or senior classification.

ANTH 421/MUST 421 Advanced Museum Studies

Credits 3. 2 Lecture Hours. 3 Lab Hours. Exploration of advanced topics in museum programs; preservation, research, education, outreach; development and implementation; emphasis on historical contexts, disciplinary intersections, ethical obligations and professional responsibilities; service to community, state and national interest and advancement of sciences. **Prerequisite:** Grade of C or better in MUST 221/ARCH 221, ARCH 221/MUST 221, or MAST 220; junior or senior classification. **Cross Listing:** MUST 421/ANTH 421.

ANTH 423 Bioarchaeology

Credits 3. 3 Lecture Hours. Role of human skeletal studies in reconstructing the biological and cultural past of humans; evidence gleaned from human skeletal remains recovered from archaeological sites such as data regarding diet, health, genetics and migration. **Prerequisites:** ANTH 225; junior or senior classification; also taught at Galveston campus.

ANTH 424 Human Evolutionary Ecology: Culture and Cooperation

Credits 3. 3 Lecture Hours. Examination of evolutionary perspective to explore culture, cooperation and sociality and subsistence behaviors across a wide variety of human cultures; part of the Human Evolutionary Ecology series along with ANTH 434. **Prerequisite:** Junior or senior classification.

ANTH 425 Human Osteology

Credits 3. 2 Lecture Hours. 3 Lab Hours. Concepts and methods used by anthropologists to identify, describe and analyze human skeletal remains from forensic and archaeological contexts. **Prerequisites:** ANTH 225 and ANTH 226, or VIBS 305; junior or senior classification.

ANTH 426 Anthropology of Food and Nutrition

Credits 3. 3 Lecture Hours. Anthropological study of human foodways and their nutritional consequences; how environmental, biological and cultural factors interact to produce patterns of food intake, and the effects of such patterns on health, growth and fertility; examples drawn primarily from non-Western societies. **Prerequisite:** ANTH 201 or ANTH 210 or ANTH 225 or NUTR 202 or approval of instructor.

ANTH 427 Human Biological Variation

Credits 3. 3 Lecture Hours. Biological basis of variation in the physical features of modern humans; details of anatomical and physiological differences of living populations to understand their adaptive and historical significance; history of human variation studies rooted in the historical notion of "race." **Prerequisites:** ANTH 225 and ANTH 226, or BIOL 214 or BIOL 225; junior or senior classification.

ANTH 430 Applied Anthropology

Credits 3. 3 Lecture Hours. Theory, ethics and practical applications of anthropological methods and concepts as they relate to planned programs of sociocultural change. **Prerequisites:** ANTH 210; junior or senior classification.

ANTH 434 Human Evolutionary Ecology: Reproduction and Parenting

Credits 3. 3 Lecture Hours. Evolutionary ecology perspective on family-formation patterns, sexuality, reproduction and parenting of humans throughout the life course and across different cultures; part of a Human Evolutionary Ecology series along with ANTH 424. **Prerequisites:** Junior or senior classification.

ANTH 435 Medical Anthropology

Credits 3. 3 Lecture Hours. Overview of medical anthropology, a subfield in anthropology which examines the biological and cultural basis of health and disease in order to understand the influence of culture on the illness experience and treatment. **Prerequisite:** Junior or senior classification or approval of instructor.

ANTH 436/RELS 436 Ancient Egypt I

Credits 3. 3 Lecture Hours. Archaeology and history of ancient Egypt from earliest times to the end of the New Kingdom period. **Prerequisites:** Junior or senior classification or approval of instructor. **Cross Listing:** RELS 436/ANTH 436.

ANTH 437 Ethnobotany

Credits 3. 3 Lecture Hours. Interdisciplinary study of the complex and dynamic relationships that exist between people and plants. **Prerequisite:** Junior or senior classification or approval of instructor.

ANTH 438/RELS 438 Ancient Egypt II

Credits 3. 3 Lecture Hours. Archaeology and history of ancient Egypt from the end of the New Kingdom to the end of the Graeco-Roman period. **Prerequisites:** Completion of ANTH 436/RELS 436 or RELS 436/ANTH 436 recommended but not required; junior or senior classification or approval of instructor. **Cross Listing:** RELS 438/ANTH 438.

ANTH 440 Studies in Globalization

Credits 3. 3 Lecture Hours. Selected issues on the anthropology of globalization such as the impact of global circulations of media, money and people on local cultures, identities and politics, migration and political economy. May be taken three times for credit. **Prerequisites:** Junior or senior classification or approval of instructor.

ANTH 444/CLAS 444 Classical Archaeology

Credits 3. 3 Lecture Hours. History of the discipline through the individuals, organizations, excavations, theoretical models and ethical issues that have shaped it. **Prerequisites:** Junior or senior classification. **Cross Listing:** CLAS 444/ANTH 444.

ANTH 445 Studies in African Diaspora

Credits 3. 3 Lecture Hours. Examination of topics related to global African diaspora including African descent populations outside of Africa wherever found (the Americas, the Caribbean, Europe, Asia, etc.); construction of blackness in Latin America; diversity of past and present African descent populations in the Old World; social and political mobilization; religion; popular culture; cultural politics; politics of identity. May be taken three times for credit. **Prerequisite:** Junior or senior classification.

ANTH 447 Lithic Artifact Analysis

Credits 3. 2 Lecture Hours. 3 Lab Hours. Laboratory-based course reviewing methods archaeologists use to analyze stone tools and debitage, including identification of tool-stone sources, reconstruction of technology, explanation of assemblage variability, and microscopic use-wear analysis. **Prerequisite:** ANTH 202 and approval of instructor; junior or senior classification.

ANTH 448 Quantitative Methods in Anthropology

Credits 3. 3 Lecture Hours. Quantitative analytical methods employed by anthropologists; includes statistical analyses, statistical software and sampling theory commonly used in anthropological research. **Prerequisites:** Junior or senior classification; STAT 302 or STAT 303.

ANTH 458 Quantitative Ethnographic Methods

Credits 3. 3 Lecture Hours. Quantitative data collection and analytical methods employed by anthropologists; includes standardized observation, structured interviews, demography and network analysis; hands-on assignments involving data collection among local community. **Prerequisite:** Junior or senior classification.

ANTH 461 Environmental Archaeology

Credits 3. 2 Lecture Hours. 3 Lab Hours. Exploration of the paleoecological context in which past humans interacted with the natural environment encompassing plants, animals and landscape; advanced method, theory and applications in paleoenvironmental reconstruction.

Prerequisites: ANTH 202 or approval of instructor; junior or senior classification.

ANTH 464 Cultural Heritage and Resource Management

Credits 3. 3 Lecture Hours. Evaluation of modern ideas about how and why archaeological, architectural, ethnographic, and natural resources should be preserved and presented to current and future societies; critical examination of the theories, methods, regulations, and ethics that guide efforts to preserve and protect cultural heritage within a context of past endeavors and future directions. **Prerequisites:** Junior or senior classification or approval of instructor.

ANTH 484 Anthropology Internship

Credits 0 to 3. 0 to 3 Other Hours. Provides students with the opportunity to gain practical experience in a variety of settings, including local, state or federal agencies; museums; non-profit organizations; non-governmental organizations; private firms. May be taken four times for credit. **Prerequisite:** Junior or senior classification.

ANTH 485 Directed Studies

Credits 0 to 9. 0 to 9 Other Hours. For individual research in anthropology on subjects not included in established courses. May be repeated for credit. **Prerequisite:** Junior or senior classification or approval of instructor; also taught at Galveston campus.

ANTH 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of anthropology. May be repeated for credit.

ANTH 491 Research

Credits 0 to 3. 0 to 3 Other Hours. Research conducted under the direction of a faculty member in Anthropology. May be taken two times for credit. **Prerequisites:** Junior or senior classification and approval of instructor.

ARAB - Arabic (ARAB)

ARAB 101 Beginning Arabic I

Credits 4. 4 Lecture Hours. (ARAB 1411) Beginning Arabic I. Introduction to Modern Standard Arabic in its written and spoken forms; emphasis on conversation, rudimentary vocabulary, simple grammar, and reading.

ARAB 102 Beginning Arabic II

Credits 4. 4 Lecture Hours. (ARAB 1412) Beginning Arabic II. Introduction of more complex grammatical constructions; vocabulary building; emphasis on putting acquired vocabulary and grammar to conversational use. **Prerequisite:** ARAB 101 or equivalent.

ARAB 104 Intensive Beginning Arabic

Credits 8. 8 Lecture Hours. Accelerated elementary language study, with oral, listening, reading and writing practice. Equivalent to ARAB 101 and ARAB 102.

ARAB 201 Intermediate Arabic I

Credits 3. 3 Lecture Hours. (ARAB 2311) Intermediate Arabic I. Practice of listening, speaking and writing skills; vocabulary building; discussion of topics related to daily life and general aspects of Arab culture.

Prerequisite: ARAB 102 or ARAB 104, or equivalent.

ARAB 202 Intermediate Arabic II

Credits 3. 3 Lecture Hours. (ARAB 2312) Intermediate Arabic II. Emphasis on comprehending printed material, perfecting pronunciation, and attending to more complex grammar; discussion of topics holding general and professional interest; knowledge of Arab culture and history.

Prerequisite: ARAB 201 or equivalent.

ARAB 204 Intensive Intermediate Arabic

Credits 6. 6 Lecture Hours. Accelerated intermediate language study, with oral, listening, reading and writing practice. Equivalent to ARAB 201 and ARAB 202. **Prerequisite:** ARAB 102 or ARAB 104.

ARAB 215 Introduction to Modern Arab Culture

Credits 3. 3 Lecture Hours. Exploration of cultural, linguistic, religious, and ethnic diversity in the Arab world; investigation of the impact of tradition and modernity on modern Arab culture; relating diverse cultural practices and products to diverse perspectives in the Arab world; taught in English.

ARAB 221 Introduction to Arabic Language and Society

Credits 3. 3 Lecture Hours. Examination of critical linguistic issues in the Arab world from a sociolinguistic perspective, including language and religion; language and power; language and nationalism; and language and education. **Prerequisite:** Approval of instructor.

ARAB 222 Field Studies I: Language, Culture, and Society

Credits 3. 3 Lecture Hours. Arabic language and culture taught in an Arabic-speaking country; living with a host family; supervised travel of cultural interest; participation in activities of host institution. **Prerequisite:** ARAB 102 or ARAB 104, or equivalent.

ARAB 258 Global Middle Eastern Cultures

Credits 3. 3 Lecture Hours. Exploration of the contemporary and historical cultures of the Middle East region; investigation of intercultural connections between the Middle East and the rest of the globe; emphasis on cultural traditions, religious communities, societal change, social movements, migration, and diaspora.

ARAB 285 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Individual supervision of readings or assigned projects in an Asian Language, selected for each student individually; written or oral reports. **Prerequisite:** Approval of Arabic and Asian Language Office Director.

ARAB 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified area of Arabic studies. May be repeated for credit.

Prerequisite: Approval of instructor.

ARAB 301 Reading and Composition

Credits 3. 3 Lecture Hours. Advanced Arabic grammar and readings of average difficulty and of different genres, including literary and journalistic texts and other culturally-enriched materials in order to develop awareness of cultural products, perspectives, and practices found in the Arab world. **Prerequisites:** ARAB 202 or ARAB 204, or equivalent; junior or senior classification or approval of instructor.

ARAB 302 Reading and Composition II

Credits 3. 3 Lecture Hours. Readings of average difficulty and of different genres, including literary and journalistic texts and other culturally-enriched materials; development of writing skills with emphasis on grammatical constructions; expansion of vocabulary and oral expression. **Prerequisites:** ARAB 301; junior or senior classification or approval of instructor.

ARAB 321 Business Arabic

Credits 3. 3 Lecture Hours. Business and financial terminologies useful in the Arab World; cultural etiquette for effective communication in Arabic business settings; oral and written business reports from a variety of authentic sources; language skills and communication strategies for traveling, shopping and conducting financial transactions in the Arab World. **Prerequisites:** ARAB 202 or ARAB 204, or equivalent; junior or senior classification or approval of instructor.

ARAB 322 Field Studies II: Language, Culture, and Society

Credits 3. 3 Lecture Hours. Arabic language and culture taught in an Arabic-speaking country; living with a host family; supervised travel of cultural interest; participation in activities of host institution. **Prerequisites:** ARAB 202 or ARAB 204, or equivalent; junior or senior classification or approval of instructor.

ARAB 323 Media Arabic

Credits 3. 3 Lecture Hours. Analysis of current events in the Arab World; use of print and electronic materials in Arabic from variety of media sources; discussion of different points of view in media representation/coverage; issues pertaining to business, politics, culture and entertainment in the Arab World. **Prerequisites:** ARAB 202 or ARAB 204, or equivalent; junior or senior classification or approval of instructor.

ARAB 475 Media and the Middle East

Credits 3. 3 Lecture Hours. Examination of how media (e.g., literature, news, film, television) contribute to our understanding of historical events in the Middle East; analysis of cultural, social, political and historical circumstances of media representation of events; exploration of various media genres' techniques and narrative structure. May be taken two times for credit with a focus on different medium. **Prerequisite:** Junior or senior classification or approval of instructor.

ARAB 485 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Individual supervision of readings or assigned projects selected for each student individually; written or oral reports. **Prerequisite:** Approval of instructor and Director of AALO.

ARAB 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of Arabic studies. May be repeated for credit. **Prerequisite:** Approval of instructor.

ARAB 491 Research

Credits 1 to 4. 1 to 4 Other Hours. Research in Arabic studies conducted under the direction of faculty member approved by the Director of AALO. May be taken 2 times for credit. **Prerequisites:** Junior or senior classification and approval of instructor.

ARCH - Architecture (ARCH)

ARCH 105 Design and Visual Communications Foundations I

Credits 5. 2 Lecture Hours. 10 Lab Hours. Architectural design principles; development of skills in perception, thought and craft as they apply to the formation of two- and three-dimensional relationships; introduction to and practice of tools, methods, techniques available for graphic communication; graphic communication and the design process; observation and other forms of free-hand drawing and drawing systems that develop representational and descriptive capabilities. **Prerequisites:** BS in Architecture major.

ARCH 106 Design and Visual Communication Foundations II

Credits 5. 2 Lecture Hours. 10 Lab Hours. Approaches to problem identification and problem solving emphasizing human, physical and cultural factors influencing architectural design; understanding of space, materiality and tectonics in a human body scale; development of drawing methods with emphasis on analytical drawing; reinforcement of visual and verbal communication as applied to design processes. **Prerequisites:** Grade of C or better in ARCH 105; major in BS in Architecture.

ARCH 115 Visual Communication Foundations I

Credits 3. 3 Lecture Hours. 0 Lab Hours. Introduction to and practice of tools, methods, techniques available for graphic communication; graphic communication and the design process; observation and other forms of free-hand drawing and drawing systems that develop representational and descriptive capabilities.

ARCH 205 Architecture Design I

Credits 5. 2 Lecture Hours. 10 Lab Hours. Issues and methods in designing environments for human habitation and well-being; projects addressing site, functional planning, spatial ordering, form generation through a recognition of the synthesis of space, structure, use and context; reinforcement of appropriate graphic and model building techniques. **Prerequisites:** Grade of C or better in ARCH 105 and ARCH 106.

ARCH 206 Architecture Design II

Credits 5. 2 Lecture Hours. 10 Lab Hours. Fundamental issues of innovative design processes and creation explored through the creative use of past, present and future materials, tools, and technologies; with an emphasis upon the research of materials, methods, scale, craft and technique as instruments of design, fabrication, and production. **Prerequisites:** Grade of C or better in ARCH 205.

ARCH 212 Social and Behavioral Factors in Design

Credits 3. 3 Lecture Hours. Social and behavioral factors in the built and natural environment; environmental perception and spatial cognition; social-environmental processes such as privacy and crowding; setting-oriented discussion on residences, education, and the workplace; the psychology of nature and natural resource management; social design and social science contribution to architectural design.

ARCH 213 Sustainable Architecture

Credits 3. 3 Lecture Hours. A comprehensive introduction to sustainability concepts, techniques and applications at all levels of the built environment, history of contemporary development of sustainable architecture from 1960 to the present; design strategies, environmental technologies and social factors for reducing building energy needs and carbon foot prints; global applications of sustainable approaches.

ARCH 216 Computational Methods in Architecture

Credits 3. 2 Lecture Hours. 2 Lab Hours. Software and processes for computation design in architecture; image editing and creation, vector drawing, 3D modeling, parametric modeling, rendering techniques and simulation.

ARCH 221/MUST 221 Foundations of Museum Studies

Credits 3. 3 Lecture Hours. Introduction to museums, cultural heritage and collections care; best practices for non-profit institutions, public engagement and the collection, preservation and exhibition of material culture; emphasis on archaeological, ethnographic, and historical collections, or other collections of cultural significance. **Cross Listing:** MUST 221/ARCH 221.

ARCH 246 Foundations of Historic Preservation

Credits 3. 3 Lecture Hours. Exploration and evaluation of the cross-disciplinary work of historic preservation; emphasis on the significance of historic places to societal well-being and conservation alternatives for historic and cultural environments; review of preservation projects and treatments; guest presentations and case studies from practicing professionals and researchers in a variety of fields.

ARCH 249 Survey of World Architecture History I

Credits 3. 3 Lecture Hours. (ARCH 1301) Survey of World Architecture History I. A survey of world architecture and the human-designed and built environment from prehistory to the 13th century.

ARCH 250 Survey of World Architecture History II

Credits 3. 3 Lecture Hours. (ARCH 1302) Survey of World Architecture History II. A survey of world architecture and the human-designed and built environment from the 13th to the 19th century.

ARCH 260 Comparative Theory in the Built and Virtual Environments

Credits 3. 3 Lecture Hours. Introduction of cultural theory and the environment; theories, special concepts and ideas relevant to the built and virtual environments with primary focus on the last fifty years; theory, theory building, and application to buildings and urban design; formation of ideas and critical ways of assessing the environment.

ARCH 281 Seminar in Contemporary Architecture

Credit 1. 1 Lecture Hour. Presentations by and discussions with professionals representing specialty areas related to environmental design through the Department of Architecture Lecture Series. May be taken four times for credit. Must be taken on a satisfactory/unsatisfactory basis.

ARCH 289 Special Topics in...

Credits 1 to 5. 0 to 10 Lab Hours. 1 to 5 Other Hours. Selected topics in an identified area of Architecture. May be repeated for credit.

ARCH 291 Research in Architecture Innovation

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in the College of Architecture. May be repeated 2 times for credit. **Prerequisite:** Approval of instructor and department head.

ARCH 305 Architecture Design III

Credits 5. 2 Lecture Hours. 10 Lab Hours. Integration of architectural theories and philosophy with environmental design systems; study of theoretical approaches to graphic and analytical thinking, problem identification and design dissemination through various media, case studies and problem resolution; conditions and forces associated with a variety of building types and the generation design solutions.

Prerequisites: Admission to upper level in BS in Architecture; ARCH 249 and ARCH 250.

ARCH 317 Digital Fabrication for Architecture

Credits 3. 1 Lecture Hour. 4 Lab Hours. Digital fabrication for architecture including software, numerically controlled tools, translation applications and management strategies for digital fabrication workflows; production of building components from three dimensional datasets of virtual architecture proposals. **Prerequisites:** Junior or senior classification or approval of instructor; ARCH 216 or approval of instructor.

ARCH 327 Conceptual Structural Analysis

Credits 3. 1 Lecture Hour. 4 Lab Hours. A non-mathematical investigation of structural systems and components with respect to behavior; selection of the most appropriate structural system for various building typologies. **Prerequisite:** Junior or senior classification or approval of instructor.

ARCH 328 Architectural Envelopes

Credits 3. 3 Lecture Hours. Study of roof, wall, glazing and screen systems of significant works in contemporary architecture and the strategies behind their making; focus on innovative materials, surface effects, and performance aspects. **Prerequisite:** Junior or senior classification in environmental design.

ARCH 330 The Making of Architecture

Credits 3. 3 Lecture Hours. Study of significant works of contemporary architecture and materials and strategies used in their making; focus on innovative materials, systems, and partnerships necessary to realize the design. **Prerequisites:** Junior or senior classification in environmental design or approval of instructor or ARCH classification.

ARCH 331 Architectural Structures

Credits 3. 2 Lecture Hours. 2 Lab Hours. Physical principles that govern statics and strength of materials through the design of architectural structures from a holistic view, in the context of architectural ideas and examples; introduction to construction, behavior of materials, and design considerations for simple and complex structural assemblies; computer applications. **Prerequisites:** Junior or senior classification in environmental design; MATH 142 or equivalent; PHYS 201.

ARCH 335 Architectural Systems

Credits 3. 2 Lecture Hours. 2 Lab Hours. Theory and applications of building energy use, envelope design, shading analysis, heating and cooling systems, lighting design; building water supply, plumbing and drainage systems; electrical, acoustical, fire and lightning protection; life safety; transportation systems and construction materials; calculations, equipment selection, and component sizing as they relate to building design. **Prerequisites:** Junior or senior classification in environmental design; PHYS 201.

ARCH 345 History of Building Technology

Credits 3. 3 Lecture Hours. Chronological development of civilization and building technology from prehistoric cultures to present; classic and modern materials, structural devices past and present, machine-produced products, prefabrication, construction methodology and servicing.

ARCH 346 Architecture, Heritage and Culture

Credits 3. 3 Lecture Hours. Global exploration of how architecture and the built environment express culture and identity; theoretical and practical approaches to cultural heritage and conservation. **Prerequisite:** Junior or senior classification.

ARCH 347 Documentation of Historic Buildings and Sites

Credits 3. 1 Lecture Hour. 4 Lab Hours. Techniques for recording historic buildings and sites; measuring and drawing to Historic American Building Survey Standards; field experience in photography, laser scanning, photogrammetry, hand measuring, field notes and record drawing preparation. **Prerequisites:** Junior or senior classification or approval of instructor.

ARCH 350 History and Theory of Modern and Contemporary Architecture

Credits 3. 3 Lecture Hours. Development of modern and contemporary architecture in the 20th and 21st centuries; materials, structure, social and economic changes as well as architectural theory. **Prerequisites:** Junior or senior classification.

ARCH 353 History of Product Design

Credits 3. 3 Lecture Hours. History of product design in Europe and America including the relationship between designer and object, the relationship of design, industry and media over time and design criticism; focus on material/technical and typological approaches, comparative method and content analysis in context of original environment and social history. **Prerequisite:** Junior or senior classification or approval of instructor.

ARCH 360 Topics in Design Build Community Service

Credits 3. 1 Lecture Hour. 4 Lab Hours. Contemporary topics in architectural design-build practices including high impact interdisciplinary learning experiences developed through a project-based learning model with a focus on the planning, design, pre-construction, construction and project delivery; team-based approach with those outside of the architecture discipline to design, plan and complete project documents, estimates and undertake the construction activities necessary to make a fully functioning community service project.

Prerequisites: Junior or senior classification or approval of instructor.

ARCH 381 Design Seminar

Credit 1. 1 Lecture Hour. Presentations by and discussions with professionals representing specialty areas related to architectural fabrication and product design. May be taken three times for credit.

Prerequisite: Junior or senior classification or approval of instructor.

ARCH 401 Design Creativity

Credits 3. 3 Lecture Hours. Fundamental critical and creative thinking skills needed to participate in and create the future; study of how design can impact the physical environment and society. **Prerequisites:** Junior or senior classification or approval of instructor.

ARCH 405 Architecture Design IV

Credits 6. 2 Lecture Hours. 12 Lab Hours. A comprehensive design studio focused on the integration of design theory with functionally sustainable environmental and structural systems; consideration of a project from site analysis and programming through design detailing. **Prerequisites:** ARCH 305, ARCH 331, ARCH 335; CARC 301 or ARCH 494; concurrent enrollment in ARCH 431 and ARCH 435.

ARCH 406 Architecture Design V

Credits 5. 2 Lecture Hours. 10 Lab Hours. Topical approaches to design, emphasizing theory and practice of architecture or related disciplines, such as urban design, interior design, health care design, etc. **Prerequisites:** Junior or senior classification; admission to upper level in BS in Architecture; grade of C or better in ARCH 305, ARCH 331 and ARCH 335; grade of C or better in CARC 301 or ARCH 494; students may with approval of the department enroll in the course during the summer term prior to taking ARCH 405, ARCH 431 and ARCH 435 if they are within 20 credit hours of graduation prior to the beginning of the following fall semester.

ARCH 413 Elements of Urban Design

Credits 3. 3 Lecture Hours. Investigation of design elements shaping the urban environment; emphasis placed on contemporary precedents in architecture, landscape and urbanism to evaluate design complexity on multiple levels: social, political, environmental, economic, cultural and geographic. **Prerequisite:** Admission to upper level division in BED or BS-URPN.

ARCH 421 Energy and Sustainable Architecture

Credits 3. 3 Lecture Hours. Understanding the various design decisions impacting sustainability and energy efficiency; includes participation in an "academic" LEED-NC rating project; interdisciplinary team approach with a design studio architect to perform the LEED-NC rating on the architect's building; application of reference material, standards, and USGBC material. **Prerequisite:** Junior and senior classification or approval of instructor.

ARCH 430 History of Ancient Architecture in the Near East, Egypt, Greece and Rome

Credits 3. 3 Lecture Hours. Examination of stylistic, structural and theoretical advancements in ancient architecture, with case studies from the Near East, Egypt, Greece and Rome. **Prerequisite:** ARCH 249 or ARTS 149; junior or senior classification or approval of degree coordinator or instructor.

ARCH 431 Integrated Structures

Credits 2. 1 Lecture Hour. 2 Lab Hours. Selection and economics of structural systems in the context of integrating structural systems into a building through good design; analysis and design of wood, steel, concrete, and composite systems and members in relation to building design. **Prerequisites:** Admission to upper level in environmental design; ARCH 305, ARCH 331, ARCH 335; concurrent enrollment in ARCH 405 and ARCH 435.

ARCH 433 Architectural Lighting

Credits 3. 3 Lecture Hours. Theory and practice of lighting design as an art and science; aperture design for sunlight control; selecting and locating luminaries to enhance interior and exterior surfaces and spaces. **Prerequisite:** ARCH 335 or junior or senior classification in EDAS.

ARCH 434 The Role of Sculpture and Painting in Ancient Architecture

Credits 3. 3 Lecture Hours. Interrelationships of architecture, painting and sculpture in the ancient world including Egypt, Mesopotamia, Crete, Greece and Rome. **Prerequisite:** ARCH 249 or ARTS 149; junior or senior classification or approval of degree coordinator or instructor.

ARCH 435 Integrated Systems

Credits 2. 1 Lecture Hour. 2 Lab Hours. Understanding how to integrate sustainable environmental systems into a building through good design; lectures support studio; systems faculty participate in studio critiques throughout the project. **Prerequisites:** Admission to upper level in environmental design; ARCH 305, ARCH 331, ARCH 335; concurrent enrollment in ARCH 405 and ARCH 431.

ARCH 437 The Gothic Cathedral

Credits 3. 3 Lecture Hours. A critical study of monumental church-building in Europe during the later Middle Ages (ca. 1140–1500 C.E.); investigation of works of architecture, sculpture and painting in relation to issues of craft, ritual and power; exploration of the afterlives of the Gothic style in the Americas, Asia and Africa. **Prerequisite:** ARCH 250 or ARTS 150; junior or senior classification or approval of degree coordinator or instructor.

ARCH 438 World Religious Architecture

Credits 3. 3 Lecture Hours. Exploration of the diverse architectural traditions of the world's major religions with an emphasis on issues of place-making, representation, ritual, identity, and culture, past and present. **Prerequisite:** Junior or senior classification.

ARCH 441 Baroque and Rococo Architecture

Credits 3. 3 Lecture Hours. The investigation of the history of architecture, the arts and society, and major creative individuals from the late sixteenth to the early eighteenth centuries. **Prerequisite:** ARCH 250 or ARTS 150; junior or senior classification or approval of degree coordinator or instructor.

ARCH 443 Aegean Art and Architecture

Credits 3. 3 Lecture Hours. Art and architecture of the prehistoric Aegean, ca. 6000-1100-B.C.E.; focus on the built environment, material culture and visual arts of early civilization in the Aegean basin; evidence for regional and vernacular architectural traditions; expressions of power, ideology and social identity through monumental architectural and elite arts of Minoan Crete and Mycenaean Greece. **Prerequisites:** Junior or senior classification; approval of instructor or degree coordinator.

ARCH 444 American Architecture

Credits 3. 3 Lecture Hours. Investigation of indigenous, vernacular and historical American architecture from 1500 to 1920; evolution of construction technologies, changing building forms and finish treatments; identification of historic architectural styles and their influence on 21st century American architecture. **Prerequisites:** ARCH 250 or ARCH 350; junior or senior classification, or approval of instructor.

ARCH 451 Strategies in Architectural Management

Credits 3. 3 Lecture Hours. Emerging strategies in the architecture and construction industry, with an emphasis on understanding the changing structure of the industry and the management of both firms and projects. **Prerequisite:** Senior classification or approval of degree coordinator.

ARCH 452 Careers in Architecture

Credits 3. 3 Lecture Hours. Career opportunities in the profession of architecture; investigations into the composition of architectural practice today and the wide range of specialties represented in architectural firms; interviews with select representative individuals. **Prerequisite:** Admission to upper level in environmental design, construction science or landscape architecture.

ARCH 457 Ethics and Professional Practice

Credits 3. 3 Lecture Hours. Issues and relationships within the business, legal and political environment; introduction to the concepts of architectural specifications and the AIA standard conditions of the construction contract; forms of construction, bidding and contract documents. For undergraduate students pursuing a professional degree and a career in architecture. **Prerequisite:** Senior classification in environmental design.

ARCH 458 Cultural and Ethical Considerations for Global Practice

Credits 3. 3 Lecture Hours. Issues and relationships within the cultural, business, legal and political environments of global practice; differences in the construction contract, bidding and various forms of construction.

Prerequisite: Junior or senior classification.

ARCH 463 Elements of Interior Architecture

Credits 3. 3 Lecture Hours. Analysis and design of architectural interiors; historical and professional perspectives incorporating programming, space planning and organization; specification and selection of furnishings and materials to satisfy user needs in residential, commercial and institutional settings. **Prerequisites:** Admission to upper level in environmental design; concurrent enrollment in ARCH 405, ARCH 431 and ARCH 435 not allowed.

ARCH 468 Preservation Field Studies

Credits 1 to 6. 1 to 6 Other Hours. Fieldwork related to practice of historic preservation and cultural heritage management; methods of documentation, analysis, planning and treatment; emphasis on identification and evaluation of multidisciplinary approaches to historic preservation and heritage conservation in global contexts; topics vary each semester. May be taken for credit up to six hours. **Prerequisites:** ARCH 246, ARCH 346, or ARCH 347; junior or senior classification or approval of instructor.

ARCH 481 Seminar

Credit 1. 1 Lecture Hour. Presentations by and discussions with professionals representing specialty areas related to environmental design; career and academic objectives. May be repeated for up to 4 credit hours. Must be taken on a satisfactory/unsatisfactory basis.

Prerequisite: Junior or senior classification or approval of instructor.

ARCH 484 Summer Internship

Credits 6. 12 Other Hours. Practical experience in an office of design allied professionals; 10- week internship with a minimum of 400 hours continuous employment; departmental pre-approval through the departmental internship coordinator required; post evaluation conducted following the internship. May not be repeated for credit. **Prerequisites:** Junior or senior classification or approval of instructor; approval of the environmental design internship coordinator.

ARCH 485 Directed Studies

Credits 1 to 5. 1 to 5 Other Hours. Special projects in architecture. May be repeated for credit. **Prerequisites:** Admission to upper level in environmental design; approval of instructor and degree coordinator.

ARCH 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Special topics in an identified area of architecture. May be repeated for credit. **Prerequisite:** Junior or senior classification; approval of instructor and degree coordinator.

ARCH 491 Advanced Architecture Innovation Research

Credits 0 to 6. 0 to 6 Other Hours. Research conducted under the direction of faculty member in the College of Architecture. May be repeated 2 times for credit. **Prerequisite:** Admission to upper level in environmental design; approval of instructor and department head.

ARCH 494 Internship

Credits 9. 18 Other Hours. Practical experience in an office of design allied professionals; fifteen week internship with a minimum of 600 hours of continuous employment; departmental pre-approval through the departmental internship coordinator required; post evaluation conducted following the internship. To be taken only as a requirement for the study away semester. May not be repeated for credit. **Prerequisites:** Junior or senior classification; admission to upper level in environmental design; CARC 481; approval of the environmental design internship coordinator.

AREN - Architectural Engr (AREN)

AREN 200 Architectural Engineering Foundations

Credits 2. 2 Lecture Hours. Introduction to the broad field and professional practice of architectural engineering, architectural engineering systems, and the role of the architectural engineer; emphasis on professional engineering design services, design and construction processes and documents, building envelope and materials, structural systems, mechanical systems, lighting systems, building systems integration, building codes and standards, fire safety, professional attributes of architectural engineers, and issues of human performance requirements and sustainability as relates to building system design. **Prerequisite:** Sophomore classification or approval of instructor.

AREN 210 Fundamentals of Building Information Modeling for Architectural Engineering

Credits 3. 2 Lecture Hours. 3 Lab Hours. Application of the fundamentals of engineering design, document production, and interdisciplinary coordination utilizing design and drafting software; application of software to model shapes, structures, and systems in 3D with parametric accuracy, precision, and ease; topics include streamline documentation work, with instant revisions to plans, elevations, schedules, and sections as projects change; and introduction of specialty toolsets; production of structural and mechanical-electrical-plumbing systems in a 3-D model.

AREN 221 Engineering Mechanics - Statics and Dynamics for Architectural Engineers

Credits 4. 4 Lecture Hours. Principles of statics, kinematics, and kinetics, with particular attention to architectural engineering applications; general principles of mechanics; concurrent force systems; statics of particles; equivalent force/moment systems; centroids and center of gravity; equilibrium of rigid bodies; trusses, and frames; internal forces in structural members; friction; second moments of areas; force action related to displacement, velocity, and acceleration of rigid bodies; kinematics of plane motion; kinetics of translation and rotation; mass moment of inertia; vibration; work, energy, and power; impulse and momentum. **Prerequisites:** Grade of C or better in MATH 251 or MATH 253, or equivalent, or concurrent enrollment; grade of C or better in PHYS 206; grade of C or better in ENGR 216/PHYS 216 or PHYS 216/ENGR 216.

AREN 281 Architectural Engineering Seminar

Credit 1. 1 Lecture Hour. Exploration of architectural engineering and its subfields; architectural engineering curriculum resources and opportunities such as internships and research; current professional challenges and ethical implications; presentations from faculty and industry guests. **Prerequisites:** Grade of C or better in ENGR 102; admission to major degree sequence in architectural engineering.

AREN 285 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Directed studies within the field of architectural engineering. **Prerequisites:** Sophomore classification and approval of multidisciplinary engineering director or delegate.

AREN 289 Special Topics in...

Credits 1 to 4. 1 to 4 Other Hours. Selected topics in an identified area of architectural engineering. May be repeated for credit.

AREN 300 Architectural Engineering Systems

Credits 3. 2 Lecture Hours. 3 Lab Hours. Analysis and application of the engineering design process to solve problems associated with the design and operation of building systems, specifically related to HVAC, electrical power and lighting, and structural integrity; communication of solutions to technical problems of building systems, through writing, presentations, and team interactions, typical of architectural engineers in the building industry; emphasis on the engineering design process in architectural engineering, structural systems for buildings, mechanical systems for heating, ventilation, and air-conditioning, electrical lighting for buildings, building fire safety, building acoustics, building codes and standards, interface issues among different building systems, and sustainability aspects of building systems. **Prerequisites:** Grade of C or better in AREN 200 and AREN 221; or approval of instructor.

AREN 310 Thermal-Fluid Sciences for Architectural Engineers

Credits 4. 4 Lecture Hours. Fundamental theory and practical application of thermal-fluid sciences adapted for architectural engineering; conservation laws, energy conversion, thermodynamic properties, open and closed systems analysis, psychrometric analysis, vapor and gas cycles with emphasis on refrigeration cycles; fluid behavior laws; dimensional analysis for external and internal flows. **Prerequisites:** Grade of C or better in AREN 221, MEEN 221, MEEN 225, or CVEN 221; grade of C or better in MATH 251 or MATH 253.

AREN 311 Thermal-Fluid Sciences II for Architectural Engineers

Credits 3. 3 Lecture Hours. Continued theory and application of thermal-fluid sciences adapted for architectural engineering; open channel flow, pumps, conduction, convection, and radiation heat transfer; heat exchangers; introduction to computational fluid dynamics and computational heat transfer for building applications. **Prerequisites:** Grade of C or better in AREN 310 or equivalent.

AREN 320 Lighting Engineering for Buildings

Credits 3. 3 Lecture Hours. Reinforces the fundamentals of illuminating engineering for building interiors; focuses on the design and analysis of electrical lighting systems, including the integration between the lighting design process and the technical foundations of building lighting; emphasis on the fundamentals of lighting engineering and basic engineering methods for building lighting systems, lighting design criteria, lighting calculations, and power budgets. **Prerequisites:** Grade of C or better in AREN 300; or approval of instructor.

AREN 330 Mechanical Systems for Buildings

Credits 3. 3 Lecture Hours. Introduction to qualitative and quantitative engineering concepts of mechanical systems for buildings for architectural engineers, including HVAC systems, control of indoor air pollutants and fire suppression systems; emphasis on thermal behavior of buildings and building envelopes, human comfort requirements and psychometrics, thermal load calculations, HVAC systems/equipment, design of space air-conditioning and its relationship to architectural design, mechanical systems for indoor air quality and for fire suppression. **Prerequisites:** Grade of C or better in AREN 300 and AREN 310; or approval of instructor.

AREN 399 High Impact Experience for Architectural Engineers

Credits 0. 0 Other Hours. Participation in an approved high-impact learning experience; reflection on professional outcomes from the National Society of Professional Engineers' Engineering Body of Knowledge; documentation and self-assessment of learning experience at mid-curriculum point. **Prerequisite:** Junior or senior classification.

AREN 401 Architectural Engineering Design I

Credits 4. 3 Lecture Hours. 3 Lab Hours. Instruction and practice in the design process applied to an architectural engineering design project; application of establishing customer need, determining requirements in terms of function and performance, developing alternative design concepts, performing trade-off studies among performance, cost and schedule, embodiment and detail design and the iteration of the above steps; major architectural engineering design project. **Prerequisites:** Grade of C or better in AREN 330, AREN 311, and CVEN 345.

AREN 402 Architectural Engineering Design II

Credits 3. 2 Lecture Hours. 3 Lab Hours. Application and extension of fundamentals of engineering design, product detail, and design development process, including case studies; emphasis on project management, marketing considerations, manufacturing detailed design specifications, failure modes, applications of codes and standards, selection of design margins, product (component) development guidelines, intellectual property, product liability and ethical responsibility; major architectural engineering design project. **Prerequisite:** Grade of C or better in AREN 401.

AREN 430 Hygrothermal Analysis of Building Envelopes

Credits 3. 3 Lecture Hours. Heat and mass transfer on and through building envelopes; solar loads; internal heat gains; estimation of space cooling and heating loads. **Prerequisites:** Grade of C or better in AREN 310; or approval of instructor.

AREN 440 Architectural Engineering Heating, Ventilating and Air Conditioning Design

Credits 3. 3 Lecture Hours. Project-based design course; select and develop the mechanical system for a building, from the programming phase to the design development and working documents; emphasis on the application HVAC principles in the design and analysis of a mechanical system in a real building, including review of building thermal load calculations & energy analysis, HVAC design goals and schematic design, system selection and system design, HVAC design development, HVAC design documents, and energy, environmental, and human comfort considerations in HVAC design. **Prerequisites:** Grade of C or better in AREN 311 and AREN 330.

AREN 485 Directed Studies

Credits 0 to 6. 0 to 6 Other Hours. Directed individual study within architectural engineering. **Prerequisites:** Junior or senior classification and approval of architectural engineering director or delegate.

AREN 489 Special Topics in...

Credits 1 to 4. 1 to 4 Other Hours. Selected topics in an identified area of architectural engineering. May be repeated for credit. **Prerequisites:** Junior or senior classification.

AREN 491 Research

Credits 1 to 6. 1 to 6 Other Hours. Research conducted under the direction of faculty member in architectural engineering. May be repeated for credit. **Prerequisites:** Junior or senior classification in engineering and approval of the architectural engineering program delegate.

ARSC - Arts & Sciences (ARSC)

ARSC 101 First Year Seminar

Credits 0. 0 Lecture Hours. 0 Lab Hours. 0 Other Hours. Development of self-efficacy, self-awareness, and sense of purpose; actively engage in learning environment inside and outside the classroom; become socially integrated within the university community. **Prerequisite:** First time in college student pursuing a major in the College of Arts & Sciences.

ARSC 104 Contemporary Issues in Science - Cosmos, Earth and Humanity

Credits 3. 3 Lecture Hours. Science for citizens; interdisciplinary survey of contemporary issues in the science of our universe or cosmos, Earth and humanity, including the big bang, evolution, genetics, vaccines and drugs; future outlook on humanity, including artificial intelligence, cryptography and cybersecurity; critically analyze science presented in the news, on television and on social media; ethical implications of research. **Cross Listing:** BIOL 104 and PHYS 104.

ARSC 105/CHEM 105 Contemporary Issues in Science - The Environment

Credits 3. 3 Lecture Hours. Science for citizens; interdisciplinary survey of contemporary issues in and future outlook on the science of our environment, including climate change, energy, plastics, agriculture, and food and water safety; future outlook on the health of our environment; critically analyze science presented in the news, on television and on social media. **Cross Listing:** CHEM 105/ARSC 105.

ARSC 201 Self-Directed Experiences with Adolescents

Credit 1. 1 Lecture Hour. 1 Lab Hour. Study of adolescents in diverse school and community settings; overview of issues in physical, mental, social and emotional development; exploration of issues related to racism, sexism, and cultural diversity; serves as the screening instrument deemed necessary by TAC Rule §227.10.8 for admission to an Educator Preparation Program such as aggieTEACH Arts & Sciences; determination of knowledge, experience, skills, and aptitude for secondary certification. **Prerequisites:** Enrollment in the College of Arts and Sciences or the College of Agriculture and Life Sciences; seeking secondary teacher certification.

ARSC 202 The Human Experience

Credits 3. 3 Lecture Hours. Introduction to classic transformative texts in the history of the arts, sciences, and humanities; interdisciplinary methods and approaches within the humanities; key ethical and moral debates across the human experience. **Cross Listing:** HIST 202 and PHIL 202.

ARSC 285 Directed Studies

Credits 0 to 9. 0 to 9 Other Hours. Directed study of specific problems in arts and sciences. May be repeated for credit. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisites:** Freshman or sophomore classification; approval of instructor.

ARSC 289 Special Topics in...

Credits 0 to 3. 0 to 3 Other Hours. Selected topics in an identified area of arts and sciences. May be repeated for credit. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

ARSC 292 Cooperative Education in Arts and Sciences

Credits 0 to 2. 0 to 2 Other Hours. Educational work assignment by a student in the field of his or her career interest and course of study. Supervision of the student will be by the cooperating employer and the instructor. A technical report, approved by the instructor, on a related subject area will be required. **Prerequisite:** Approval of College's Director of Academic Operations; freshmen and sophomore classification.

ARSC 301 College of Arts and Sciences Study Abroad

Credits 0 to 18. 0 to 18 Other Hours. For student in approved programs abroad. May be repeated for credit. **Prerequisites:** Admission to approved program and approval of Academic Dean.

ARSC 392 Cooperative Education in Arts and Sciences

Credits 2. 2 Other Hours. Educational work assignment by a student in the field of his or her career interest and course of study. Supervision of the student will be by the cooperating employer and the instructor. A technical report, approved by the instructor, on a related subject area will be required. **Prerequisite:** Approval of College's Director of Academic Operations; junior classification.

ARSC 485 Directed Studies

Credits 0 to 9. 0 to 9 Other Hours. Directed study of specific problems in arts and sciences. May be repeated for credit. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisites:** Junior or senior classification; approval of instructor.

ARSC 489 Special Topics in...

Credits 1 to 4. 1 to 4 Other Hours. Selected topics in an identified area of arts and sciences. May be repeated for credit. **Prerequisites:** Junior or senior classification and approval of instructor.

ARSC 492 Cooperative Education in Arts and Sciences

Credits 0 to 2. 0 to 2 Other Hours. Educational work assignment by a student in the field of his or her career interest and course of study. Supervision of the student will be by the cooperating employer and the instructor. A technical report, approved by the instructor, on a related subject area will be required. **Prerequisite:** Approval of College's Director of Academic Operations; senior classification.

ARTS - Art (ARTS)

ARTS 101 Lumiere - Paris The City of Lights

Credit 1. 1 Lecture Hour. Overview of French art, culture and society in nineteenth-century Paris; focus on the movements of Academicism, Realism and Impressionism; the artists and artworks of the time; exploration of issues in early Modern society; and connections between art and society through the use of the strategy game ARTé: Lumière.

ARTS 102 Mecenas - The World of the Medici

Credit 1. 1 Lecture Hour. Survey of architecture, painting, sculpture and the minor arts from the Italian Renaissance of the 15th and 16th centuries surrounding the Medici family; the intersection with art patronage, economics and politics through the strategy game Arté Mecenas.

ARTS 103 Design I

Credits 3. 2 Lecture Hours. 4 Lab Hours. (ARTS 1311) Design I. Two-dimensional design; fundamentals of line, color, form, texture, shape, space and composition. **Prerequisites:** Graphic Design or Studio Art minor.

ARTS 104 Introduction to Graphic Design

Credit 1. 2 Lab Hours. Exploration of the concepts and techniques utilized in graphic design; layout, typography, use of color, design principles; integration of type and images. **Prerequisites:** Graphic Design or Studio Art minor.

ARTS 111 Drawing I

Credits 3. 2 Lecture Hours. 4 Lab Hours. (ARTS 1316) Drawing I. Principles of composition and form, media, techniques, and subjects; exploration of perceptual and descriptive drawing; mark making as a developmental process in art and design practice. **Prerequisites:** Graphic Design or Studio Art minor.

ARTS 115 Drawing for Visualization

Credits 3. 2 Lecture Hours. 4 Lab Hours. Investigation of and practice with media, methods and techniques in communication of design; observational drawing; proportion, form, line and value. **Prerequisite:** Lower division in Visualization.

ARTS 116 Drawing II

Credits 3. 2 Lecture Hours. 4 Lab Hours. Development and reinforcement of skills established in ARTS 111; measuring methods, composition, proportion, form, line, and value. **Prerequisites:** Grade C or better in ARTS 111 or ARTS 115.

ARTS 149 Art History Survey I

Credits 3. 3 Lecture Hours. (ARTS 1303) Art History Survey I. Survey of architecture, painting, sculpture and the minor arts from prehistoric times to 14th century.

ARTS 150 Art History Survey II

Credits 3. 3 Lecture Hours. (ARTS 1304) Art History Survey II. Survey of architecture, painting, sculpture and the minor arts from the 14th century to the end of the 20th century; also taught at Galveston campus.

ARTS 210 Introduction to Digital Photography

Credits 3. 2 Lecture Hours. 3 Lab Hours. (ARTS 2356) Introduction to Digital Photography. Introduction to photography; digital camera controls; creation, manipulation and critique of the digital image; composition and aesthetics; exposure control; digital work-flow. **Prerequisite:** Non-visualization majors only.

ARTS 212 Life Drawing

Credits 3. 1 Lecture Hour. 6 Lab Hours. (ARTS 2323) Life Drawing. Study of the form, volume, structure and movement of the human figure; emphasis on proportion and anatomy. **Prerequisite:** Grade of C or better in ARTS 111 or ARTS 115.

ARTS 231 Digital Form and Fabrication

Credits 3. 2 Lecture Hours. 4 Lab Hours. Introduction to and development of three-dimensional modeling and prototyping skills for sculptural form. **Prerequisites:** Grade of C or better in VIST 106 or equivalent.

ARTS 234 Body Art of Tattoos

Credits 3. 3 Lecture Hours. History of body art from the Stone Age to present day; aesthetics, sign, symbol, social and cultural significance.

ARTS 255 Typography

Credits 3. 2 Lecture Hours. 4 Lab Hours. Introduction to the art and history of typography; basic understanding of typography; exploration of typography through reading, research, exercises, and design production; the history of typographic forms, principles of typographic composition, and the expressive potential of type. **Prerequisites:** Grade of C or better in VIST 105 or ARTS 104.

ARTS 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified area of art history or visualization. May be repeated for credit.

ARTS 301 Artificial Intelligence in Visual Arts

Credits 3. 2 Lecture Hours. 4 Lab Hours. Examination of the role of AI in the visual arts; exploration of AI technologies including diffusion models, generative algorithms, machine learning; analyzes the impact of AI on creativity, workflow, authorship, and artistic expression.

Prerequisites: PVFA 201; PVFA 301 or concurrent enrollment; junior or senior classification or approval of instructor.

ARTS 303 Graphic Design I

Credits 3. 2 Lecture Hours. 4 Lab Hours. Principles and elements of graphic design; composition problem solving, conceptual thinking and application to visual communication. **Prerequisites:** Grade of C or better in ARTS 104 or VIST 105.

ARTS 304 Graphic Design II

Credits 3. 2 Lecture Hours. 4 Lab Hours. Continuation of ARTS 303; concepts in advanced graphics as a tool for design solutions for publication and promotion; emphasis on creative thinking over technology. **Prerequisites:** ARTS 303; junior or senior classification.

ARTS 305 Painting I

Credits 3. 2 Lecture Hours. 4 Lab Hours. Traditional and contemporary painting approaches and media; emphasis on form, composition, observational representation. **Prerequisite:** Grade of C or better in ARTS 111 or ARTS 115.

ARTS 308 Sculpture

Credits 3. 1 Lecture Hour. 5 Lab Hours. Principles and processes of form making; space and materials; context and content of three-dimensional form. **Prerequisite:** Grade of C or better in ARTS 111 or ARTS 115.

ARTS 311 Traditional Photography

Credits 3. 2 Lecture Hours. 4 Lab Hours. Photographic image as a medium of visual expression; basic theory and practice of still photography; historic development and aesthetic concern for photographic imagery. **Prerequisites:** Grade of C or better in ARTS 103 or VIST 205.

ARTS 312 Advanced Photography

Credits 3. 2 Lecture Hours. 3 Lab Hours. Advanced photographic image-making; development, control and presentation of the expressive photographic image; traditional and/or new media. **Prerequisite:** Grade of C or better in ARTS 210, VIST 310, or ARTS 311.

ARTS 315 Figure Drawing For Narrative and Concept Development

Credits 3. 2 Lecture Hours. 4 Lab Hours. Exploration of contemporary drawing practices and theory; investigation into the relationship with digital media including animation, photography and other digital technologies; development of personal approaches to media, techniques and thematic content; creation of a creative workflow and visual vocabulary. **Prerequisite:** Grade of C or better in ARTS 212.

ARTS 325 Digital Painting

Credits 3. 2 Lecture Hours. 4 Lab Hours. Theory and practice of digital painting media; exploration of traditional and new forms of art making and creativity; emphasis on color theory; field trip required. **Prerequisites:** Grade of C or better in ARTS 111 or ARTS 115.

ARTS 328 Advanced Painting

Credits 3. 1 Lecture Hour. 5 Lab Hours. Experiments in spatial design; intermediate aspects of creative process; issues in contemporary art; modeling and construction techniques as they may facilitate the generation of new forms and compositions; formal visual analysis and critique. May be taken two times for credit. **Prerequisites:** ARTS 305; junior or senior classification; PVFA major or approval of instructor.

ARTS 329 Texas Art History

Credits 3. 3 Lecture Hours. The development of visual arts in Texas; an examination of art movements, artists and major works exhibiting a broad range of artistic techniques. **Prerequisite:** Grade of C or better in ARTS 149, ARTS 150, ARTS 349, ARCH 249, ARCH 250, or ARCH 350.

ARTS 330 The Arts of America

Credits 3. 3 Lecture Hours. Survey of painting, sculpture, crafts and architecture of prehistoric America to the present; emphasis on art as a record of cultural, economic and social evolution. **Prerequisite:** Grade of C or better in ARTS 149, ARTS 150, ARTS 349, ARCH 249, ARCH 250, or ARCH 350.

ARTS 335 The Art and Architecture of Rome

Credits 3. 3 Lecture Hours. Rome as a microcosm of western civilization; a survey of western architectural and art history from antiquity through the Baroque; a focus on the Eternal City's buildings, paintings, mosaics and sculptures exploring criteria, methods, goals and results of major architectural and artistic movements and the people involved. **Prerequisite:** Grade of C or better in ARTS 149, ARTS 150, ARTS 349, ARCH 249, ARCH 250, or ARCH 350.

ARTS 339 Themes in Contemporary Art

Credits 3. 3 Lecture Hours. Thematic survey of art since 1960; exploration of changing roles in art production, performance, presentation and criticism; art and artist in the global context; contemporary theory and criticism. **Prerequisite:** Admission to upper division.

ARTS 340 History of the Photographic Image

Credits 3. 3 Lecture Hours. History of photography; social, cultural, political, scientific and artistic contexts; important photographic themes and photographers. **Prerequisite:** ARTS 149, ARTS 150, ARTS 349, ARCH 249, ARCH 250, or ARCH 350.

ARTS 341 History of Animation

Credits 3. 3 Lecture Hours. History of the animated image in the nineteenth-century through the twenty-first century; developments, theories and ideologies in computer animation. **Prerequisites:** Grade C or better in ARTS 149, ARTS 150, ARTS 349, ARCH 249, ARCH 250, ARCH 350, or FILM 299.

ARTS 342 History of Graphic Design

Credits 3. 3 Lecture Hours. History of graphic design; understanding visual language, semiotic theory, technological developments associated with graphic design production, social, cultural, political and artistic influence on visual communication. **Prerequisite:** ARTS 149, ARTS 150, ARTS 349, ARCH 249, ARCH 250, or ARCH 350.

ARTS 343 History of Illustration

Credits 3. 3 Lecture Hours. History of illustration; early scrolls, codexes and manuscript illumination; print culture; commercial processes of the 19th and 20th centuries. **Prerequisite:** ARTS 149, ARTS 150, ARTS 349, ARCH 249, ARCH 250, or ARCH 350.

ARTS 345 History of Gaming

Credits 3. 3 Lecture Hours. Modern game creation and play; theory, history, and development. **Prerequisites:** ARTS 149, ARTS 150, ARTS 349, ARCH 249, ARCH 250, or ARCH 350.

ARTS 349 The History of Modern Art

Credits 3. 3 Lecture Hours. Chronological development of late 19th through 20th century art; emphasis on key artists, paintings, sculpture, photography and architecture. **Prerequisite:** Junior or senior classification or approval of instructor and undergraduate program coordinator.

ARTS 350 The Arts and Civilization

Credits 3. 3 Lecture Hours. Investigation of the image of work of selected periods in terms of criticism, aesthetic rationale, specific masters and social significance by going beyond historical chronology. **Prerequisites:** Grade of C or better in ARTS 149, ARTS 150, ARTS 349, ARCH 249, ARCH 250, or ARCH 350.

ARTS 353 Color Theory

Credits 3. 2 Lecture Hours. 4 Lab Hours. Examination of color and color theory including optical phenomena, color theory and perception; application and principles with respect to art and design; two-dimensional and three-dimensional projects examining color theories. **Prerequisites:** Junior classification in Visualization major; Graphic Design or Studio Art minor.

ARTS 356 Motion Graphics

Credits 3. 2 Lecture Hours. 4 Lab Hours. Investigation of visual communication and commercial art as time-based media; including skill development in the use of software to develop storyboards and animation including creating, importing, and sequencing media elements; focus on the effective use of graphic design elements in motion including type, logos, infographics, and color. **Prerequisites:** Grade of C or better in ARTS 104 or VIST 105; grade of C or better in ARTS 303.

ARTS 403 Graphic Design III

Credits 3. 2 Lecture Hours. 4 Lab Hours. Advanced graphic design concepts and practices; development of unified graphic campaigns to promote a product, an organization, a publication, a service, or business; advanced problem-solving techniques based on the design process through research, analysis, and presentation; systematic approach to visual development. **Prerequisites:** ARTS 303 and ARTS 304; junior or senior classification or approval of instructor and undergraduate program coordinator; knowledge of industry-standard software (Adobe Photoshop, InDesign and Illustrator) is expected.

ARTS 435 Digital Sculpture

Credits 3. 2 Lecture Hours. 4 Lab Hours. Instruction in advanced digital workflows and aesthetic techniques for the creation of narrative and non-objective sculpture. **Prerequisites:** Junior or senior classification; grade of C or better in ARTS 231 and VIST 106.

ARTS 445 Byzantine Art and Architecture

Credits 3. 3 Lecture Hours. A critical and historical investigation of Mediterranean art and architecture from the third century to the middle of the fifteenth century; emphasis on the artistic achievements from the late antique Mediterranean and the Byzantine Empire; investigation of architectural decoration, public monuments, cultural diversity and controversies over images. **Prerequisite:** Grade of C or better in ARTS 149, ARTS 150, ARTS 349, ARCH 249, ARCH 250, or ARCH 350.

ARTS 455 Experimental Typography

Credits 3. 1 Lecture Hour. 5 Lab Hours. Investigation of typography in three-dimensional space; exploration of typography in its traditional and experimental forms; exploration of how typography lives in public spaces and how typography can be an interactive and hands-on experience. May be taken for credit up to 6 hours. **Prerequisites:** Grade C or better in ARTS 255, ARTS 303 and ARTS 304.

ARTS 485 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Special problems in the fine and applied visual and plastic arts. May be repeated for up to 12 credit hours. **Prerequisite:** Approval of instructor and undergraduate program coordinator.

ARTS 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified field of the fine or applied visual and plastic arts. May be repeated for up to 9 credit hours. **Prerequisite:** Approval of instructor and undergraduate program coordinator.

ASCC - Academic Success Center (ASCC)

ASCC 001 Basic Math Skills

Credits 0. 3 Other Hours. Developmental instruction in mathematics; includes the integers and rational numbers and applications, exponents, polynomials, solution of equations, graphing, elementary geometry and reasoning skills; also taught at Galveston and Qatar campuses. May not be used for credit toward a degree.

ASCC 002 Corequisite Math Support

Credits 0. 3 Other Hours. Support course for TSI-liable students enrolled in entry-level for-credit MATH course as part of the Texas Success Initiative mandate; designed to follow the stated syllabus of the given MATH course; fundamental support for at-risk math students to enhance the likelihood of success. May not be used for credit toward a degree. **Prerequisite:** Concurrent enrollment in entry-level for-credit MATH course; also taught at Galveston and Qatar campuses.

ASCC 003 Corequisite Integrated Reading Writing Support

Credits 0. 3 Other Hours. Support course for TSI-liable students enrolled in an entry level for-credit ENGL, HIST, POLS, or PBSI course as part of the Texas Success Initiative mandate; designed to follow the stated syllabus of the given ENGL, HIST, POLS, or PBSI course; fundamental support for at-risk reading and writing students to enhance the likelihood of success. May not be used for credit toward a degree. **Prerequisite:** Concurrent enrollment in entry-level ENGL, HIST, POLS, or PBSI course; also taught at Galveston and Qatar campuses.

ASCC 004 Reading/Writing Connection

Credits 0. 3 Other Hours. Individualized instruction designed to refine and practice the basic reading and writing skills by integrating the related concepts of the two areas; also taught at Galveston and Qatar campuses. May not be used for credit toward a degree.

ASCC 005 Fundamental Academic Skills

Credits 0. 0 Lecture Hours. Designed to address the fundamental math, reading, and writing skills for students needing instruction at the adult basic education (ABE) level; also taught at Galveston and Qatar campuses. May not be used for credit towards a degree.

ASCC 101 Application of Learning Theories to College Studies

Credits 0 to 3. 0 to 3 Lecture Hours. The study of critical theories of learning with application to academic performance; designated as the university's learning framework course, this course is designed to help students understand learning theory and develop strategies for successful completion of college level studies; also taught at Qatar campus.

ASCC 102 Career Awareness

Credits 0 to 3. 0 to 3 Lecture Hours. Encourages planning career and life goals early in academic career for timely decision-making related to academics, acquiring marketable skills, pursuing relevant experiential education, and participating in student/professional organizations; acquaints students with realities of early career, emphasizes utilization of resources on a timely basis for competitiveness in job market; also taught at Qatar campus.

ASCC 289 Special Topics in...

Credits 0 to 3. 0 to 3 Lecture Hours. Selected topics in academic development and improvement. **Prerequisite:** Approval of coordinator; also taught at Qatar campus.

ASIA - Asian Studies (ASIA)

ASIA 229/ENGL 229 Asian American Literature and Culture

Credits 3. 3 Lecture Hours. Introduction to the historical scope of Asian American literature and culture. **Cross Listing:** ENGL 229/ASIA 229.

ASIA 285 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Selected fields of Asian Studies not covered in depth by other courses. Reports and extensive reading required. May be repeated for credit. **Prerequisite:** Approval of director of Asian Studies.

ASIA 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in Asian studies. May be repeated for credit.

ASIA 349/HIST 349 The Vietnam War/The American War

Credits 3. 3 Lecture Hours. Vietnam's relations with the West; French colonialism; origins and development of Vietnamese nationalism; Cold War and American involvement; wartime societies in North and South Vietnam; expansion of the war to Cambodia and Laos; anti-war movements in the United States; reasons for the American defeat; consequences and lessons of the war. **Prerequisites:** Junior or senior classification. **Cross Listing:** HIST 349/ASIA 349.

ASIA 350/HIST 350 World War II in Asia and the Pacific

Credits 3. 3 Lecture Hours. Origins and development of Japanese imperialism; Japan's expansion into East and Southeast Asia and the Pacific; wartime societies; collaboration and resistance; effects of the war in the United States on Japanese-Americans; outcomes of the war; remembrance of the war. **Prerequisite:** Junior or senior classification. **Cross Listing:** HIST 350/ASIA 350.

ASIA 352/HIST 352 Modern East Asia

Credits 3. 3 Lecture Hours. Impact of the West on traditional China and Japan; the response through modernization; rise of nationalism and formation of modern nation states. **Prerequisite:** Junior or senior classification. **Cross Listing:** HIST 352/ASIA 352.

ASIA 354/HIST 354 Imperial China

Credits 3. 3 Lecture Hours. History of imperial China from the earliest dynasties through the mid-19th century, including major political events, the structure of Chinese government, economic development, philosophies and religion, wars and military and culture and daily life. **Prerequisite:** Junior or senior classification. **Cross Listing:** HIST 354/ASIA 354.

ASIA 355/HIST 355 Modern China

Credits 3. 3 Lecture Hours. History of China from the coming of the West to the present; social, economic and political changes which have taken place during that period. **Prerequisite:** Junior or senior classification. **Cross Listing:** HIST 355/ASIA 355.

ASIA 356/HIST 356 Twentieth Century Japan

Credits 3. 3 Lecture Hours. Industrialization and modernization of Japan; its rise from an isolated nation to a major world power and economic giant. **Prerequisite:** Junior or senior classification. **Cross Listing:** HIST 356/ASIA 356.

ASIA 358/HIST 358 Chinese Cultural History

Credits 3. 3 Lecture Hours. Examination of Chinese culture and its evolution over the last 4,000 years; customs, art, literature, festivals, folklore, religion, architecture, medicine, and everyday life. **Prerequisite:** Junior or senior classification. **Cross Listing:** HIST 358/ASIA 358.

ASIA 401 Slavery in World History

Credits 3. 3 Lecture Hours. Comparative history of human slavery; slavery in the Ancient World, Asia, Africa; varieties of modern slavery in the New World since 1500; abolition of slavery and continuing forms of human bondage in the contemporary world. **Prerequisite:** Junior or senior classification. **Cross Listing:** AFST 401 and HIST 401.

ASIA 463 Gender in Asia

Credits 3. 3 Lecture Hours. Gender dynamics in Asia; changes in gender roles; women's movements; women and the economy; women and politics; men's and women's private lives. **Prerequisite:** Junior or senior classification. **Cross Listing:** SOCI 463 and WGST 463.

ASIA 485 Directed Studies

Credits 1 to 3. 1 to 3 Other Hours. Selected fields of Asian Studies not covered in depth by other courses. Reports and extensive reading required. May be repeated for credit. **Prerequisite:** Approval of director of Asian Studies.

ASIA 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in Asian Studies. May be repeated for credit.

ASIA 491 Research

Credits 1 to 3. 1 to 3 Other Hours. Research conducted under the direction of a faculty member in Asian Studies. May be repeated 3 times for credit. **Prerequisites:** 6 credits of ASIA; junior or senior classification; approval of instructor.

ASTR - Astronomy (ASTR)

ASTR 101 Basic Astronomy

Credits 3. 3 Lecture Hours. (ASTR 1303 or PHYS 1303) Basic Astronomy. A qualitative approach to basic stellar astronomy; earth-moon-sun relationships then studies of distances to stars, stellar temperatures, and other physical properties; birth, life on the main sequence of the H-R diagram, and ultimate fates of stars; not open to students who have taken ASTR 111 or ASTR 314.

ASTR 102 Observational Astronomy

Credit 1. 3 Lab Hours. (ASTR 1103 or PHYS 1103) Observational Astronomy. Observational and laboratory course; use of techniques and instruments of classical and modern astronomy.

ASTR 103 Introduction to Stars and Exoplanets

Credits 3. 3 Lecture Hours. A qualitative study of stellar birth, stellar structure and evolution, stellar nucleosynthesis, the Hertzsprung-Russell Diagram, white dwarfs, neutron stars, supernovae, black holes, proto-planetary systems, origin of the solar system and the search for exoplanets; utilizes active learning methods that incorporate observations from the current generation of ground and space-based telescopes. Open to all majors.

ASTR 104 Introduction to Galaxies and Cosmology

Credits 3. 3 Lecture Hours. A qualitative study of properties of galaxies, galaxy evolution through cosmic time, galactic archaeology, active galactic nuclei, super-massive black holes, large-scale structure, the expansion history of the universe, cosmological parameters and Big Bang nucleosynthesis; utilizes active learning methods that incorporate observations from the current generation of ground and space-based telescopes. Open to all majors.

ASTR 109/PHYS 109 Big Bang and Black Holes

Credits 3. 3 Lecture Hours. Designed to give an intuitive understanding of the Big Bang and Black Holes, without mathematics, and de-mystify them for the non-scientist. **Cross Listing:** PHYS 109/ASTR 109.

ASTR 111 Overview of Modern Astronomy

Credits 4. 3 Lecture Hours. 2 Lab Hours. (ASTR 1303 and ASTR 1103, ASTR 1403, PHYS 1303 and PHYS 1103, PHYS 1403) Overview of Modern Astronomy. Roots of modern astronomy; the scientific method; fundamental physical laws; the formation of planets, stars, and galaxies; introduction to cosmology; includes an integrated laboratory that reinforces the lecture topics, including hands-on experience with telescopes and imaging of celestial objects; not open to students who have taken ASTR 101 or ASTR 314.

ASTR 119/PHYS 119 Big Bang and Black Holes: Laboratory Methods

Credit 1. 2 Lab Hours. Hands-on understanding of the concepts surrounding the Big Bang and Black Holes; emphasis on the evidence-based decision making process, methods and presentation; for non-scientists. Companion course for ASTR 109/PHYS 109/PHYS 109/ASTR 109. **Prerequisite:** ASTR/PHYS 109/ASTR 109 or registration therein. **Cross Listing:** PHYS 119/ASTR 119.

ASTR 285 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Special work in laboratory or theory to meet individual requirements in cases not covered by regular curriculum; intended for use as lower-level credit. **Prerequisite:** Approval of department head.

ASTR 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified area of astronomy. May be repeated for credit. **Prerequisite:** Approval of instructor.

ASTR 291 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in astronomy. May be repeated 2 times for credit. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

ASTR 314 Survey of Astronomy

Credits 3. 3 Lecture Hours. Primarily for majors in science and engineering. Kepler's laws, law of gravitation, solar system, stars, stellar evolution, nucleosynthesis, cosmology, clusters, nebulae, pulsars, quasars, black holes. **Prerequisite:** PHYS 207 or PHYS 208.

ASTR 320 Astrophysical Research Methods

Credits 3. 3 Lecture Hours. Background and tools used in modern astrophysical research, including reduction of photometric and spectroscopic data, signal-to-noise and error calculations and order-of-magnitude estimates. **Prerequisite:** Grade of C or better in ASTR 314 or approval of instructor.

ASTR 401 Stars and Extrasolar Planets

Credits 3. 3 Lecture Hours. How stars are born, how internal structure changes, nuclear fuel burned and ultimate fate; extrasolar planet detection, formation, properties and habitability. **Prerequisite:** ASTR 314.

ASTR 403 Extragalactic Astronomy and Cosmology

Credits 3. 3 Lecture Hours. Physical makeup of individual galaxies and large scale structure in the universe; origin and eventual fate of the universe; interpretation of observational data as it relates to baryonic matter, Dark Matter and cosmological models with Dark Energy. **Prerequisite:** ASTR 314.

ASTR 420 Advanced Astrophysical Research Methods

Credits 3. 3 Lecture Hours. Advanced research techniques used by modern-day astronomers to obtain, process and analyze data from grounds and space-based telescopes. **Prerequisites:** Grade of C or better in ASTR 320 or approval of instructor.

ASTR 485 Directed Studies

Credits 1 to 12. 1 to 12 Other Hours. Special work in laboratory or theory to meet individual requirements in cases not covered by regular curriculum. **Prerequisite:** Approval of department head.

ASTR 489 Special Topics in...

Credits 1 to 4. 0 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified topic of astronomy. May be repeated for credit. **Prerequisite:** Approval of instructor.

ASTR 491 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in astronomy. May be repeated for credit. Registration in multiple sections of this course is possible within a given semester provided that the per semester credit hour limit is not exceeded. **Prerequisites:** Junior or senior classification and approval of instructor.

ATMO - Atmospheric Sciences (ATMO)

ATMO 110/GEOL 110 Disasters and Society

Credits 3. 3 Lecture Hours. Exploration of the science behind disasters; how they occur, the choices society makes that create or affect disasters, how certain populations are privileged during disasters by the decisions society has made and how science informs preparation for and response to future disasters. **Cross Listing:** GEOL 110/ATMO 110.

ATMO 201 Weather and Climate

Credits 3. 3 Lecture Hours. Structure, energy, and motions of the atmosphere; climate; fronts and cyclones; atmospheric stability; clouds and precipitation; severe storms.

ATMO 202 Weather and Climate Laboratory

Credit 1. 2 Lab Hours. Practical laboratory experiments and exercises, conducted in the meteorology and computer laboratories, concerning the fundamental physical processes underlying atmospheric phenomena, and the collection, display and interpretation of meteorological information. For non-majors only.

ATMO 203 Weather Forecasting Laboratory

Credit 1. 2 Lab Hours. Short-range weather forecasting practice; numerical guidance; weather map analysis and discussions. **Prerequisite:** ATMO 201 or concurrent enrollment.

ATMO 210 Climate Change

Credits 3. 3 Lecture Hours. Examination of the science of climate change; past and present causes of global-scale climate change; basis for projections of future climate change and its potential impacts; existing and proposed policy responses; critical evaluation of scientific information.

ATMO 215 Climate Risk in the 21st Century

Credits 3. 3 Lecture Hours. Exploration of the fundamental risk of climate change, including both physical and economic risks, and the complex challenges of energy transition; the political and social dynamics that shape climate policy and the debate over climate change; comprehensive understanding through analysis of historical and contemporary issues of the risks and opportunities of our rapidly changing climate and climate policy.

ATMO 251 Weather Observation and Analysis

Credits 3. 2 Lecture Hours. 2 Lab Hours. Standard and experimental weather observing techniques; subjective and objective analysis; application of conceptual models; simple kinematic and dynamic constraints. **Prerequisite:** ATMO 203 or concurrent enrollment; MATH 172 or MATH 152, or concurrent enrollment.

ATMO 285 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Offered to enable majors in meteorology to undertake and complete with credit in their particular fields of specialization limited investigations not covered by any other courses in established curriculum. **Prerequisite:** Freshman or sophomore classification.

ATMO 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of meteorology. May be repeated for credit. **Prerequisite:** Approval of instructor.

ATMO 291 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in atmospheric sciences. May be repeated 2 times for credit. Registration in multiple sections of this course is possible within a given semester provided that the per semester credit hour limit is not exceeded. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

ATMO 321 Computer Applications in the Atmospheric Sciences

Credits 3. 2 Lecture Hours. 2 Lab Hours. Introduction to technical computing methods in the atmospheric sciences; use of specialized software and data analysis systems for meteorological applications.

ATMO 324 Physical and Regional Climatology

Credits 3. 2 Lecture Hours. 2 Lab Hours. Climate causes; global and surface energy balance; hydrologic cycle; general circulation; climate change; climate data analysis. **Prerequisites:** ATMO 201; MATH 251 or concurrent enrollment; ATMO 321 or equivalent, or concurrent enrollment; junior or senior classification.

ATMO 326 Environmental Atmospheric Science

Credits 3. 2 Lecture Hours. 2 Lab Hours. Basic concepts of meteorology as needed in environmental sciences; patterns of meteorological and climatic elements and their relevance in terrestrial ecology and urban sciences; solar and wind energy physics; practical experience in use of instruments to measure micro-climates as they relate to meteorological conditions and analysis of data. **Prerequisites:** ATMO 201 or GEOG 203, or approval of instructor.

ATMO 335 Atmospheric Thermodynamics

Credits 3. 3 Lecture Hours. Application of thermodynamics to Earth's atmosphere; phase changes of water; stability concepts; introduction to physical chemistry. **Prerequisites:** CHEM 120; MATH 251; PHYS 206.

ATMO 336 Atmospheric Dynamics

Credits 4. 3 Lecture Hours. 2 Lab Hours. Kinematic concepts and relationships; equations of motion; geostrophic and accelerated motions; the vorticity equation and Rossby waves. **Prerequisites:** ATMO 321, ATMO 335, and MATH 308, or concurrent enrollment; junior or senior classification.

ATMO 352 Severe Weather and Mesoscale Forecasting

Credits 3. 2 Lecture Hours. 2 Lab Hours. Parcel theory for dry and moist convection; sounding diagrams and their application to atmospheric convection; organization of midlatitude convection and severe weather; thunderstorm forecasting. **Prerequisite:** ATMO 251, and MATH 152 or MATH 172.

ATMO 363 Introduction to Atmospheric Chemistry and Air Pollution

Credits 3. 3 Lecture Hours. Descriptive introduction of the composition and chemistry of natural and pollutant compounds in the atmosphere; transport, cycling and reactivity of atmospheric material; atmospheric measurements, data processing, air quality and human health issues; air pollution trends and climate change. **Prerequisites:** CHEM 119 and CHEM 120 or approval of instructor.

ATMO 370 Student High Impact Experiences in Meteorology

Credits 1 to 4. 1 to 4 Other Hours. Observation, study and analysis of meteorological phenomena and processes in the regional settings in which they occur; domestic and study-abroad high impact learning experiences. **Prerequisite:** ATMO 201 or concurrent enrollment.

ATMO 435 Synoptic-Dynamic Meteorology

Credits 3. 3 Lecture Hours. Dynamics and diagnosis of synoptic-scale systems; perturbation theory and baroclinic instability; wave energetics, frontogeneses. **Prerequisites:** ATMO 336 or equivalent; MATH 308.

ATMO 441 Satellite Meteorology and Remote Sensing

Credits 3. 2 Lecture Hours. 2 Lab Hours. Introduction to satellite orbit dynamics, atmospheric radiative transfer, atmospheric remote sensing methods, and analysis and application of remotely sensed meteorological data. **Prerequisites:** ATMO 324 and MATH 308; ATMO 446 or concurrent enrollment.

ATMO 443 Radar Meteorology

Credits 3. 2 Lecture Hours. 2 Lab Hours. Principles of radar theory, hardware, operations and analysis using real-time radar and computer-based case studies; conventional, Doppler and polarimetric weather radar; precipitation estimation, hydrometeor identification and air motion analysis; observations and analyses of thunderstorms, mesocyclones, tornadoes and gust fronts. **Prerequisites:** ATMO 352; PHYS 207 or PHYS 219.

ATMO 444 The Science and Politics of Global Climate Change

Credits 3. 3 Lecture Hours. Examination of the policy and scientific debate over climate change; how scientific debates produce "knowledge"; how political debates produce policies; how policy debates use science; scientific evidence for climate change; impacts of climate change; possible responses to climate change; the political debate over climate change. **Prerequisite:** ATMO 210; junior or senior classification or approval of instructor.

ATMO 446 Physical Meteorology

Credits 3. 3 Lecture Hours. Physics and meteorology of clouds and precipitation; atmospheric electricity; radiative transfer. **Prerequisite:** ATMO 335.

ATMO 455 Numerical and Machine Learning-Based Weather Prediction

Credits 3. 2 Lecture Hours. 2 Lab Hours. Basic principles of computer models for weather prediction, critical evaluation of models and model outputs; data assimilation; atmospheric predictability; ensemble forecasting. **Prerequisites:** Junior or senior classification, approval of instructor.

ATMO 456 Practical Weather Forecasting

Credits 3. 1 Lecture Hour. 4 Lab Hours. Advanced weather forecasting techniques with application to a variety of forecasting problems, both public and private sector. **Prerequisites:** ATMO 435 or registration therein; junior or senior classification.

ATMO 459 Tropical Meteorology

Credits 3. 3 Lecture Hours. Tropical climatology; structure, evolution, and motion of tropical cyclones; tropical cyclone hazards; large-scale tropical phenomena. **Prerequisites:** ATMO 336; ATMO 352 or concurrent enrollment.

ATMO 461 Broadcast Meteorology

Credit 1. 2 Lab Hours. Instruction in the practice of broadcast meteorology; practice in and preparation of weather forecast products and demonstration videotapes. May be taken two times for credit with faculty advisor approval. **Prerequisites:** ATMO 335 or registration therein; MATH 308 or registration therein; junior or senior classification.

ATMO 463 Air Quality

Credits 3. 3 Lecture Hours. Atmospheric pollution sources, transport, sinks, and effects; monitoring of air pollutant emissions and of ambient concentrations; use of models to simulate air pollution; regulation of emissions and ambient concentrations; greenhouse gas emissions regulations. **Prerequisite:** CHEM 119 or CHEM 107 or approval of instructor; junior or senior classification.

ATMO 464 Laboratory Methods in Atmospheric Sciences

Credits 3. 2 Lecture Hours. 4 Lab Hours. Instruction in chemical techniques used to monitor the atmosphere and other earth systems; sampling strategies; survey of current literature focusing on development of new techniques. **Prerequisites:** CHEM 119 and one semester of calculus (MATH 171 or equivalent).

ATMO 484 Internship

Credits 0 to 3. 0 to 3 Other Hours. Supervised internship at National Weather Service or in broadcast meteorology or elsewhere with faculty advisor approval; must complete a report and have a letter from supervisor for credit. May be taken three times for credit. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisites:** ATMO 251; approval of faculty advisor.

ATMO 485 Directed Studies

Credits 1 to 23. 1 to 23 Other Hours. Offered to enable majors in meteorology to undertake and complete with credit in their particular fields of specialization limited investigations not covered by any other courses in established curriculum. **Prerequisite:** Junior or senior classification.

ATMO 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of meteorology. May be repeated for credit.

ATMO 491 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in atmospheric sciences. May be repeated 2 times for credit. Registration in multiple sections of this course is possible within a given semester provided that the per semester credit hour limit is not exceeded. **Prerequisites:** Junior or senior classification and approval of instructor.

ATTR - Athletic Training (ATTR)

ATTR 201 Field Experience in Athletic Training I

Credit 1. 4 Lab Hours. Field based experience in athletic training to provide on-the-job training designed to enhance and clarify career objectives; knowledge and skill development in professional behaviors, injury prevention and risk management. **Prerequisite:** Kinesiology majors.

ATTR 202 Field Experience in Athletic Training II

Credit 1. 4 Lab Hours. Field based experience in athletic training to provide on-the-job training designed to enhance and clarify career objectives; knowledge and skill development in recognition and evaluation of common injuries and illnesses and their management. **Prerequisite:** Grade of B or better in ATTR 201.

ATTR 301 Field Experience in Athletic Training I

Credit 1. 4 Lab Hours. Field based experience in athletic training to provide on-the-job training designed to enhance and clarify career objectives; knowledge and skill development in the treatment and rehabilitation of athletic injuries. **Prerequisite:** Grade of B or better in ATTR 202.

ATTR 302 Field Experience in Athletic Training II

Credit 1. 4 Lab Hours. Field based experience in athletic training to provide on-the-job training designed to enhance and clarify career objectives; knowledge and skill development in athletic training administration; exploration of policy and position statements; professional development. **Prerequisite:** Grade of B or better in ATTR 301.

BAEN - Biological & Ag Engr (BAEN)

BAEN 201 Analysis of Biological and Agricultural Engineering Problems

Credits 3. 1 Lecture Hour. 4 Lab Hours. Overview of Biological and Agricultural Engineering discipline through case studies and engineering design problems; introduction to engineering design utilizing computer programming, 3-D computer-aided modeling and 2-D engineering drawings; introduction to manufacturing processes. **Prerequisites:** Grade of C or better in ENGR 102; grade of C or better in MATH 151; grade of C or better in CHEM 107 and CHEM 117, or CHEM 102 and CHEM 112, or CHEM 120.

BAEN 281 Professional Development Seminar

Credits 1. 1 Lecture Hour. Familiarization with engineering design process used in professional environments where BAEN and AGSM graduates are employed; discussion of professional development topics; improvement of technical communication skills. May be taken 4 times for credit.

BAEN 284 Internship

Credits 0. 0 Lecture Hours. 0 Lab Hours. 0 Other Hours. No Credit. Practical experience working in a professional biological and agricultural engineering setting. May be taken three times. **Prerequisite:** Freshman or sophomore classification; approval of the instructor.

BAEN 285 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Selected problems in any phase of agricultural engineering; credit and specific content dependent upon background, interest, ability and needs of student enrolled; individual consultations and reports required. **Prerequisites:** Freshman or sophomore classification; approval of department head.

BAEN 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of agricultural engineering. May be repeated for credit. **Prerequisite:** Approval of instructor.

BAEN 291 Research

Credits 0 to 3. 0 to 3 Other Hours. Research conducted under the direction of faculty member in biological and agricultural engineering. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

BAEN 301 Biological and Agricultural Engineering Fundamentals I

Credits 3. 2 Lecture Hours. 3 Lab Hours. Fundamental engineering concepts related to agricultural systems including the environment (soil, water, and air), plant and animal production systems and processing, and associated machines and facilities; application of techniques for data collection and analysis to problems in biological and agricultural engineering; design of experiments and communication of experimental results. **Prerequisite:** Grade of C or better in MEEN 221 or concurrent enrollment.

BAEN 302 Biological and Agricultural Engineering Fundamentals II

Credits 3. 2 Lecture Hours. 3 Lab Hours. Fundamentals of microbiology and biochemistry as they apply to biological and agricultural engineering systems to produce useful products and/or benign wastes; topics include microbiology, chemistry of biomolecules, microbial metabolism, bioenergetics, kinetics, mass transfer, bioreactor design, bioprocesses, and downstream processing. **Prerequisites:** Grade of C or better in BIOL 113 or BIOL 111; Grade of C or better in CHEM 222 or CHEM 227 or concurrent enrollment.

BAEN 320 Engineering Thermodynamics

Credits 3. 2 Lecture Hours. 2 Lab Hours. First and second laws of thermodynamics; properties of pure substances; analysis of closed and open systems; applications to steady-flow and non-flow processes; power and refrigeration cycles; psychrometrics. **Prerequisites:** Grade of C or better in MEEN 221 or CVEN 221; grade of C or better in MATH 251 or MATH 253 or concurrent enrollment.

BAEN 340 Fluid Mechanics

Credits 3. 3 Lecture Hours. Fundamentals of fluid properties; basic conservation principles of momentum, energy and continuity; flow through closed conduits; open channel flow; principles of turbomachines and compressible flow. **Prerequisites:** Grade of C or better in MEEN 221; grade of C or better in BAEN 320 or concurrent enrollment.

BAEN 354 Engineering Properties of Biological Materials

Credits 3. 2 Lecture Hours. 3 Lab Hours. Relationships between composition, structure and properties of biological materials; definition and measurement of mechanical, physical, thermal and other material properties; variability of properties; application of properties to engineering analysis and design of biological and agricultural processes and systems. **Prerequisite:** Grade of C or better in MEEN 222/MSEN 222 or MSEN 222/MEEN 222.

BAEN 365 Unit Operations for Biological and Agricultural Engineering

Credits 3. 2 Lecture Hours. 3 Lab Hours. Theoretical and practical understanding of basic unit operations required to design processes and equipment in the agricultural, biological, environmental, and food industries, with unique constraints presented by biological and agricultural systems considered in design of all units. **Prerequisites:** Grade of C or better in BAEN 340; junior or senior classification.

BAEN 366 Transport Processes in Biological Systems

Credits 3. 3 Lecture Hours. Basic principles governing transport of energy and mass; application of these principles to analysis and design of processes involving biological, environmental and agricultural systems. **Prerequisites:** Grade of C or better in BAEN 320, BAEN 340, and BAEN 365 or concurrent enrollment; grade of C or better in MATH 308; junior or senior classification.

BAEN 370 Measurement and Control of Biological Systems and Agricultural Processes

Credits 3. 2 Lecture Hours. 2 Lab Hours. Theory and application of sensors and techniques in the design of systems for automatic control in biological systems and agricultural production and processing; sensor operation; signal processing; control techniques; automation and robotics. **Prerequisite:** Grade of C or better in ECEN 215.

BAEN 375 Design Fundamentals for Agricultural Machines and Structures

Credits 3. 3 Lecture Hours. Applications of stress/strain relationships and failure theory to the design of agricultural machines and structures; structural properties of engineering materials; finite element analysis and computer aided engineering design. **Prerequisite:** Grade of C or better in CVEN 305.

BAEN 399 Professional Development

Credits 0. 0 Other Hours. Participation in an approved high-impact learning practice; reflection on professional outcomes from the National Society of Professional Engineers' Engineering Body of Knowledge; documentation and self-assessment of learning experience. **Prerequisites:** Junior or senior classification; or approval of instructor.

BAEN 401 Bioprocess Systems Design

Credits 3. 2 Lecture Hours. 2 Lab Hours. Application of engineering and biological principles in bioprocess systems design; design and scale up of upstream and downstream unit operations including bioreactors, sedimentation, centrifugation, membraned filtration, adsorption and produce formulation; bioprocess integration, scale up and sustainability assessment. **Prerequisites:** Grade of C or better in BAEN 302 and BAEN 365; grade of C or better in BAEN 320 or concurrent enrollment.

BAEN 412 Hydraulic Power

Credits 3. 2 Lecture Hours. 2 Lab Hours. Hydraulic power systems; energy and power relationships; hydraulic fluid properties; frictional losses in pipelines; hydraulic pumps, cylinders, valves and motors; servo and proportional valves; circuit design and analysis; conductors, fittings and ancillary devices; maintenance of hydraulic systems; pneumatic components and circuits; electrical controls and fluid logic; electro-hydraulic systems. **Prerequisites:** Grade of C or better in BAEN 340 or equivalent, or approval of instructor.

BAEN 414 Renewable Energy Conversions

Credits 3. 2 Lecture Hours. 2 Lab Hours. Energy/power systems through engineering and technical aspects of quantifying and designing the suitability of several types of renewable energy resources; new insights of vast resources that future engineers can harness to augment diminishing supplies of nonrenewable energy. **Prerequisite:** Grade of C or better in BAEN 320 or equivalent, or approval of instructor.

BAEN 417 Fundamentals of Nanoscale Biological Engineering

Credits 3. 3 Lecture Hours. Nanostructures, nanofabrication methods, instrumentation and applications pertinent to Biological, Food and Bioenergy systems; identification and utilization of key tools available for fabricating, manipulating and analysis of nanostructures used in biological engineering applications. **Prerequisite:** Senior classification in engineering or approval of instructor.

BAEN 420 Food Rheology

Credits 3. 3 Lecture Hours. Theoretical and applied learning of rheology of food materials necessary for processing and preservation; topics include viscous liquids, structured materials, and hard solids; fundamental relationships between materials structure and measured properties to observed physical and performance behavior with regard to processing and mouthfeel. **Prerequisites:** Junior or senior classification or approval from instructor.

BAEN 422/CHEN 422 Unit Operations in Food Processing

Credits 3. 2 Lecture Hours. 2 Lab Hours. Design of food process engineering systems; basic concepts of rheology and physical properties of foods; fundamentals of heat and mass transfer and process control. **Prerequisites:** Grade of C or better in CHEN 205 and CHEN 304, or MEEN 221. **Cross Listing:** CHEN 422/BAEN 422.

BAEN 427 Engineering Aspects of Packaging

Credits 3. 3 Lecture Hours. Introduction to properties and engineering aspects of materials for use as components of a package and/or packaging system; principles of design and development of packages; evaluation of product-package-environment interaction mechanisms; testing methods; environmental concerns; regulations; food packaging issues. **Prerequisite:** Junior or senior classification or approval of instructor.

BAEN 431 Fundamentals in Bioseparations

Credits 3. 2 Lecture Hours. 2 Lab Hours. Design principles and application of chemical engineering unit operations to the production of therapeutic and bioactive molecules. **Prerequisite:** Grade of C or better in BAEN 302, BMEN 282, CHEN 282, or CHEN 482.

BAEN 432 Bioaerosols and Modeling

Credits 3. 2 Lecture Hours. 2 Lab Hours. Overview of physical, mechanical, fluid dynamical, electrical, optical, and molecular aspects of bioaerosols; bioaerosol generation, sampling and deposition measurements including size distribution, morphology, chemical composition, bioaerosol samplers, sample analysis, dry and wet deposition, and biofilm resuspension; health effects of bioaerosols, antibiotic resistance, ambient sampling in industrial and agricultural fields. **Prerequisites:** Senior classification or approval of instructor.

BAEN 460 Principles of Environmental Hydrology

Credits 3. 3 Lecture Hours. Hydrologic cycle; precipitation, evaporation, evapotranspiration, infiltration, percolation, runoff, streamflow; groundwater and surface water flow; transport of contaminants in surface water; measurement and analysis of hydrologic data for engineering design. **Prerequisites:** Grade of C or better in BAEN 340.

BAEN 464 Irrigation and Drainage Engineering

Credits 3. 2 Lecture Hours. 2 Lab Hours. Engineering principles and design of both surface and pressurized irrigation systems; introduction to the design of surface and subsurface drainage systems including crop water requirements, soil moisture, irrigation scheduling, surface irrigation, sprinkler irrigation, trickle irrigation, pumps, pipelines, irrigation canals, irrigation wells, and surface and subsurface drainage. **Prerequisite:** Grade of C or better in BAEN 340, EVEN 311/CVEN 311, or CVEN 311/EVEN 311.

BAEN 465 Design of Biological Waste Treatment Systems

Credits 3. 3 Lecture Hours. Management and treatment of high organic content wastes, with emphasis on agricultural and food processing wastes; engineering design of biological waste treatment processes; regulatory aspects affecting management of agricultural wastes. **Prerequisite:** Grade of C or better in BIOL 111 and CHEM 222 or CHEM 227, or BAEN 302, or EVEN 320; or approval of instructor.

BAEN 468 Soil and Water Conservation Engineering

Credits 3. 2 Lecture Hours. 2 Lab Hours. Engineering principles of soil and water conservation; open channel flow principles, hydraulic grade stabilization, erosion control, storm water management, design of structures for floodwater routing, culvert design, design of waterways and agricultural reservoirs, stream bank protection, water quality assessment, groundwater flow, surface water modeling. **Prerequisites:** Grade of C or better in BAEN 340, EVEN 311/CVEN 311, or CVEN 311/EVEN 311.

BAEN 469 Water Quality Engineering

Credits 3. 3 Lecture Hours. Nonpoint source pollution processes including transport mechanisms and contaminant fate; design of best management practices for abating nonpoint source pollution. **Prerequisite:** Grade of C or better in BAEN 340, CVEN 311/EVEN 311, or EVEN 311/CVEN 311.

BAEN 471/CHEN 471 Bioreactor Engineering

Credits 3. 3 Lecture Hours. Fundamentals of microbial and enzyme kinetics; basic biochemical reaction theory and reactor systems; heterogeneous reactions and transport considerations in enzyme and cell reactors, and immobilized systems; bioreactor design considerations in bioprocessing. **Prerequisite:** Grade of C or better in CHEN 282, CHEN 482, or BAEN 302; junior or senior classification or approval of instructor. **Cross Listing:** CHEN 471/BAEN 471.

BAEN 477/MEEN 477 Air Pollution Engineering

Credits 3. 3 Lecture Hours. Design of air pollution abatement equipment and systems to include cyclones, bag filters and scrubbers; air pollution regulations; permitting; dispersion modeling; National Ambient Air Quality Standards. **Prerequisite:** Grade of C or better in BAEN 340, CVEN 311/EVEN 311, EVEN 311/CVEN 311, or MEEN 344. **Cross Listing:** MEEN 477/BAEN 477.

BAEN 479 Biological and Agricultural Engineering Design I

Credits 3. 3 Lecture Hours. Capstone design project selection from problems posed by biological and agricultural engineers in industrial practice; completion of project feasibility study and outline; design philosophy, teamwork and communication; economics; product liability and reliability; use of standards and codes; goal setting, professional development, and time management; project to be completed in BAEN 480. **Prerequisites:** Grade of C or better in BAEN 340 and BAEN 365; grade of C or better in BAEN 366 or BAEN 370; grade of C or better in BAEN 354 or concurrent enrollment.

BAEN 480 Biological and Agricultural Engineering Design II

Credits 3. 6 Lab Hours. Continuation of engineering design experience through team solution of design problem developed in BAEN 479; preparation of design solution under supervision of biological and agricultural engineering staff and clients; critical evaluation of results by students; staff and industrial consultants. **Prerequisites:** Grade of C or better in BAEN 479.

BAEN 481 Seminar

Credit 1. 1 Other Hour. Review of current literature dealing with agricultural engineering problems presented by staff members and students. **Prerequisite:** Senior classification.

BAEN 484 Internship

Credits 0. 0 Lecture Hours. 0 Lab Hours. 0 Other Hours. No Credit. Practical experience working in a professional biological and agricultural engineering setting. May be taken three times. **Prerequisite:** Junior or senior classification; approval of the instructor.

BAEN 485 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Selected problems in any phase of agricultural engineering. Credit and specific content dependent upon background, interest, ability and needs of student enrolled. Individual consultations and reports required. **Prerequisites:** Junior or senior classification and approval of department head.

BAEN 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Special topics in an identified area of agricultural engineering. May be repeated for credit. **Prerequisite:** Approval of department head.

BAEN 491 Research

Credits 0 to 3. 0 to 3 Other Hours. Research conducted under the direction of faculty member in biological and agricultural engineering. May be repeated 2 times for credit. Registration in multiple sections of this course are possible within a given semester provided that the per semester credit hour limit is not exceeded. **Prerequisites:** Junior or senior classification and approval of instructor.

BEFB - Bilingual Ed Field Based (BEFB)

BEFB 425 Student Teaching in Hispanic Bilingual Education

Credits 3. 3 Lecture Hours. Observation and participation in Hispanic bilingual education classroom activity; supervised student teaching in accredited school. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisites:** 2.5 GPA in teaching fields and professional development; approval of department head; senior classification. Must be taken concurrently with BEFB 426.

BEFB 426 Effective Instruction of Hispanic Students of Diverse Abilities

Credits 3. 3 Lecture Hours. Field-based application of effective instructional strategies for teaching Hispanic bilingual students of diverse abilities. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisites:** 2.5 GPA in teaching fields and professional development; approval of department head. Must be taken concurrently with BEFB 425.

BEFB 470 Bilingual Assessment and Monitoring

Credits 3. 3 Lecture Hours. Assessment of language ability for second language learners; assessment instruments in bilingual/ESL programs; scoring and evaluation of second language assessment instruments. **Prerequisites:** Junior or senior classification; BEFB 472 and BEFB 474. Must be taken concurrently with BEFB 476.

BEFB 472 Bilingual and Dual Language Methodologies

Credits 3. 3 Lecture Hours. Use of theory and effective teaching practice in promoting student's development of strong social and academic skills; relationship of culture to language. **Prerequisite:** Junior or senior classification. Must be taken concurrently with BEFB 474.

BEFB 474 Biliteracy for Bilingual and Dual Language Classrooms

Credits 3. 3 Lecture Hours. Social and linguistic characteristics of second language learners influencing literacy skills; reading and literature instruction for second language learners; reading and writing process across the curriculum for second language learners. **Prerequisite:** Junior or senior classification. Must be taken concurrently with BEFB 472.

BEFB 476 Content Area Instruction for Bilingual Programs

Credits 3. 3 Lecture Hours. Use of theory and various approaches for integrating English as a second language; learning strategies relating to how plans, procedures and units engage language teachers, students and learning environments. **Prerequisite:** Junior or senior classification. Must be taken concurrently with BEFB 470.

BEFB 482 Seminar in Teachers as Effective Communicators

Credit 1. 1 Lecture Hour. Effective communication techniques for working with learners, colleagues, administrators and stakeholders; professional and social linguistic protocols for bilingual education teachers. **Prerequisites:** Junior or senior classification; concurrent enrollment in BEFB 472 and BEFB 474.

BESC - Bioenvironmental Sci (BESC)

BESC 201 Introduction to Bioenvironmental Sciences

Credits 3. 3 Lecture Hours. A broad survey of environmental science with an emphasis on scientific literacy, current events, global and international issues and historic context.

BESC 203 Microbiomes and Their Environment

Credits 3. 3 Lecture Hours. Fundamentals of microbiomes; emphasis of interactions between microbiomes and their environments; assessment of impacts of microbiome functions on human, animals, plants and environmental processes; consideration of social and legal implications of microbiome engineering.

BESC 204 Molds and Mushrooms: The Impact of Fungi on Society and the Environment

Credits 3. 3 Lecture Hours. Introduction to the fungi and the impact these organisms have on society and the environment; includes life cycles of fungi; classification schemes, pathogens of plants, animals and humans, fungi in food production; toxic fungi and the law, and others.

BESC 285 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Individually supervised research or advanced studies for lower-division undergraduate students to independently investigate special problems not available in existing courses. **Prerequisite:** Approval of instructor in consultation with departmental advisor.

BESC 291 Research

Credits 1 to 4. 1 to 4 Other Hours. Research conducted under the direction of faculty member in bioenvironmental sciences. May be repeated 3 times for credit. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

BESC 311 International Perspectives on Environmental Issues

Credits 3. 3 Lecture Hours. Role of the United Nations and other institutions that promote international cooperation toward sustainable development goals; influence of cultural views on critical thinking about environmental issues, including population, water and agriculture, biodiversity and energy. **Prerequisite:** Junior classification or approval of instructor; must attend two mandatory pre-departure meetings.

BESC 314 Pathogens, the Environment and Society

Credits 3. 3 Lecture Hours. The impact of microorganisms (bacteria, fungi and viruses) on the development of modern culture and society; the role pathogens played in the history of mankind and the influence of the changing environment on emerging diseases. **Prerequisite:** Junior or senior classification.

BESC 320 Water and the Bioenvironmental Sciences

Credits 3. 3 Lecture Hours. Critical understanding of salient issues relating to fresh water as a limited and important bioenvironmental resource. **Prerequisite:** Junior or senior classification.

BESC 357 Biotechnology for Biofuels and Bioproducts

Credits 3. 3 Lecture Hours. Biotechnology issues in developing bioenergy as a renewable energy source; emphasis on the three generations of bioenergy and enabling technologies; special topics include recent advances in bioenergy research, government policy, and industrial development. **Prerequisite:** BESC 201 and junior or senior classification.

BESC 367 U.S. Environmental Regulations

Credits 3. 3 Lecture Hours. Investigation of the legal infrastructure of the U.S. associated with regulating environmental impacts; examination of major U.S. environmental statutes associated with air and water quality, toxic substances, waste and hazardous substance release, energy and natural resources; review the relationship between U.S. policy and international environmental regulations. **Prerequisites:** BESC 201, ENSS 105 or RWFM 308.

BESC 401 Bioenvironmental Microbiology

Credits 3. 3 Lecture Hours. The interactions of microorganism in diverse environments; applied aspects of microbial interactions in the environment, their effects on the environment, and potential use to solve environmental problems. **Prerequisites:** CHEM 222 or CHEM 227; or approval of instructor.

BESC 402 Microbial Processes in Bioremediation

Credits 3. 3 Lecture Hours. Metabolic pathways of microbes involved in the biodegradation of hazardous materials; ecological requirements for biotreatability of contaminated sites; emphasis on factors affecting microbial growth; strategies for in situ bioaugmentation. **Prerequisite:** CHEM 222 or CHEM 227.

BESC 403 Sampling and Environmental Monitoring

Credits 3. 2 Lecture Hours. 3 Lab Hours. Introduction to environmental sampling and methodology; strategies and analyses of sampling data; overview of current applications of sampling and monitoring in the environmental sciences; emphasis on practical aspects of sampling from air, soil and water; detection and quantification of microbial and chemical unknowns in environmental media. **Prerequisite:** Junior or senior classification or approval of instructor.

BESC 411 Environmental Health and Safety Compliance

Credits 3. 3 Lecture Hours. 1 Lab Hour. Investigation of various Environmental Health and Safety (EHS) practices necessary for compliance with state and federal regulations; reinforcement of real-world understanding; tour several regulated facilities on campus and learn about the particular TAMU-EHS compliance management strategies for each (utilities, underground storage tanks, wastewater treatment and hazardous waste facility). **Prerequisite:** BESC 367 or similar regulation intensive course and approval of instructor.

BESC 421 Bioenvironmental Project Planning and Management

Credits 3. 3 Lecture Hours. Management processes for managing projects in academic, government or industry settings; exploration of projects that are hypothesis driven, exploratory and product-driven; critical communication planning, meeting stakeholders and sponsors expectations and ensuring regulatory compliance; emphasis on project management life cycle, managing change, communication planning and the work environment. **Prerequisite:** BESC 201; junior or senior classification or approval of instructor.

BESC 431 Bioenvironmental Data Analysis

Credits 3. 3 Lecture Hours. Data management, analysis and interpretation specifically for bioenvironmental research purposes; development of skills required to draw conclusions from data, specifically the types of data relevant to studying the interface of biological and environmental processes; exploration of the challenges of bioenvironmental data analysis; exposure to and development of skills in presentations that highlight the challenges of successfully communicating results and conclusions that necessarily rest on interpretation and assumptions. **Prerequisite:** BESC 201; STAT 201, STAT 302 or STAT 303.

BESC 481 Seminar

Credit 1. 1 Lecture Hour. Capstone course for topics in bioenvironmental sciences; critical analysis of environmental issues through written themes and presentations. May be taken three times for credit. **Prerequisites:** BESC 201 and senior classification in BESC major.

BESC 484 Field Experience

Credits 1 to 4. 1 to 4 Other Hours. An on-the-job supervised experience program conducted in the area of the student's specialization.

Prerequisite: Junior or senior classification or approval of department head.

BESC 485 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Special problems for advanced undergraduates to permit study of subject matter not available in existing courses. **Prerequisite:** BESC 201 or approval of instructor.

BESC 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 1 to 4 Lab Hours. Selected topics in an identified area of bioenvironmental sciences. May be repeated for credit. **Prerequisite:** BESC 201 or approval of instructor.

BESC 491 Research

Credits 1 to 4. 1 to 4 Other Hours. Research conducted under the direction of faculty member in bioenvironmental sciences. May be repeated 3 times for credit. Registration in multiple sections of this course are possible within a given semester provided that the per semester credit hour limit is not exceeded. **Prerequisites:** Junior or senior classification and approval of instructor.

BICH - Biochemistry (BICH)

BICH 101/GENE 101 Introduction to Biochemical and Genetics Research Methods

Credit 1. 1 Lecture Hour. Foundational concepts for biochemistry and genetics research methods; topics include principles of the scientific method, experimental design, analytical tools, and logical thinking, with a special focus on the use of emerging technologies such as artificial intelligence (AI) in biochemical and genetics research. **Prerequisites:** Freshman classification in biochemistry or genetics. **Cross Listing:** GENE 101/BICH 101.

BICH 102/GENE 102 Introduction to Biochemical and Genetic Techniques

Credit 1. 2 Lab Hours. Introduction to biochemistry and genetics essential techniques; concepts learned from BICH/GENE 101/BICH 101 utilized in practical laboratory situations to understand the relevance and use of these techniques in real-world research settings. **Prerequisites:** Grade of C or better in BICH 101/GENE 101 or GENE 101/BICH 101; freshman classification in biochemistry or genetics. **Cross Listing:** GENE 102/BICH 102.

BICH 201/GENE 201 Introduction to Information Literacy and Artificial Intelligence Tools for Biochemistry and Genetics

Credit 1. 1 Lecture Hour. Introduction to essential skills and knowledge for effective learning, information retrieval, evaluation, and utilization of AI tools in the fields of biochemistry and genetics; developing critical thinking abilities, learning to navigate scientific literature, evaluating the credibility of information sources, and leveraging AI tools to enhance their research and problem-solving capabilities. **Prerequisites:** Grade of C or better in BICH 102/GENE 102 or GENE 102/BICH 102; sophomore classification in biochemistry or genetics. **Cross Listing:** GENE 201/BICH 201.

BICH 202/GENE 202 Biochemical and Genetic Concepts in Medicine - Case Studies

Credit 1. 1 Lecture Hour. Exploration of the link between fundamental genetic and biochemical processes and disease states, using case studies of several human diseases; deeper comprehension and critical thinking about molecular causes of diseases and treatment strategies. **Prerequisites:** Grade of C or better in BICH 201/GENE 201 or GENE 201/BICH 201; sophomore classification in biochemistry or genetics. **Cross Listing:** GENE 202/BICH 202.

BICH 285 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Introduction to laboratory research. **Prerequisite:** Freshman or sophomore classification in biochemistry or approval of instructor.

BICH 303 Elements of Biological Chemistry

Credits 3. 3 Lecture Hours. Survey of the biochemical sciences designed for the non-biochemistry major; overview of the chemistry and metabolism of biologically important molecules, the biochemical basis of life processes, cellular metabolism and regulation. Students requiring biochemistry in greater depth should register for BICH 410 and BICH 411. **Prerequisites:** CHEM 222, CHEM 227 or CHEM 257; not open to biochemistry majors.

BICH 403 Cellular Biophysics

Credits 3. 3 Lecture Hours. Current topics in cellular biophysics and systems biology; quantitative and predictive perspectives of cellular life; basic tools of biophysics such as fluorescence imaging and data analysis. **Prerequisites:** BIOL 112 and MATH 152; BICH 440 or concurrent enrollment.

BICH 404 Biochemical Calculations

Credits 2. 2 Lecture Hours. Quantitative and computational approaches to biochemical problems. **Prerequisites:** Grade of C or better in BICH 440 or concurrent enrollment; junior or senior classification.

BICH 406 Molecular Mechanisms of Cell Interactions

Credits 3. 3 Lecture Hours. Current topics in biomolecules, natural product antibiotics and application in infectious diseases, modern and historical approaches to antibiotic discovery, biomedical glycobiology, glycosylation in diseases and pathobiology. **Prerequisites:** BICH 441.

BICH 409 Principles of Biochemistry

Credits 3. 3 Lecture Hours. A rigorous, survey of topics in biochemistry; topics include structure and function of molecules within living cells, major metabolic pathways and their regulation and role in disease; provides preparation for advanced study in the health sciences. **Prerequisites:** CHEM 228 or CHEM 258.

BICH 410 Comprehensive Biochemistry I

Credits 3. 3 Lecture Hours. 1 Lab Hour. Structure, function and chemistry of proteins and carbohydrates; kinetics, mechanisms and regulation of enzymes; metabolism of carbohydrates. Not open to biochemistry or genetics majors. **Prerequisites:** CHEM 228 or CHEM 258; junior or senior classification.

BICH 411 Comprehensive Biochemistry II

Credits 3. 3 Lecture Hours. 1 Lab Hour. A continuation of BICH 410; structure, function, chemistry and metabolism of lipids and nucleic acids; cellular metabolism viewed from the standpoint of energetics and control mechanisms; interrelationships of metabolic pathways. **Prerequisite:** BICH 410; not open to biochemistry or genetics majors.

BICH 412 Biochemistry Laboratory I

Credit 1. 3 Lab Hours. Selected methods used to identify, isolate, purify and characterize biomolecules. Not open to biochemistry or genetics majors. **Prerequisite:** BICH 410 or registration therein.

BICH 414 Biochemical Techniques I

Credits 2. 6 Lab Hours. Analysis of the effects of charge on protein function and stability; techniques include site-directed mutagenesis, protein purification, affinity chromatography, SDS-PAGE, enzyme kinetics, MALDI-TOF, molecular modeling, and protein folding. **Prerequisites:** BICH 440, BICH 409, or BICH 410; major in biochemistry, genetics, microbiology, and molecular and cell biology.

BICH 416/GENE 416 Mechanisms of Cell Division

Credit 1. 1 Lecture Hour. Mitotic cell cycle; progression of biochemical and morphological phases and events; duplication of cellular constituents and segregation into daughter cells. **Prerequisites:** BICH 409, BICH 410, or BICH 440; junior or senior classification in biochemistry or genetics. **Cross Listing:** GENE 416/BICH 416.

BICH 419/GENE 419 Computational Techniques for Evolutionary Analysis

Credits 3. 3 Lecture Hours. Computational techniques for studying evolution; algorithms for construction and analysis of evolutionary relationships. **Prerequisite:** Junior or senior classification or approval of instructor. **Cross Listing:** GENE 419/BICH 419.

BICH 420/GENE 420 Bioethics

Credits 3. 3 Lecture Hours. The application of ethical theory to the use of modern genetics and biochemistry stressing the social implications of genetic engineering, agricultural manipulation and biotechnology. **Prerequisites:** GENE 302 or GENE 303; BICH 409, BICH 410, or BICH 440. **Cross Listing:** GENE 420/BICH 420.

BICH 431/GENE 431 Molecular Genetics

Credits 3. 3 Lecture Hours. Molecular basis for inheritance; gene structure and function, chromosomal organization, replication and repair of DNA, transcription and translation, the genetic code, regulation of gene expression, genetic differentiation and genetic manipulations.

Prerequisite: BICH 409, BICH 410, or BICH 440; GENE 301, GENE 302, GENE 303, GENE 320/BIMS 320 or BIMS 320/GENE 320. **Cross Listing:** GENE 431/BICH 431.

BICH 432/GENE 432 Laboratory in Molecular Genetics

Credits 2. 6 Lab Hours. Laboratory for molecular genetics providing technical experience with tools of molecular biology. **Prerequisite:** GENE 301, GENE 302, GENE 303, BIMS 320/GENE 320 or GENE 320/BIMS 320; BICH 431/GENE 431 or GENE 431/BICH 431. **Cross Listing:** GENE 432/BICH 432.

BICH 440 Biochemistry I

Credits 3. 3 Lecture Hours. Rigorous treatment of the structure, function and chemistry of proteins and carbohydrates; kinetics, mechanisms and regulation of enzymes; metabolism of carbohydrates; designed for biochemistry and genetics majors. **Prerequisites:** Grade of C or better in CHEM 228 or CHEM 258; grade of C or better in BICH 404 or concurrent enrollment.

BICH 441 Biochemistry II

Credits 3. 3 Lecture Hours. Continuation of BICH 440; structure, function, chemistry and metabolism of lipids and nucleic acids, cellular metabolism viewed from the standpoint of energetics and control mechanisms; interrelationships of metabolic pathways. Course designed for biochemistry and genetics majors and honors students only. **Prerequisite:** Grade of C or better in BICH 440.

BICH 450/BIOL 450 Genomics

Credits 4. 3 Lecture Hours. 3 Lab Hours. The study of genomic data includes consideration of the logic behind the most important genomic approaches, as well as their capabilities and limitations in investigating biological processes; the science of accessing and manipulating genomic data; and practical applications, including development of an hypotheses-driven datamining experiment. **Prerequisites:** BIOL 213, GENE 301 or GENE 302, BICH 431/GENE 431 or GENE 431/BICH 431, or BIOL 351; junior or senior classification or approval of instructor. **Cross Listing:** BIOL 450/BICH 450.

BICH 456 Ribonucleic Acid World

Credits 3. 3 Lecture Hours. Emphasis on novel roles and mechanisms of newly discovered Ribonucleic Acid (RNA) species including non-coding RNA's; RNA silencing, circular RNA's, RNA guided epigenetic regulation, clustered regulary interspaced short palindromic repeats (CRISPR)-Cas immunity, genome editing, telomerase biogenesis, riboswitches, exosome, editosome and RNA remodeling. **Prerequisites:** GENE 301, GENE 302, or GENE 303; BICH 410, BICH 440, BIOL 351, or BIOL 413.

BICH 460 Genome Annotation with Ontologies

Credit 1. 2 Lab Hours. Use of ontologies as structured controlled vocabularies for the organization of biological data; annotation based on critical reading of the scientific literature. May be taken two times for credit. **Prerequisite:** Junior or senior classification or approval of instructor.

BICH 464/GENE 464 Bacteriophage Genomics

Credits 3. 1 Lecture Hour. 4 Lab Hours. Examination of the latest technologies in genomic analysis by sequencing and annotating the genomes of novel bacterial viruses (phage); generates real data which will be submitted to the NIH/NCBI public database; includes phage biology and potential uses. **Prerequisites:** GENE 302 or GENE 303; BIOL 351 or concurrent enrollment. **Cross Listing:** GENE 464/BICH 464.

BICH 485 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Directed study in biochemistry not included in established courses. **Prerequisites:** Junior or senior classification; approval of instructor and department head.

BICH 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified area of biochemistry, biophysics or nutrition. May be repeated for credit. **Prerequisite:** Junior or senior classification in life or physical sciences.

BICH 491 Research

Credits 0 to 4. 0 to 4 Other Hours. Laboratory research supervised by faculty in biochemistry or biophysics. **Prerequisite:** Biochemistry major.

BIMS - Biomedical Science (BIMS)

BIMS 101 Introduction to Biomedical Sciences

Credit 1. 1 Lecture Hour. Integration into the BIMS program through content and assignments; understanding of problem solving, personal, and social responsibility; development of self-efficacy, self-awareness, and sense of purpose; becoming actively engaged inside and outside the classroom; becoming socially integrated within the university community. **Prerequisites:** BIMS major.

BIMS 110 One Health in Action

Credit 1. 1 Lecture Hour. Exploration of the concept of One Health; the interconnected and interdependent health of humans, animals and ecosystems; the conceptual framework that encompasses human and veterinary medical sciences, agricultural sciences, food safety, public health, epidemiology, environmental health, toxicology, wildlife ecology and conservation and many related fields of study or research. **Prerequisite:** Freshman or sophomore classification or approval of instructor.

BIMS 120 Learners in Transition

Credits 0. 0 Lecture Hours. 0 Lab Hours. 0 Other Hours. High-impact, one-semester course; acclimation to the university, the College of Veterinary Medicine & Biomedical Sciences faculty, the BIMS program staff and peer mentors; exploration of campus resources, discourse from faculty and students, meetings with advisors, determination of strengths and exploration of personal and financial wellness, diversity and inclusion. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisite:** BIMS and NRSC-TPC majors; freshman classification.

BIMS 125 Animals in Society

Credit 1. 2 Lab Hours. Introduction to integration of humans and animals in society, focusing on animal, human and environmental health of common species as well as special roles of animals. **Prerequisite:** Freshman classification.

BIMS 201 Introduction to Phenotypic Expression in the Context of Human Medicine

Credits 2. 2 Lecture Hours. Study of human genetics with respect to gene expression as it pertains to the cell cycle, development, cancer, aging and epigenetics; discussions and debates surrounding medical examples and case studies. **Prerequisite:** BIOL 112, CHEM 227; or approval of instructor.

BIMS 250 Professionalism, Skill Development, Career Exploration, and Ethical Conduct in BIMS

Credit 1. 1 Lecture Hour. Skills and ethical procedures to assist in professional practice of Biomedical Sciences; exploration of business and professional concepts; topics include development of the individual, ethical integrity, interpersonal dynamics, effective communication skills. **Prerequisites:** Sophomore classification in Biomedical Sciences.

BIMS 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified area of biomedical science. May be repeated for credit. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

BIMS 291 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in biomedical sciences. May be repeated for credit. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

BIMS 301 Biomedical Sciences Study Abroad

Credits 2 to 12. 2 to 12 Lecture Hours. For students in approved programs abroad. May be repeated for credit. Maximum 3 hours free elective credit in the BIMS degree plan. Must be taken on a satisfactory/unsatisfactory basis.

BIMS 303 Research Methodologies and Experimental Design in Biomedical Sciences

Credits 3. 3 Lecture Hours. Exploration of various research methodologies and experimental designs; includes lab-based, field based, quantitative, qualitative and mixed methods approach; emphasis on best practices in research; analysis and interpretation of data to draw conclusions; development of critical thinking skills; focus on appropriate methodologies for various experimental designs. **Prerequisites:** Grade of C or better in CHEM 257; junior classification.

BIMS 320/GENE 320 Biomedical Genetics

Credits 3. 3 Lecture Hours. Fundamental genetic principles as applied to biomedical science; Mendelian inheritance, linkage and genetic mapping, mutagenesis and pedigree analysis; molecular basis of gene function and inherited disease; gene therapy and genetic counseling. Only one of the following will satisfy the requirements for a degree: GENE 301, GENE 302, GENE 315, GENE 320/BIMS 320, or BIMS 320/GENE 320. **Prerequisites:** Grade of C or better in CHEM 228 or CHEM 258; PHYS 207 or grade of C or better in PHYS 202; junior or senior classification. **Cross Listing:** GENE 320/BIMS 320.

BIMS 380 Equine-Assisted Activities and Therapies - Best Practices

Credits 3. 2 Lecture Hours. 2 Lab Hours. Exploration of concepts behind Equine-Assisted Activities and Therapies (EAAT); principles of EAAT, horse welfare, safety factors, effective techniques to promote healing of participants and career options.

BIMS 402/VIBS 402 Anatomy

Credits 4. 2 Lecture Hours. 6 Lab Hours. Clinical and functional anatomy focused on pre-professional training; includes anatomy of all major body systems. **Prerequisites:** Grade of C or better in BIOL 112 and CHEM 258; junior or senior classification; minimum GPA 2.75; or approval on instructor. **Cross Listing:** VIBS 402/BIMS 402.

BIMS 405/GENE 405 Mammalian Genetics

Credits 3. 3 Lecture Hours. Comparative mammalian genetic systems with emphasis on laboratory animals; organization and expression of mammalian genes; development and use of genetically defined animals in biomedical and genetic research. **Prerequisites:** GENE 301, BIMS 320/GENE 320 or GENE 320/BIMS 320; junior or senior classification. **Cross Listing:** GENE 405/BIMS 405.

BIMS 421/GENE 421 Advanced Human Genetics

Credits 3. 3 Lecture Hours. A rigorous, analytical approach to genetic analysis of humans including diagnosis and management of genetic disease in humans; transmission of genes in human populations; human cytogenetics; the structure of human genes; human gene mapping; molecular analysis of genetic disease; genetics screening and counseling. **Prerequisites:** GENE 302; BICH 410 or BICH 440. **Cross Listing:** GENE 421/BIMS 421.

BIMS 481 Seminar

Credit 1. 1 Other Hour. Exploration of published scientific research via guided discussions; familiarization with the necessary skills to conduct an appropriate literature search of the scientific record; extensive practice in effectively communicating biomedical science through oral presentation. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisites:** Junior or senior classification; BIMS major; BIOL 401, BIOL 402, BIOL 403, VIBS 310, or VIBS 311.

BIMS 484 Internship

Credits 0 to 3. 0 to 3 Other Hours. Supervised internship in the biomedical sciences workforce for practical application of biomedical sciences knowledge. May be taken for credit up to six hours. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisites:** Approval of instructor.

BIMS 485 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Directed individual study of problems in the biomedical sciences with emphasis in the allied health professions, hospital administration, and the health-related industry approved by the instructor. **Prerequisites:** Junior or senior classification; approval of instructor; BIMS major with a minimum overall 2.5 TAMU GPA.

BIMS 489 Special Topics in...

Credits 1 to 4. 1 to 4 Other Hours. Selected topics in an identified area of biomedical science. May be repeated for credit. **Prerequisite:** Junior or senior classification; BIMS major with a minimum overall 2.5 TAMU GPA.

BIMS 491 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in biomedical sciences. May be repeated for credit. **Prerequisites:** Grade of C or better in CHEM 228 or CHEM 258; grade of C or better in PHYS 202; junior or senior classification; approval of instructor.

BIMS 499 Biomedical Sciences Capstone Experience

Credit 1. 1 Other Hour. Integration of foundational biomedical science knowledge, competencies, and coursework through an individual capstone project based on research and presentation of an approved topic; formal presentation of both translational and integrative application of information as well as the expected impacts of the selected topic. **Prerequisites:** Senior classification and approval of instructor, or concurrent participation in the Biomedical Research Certificate.

BIOL - Biology (BIOL)

BIOL 100 Horizons in Biology

Credits 0-1. 0-1 Lecture Hours. Introduction to the study of biology at Texas A&M University; gain knowledge of departmental and campus resources to assist and enhance the pursuit of a degree in biology, microbiology, molecular and cellular biology or zoology. **Prerequisites:** First-year and first-time-in-college freshman majoring in BIOL, MBIO, BMBB and ZOOL.

BIOL 101 Botany

Credits 4. 3 Lecture Hours. 3 Lab Hours. Structure, physiology and development of plants with an emphasis on seed plants. (Not open to students who have taken BIOL 111 and BIOL 112 or BIOL 113.); includes laboratory that reinforces and provides supplemental information related to the lecture topics.

BIOL 104 Contemporary Issues in Science - Cosmos, Earth and Humanity

Credits 3. 3 Lecture Hours. Science for citizens; interdisciplinary survey of contemporary issues in the science of our universe or cosmos, Earth and humanity, including the big bang, evolution, genetics, vaccines and drugs; future outlook on humanity, including artificial intelligence, cryptography and cybersecurity; critically analyze science presented in the news, on television and on social media; ethical implications of research. **Cross Listing:** ARSC 104 and PHYS 104.

BIOL 107 Zoology

Credits 4. 3 Lecture Hours. 3 Lab Hours. (BIOL 1313 and 1113, 1413) Zoology. Survey of animal life with respect to cell organization, genetics, evolution, diversity of invertebrates/vertebrates, anatomy/physiology, and interaction of animals with their environment; includes laboratory that reinforces and provides supplemental information related to lecture topics. (Not open to students who have taken BIOL 111 and BIOL 112 or BIOL 113).

BIOL 111 Introductory Biology I

Credits 4. 3 Lecture Hours. 3 Lab Hours. (BIOL 1306 and 1106, 1406) Introductory Biology I. First half of an introductory two-semester survey of contemporary biology that covers the chemical basis of life, structure and biology of the cell, molecular biology and genetics; includes laboratory that reinforces and provides supplemental information related to the lecture topics; also taught at Galveston campus.

BIOL 112 Introductory Biology II

Credits 4. 3 Lecture Hours. 3 Lab Hours. (BIOL 1307 and 1107, 1407) Introductory Biology II. The second half of an introductory two-semester survey of contemporary biology that covers evolution, history of life, diversity and form and function of organisms; includes laboratory that reinforces and provides supplemental information related to the lecture topics. **Prerequisite:** BIOL 111; also taught at Galveston campus.

BIOL 113 Essentials in Biology

Credits 3. 3 Lecture Hours. (BIOL 1308, BIOL 1408) Essentials in Biology. One-semester biology for non-majors; overview of essential biological concepts and their application to real world and contemporary issues; topics include evolution, biodiversity, cellular, molecular and forensic biology, genetics and heredity to scientific literacy, human impact on the environment, genetically modified organisms and emerging diseases.

BIOL 206 Introductory Microbiology

Credits 4. 3 Lecture Hours. 4 Lab Hours. (BIOL 2320 and 2120, BIOL 2321 and 2121, BIOL 2420, BIOL 2421) Introductory Microbiology. Basic microbiology of prokaryotes and eukaryotes; main topics include morphology, physiology, genetics, taxonomy, ecology, medically important species and immunology; mandatory laboratory designed to give hands-on experience and to reinforce basic principles. **Prerequisites:** BIOL 101, BIOL 107, BIOL 111, or BIOL 113; CHEM 119. May not be used for credit by biology, molecular and cell biology, microbiology, zoology, pre dentistry or premedicine majors.

BIOL 213 Molecular Cell Biology

Credits 3. 3 Lecture Hours. Exploration of the molecular basis of cell structure, function and evolution; gene regulation, cell division cycle, cancer, immunity, differentiation, multicellularity and photosynthesis. **Prerequisite:** BIOL 112 and CHEM 120.

BIOL 214 Genes, Ecology and Evolution

Credits 3. 3 Lecture Hours. A genetically-based introduction to the study of ecology and evolution; emphasis on the interactions of organisms with each other and with their environment. **Prerequisite:** BIOL 112.

BIOL 285 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Problems in various phases of plant, animal and microbial science. **Prerequisites:** Freshman or sophomore classification; approval of ranking professor in field chosen and Undergraduate Advising Office.

BIOL 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of biology. May be repeated for credit. **Prerequisite:** Approval of instructor.

BIOL 291 Research

Credits 0 to 4. 0 to 4 Other Hours. Active research of basic nature under the supervision of a Department of Biology faculty member. May be repeated for credit. **Prerequisites:** Freshman or sophomore classification and approval of faculty member.

BIOL 302 Careers in Biology

Credit 1. 1 Lecture Hour. Development of job search skills; utilization of career resources; self-assessment of career interests and career objectives; strategies for professional correspondence and networking; business etiquette and interviewing techniques; insight into life science career opportunities. **Prerequisites:** Junior or senior classification; department of biology majors only; or approval of instructor.

BIOL 318 Chordate Anatomy

Credits 4. 3 Lecture Hours. 3 Lab Hours. Classification, phylogeny, comparative anatomy, and biology of chordates; diversity, protochordates, vertebrate skeletons, shark and cat anatomy studied in laboratory. **Prerequisite:** BIOL 214 or approval of instructor.

BIOL 319 Integrated Human Anatomy and Physiology I

Credits 4. 3 Lecture Hours. 3 Lab Hours. Integrated approach to cellular, neural, skeletal, muscular anatomy and physiology; includes some histology, histopathology, radiology and clinical correlations. **Prerequisite:** BIOL 111 and BIOL 112, or BIOL 107.

BIOL 320 Integrated Human Anatomy and Physiology II

Credits 4. 3 Lecture Hours. 3 Lab Hours. Continuation of BIOL 319. Integrated approach to endocrine, cardiovascular, respiratory, digestive, urinary, reproductive and developmental anatomy and physiology; includes some histology, histopathology, radiology and clinical correlations. **Prerequisite:** BIOL 319 or approval of instructor.

BIOL 335 Invertebrate Zoology

Credits 4. 3 Lecture Hours. 3 Lab Hours. Morphology, taxonomy, natural history and phylogeny of invertebrate animals, with emphasis on biodiversity; class includes both lecture and lab. Labs include study of preserved material and demonstration of living animals in aquaria and terraria. **Prerequisite:** BIOL 214 or approval of instructor.

BIOL 349 Bioinformatics

Credits 3. 3 Lecture Hours. Comprehensive analysis of bioinformatics tools applicable to eukaryotic organisms; theoretical background of computational algorithms, with an emphasis on application of computational tools related to modern molecular biological research. **Prerequisites:** BIOL 213; GENE 301, GENE 302, GENE 303, BIMS 320/GENE 320, or GENE 320/BIMS 320 recommended; or approval of instructor.

BIOL 350 Computational Genomics

Credits 3. 2 Lecture Hours. 2 Lab Hours. Hands-on approach to obtaining, organizing and analyzing genome-related data; emphasis on asking and answering biologically relevant questions by designing and performing experiments using computers; understanding biology from a computational perspective. **Prerequisite:** Junior or senior classification in life sciences, engineering, mathematics, chemistry.

BIOL 351 Fundamentals of Microbiology

Credits 4. 3 Lecture Hours. 4 Lab Hours. Introduction to modern microbiology with emphasis on prokaryotes; includes microbial cell structure, function, and physiology; genetics, evolution, and taxonomy; bacteriophage and viruses; pathogenesis and immunity; and ecology and biotechnology; includes laboratory experience with microbial growth and identification. **Prerequisites:** BIOL 112; CHEM 257, or CHEM 227 and CHEM 237, or CHEM 231; or approval of instructor; also taught at Galveston campus.

BIOL 352 Diagnostic Bacteriology

Credits 4. 2 Lecture Hours. 6 Lab Hours. Practical experience in handling, isolation and identification of pathogenic microorganisms using biochemical tests and rapid identification techniques. **Prerequisite:** BIOL 351 or approval of instructor.

BIOL 357 Ecology

Credits 3. 3 Lecture Hours. Analysis of ecosystems at organismal, population, interspecific and community levels. **Prerequisite:** BIOL 214 or approval of instructor.

BIOL 388 Principles of Animal Physiology

Credits 4. 3 Lecture Hours. 3 Lab Hours. Introduction to how animals function, including basics of neurophysiology, endocrinology, muscular, cardiovascular, respiratory, osmoregulatory, and metabolic physiology; broadly comparative in scope and encompassing adaptation of physiological systems to diverse environments; the laboratory stresses techniques used for monitoring and investigating physiological mechanisms and responses to environmental changes. **Prerequisites:** BIOL 214, CHEM 228, or CHEM 258, or approval of instructor.

BIOL 400 Tropical Ecology of Costa Rica

Credits 6. 2 Lecture Hours. 12 Lab Hours. Advanced field-intensive course conducted at multiple biological field stations located throughout Costa Rica; exposure to a wide variety of tropical ecological principles using largely observational and some sampling techniques; experience with amazing diversity of wildlife and habitats from hot, humid low land rainforests to the high elevations of the Talamanca páramo; development of a variety of natural history skills needed to understand the complex interactions of plants and animals in tropical environments; requires detailed journal of ecological principles observed while in Costa Rica to be used as basis for final written report; opportunities to experience the unique and friendly culture of one of Central America's most successful countries and discover how anthropogenic activities affect biodiversity. **Prerequisites:** Junior or senior classification; approval of instructor; BIOL 357 preferred.

BIOL 401 Critical Writing in Biology

Credit 1. 1 Lecture Hour. Reading scientific papers and writing short synopses of papers with a focus on learning how to think and write like a scientist; fills the current Writing Intensive "W" course requirement for biology. **Prerequisite:** BIOL 213 or CHEM 228; junior or senior classification.

BIOL 402 Communicating Biological Research to the Public

Credit 1. 1 Lecture Hour. Interpretation of scientific papers; analysis of how research findings are communicated to lay audiences; creation of synopses of research findings for the general public. **Prerequisite:** BIOL 213 or CHEM 228; junior or senior classification.

BIOL 403 Medical Narratives

Credit 1. 1 Lecture Hour. Focus on reading and analyzing brief nonfiction stories about medicine; exploration of different perspectives and experiences with illness and medicine. **Prerequisites:** BIOL 213 or CHEM 228; junior or senior classification or approval of instructor.

BIOL 405 Comparative Endocrinology

Credits 3. 3 Lecture Hours. Basic principles of endocrinology including structure and functions of hormones in vertebrates; hormonal control of growth, metabolism, osmoregulation, and reproduction; endocrine techniques and mechanism of hormone action. **Prerequisites:** BIOL 214; CHEM 227 or CHEM 257.

BIOL 406/GENE 406 Bacterial Genetics

Credits 3. 3 Lecture Hours. A problem oriented course surveying the manipulation and mechanisms of genetic systems in bacteria; recombination, structure and regulation of bacterial genes, plasmids and phages. **Prerequisites:** BIOL 351; GENE 302. **Cross Listing:** GENE 406/BIOL 406.

BIOL 407 Biological Clocks

Credits 3. 3 Lecture Hours. Examination of the basic mechanisms of biological timing; in depth study of clocks in model organisms and the relationship between clocks and human health and disease. **Prerequisites:** BICH 431/GENE 431, BIOL 213 or GENE 431/BICH 431.

BIOL 411 Synthetic Biology of Microbes

Credits 3. 3 Lecture Hours. Underlying technical basis for synthetic biology; tools used to generate recombinant molecules; genetic circuitry and modules applied to bacteria; design and fabrication of genes, biological components and entire organisms; survey actual and theoretical applications. **Prerequisites:** BIOL 351 or BICH 431/GENE 431.

BIOL 413 Cell Biology

Credits 3. 3 Lecture Hours. Structure, function, and biogenesis of cells and their components; interpretation of dynamic processes of cells, including protein trafficking, motility, signaling and proliferation. **Prerequisites:** BIOL 213, GENE 302, or GENE 303; BICH 410 or BICH 440.

BIOL 414 Developmental Biology

Credits 3. 3 Lecture Hours. Concepts of development in systems ranging from bacteriophage to the mammalian embryo; use of recombinant DNA technology and embryo engineering to unravel the relationships between growth and differentiation, morphogenesis and commitment, aging and cancer. **Prerequisite:** BIOL 213 or GENE 302; BICH 410 or BICH 440.

BIOL 423 Cell Biology Laboratory

Credits 2. 1 Lecture Hour. 3 Lab Hours. Modern methods of study of cell structure and cell function. **Prerequisites:** BICH 410 and BIOL 413, or concurrent enrollment or approval of instructor.

BIOL 428 Cellular Neuroscience

Credits 3. 3 Lecture Hours. Cell biology, molecular biology and biophysics of neurons as it pertains to their fundamental role in the physiological basis of behavior; study of how neurons create, maintain and exploit electrical signals for information coding and transmission; principles of electrical and chemical signaling between neurons, and the role of intracellular signaling for signal modulation and synaptic plasticity; exploration of a broad range of state-of-the-art molecular tools currently used to study the nervous system, and the cellular basis for many of the most common neurological disorders affecting humans as well as the strategies and therapies for their treatment. **Prerequisites:** BIOL 213 and PSYC 235, or approval of instructor. **Cross Listing:** NRSC 428/BIOL 428.

BIOL 430 Biological Imaging

Credits 4. 3 Lecture Hours. 3 Lab Hours. Still and video photography and photomicrography, computerbased digital image analysis and processing of biological images; theory and principles of light and electron microscopy including transmission and scanning electron microscopy; optical contrast methods for light microscopy including phase contrast, DIC, polarizing light and confocal laser scanning microscopy. **Prerequisite:** Junior classification or approval of instructor.

BIOL 434/NRSC 434 Regulatory and Behavioral Neuroscience

Credits 3. 3 Lecture Hours. Cell biology and biophysics of neurons; functional organization of the vertebrate nervous system; physiological basis of behavior. **Prerequisites:** BIOL 213; BIOL 319, BIOL 320, BIOL 388, BIOL 413, or PBSI 235, or approval of instructor. **Cross Listing:** NRSC 434/BIOL 434.

BIOL 435 Laboratory for Regulatory and Behavioral Neuroscience

Credit 1. 3 Lab Hours. Study of modern methods and tools used to investigate nervous system structure and function. **Prerequisite:** BIOL 213; BIOL 319, BIOL 320, BIOL 388, BIOL 413, BIOL 428, BIOL 434/ NRSC 434, NRSC 235, NRSC 335, NRSC 428/BIOL 428, NRSC 434/BIOL 434, or PBSI 235, or approval of instructor.

BIOL 438 Bacterial Physiology

Credits 3. 3 Lecture Hours. Structure and function of prokaryotic cells, with emphasis on evolutionary adaptations to different environmental, developmental, and pathogenic selection pressures; formation of teams and preparation of presentations on specific topics in microbiology. **Prerequisites:** BIOL 351; BIOL 406/GENE 406 or concurrent enrollment; BICH 410, BICH 431/GENE 431 and GENE 302 strongly recommended.

BIOL 440 Marine Biology

Credits 4. 3 Lecture Hours. 3 Lab Hours. Introduction to biology of common organisms inhabiting bays, beaches and near-shore oceanic waters with special reference to Gulf of Mexico biota; emphasis on classification, distribution, history, ecology, physiology, mutualism, predation, major community types and economic aspects of marine organisms. **Prerequisite:** BIOL 214 or approval of instructor.

BIOL 443 Early Stages of Animal Evolution

Credits 3. 2 Lecture Hours. 2 Lab Hours. Analysis of the earliest stages of animal evolution by integrating various scientific fields such as genomics, paleontology, metabolism, morphology, environment, development and behavior; includes hands-on exploration of fossils and modern animals to understand how evolution shaped our world. **Prerequisites:** BIOL 214; junior or senior classification.

BIOL 444/NRSC 444 Neural Development

Credits 3. 3 Lecture Hours. Cellular and molecular mechanisms of nervous system development including neural induction and the basis of complex behaviors; use of a wide range of model organisms with a specific emphasis on vertebrate nervous system development.

Prerequisites: BIOL 213, BIOL 319, BIOL 320, BIOL 413, BIOL 388, or PBSI 235. **Cross Listing:** NRSC 444/BIOL 444.

BIOL 445 Biology of Viruses

Credits 3. 3 Lecture Hours. Structure, composition and life cycles of viruses; methods used to study viruses; their interaction with host cells; mechanisms of pathogenicity and cellular transformation; responses of the host to viral infection, and vaccine applications; in-depth study of the life cycles of the major classes of viruses and discussion of emerging viruses. **Prerequisite:** BIOL 213 or BIOL 351 or approval of instructor.

BIOL 450/BICH 450 Genomics

Credits 4. 3 Lecture Hours. 3 Lab Hours. The study of genomic data includes consideration of the logic behind the most important genomic approaches, as well as their capabilities and limitations in investigating biological processes; the science of accessing and manipulating genomic data; and practical applications, including development of an hypotheses-driven datamining experiment. **Prerequisites:** BIOL 213, GENE 301 or GENE 302, BICH 431/GENE 431 or GENE 431/BICH 431, or BIOL 351; junior or senior classification or approval of instructor. **Cross Listing:** BICH 450/BIOL 450.

BIOL 454 Immunology

Credits 3. 3 Lecture Hours. Introduction to basic immunological concepts and principles of serology. **Prerequisite:** BIOL 351 or equivalent or approval of instructor.

BIOL 455 Laboratory in Immunology

Credits 2. 6 Lab Hours. Practical application of serological principles which include precipitation, agglutination and blood banking principles; techniques in tissue culture and hybridoma technology also included. **Prerequisite:** BIOL 454 or registration therein.

BIOL 456 Medical Microbiology

Credits 3. 3 Lecture Hours. Microbiology, epidemiology and pathology of human pathogens with an emphasis on bacterial agents. **Prerequisite:** BIOL 351 or approval of instructor.

BIOL 461 Antimicrobial Agents

Credit 1. 1 Lecture Hour. Understanding of antimicrobial agents, limitations of use, biosynthesis and regulation, and challenges in development as new therapeutics. **Prerequisites:** BICH 410 or BICH 440 and BIOL 351 or VTPB 405.

BIOL 466 Principles of Evolution

Credits 3. 3 Lecture Hours. Evolutionary patterns, mechanisms and processes at the organismal, chromosomal and molecular levels; modes of adaptation and the behavior of genes in populations. **Prerequisite:** GENE 302 or approval of instructor.

BIOL 467 Integrative Animal Behavior

Credits 3. 3 Lecture Hours. Examines how behavior contributes to survival and reproduction, and how evolutionary history and ecological circumstance interact to shape the expression of behavior; focus on integrative nature of behavior; how the interaction of evolutionary processes, mechanistic constraints, and ecological demands determine behavioral strategies. **Prerequisite:** BIOL 214, BIOL 357, BIOL 388, BIOL 405, BIOL 434/NRSC 434, or BIOL 466, or approval of instructor.

BIOL 480 Departmental Colloquium

Credit 1. 1 Lecture Hour. Attend presentations given by renowned scientists from various fields of biology; learn about new developments in science; stay abreast of current and trending research topics.

Prerequisites: Senior classification; majors in BIOL, MICRO, BMB and ZOOL.

BIOL 481 Seminar in Biology

Credit 1. 1 Lecture Hour. Recent advances. **Prerequisite:** Senior undergraduate majors in biology, microbiology, botany or zoology.

BIOL 484 Internship

Credits 0 to 4. 0-1 Other Hours. Directed internship in a private firm or public agency to provide research experience appropriate to the student's degree program and career objectives. May be taken two times.

Prerequisite: Approval of internship agency and advising office.

BIOL 485 Directed Studies

Credits 1 to 12. 1 to 12 Other Hours. Problems in various phases of plant, animal and bacteriological science. **Prerequisites:** Junior classification; approval of ranking professor in field chosen and Undergraduate Advising Office.

BIOL 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 10 Lab Hours. Selected topics in an identified area of biology. May be repeated once for credit.

BIOL 491 Research

Credits 0 to 4. 0 to 4 Other Hours. Active research of basic nature under the supervision of a Department of Biology faculty member. May be taken two times. Registration in multiple sections of this course is possible within a given semester provided that the per semester credit hour limit is not exceeded. **Prerequisite:** Approval of departmental faculty member.

BIOL 492 Biomedical Therapeutics Development

Credit 1. 1 Lecture Hour. Basic aspects of the biotechnology business; includes key aspects of biotechnology patents, the main steps in preclinical drug development and company structure and funding. **Prerequisites:** BIOL 213 or equivalent; CHEM 227 and CHEM 228.

BIOL 495 Biology Capstone: Research Communication in the Life Sciences

Credits 2. 2 Lecture Hours. Culmination of capstone research experience; formalization of research results in written and oral forms; introduction to primary genres or scientific writing; apply principles of rhetoric and composition to diverse methods of professional communication. **Prerequisite:** BIOL 452, BICH 464/GENE 464, BIOL 400, BIOL 493 or BIOL 491 or approval of instructor.

BIOL 496 Ethics in Biological Research

Credit 1. 1 Lecture Hour. Fraud in science, how to recognize it, and how to avoid committing fraud; includes the basis of ethics and plagiarism, negotiation techniques and conflict management, the regulations and ethics covering animal and human experiments, record-keeping, data management and peer review. **Prerequisite:** BIOL 491, NRSC 491, BICH 491, GENE 491, BIMS 491, CHEM 491, BIOL 351, or BICH 410, or approval of instructor.

BMEN - Biomedical Engineering (BMEN)

BMEN 153 Pathways in Biomedical Engineering

Credit 1. 1 Lecture Hour. Overview of biomedical engineering and the biomedical engineering industry, including specialties, degree requirements and scholastic programs in the Department of Biomedical Engineering. **Prerequisite:** Biomedical Engineering major.

BMEN 201 Professional Development Essentials

Credits 3. 3 Lecture Hours. Examination of professional development essentials required to be a professional biomedical engineer; topics include academic, engineering, and medical ethics; critical thinking and problem-solving skills; and written, verbal, and mathematical communication skills. **Prerequisites:** Grade of C or better in MATH 152; Biomedical Engineering major.

BMEN 207 Computing for Biomedical Engineering

Credits 3. 2 Lecture Hours. 3 Lab Hours. Introduction to the principles of computer programming for biomedical applications including program design and development, programming techniques and documentation; introduction to and programming in the Python and LabVIEW environments, and computer-aided design application in SolidWorks environments. **Prerequisite:** Grade of C or better in MATH 152 and ENGR 102; Biomedical Engineering major.

BMEN 211 Biomedical Applications of Signals and Systems

Credits 3. 3 Lecture Hours. Quantitative analysis of biomedical and physiological signals; Fourier and Laplace transforms; filtering of biomedical signals; electrical circuits and analog representations of physiological systems as model systems; A/D conversion and sampling. **Prerequisites:** Admitted to major degree sequence; PHYS 207 or PHYS 208; MATH 308 or concurrent enrollment.

BMEN 250 Biostatistics and Data Visualization

Credits 3. 3 Lecture Hours. Introduction to statistical thinking for biomedical engineering problem-solving and decision-making applied to the benchtop, laboratory, and clinical testing and to the quality engineering procedures of verification and validation; topics include descriptive statistics, estimation, hypothesis testing, regression and correlation, experimental design, data visualization, and ethics of statistical practice. **Prerequisites:** Grade of C or better in MATH 152 and ENGR 102; Biomedical Engineering major.

BMEN 253 Discovering Biomedical Engineering Design Thinking

Credit 1. 1 Lecture Hour. Identification and exploration of what constitutes a medical device and the unique aspects of medical device design that are imposed by medical device regulation. **Prerequisite:** Biomedical Engineering major.

BMEN 254 Biomedical Engineering Design I

Credit 1. 1 Lecture Hour. Introduction into biomedical engineering design and relevant biomedical topics. **Prerequisites:** Grade of C or better in BMEN 253; Biomedical Engineering major.

BMEN 285 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Allows students to undertake special projects in biomedical engineering at an earlier point in their studies than required for BMEN 485. **Prerequisite:** Approval of Director of Undergraduate Programs.

BMEN 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified area of biomedical engineering. May be repeated for credit. **Prerequisite:** Approval of instructor.

BMEN 291 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in biomedical engineering. May be repeated 2 times for credit. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

BMEN 305 Bioinstrumentation

Credit 1. 3 Lab Hours. Introduction to biomedical instrumentation design; hands on acquisition of biomedical signals; design, building and testing of bioinstrumentation circuits including analog signal amplifiers and analog filter circuits. **Prerequisite:** Grade of C or better in BMEN 211; grade of C or better in BMEN 321 or concurrent enrollment.

BMEN 311 Imaging Living Systems

Credits 3. 3 Lecture Hours. Examination of microscopy and clinical imaging modalities in biomedical applications across intracellular to whole body length scales; microscopy topics include optical, electron, scanning probe, infrared, intravital, and other techniques; clinical imaging techniques to be covered include x-ray, ultrasound, magnetic resonance imaging, computed and positron emission tomography, and other specialized clinical imaging. **Prerequisites:** Grade of C or better in BMEN 207 or approval of instructor; Biomedical Engineering major.

BMEN 321 Circuits, Signals, and Systems

Credits 3. 2 Lecture Hours. 3 Lab Hours. Examination of circuits and linear and nonlinear systems concepts required for quantitative analysis of biomedical and physiological signals and design of biomedical systems; topics include electrical circuit fundamentals, operational amplifiers, frequency response, electrical transients, impulse response, transfer functions, convolution, Fourier and Laplace transforms, filtering of biomedical signals, electrical circuits and analog representations of physiological systems as model systems, and A/D conversion and sampling; theoretical investigations and hands-on acquisition of biomedical signals and designing, building, and testing bioinstrumentation circuits. **Prerequisites:** Grade of C or better in BMEN 207, BMEN 250 or STAT 312, MATH 308, and PHYS 207; Biomedical Engineering major.

BMEN 322 Biosignal Analysis

Credits 3. 3 Lecture Hours. Design and application of analog and digital signal analysis in biomedical engineering; characteristics of biomedical signals; design considerations for analog-to-digital and digital-to-analog circuitry; biosignal transformation methods; analog and digital filter design for biomedical signals. **Prerequisite:** BMEN 321.

BMEN 341 Biotransport

Credits 3. 3 Lecture Hours. Fundamentals of momentum, mass, and energy transport related to living or biomedical systems; examination of the basic principles and constitutive equations of a variety of biological transport phenomena, with length scales ranging from intracellular to organ level; topics include fluid mechanics; transport by diffusion, along with effects of convection, electrochemical potential, and chemical reactions; and energy-tissue interactions; emphases are given to fundamental principles, quantitative approaches, and biomedical applications of these principles and techniques. **Prerequisites:** Grade of C or better in BMEN 207 or concurrent enrollment, MATH 308, and PHYS 207 or PHYS 208; Biomedical Engineering major.

BMEN 343 Biomedical Engineering Materials

Credits 3. 2 Lecture Hours. 3 Lab Hours. Properties, preparation, and characterization of natural and man-made materials encountered in biomedical applications; topics include the chemical structure of metals, ceramics, and polymers; physical, mechanical, bulk, and surface properties of biomaterials; biomaterial degradation; and biomaterial processing; theoretical investigations and hands-on acquisition and interpretation of biomaterial preparation and characterization data. **Prerequisites:** Grade of C or better in MATH 308 and BMEN 361; Biomedical Engineering major.

BMEN 344 Biological Interactions and Testing

Credits 3. 2 Lecture Hours. 3 Lab Hours. Application of quantitative engineering principles and bioimaging, bioassay, and biomolecule activity testing to elucidate the interactions between materials and biological systems; topics include protein and cell interactions with biomaterials; biomaterial implantation; acute inflammation, wound healing and the presence of biomaterials immune responses to biomaterials; thrombosis; infection; tumorigenesis; and calcification of biomaterials; examination of theoretical investigations, hands-on acquisition, and interpretation of biological interaction data. **Prerequisite:** Grade of C or better in MATH 308 and VTPP 435; Biomedical Engineering major.

BMEN 345 Biomaterials Lab

Credit 1. 3 Lab Hours. Experimental methods used to prepare and characterize polymeric biomaterials used in biomedical engineering; related fundamental aspects of forming a hypothesis, experimental design, empirical observation, data collection, interpretation and presentation of data. **Prerequisite:** Grade of C or better in BMEN 343; grade of C or better and concurrent enrollment in BMEN 250.

BMEN 351 Biomedical and Health Data Science

Credits 3. 3 Lecture Hours. Exploration of applications of data analytics, machine learning, and deep learning in health sciences and biomedical data; topics include theoretical foundations, algorithms and methods of deriving valuable insights from data, predictive health analysis, electronic health records, medical image analysis, computational drug discovery, and genome structure prediction using predictive modeling. **Prerequisites:** Grade of C or better in BMEN 207 and BMEN 250 or STAT 312; Biomedical Engineering major.

BMEN 353 Biomedical Engineering Device Design II

Credit 1. 1 Lecture Hour. Identification of needs, concept ideation and selection, and creating an initial prototype for user testing within the biomedical engineering process. **Prerequisites:** Grade of C or better in BMEN 254; Biomedical Engineering major.

BMEN 354 Biomedical Engineering Design III

Credits 2. 2 Lecture Hours. Analysis of validation and verification testing for biomedical engineering design, along with manufacturing readiness, market-entry readiness, and post-market engineering activities. **Prerequisites:** Grade of C or better in BMEN 353; Biomedical Engineering major.

BMEN 361 Biomedical Engineering Mechanics

Credits 3. 2 Lecture Hours. 3 Lab Hours. Examination of biomedical engineering mechanics with a focus on biomedical devices, biomaterials, and hard and soft biological tissues; topics include fundamentals of static mechanics, motion biomechanics, and mechanics of materials supplemented with experimental design, simulation, and mechanical testing; exploration of theoretical investigations and hands-on acquisition; interpretation and application of biomechanical data. **Prerequisites:** Grade of C or better in BMEN 207 and BMEN 250 or STAT 312; Biomedical Engineering major.

BMEN 399 Engineering Professional Development

Credits 0. 0 Other Hours. Participation in an approved high-impact learning practice; reflection on professional outcomes from engineering body of knowledge; documentation and self-assessment of learning experience at mid-curriculum point. **Prerequisites:** Admission to biomedical engineering; junior or senior classification or approval of instructor.

BMEN 400/VTPP 401 History of Human and Veterinary Medicine in Europe

Credits 4. 4 Lecture Hours. Addresses the major developments in human and veterinary medicine in Europe from the Middle Ages to the present; explores key events and figures in medical history and analyzes issues of current biomedical concern in a historical context; for example, animal rights, ethics of humane experimentation, euthanasia. **Prerequisites:** Admitted to major degree sequence in biomedical engineering; VTPP 434. **Cross Listing:** VTPP 401/BMEN 400.

BMEN 401 Principles and Analysis of Biological Control Systems

Credits 3. 3 Lecture Hours. Techniques for generating quantitative mathematical models of physiological control systems and devices; the behavior of physiological control systems using both time and frequency domain methods. **Prerequisite:** BMEN 321.

BMEN 402 Biomedical Optics Laboratory

Credits 3. 2 Lecture Hours. 3 Lab Hours. Biomedical optics technology; basic engineering principles used in developing therapeutic and diagnostic devices; hands-on labs including optical monitoring, diagnostic and therapeutic experiments. **Prerequisite:** PHYS 207 or PHYS 208 or approval of instructor; Biomedical Engineering major or minor.

BMEN 404 FDA Good Laboratory and Clinical Practices

Credits 3. 3 Lecture Hours. Implementation of Good Laboratory Practices (GLP) for the submission of preclinical studies and use of Good Clinical Practices (GCP) in clinical trials in accordance with Food and Drug Administration (FDA) regulations; includes similarities and differences in GLP and GCP critical for the introduction of new drugs and medical devices. **Prerequisites:** BMEN 253; junior or senior classification.

BMEN 406 Medical Device Path to Market

Credits 3. 3 Lecture Hours. Path to market for a medical device with specific attention to the regulatory affairs to enable the development of an appropriate regulatory strategy due to the highly regulated global environment. **Prerequisites:** BMEN 253; junior or senior classification, or approval of instructor.

BMEN 420 Medical Imaging

Credits 3. 3 Lecture Hours. Principles of major imaging modalities including x-ray radiography, x-ray computed tomography (CT), ultrasonography and magnetic resonance imaging; including a brief discussion on other emerging imaging technologies such as nuclear imaging (PET and SPECT). **Prerequisites:** Grade of C or better in BMEN 321; junior or senior classification.

BMEN 422 Bioelectromagnetism

Credits 3. 3 Lecture Hours. Electric, magnetic and electromagnetic phenomena associated with biological tissues; source modeling based on physiological current including line and volume conductor models as well as electromagnetic-based stimulation, sensing and imaging. **Prerequisites:** Admission into the degree sequence of the major and BMEN 321 or approval of instructor.

BMEN 425 Biophotonics

Credits 3. 3 Lecture Hours. Theory and application of optical instrumentation, including light sources, lasers, detectors, and optical fibers; instrumentation and engineering in biomedical applications of optics in therapeutics, diagnostics, and biosensing. **Prerequisites:** Grade of C or better in BMEN 311; Biomedical Engineering majors; junior or senior classification.

BMEN 427 Magnetic Resonance Engineering

Credits 3. 2 Lecture Hours. 3 Lab Hours. Design, construction and application of instrumentation for MR imaging; fundamentals of the architecture of an MR spectrometer and the gradient subsystem used for image localization; emphasis on the radiofrequency sensors and systems used for signal generation and reception. **Prerequisites:** Grade of C or better in ECEN 322 or BMEN 420; junior or senior classification.

BMEN 428/CSCE 461 Embedded Systems for Medical Applications

Credits 3. 2 Lecture Hours. 3 Lab Hours. Principles of embedded system architecture and programming; fundamentals and theoretical foundations of wireless communication systems; hands-on experiences of how an embedded system could be used to solve problems in biomedical engineering; projects on wireless sensors and imaging for medical devices. **Prerequisite:** Grade of C or better in BMEN 321, CSCE 350/ECEN 350, or CSCE 315, or approval of instructor. **Cross Listing:** CSCE 461/BMEN 428.

BMEN 431 Biomolecular Engineering

Credits 3. 3 Lecture Hours. Foundations for understanding and experimental approaches for measuring and manipulating biomolecules; proteins, nucleic acids and carbohydrates; thermodynamics and kinetics of biomolecular reactions. **Prerequisites:** Grade of C or better in BMEN 344 or concurrent enrollment; junior or senior classification; Biomedical Engineering majors; or approval of instructor.

BMEN 432 Molecular and Cellular Biomechanics

Credits 3. 3 Lecture Hours. Introduces biomolecules and their assemblies that play structural and dynamical roles in subcellular to cellular level mechanics; emphasis on quantitative/theoretical descriptions; discussions of the relevant experiment approaches to probe these nano to micro-scale phenomena; includes topics in self-assembly of cytoskeleton and biomembranes, molecular motors, cell motility, and mechanotransduction. **Prerequisite:** BMEN 361.

BMEN 433 Biomolecular and Cellular Engineering Laboratory

Credits 3. 2 Lecture Hours. 3 Lab Hours. Laboratory biosafety and biohazard awareness; cell culture protocols and standards for biocompatibility testing; setting protocols for cellular and biomolecular projects; bioimaging, bioassays and biomolecule activity testing. **Prerequisites:** VTPP 435; BMEN 431 or concurrent enrollment; majors in biomedical engineering; junior or senior classification; or approval of instructor.

BMEN 448 Healthcare Technology in the Developing World

Credits 3. 1 Lecture Hour. 6 Lab Hours. Principles of operation for major types of medical equipment; physiology underlying the measurement; major functional (system) pieces for each instrument; typical problems/applications of each instrument. **Prerequisite:** Grade of C or better in MATH 152 and PHYS 207; approval of instructor.

BMEN 450 Case Studies

Credit 1. 1 Lecture Hour. Examination of the process through which clinically defined problems are addressed from the perspective of biomedical engineering through the use of case studies; issues of technology transfer and clinical evaluation. **Prerequisite:** Admitted to major degree sequence; junior or senior classification.

BMEN 452 Mass and Energy Transfer in Biosystems

Credits 3. 3 Lecture Hours. Transport phenomena associated with physiological systems and their interaction with medical devices; exchange processes in artificial life support systems and diagnostic equipment. **Prerequisite:** Grade of C or better in BMEN 341; Biomedical Engineering major or minor.

BMEN 453 Analysis and Design Project I

Credits 3. 2 Lecture Hours. 3 Lab Hours. Team-based biomedical engineering analysis and design project involving needs statement generation, ideation, technical specifications, subsystem analysis, and design of complete biomedical system to fit unique needs. **Prerequisites:** Grade of C or better in BMEN 321, BMEN 344, BMEN 354, and BMEN 361; Biomedical Engineering major.

BMEN 454 Analysis and Design Project II

Credits 3. 9 Lab Hours. Continuation of BMEN 453. **Prerequisite:** Grade of C or better in BMEN 453; Biomedical Engineering major.

BMEN 457 Orthopedic Biomechanics

Credits 3. 3 Lecture Hours. Development of competencies in biomechanical principles using practical examples and clinical case studies; application of biomechanical knowledge to the evaluation of musculoskeletal tissues and structures, and treatment options for musculoskeletal dysfunction. **Prerequisite:** BMEN 361 or equivalent course approved by instructor.

BMEN 458 Motion Biomechanics

Credits 3. 3 Lecture Hours. Skeletal anatomy and mechanics; muscle anatomy and mechanics; theory and application of electromyography; motion and force measuring equipment and techniques; inverse dynamics modeling of the human body; current topics in musculoskeletal biomechanics research. **Prerequisites:** BMEN 207 or approval of instructor; junior or senior classification.

BMEN 461 Cardiac Mechanics

Credits 3. 3 Lecture Hours. Application of continuum mechanics and computational solid mechanics to the study of the mammalian heart; utilization of continuum mechanics and finite element analysis in solving non-linear boundary value problems in biomechanics. **Prerequisites:** BMEN 341 and BMEN 361.

BMEN 463 Soft Tissue Mechanics and Finite Element Methods

Credits 3. 3 Lecture Hours. Application of continuum mechanics and finite element methods to the study of the mechanical behavior of soft tissues and associative applications in biomedicine. **Prerequisites:** BMEN 341 and BMEN 361.

BMEN 464 Cancer Bioengineering

Credits 3. 3 Lecture Hours. Examination of cancer from an engineering perspective focusing on cancer as a complex interaction of tumor cells, support cells, and immune cells; quantifying and engineering tumor microenvironments; engineering advances in cancer discovery and therapeutic interventions; emphasis on systems integration to address cancer challenges. **Prerequisites:** Grade of C or better in BMEN 343 and VTPP 435; grade of C or better in BMEN 480 or concurrent enrollment.

BMEN 465 Biomechanics Experiential Learning Lab

Credit 1. 3 Lab Hours. Applications in biomechanics (solid and fluid); includes experimental methods used to investigate biomechanical factors in the assessment of therapeutic interventions; mechanical testing load frames; motion capture systems, high speed imaging and flow systems; hypothesis forming, experimental design, empirical observation, data collection and interpretation, and presentation of results. **Prerequisite:** Grade of C or better in BMEN 361.

BMEN 469 Entrepreneurial Pathways in Medical Devices

Credits 3. 3 Lecture Hours. Overview of fundamental elements and development steps for an effective strategy pathway including regulatory pathway for commercialization of medical product/medical device innovations; application of the basic regulations and associated requirements and enforcements for product market approval; exploration of product quality test method design requirements; understanding of the applicable regulations and standards pertaining to the design, testing, approval and marketing of medical devices. **Prerequisite:** Admitted to major degree sequence (upper-level) in biomedical engineering.

BMEN 471 Numerical Methods in Biomedical Engineering

Credits 3. 3 Lecture Hours. Application of numerical analysis to analyze molecular, cellular and physiological systems, using general techniques including programming in MATLAB to analyze steady and dynamic systems. **Prerequisites:** BMEN 207 and VTPP 434.

BMEN 472 Computational Fluid Dynamics in Biomedical Engineering

Credits 3. 3 Lecture Hours. Fundamentals of computational fluid dynamics (CFD) for biomedical applications; topics include discretization of fundamental balance relations; modeling physiologic geometries; mesh generation; modeling physics; iterative solution approach; and analysis of simulation results; emphasis on the role of CFD in biomedical device design and patient-tailored medicine. **Prerequisites:** Grade of C or better in BMEN 341; junior or senior classification or approval of instructor.

BMEN 480 Biomedical Engineering of Tissues

Credits 3. 3 Lecture Hours. Introduction to aspects of tissue engineering with and emphasis placed on tissue level topics including tissue organization and biological processes, with insights from recent literature (state-of-the-art). **Prerequisite:** BMEN 343.

BMEN 481 Seminar

Credits 0. 0 Other Hours. Research based seminar focused on the identification and pursuit of research experiences within the local biomedical engineering community. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisites:** BMEN major; junior or senior classification.

BMEN 482 Polymeric Biomaterials

Credits 3. 3 Lecture Hours. Preparation, properties, and biomedical applications of polymers including polymerization; structure-property relationships; molecular weight and measurement; morphology; thermal transitions; network formation; mechanical behavior; polymetric surface modification; polymer biocompatibility and bioadhesion; polymers in medicine, dentistry, and surgery; polymers for drug delivery; polymeric hydrogels; and biodegradable polymers. **Prerequisite:** BMEN 343.

BMEN 483 Polymeric Biomaterial Synthesis

Credits 3. 3 Lecture Hours. Overview of polymer synthetic routes and key structure-property relationships with emphasis on the design of polymeric systems to achieve specific properties; tissue engineering and drug delivery applications will be used as model systems to explore the process of biomaterial design from synthesis to device evaluation.

Prerequisite: BMEN 343 or approval of instructor.

BMEN 484 Internship

Credits 0 to 3. 0 to 3 Other Hours. Industry experience from both an experiential perspective as well as networking; reflect upon the experience gained during an internship with an outside entity; learn what it takes to be successful in industry. **Prerequisites:** Admission to Biomedical Engineering major; BMEN 253.

BMEN 485 Directed Studies

Credits 0 to 6. 0 to 6 Other Hours. Allows students to undertake special projects in biomedical engineering. **Prerequisite:** Approval of instructor or Director of Undergraduate Programs.

BMEN 486 Biomedical Nanotechnology

Credits 3. 3 Lecture Hours. Nanotechnology applications in biomedicine; concepts of scale; unique properties at the nanoscale; biological interaction, transport, and biocompatibility of nanomaterials; current research and development of nanotechnology for medical applications, including sensors, diagnostic tools, drug delivery systems, therapeutic devices, and interactions of cells and biomolecules with nanostructured surfaces. **Prerequisite:** BMEN 343, senior classification or approval of instructor.

BMEN 487 Drug Delivery

Credits 3. 3 Lecture Hours. Mechanisms for controlled release of pharmaceutically active agents and the development of useful drug delivery systems; controlled release mechanisms including diffusive, convective, and erosive driving forces by using case studies related to oral, topical and parenteral release in a frontier interdisciplinary scientific research format. **Prerequisites:** BMEN 343; senior classification in biomedical engineering or approval of instructor.

BMEN 489 Special Topics in...

Credits 1 to 4. 1 to 4 Other Hours. New or unique areas of biomedical engineering which are of interest to biomedical engineering and other undergraduate students.

BMEN 491 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in biomedical engineering. May be repeated for credit. **Prerequisites:** Junior or senior classification and approval of instructor.

BOTN - Botany (BOTN)

BOTN 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of botany. May be repeated for credit. **Prerequisite:** Approval of instructor.

BOTN 291 Research

Credits 1 to 4. 1 to 4 Other Hours. Active research of basic nature under the supervision of a Department of Biology faculty member.

Prerequisites: Freshman or sophomore classification and approval of instructor.

BOTN 485 Directed Studies

Credits 3. 3 Lecture Hours. Problems in various phases of plant, animal and bacteriological science. **Prerequisites:** Junior classification; approval of ranking professor in field chosen and Undergraduate Advising Office.

BOTN 491 Research

Credits 1 to 4. 1 to 4 Other Hours. Active research of basic nature under the supervision of a Department of Biology faculty member.

Prerequisites: Junior or senior classification and approval of instructor.

BUSH - Geo Bush School of Gov (BUSH)

BUSH 141 Bush Undergraduate Success Hub

Credits 3. 3 Lecture Hours. Guidance for those entering the Bush School of Government and Public Service; creating a mission and purpose for higher education career; fostering an inclusive environment that cultivates a sense of purpose towards public service, engagement in opportunities, and advancement in overall understanding of the world; development of self-efficacy, self-awareness and a sense of purpose; engagement in the learning environment both inside and outside of the classroom; social integration within the Bush School of Government and Public Service community.

BUSH 241 Democracy, Civic Engagement, and Community Leadership

Credits 3. 3 Lecture Hours. An exploration into democracy, civic engagement, and community leadership with an emphasis on engaging in public service as citizens.

BUSH 285 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Directed study of selected problems in government and public service not covered in other courses. May be taken two times for credit. **Prerequisites:** Freshman or sophomore classification admitted to the Bush School and approval of instructor.

BUSH 300 Bush School Study Abroad

Credits 0 to 18. 0 to 18 Other Hours. For students in approved programs abroad. May be repeated for credit. **Prerequisites:** INTA, INTS, or POLS majors; junior or senior classification.

BUSH 485 Directed Studies

Credits 0 to 3. 0 to 3 Other Hours. Research problems and readings for students in the Bush School; directed independent study of a topic related to government and public service that relates to a student's area of interest. **Prerequisites:** Junior or senior classification or approval of instructor.

BUSH 489 Special Topics in...

Credits 1 to 4. 1 to 4 Other Hours. Selected topics in an identified area of government and public service. May be repeated for credit. **Prerequisites:** Junior or senior classification.

BUSN - Mays Business School (BUSN)

BUSN 101 Freshman Business Initiative

Credits 3. 3 Lecture Hours. (BUSI 1301) Freshman Business Initiative. Freshman orientation to business and to Mays Business School; introduction to majors within the business school and associated career opportunities; introduction and development of personal and professional competencies, with emphasis on self-leadership, business communication, ethical decision making, and teamwork. **Prerequisite:** Freshmen admitted to Mays Business School; also taught at Galveston campus.

BUSN 125 Business Learning Community I

Credits 3. 3 Lecture Hours. Focuses on the base competencies that relate to effectively managing people, tasks and organizations, and change and innovation; develops skills in personal and professional competencies, analytical and critical thinking skills, written and oral communication skills, interpersonal skills and problem-solving skills; research emphasis. **Prerequisite:** Selection for Mays Business School Honors Program.

BUSN 203 Statistical Methods for Business

Credits 3. 3 Lecture Hours. (BUSI 2305) Statistical Methods for Business. Collection, tabulation and presentation of numerical data; sampling, estimation of averages and variation, probability and error, hypothesis testing and correlation. Only one of the following will satisfy the requirements for a degree: STAT 201 or BUSN 203; STAT 201 may not be used to satisfy the BUSN 203 requirement in BBA degree programs. **Prerequisites:** MATH 140, MATH 142, or equivalent; Business, Agribusiness, and Maritime Business Administration majors; also taught at Galveston campus.

BUSN 204 Discover Consulting

Credits 3. 3 Lecture Hours. Learning the basic of management consulting; consulting firm distinctions (MBB, Big Four, boutique); value-creation models; consulting offerings; organizational structures and roles; career paths; consulting frameworks, diagnostics, analytics, methodologies; consulting project life cycle; client dynamics and influence; critical thinking; mental math strategies; interviewing skills; resume writing; self-awareness (EQ & CQ); personal presence. **Prerequisites:** Sophomore classification or approval by instructor.

BUSN 206 Emerging Business Technology Environment

Credits 3. 3 Lecture Hours. Analysis, recording, and reviewing of impactful technology businesses; foundational business leadership and personal brand development; analysis of customer lifecycle choices and business opportunity identification. **Prerequisites:** Business of Technology certificate; approval of instructor.

BUSN 207 New Product Development and Go-to-Market Strategies

Credits 3. 3 Lecture Hours. Analysis and review of impactful technology businesses; ideating new products and services; product development process; developing opportunity identification; A/B testing of new product ideas; mapping customer value. **Prerequisites:** Business of Technology certificate; approval of instructor.

BUSN 208 Business Application Development

Credits 3. 3 Lecture Hours. Review and development of code-based business applications; foundations of user experience and user interface designs; analysis of code performance and tracking app experience in the iPhone Operating Systems (IOS) Database market. **Prerequisites:** Business of Technology certificate; approval of instructor; CSCE 110 or CSCE 120.

BUSN 209 Business in Technology Experience

Credits 3. 3 Lecture Hours. Examination of global business and technology environment in the west coast; history, culture, politics, and innovation influencing innovation & infrastructure; combination of classroom work and field trip. **Prerequisites:** Business of Technology certificate; approval of instructor.

BUSN 213 Overview of the Energy Industry

Credit 1. 1 Lecture Hour. Overview of the business model of energy companies; study of how the different functional areas of an energy firm work together to create value **Prerequisite:** Admission to Mays Business school.

BUSN 225 Business Competency

Credits 3. 3 Lecture Hours. Application of core business competencies of leadership, communication, decision making, ethics and teamwork. **Prerequisites:** BUSN 101 or BUSN 125; selection for Mays Business School Honors Program.

BUSN 232 Resource Development

Credits 3. 3 Lecture Hours. Examination of resource development and the fundraising process in nonprofit organizations and social enterprises; introduction to the funding methods and interconnectedness of government, individuals, foundations and corporations as nonprofits seek to address societal challenges; overview of donor motivations, sources of support, staff/board roles in fundraising, earned income strategies and ethical practices. **Prerequisites:** Mays Business School majors only.

BUSN 285 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Directed study of selected problem in business not covered in other courses. May be taken two times for credit. **Prerequisites:** Freshman or sophomore classification admitted to Mays Business School and approval of instructor.

BUSN 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of business and public service. May be repeated for credit. **Prerequisite:** Freshman or sophomore in business.

BUSN 299 Professional and High Impact Experiences

Credits 0. 0 Other Hours. Participation in professional and/or high impact experiences. May be repeated for credit. Must be taken on a satisfactory/unsatisfactory basis.

BUSN 302 Nonprofit Perspectives

Credit 1. 1 Lecture Hour. Examination of the size, scope and distinctiveness of the nonprofit sector; development of a comprehensive view of the nonprofit sector by engaging with a diversity of perspectives from private, government or nonprofit organizations. **Prerequisite:** Mays Business School major; junior or senior classification or approval of instructor.

BUSN 325 Business Honors Seminar I

Credit 1. 1 Other Hour. Development and analysis of professional skills for application in the workplace. **Prerequisite:** Grade of C or better in BUSN 125 and BUSN 225; Business Honors majors.

BUSN 392 Cooperative Education in Business

Credits 2. 40 Other Hours. Educational work assignment in the field in which the student is interested. Supervision will be by employer with technical report required at semester's end. May be taken three times for credit.

BUSN 401 Mays Business Fellows I

Credits 3. 3 Lecture Hours. A seminar for the development of leadership and management skills. **Prerequisite:** Selection for Mays Business Fellows Program.

BUSN 403 Business Writing and Communication

Credits 3. 3 Lecture Hours. Essential written communication skills for business; theory, hands-on practice, real-world scenarios; proficiency in written business communication; written documents, digital presence; effective communication strategies; career readiness, professional relationships; identifying, analyzing stakeholders; achieving communication objectives; self-reflection, peer review; understanding personal communication strengths, biases. **Prerequisite:** Junior or senior classification or approval of instructor.

BUSN 404 Career Design

Credits 3. 3 Lecture Hours. Tools and insights to craft a life and career that aligns with values, aspirations, and educational experiences; emphasis on design thinking principles, guiding through self-discovery, exploration of passions, skills, and potential life trajectories; foundational framework for making intentional, informed decisions about life and careers. **Prerequisites:** Junior or senior classification; approval of instructor.

BUSN 405 Consulting Interview Preparation

Credits 3. 3 Lecture Hours. Case interviews preparation; behavioral fit interview practice; mastery of MECE categorization; managing a client; making data-based recommendations using the Pyramid Principle; developing and communicating stories demonstrating professional drive, and business competence; managing cross-examination and probing questions. **Prerequisites:** Grade of C or better in BUSN 204 or approval of instructor.

BUSN 432 Strategic Philanthropy

Credits 3. 3 Lecture Hours. Examination of historical trends in philanthropy; participation in grant making process through the lens of a private foundation; engagement with local and national philanthropic leaders; development of personal philanthropic ethic through a grant making simulation that includes due diligence, writing grants and reaching collective decisions. **Prerequisites:** Junior or senior classification or approval of instructor.

BUSN 450 Business Transformation with Generative Artificial Intelligence

Credits 3. 3 Lecture Hours. Leverage Generative Artificial Intelligence (AI) and Large Language Models (LLMs) across major business functions, including marketing, management, product development, operations, accounting, and finance; application of a variety of AI/LLM tools to enable business efficiency and effectiveness; focusing on practical business applications and ethical considerations; building custom AI tools for specific business needs. **Prerequisites:** Artificial Intelligence in Business minor only; junior or senior classification.

BUSN 455 Automating Business Story Telling Using Artificial Intelligence

Credits 3. 3 Lecture Hours. Business data visualization principles and evaluation strategies; use of tools such as dashboards, Python, Tableau/PowerBI; effective storytelling using automated visualization enabled by artificial intelligence; connecting data analytics to business outcomes and communicating those outcomes to higher management and consumers. **Prerequisites:** Artificial Intelligence in Business minor only; junior or senior classification; BUSN 450 or concurrent enrollment.

BUSN 460 Machine Learning, Predictive Modeling, and Business Applications

Credits 3. 3 Lecture Hours. Building knowledge needed for acquiring advanced machine learning (ML) skills useful in business; preparation for collaborative work on business applications using ML techniques; ML concepts; overview of ML algorithms/models; management of a ML project from a business perspective; real-world use cases of ML in various business functions and industries, using predictive analytics to transform business processes and functions. **Prerequisites:** Artificial Intelligence in Business minor; junior or senior classification; BUSN 450 or concurrent enrollment.

BUSN 465 Business Applications of Deep Learning - Image Audio and Video Data

Credits 3. 3 Lecture Hours. Advanced skills for analyzing and extracting insights for business from image, unstructured audio and video data using deep learning; applying deep learning techniques to real-world business scenarios, including customer-driven applications; leveraging state-of-the-art AI tools and methodologies to process, analyze, and derive actionable insights from audio and video data; enhancing decision-making and operational efficiency across various business domains; tackling complex challenges in the evolving landscape of business data analysis. **Prerequisites:** Artificial Intelligence in Business minor; junior or senior classification; BUSN 450 or concurrent enrollment.

BUSN 470 Applied Natural Language Processing for Business Decisions

Credits 3. 3 Lecture Hours. Application of natural language processing tools to derive business information from unstructured text; extraction of text and tables from documents and websites; increase effectiveness and efficiency when using business relevant textual data (ex., analyst reports, corporate filings, emails, political/regulatory comments, and business customer/transaction files). **Prerequisites:** Artificial Intelligence in Business minor only; junior or senior classification; BUSN 450 or concurrent enrollment.

BUSN 481 Seminar

Credits 0-1. 0-1 Other Hours. Exploration of current business topics or competencies. May be taken four times for credit. **Prerequisites:** Junior or senior classification or approval of instructor.

BUSN 484 Internship

Credits 0 to 4. 0 to 4 Other Hours. Professional internship or practical experience in a field in which the student is interested, under the direction of the business honors director or a business school faculty member. May be taken two times for credit. **Prerequisite:** Business honors major or approval of instructor.

BUSN 485 Directed Studies

Credits 1 to 6. 1 to 6 Other Hours. Directed study on selected problems in the area of business administration not covered in other courses. May be repeated for credit. **Prerequisites:** Admission to upper division in Mays Business School; approval of instructor.

BUSN 489 Special Topics in...

Credits 1 to 4. 1 to 4 Other Hours. Selected topics in an identified area of business and public service. May be repeated for credit. **Prerequisites:** Junior or senior classification in business.

BUSN 491 Research

Credits 1 to 4. 1 to 4 Other Hours. Research conducted under the direction of faculty member in Mays Business School. May be repeated 1 times for credit. **Prerequisites:** Junior or senior classification admitted to Mays Business School and approval of instructor.

CARC - College of Architecture (CARC)

CARC 101 Cultural and Social Issues in the Natural, Built and Virtual Environment

Credits 3. 3 Lecture Hours. Introduction to cultural and social issues in planning, design, construction, creativity and the visual arts; exploration of how individual and collective values and beliefs are expressed in the practice of architecture, landscape architecture, urban planning, construction science and the arts; how these fields internalize and reify these values while creating the natural, built and virtual environments; emphasis on civil discourse to help recognize positionality and work collaboratively in a multicultural society.

CARC 181 First Year Seminar

Credit 1. 1 Lecture Hour. Seminar on various contemporary topics; introduction to high quality college instruction and research; focus on writing, speaking, exploration, discussion and research. May be taken two times for credit. **Prerequisite:** First time in college and College of Architecture undergraduate studies.

CARC 291 Research

Credits 1 to 4. 1 to 4 Other Hours. Research conducted under the direction of a faculty member. May be repeated 2 times for credit. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

CARC 300 College of Architecture Study Abroad

Credits 1 to 18. 1 to 18 Other Hours. For students in approved study abroad programs participating in reciprocal educational exchange programs. May be repeated for credit. **Prerequisite:** Junior or senior classification; approval of assistant dean for international programs and initiatives.

CARC 301 Field Studies in Design Innovation

Credits 1 to 18. 1 to 18 Other Hours. Design innovation in international and domestic environments away from the Texas A&M University campus; emphasis on the cultural, social, economic, geographical, climatic and technological factors influencing design solutions for human needs. May be taken up to two times in the same semester. **Prerequisite:** Junior or senior classification; CARC 481; approval of assistant dean for international programs and initiatives.

CARC 311 Field Studies in Design Communication

Credits 3. 2 Lecture Hours. 4 Lab Hours. Design communication in international and domestic environments away from the Texas A&M University campus; emphasis on the tools, methods and techniques for design communication. May be taken up to two times in the same semester. **Prerequisite:** Junior or senior classification; approval of assistant dean for international programs and initiatives.

CARC 321 Field Studies in Design Technology

Credits 3. 3 Other Hours. Design technology in international and domestic environments away from the Texas A&M University campus; emphasis on structural, material and environmental systems and methods of construction utilized to realize design solutions. May be taken up to two times in the same semester. **Prerequisite:** Junior or senior classification; approval of assistant dean for international programs and initiatives.

CARC 331 Field Studies in Design Philosophy

Credits 3. 3 Other Hours. Design philosophy in international and domestic environments away from the Texas A&M University campus; emphasis on the historical, philosophical, cultural, social and economic factors that influence design solutions. May be taken up to two times in the same semester. **Prerequisites:** Junior or senior classification; approval of assistant dean for international programs and initiatives.

CARC 411 Interdisciplinary Methods on Smart and Connected Communities

Credits 3. 3 Lecture Hours. Empirical cases of smart and connected communities; development of critical thinking and teambuilding skills; exposure to interdisciplinary collaboration; exploration of serving vulnerable populations and small communities with emerging technologies; exploration of promises and challenges of disruptive technologies; discussion of community engagement; opportunities and socio-economic disruptions brought by the emerging technologies from a diverse and global perspective; strategies and frameworks to utilize smart-city technologies in a diverse and global society. **Prerequisites:** Junior or senior classification or approval of instructor.

CARC 412 Interdisciplinary Capstone on Smart and Connected Communities

Credits 3. 3 Lecture Hours. Interdisciplinary capstone project; smart and connected communities; scalable interventions to address challenges of small, underserved communities; preparation in critical thinking and creative problem solving; measurable impacts on a real community. Must be taken on a satisfactory/unsatisfactory basis.

CARC 421 Interdisciplinary Project Delivery Through Real-World Projects

Credits 1 to 3. 1 to 3 Lecture Hours. Interaction and observation of interdisciplinary teams of the Built Environment during the planning, designing and/or constructing of real-world project(s). May be taken for credit up to 6 hours. **Prerequisites:** Junior or senior classification; approval of instructor.

CARC 481 Seminar

Credits 0-1. 0-1 Other Hours. Preparatory seminar for select College of Architecture study away and internships; topics include introduction to the language, culture and history of study abroad location. Must be taken prior to the student's study away semester. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisites:** Junior or senior classification; approval of assistant dean for international programs and initiatives.

CARC 484 Internship

Credits 1 to 6. 0 Lecture Hours. 1 to 6 Other Hours. Practical experience in a working situation either during the semester or summer; work experience must have relevance to the degree sought and career objectives. **Prerequisite:** Junior or senior classification required; approval of academic advisor required; USAR majors.

CARC 485 Directed Studies

Credits 1 to 6. 1 to 6 Other Hours. Individual research in architecture, construction science or landscape architecture in an international or domestic environment away from the Texas A&M University campus. May be taken up to two times in the same semester. **Prerequisite:** Junior or senior classification; approval of assistant dean for international programs and initiatives.

CARC 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified area of architecture. May be repeated for credit.

Prerequisites: Junior or senior classification; approval of assistant dean for international programs and initiatives.

CARC 491 Research

Credits 1 to 4. 1 to 4 Other Hours. Research conducted under the direction of a faculty member. May be repeated 2 times for credit.

Prerequisites: Junior or senior classification; approval of assistant dean for international programs and initiatives.

CEHD - Coll of Ed & Human Dev (CEHD)

CEHD 101 Learning Community Foundations of Leadership

Credit 1. 1 Lecture Hour. Exploration of leadership identity, and reflection on lessons learned during the first year of college. Must be taken on a satisfactory/unsatisfactory basis.

CEHD 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of education and human development. May be repeated for credit. **Prerequisite:** Approval of instructor.

CEHD 291 Research

Credits 1 to 4. 1 to 4 Other Hours. Research conducted under the direction of faculty member in the College of Education and Human Development. May be repeated 2 times for credit. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

CEHD 300 Education and Human Development Study Abroad

Credits 0 to 18. 0 to 18 Lecture Hours. For students in approved programs to study abroad. May be repeated for credit. **Prerequisites:** Approval of department head; junior or senior classification.

CEHD 491 Research

Credits 1 to 4. 1 to 4 Other Hours. Research conducted under the direction of faculty member in the College of Education and Human Development. May be repeated 2 times for credit. **Prerequisites:** Junior or senior classification and approval of instructor.

CHEM - Chemistry (CHEM)

CHEM 100 Horizons in Chemistry

Credit 1. 1 Lecture Hour. An introduction to chemistry and its relationship to and influence on society; emphasis on chemical demonstrations and the practical application of chemical phenomena. For chemistry majors. **Prerequisite:** Major in chemistry or approval of instructor.

CHEM 105/ARSC 105 Contemporary Issues in Science - The Environment

Credits 3. 3 Lecture Hours. Science for citizens; interdisciplinary survey of contemporary issues in and future outlook on the science of our environment, including climate change, energy, plastics, agriculture, and food and water safety; future outlook on the health of our environment; critically analyze science presented in the news, on television and on social media. **Cross Listing:** ARSC 105/CHEM 105.

CHEM 106 Molecular Science for Citizens

Credits 3. 3 Lecture Hours. (CHEM 1305, 1405*) Molecular Science for Citizens. Molecules that control daily life explored via a conceptual approach to molecular science; properties, synthesis, transformations and utility of important molecules and fuels, fibers, metals, pharmaceuticals, foods, biomolecules and structural materials; pollution, consumerism, energy production, disease, biotechnology and risk-benefit analysis considered; also taught at Galveston campus.

CHEM 107 General Chemistry for Engineering Students

Credits 3. 3 Lecture Hours. (CHEM 1309, 1409*) General Chemistry for Engineering Students. Introduction to important concepts and principles of chemistry; emphasis on areas considered most relevant in an engineering context; practical applications of chemical principles in engineering and technology. Students completing CHEM 107 and changing majors to curricula requiring CHEM 101 and CHEM 102 may substitute CHEM 107 for CHEM 101. Only one of the following will satisfy the requirements for a degree: CHEM 107 or CHEM 101. **Prerequisites:** Concurrent enrollment in CHEM 117; grade of C or better in MATH 150, or equivalent, or acceptable score on Texas A&M University math placement exam; also taught at Galveston and Qatar campuses.

CHEM 116 Molecular Science for Citizens Laboratory

Credit 1. 3 Lab Hours. (CHEM 1105, 1405*) Molecular Science for Citizens Laboratory. The importance of molecular science to daily life illustrated by using experiments, demonstration and videos; designed to accompany CHEM 106. **Prerequisite:** CHEM 106 or registration therein; also taught at Galveston campus.

CHEM 117 General Chemistry for Engineering Students Laboratory

Credit 1. 3 Lab Hours. (CHEM 1109, 1409*) General Chemistry for Engineering Students Laboratory. Introduction to important concepts and principles of chemistry in the laboratory; emphasis on areas considered most relevant in an engineering context; practical applications of chemical principles in engineering and technology. Students completing CHEM 117 and changing majors to curricula requiring CHEM 111 and CHEM 112 may substitute CHEM 117 for CHEM 111. Only one of the following will satisfy the requirements for a degree: CHEM 117 or CHEM 111. **Prerequisites:** CHEM 107 or registration therein; also taught at Galveston and Qatar campuses.

CHEM 119 Fundamentals of Chemistry I

Credits 4. 3 Lecture Hours. 3 Lab Hours. (CHEM 1311 and 1111, 1411) Fundamentals of Chemistry I. Introduction to modern theories of atomic structure and chemical bonding; chemical reactions; stoichiometry; states of matter; solutions; equilibrium; acids and bases; coordination chemistry; methods and techniques of chemical experimentation; qualitative and semiquantitative procedures applied to investigative situations; also taught at Galveston campus. **Prerequisites:** Completion of at least 90% of the ALEKS chemistry preparatory module.

CHEM 120 Fundamentals of Chemistry II

Credits 4. 3 Lecture Hours. 3 Lab Hours. (CHEM 1312 and 1112, 1412) Fundamentals of Chemistry II. Theory and applications of oxidation-reductions systems; thermodynamics and kinetics; complex equilibria and solubility product; nuclear chemistry; descriptive inorganic and organic chemistry; introduction to analytical and synthetic methods and to quantitative techniques to both inorganic and organic compounds with emphasis on an investigative approach. **Prerequisites:** CHEM 119, or CHEM 107 and CHEM 117; also taught at Galveston and Qatar campuses.

CHEM 181 Peer-Assisted Learning Pedagogy for Chemistry

Credits 0-1. 0-1 Lecture Hours. Introduction and integration of current learning theory, evidence-based learning, and educational psychology into the daily operations and practice of the Chemistry Learning Laboratory; must be a peer-tutor for the Chemistry Learning Laboratory. **Prerequisites:** Grade of B or better in CHEM 107, or CHEM 119 and CHEM 120; or grade of B or better in CHEM 257 and CHEM 258; approval of instructor.

CHEM 220 Physics and Chemistry of Inorganic Materials

Credits 3. 3 Lecture Hours. Structure, properties and function of materials developed from an atomistic and molecular perspective emphasizing quantum chemical descriptions; elements of solid-state chemistry and physics including bonding, crystal structure and symmetry, origin of electronic band structure, synthesis and characterization tools in materials chemistry and role of finite size effects. **Prerequisite:** CHEM 120; concurrent enrollment in PHYS 207.

CHEM 222 Elements of Organic and Biological Chemistry

Credits 3. 3 Lecture Hours. Organic chemistry and its applications to biological and agricultural chemistry, including chemistry of functional groups, acid-base and redox chemistry, stereochemistry and chemistry of important biological compounds. Not to be used as the basis for further study in organic chemistry or biochemistry. **Prerequisite:** CHEM 101, CHEM 119, or CHEM 107.

CHEM 227 Organic Chemistry I

Credits 3. 3 Lecture Hours. (CHEM 2323, 2423*) Organic Chemistry I. Introduction to chemistry of compounds of carbon; general principles and their application to various industrial and biological processes. **Prerequisite:** CHEM 102 or CHEM 120; concurrent enrollment in CHEM 237 is suggested; also taught at Galveston and Qatar campuses.

CHEM 228 Organic Chemistry II

Credits 3. 3 Lecture Hours. (CHEM 2325, 2425*) Organic Chemistry II. Continuation of CHEM 227. **Prerequisite:** CHEM 227; concurrent registration in CHEM 238 is suggested; also taught at Galveston and Qatar campuses.

CHEM 231 Techniques of Organic Chemistry

Credits 2. 1 Lecture Hour. 3 Lab Hours. Techniques of organic chemistry; preparation, properties of typical organic compounds; separation, purification, analysis, and characterization of organic compounds. **Prerequisites:** CHEM 112 or CHEM 120; concurrent enrollment in CHEM 227.

CHEM 234 Organic Synthesis and Analysis

Credits 3. 1 Lecture Hour. 6 Lab Hours. The synthesis of significant types of organic compounds and study of their properties; laboratory separations of mixtures of organic substances, identification of compounds by functional group tests and preparation of derivatives; instrumental methods of separation, identification and analysis. **Prerequisites:** CHEM 228 or concurrent enrollment; CHEM 231, CHEM 237 or CHEM 257.

CHEM 237 Organic Chemistry Laboratory

Credit 1. 3 Lab Hours. (CHEM 2123, 2423*) Organic Chemistry Laboratory. Operations and techniques of elementary organic chemistry laboratory; preparation, reactions and properties of representative organic compounds. **Prerequisites:** CHEM 102 and CHEM 112, or CHEM 120; CHEM 227 or concurrent enrollment; also taught at Galveston and Qatar campuses.

CHEM 238 Organic Chemistry Laboratory

Credit 1. 3 Lab Hours. (CHEM 2125, 2425*) Organic Chemistry Laboratory. Continuation of CHEM 237. **Prerequisites:** CHEM 228 or concurrent enrollment; CHEM 231, CHEM 237, or CHEM 257; also taught at Galveston and Qatar campuses.

CHEM 242 Elementary Organic Chemistry Laboratory

Credit 1. 3 Lab Hours. Operations and techniques of elementary organic chemistry laboratory with emphasis on experiments for students of agriculture. **Prerequisite:** CHEM 222 or registration therein.

CHEM 257 Organic Chemistry I - Structure and Function

Credits 4. 3 Lecture Hours. 3 Lab Hours. Introduction to the chemistry of carbon-containing compounds, including general principles and application to various academic, industrial, and biological processes; includes elementary operations and techniques of organic chemistry laboratories. **Prerequisites:** CHEM 102 or CHEM 120; also taught at Galveston campus.

CHEM 258 Organic Chemistry II - Reactivity and Applications

Credits 4. 3 Lecture Hours. 3 Lab Hours. Continuation of CHEM 257; introduction to the chemistry of carbon-containing compounds, including general principles and application to various academic, industrial, and biological processes; includes elementary operations and techniques of organic chemistry laboratories. **Prerequisites:** CHEM 257; or CHEM 227 and CHEM 237; also taught at Galveston campus.

CHEM 285 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Introduction to research, library and laboratory work designed for the freshman or sophomore students. **Prerequisite:** Approval of department head.

CHEM 289 Special Topics in...

Credits 0 to 4. 0 to 4 Lecture Hours. Selected topics in an identified area of chemistry. May be repeated for credit. **Prerequisite:** Approval of instructor.

CHEM 291 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in chemistry. May be repeated 2 times for credit. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

CHEM 310 Elements of Physical Chemistry

Credits 3. 3 Lecture Hours. Thermodynamics, Quantum theory, spectroscopy, reaction kinetics, electrochemistry and macromolecules; may not be used by chemistry majors. **Prerequisites:** CHEM 102 or CHEM 120; MATH 151 and MATH 152, MATH 140 and MATH 142, MATH 168 and MATH 142, or MATH 147 and MATH 148, or equivalent; PHYS 201 or PHYS 218, or PHYS 206 and PHYS 226; Galveston campus.

CHEM 311 Physical Chemistry Laboratory

Credit 1. 3 Lab Hours. Quantitative experiments designed to illustrate some principles of thermodynamics, quantum theory, kinetics and spectroscopy; may not be used by chemistry majors. **Prerequisites:** CHEM 310, CHEM 322, or CHEM 327, or concurrent enrollment; Galveston campus.

CHEM 315 Fundamentals of Quantitative Analysis

Credits 3. 3 Lecture Hours. Quantitative and statistical methods of analysis; solution chemistry; chemical equilibrium of analytically useful reactions; advanced analytical methods including electrochemistry, separations and kinetic methods. **Prerequisite:** CHEM 102 or CHEM 120.

CHEM 316 Quantitative Analysis

Credits 2. 2 Lecture Hours. Introductory quantitative chemical analysis; error propagation and statistics; chemical equilibrium for titrations of weak acids, polyprotic acids, and EDTA; basic chemical instrumentation including spectrophotometry, electrochemistry, and chromatography. **Prerequisite:** CHEM 102 or CHEM 120; also taught at Galveston and Qatar campuses.

CHEM 318 Quantitative Analysis Laboratory

Credit 1. 3 Lab Hours. Laboratory work consists of selected experiments in quantitative analysis designed to typify operations of general analytical lab, including chemical analyses by volumetric and gravimetric methods; introduction to chemical measurements by spectroscopic and separations techniques and associated instrumentation. **Prerequisites:** CHEM 112 or CHEM 120; CHEM 315 or CHEM 316, or concurrent enrollment; also taught at Galveston and Qatar campuses.

CHEM 321 Physical Chemistry for Life Sciences

Credits 3. 3 Lecture Hours. Physical chemistry for the description of biological processes and the structure and behavior of biological molecules and macromolecules; theory of thermodynamics, kinetics, quantum and statistical mechanics. **Prerequisites:** CHEM 107 or CHEM 120; PHYS 206 or PHYS 201; MATH 152, MATH 172, or MATH 148, or equivalent.

CHEM 322 Physical Chemistry for Engineers

Credits 3. 3 Lecture Hours. Quantum theory, spectroscopy, statistical mechanics, kinetic theory, reaction kinetics, electrochemistry and macromolecules. **Prerequisites:** CHEM 102 or CHEM 120; CHEN 205 and CHEN 354; MATH 152 or equivalent; also taught at Galveston and Qatar campuses.

CHEM 325 Physical Chemistry Laboratory I

Credit 1. 3 Lab Hours. Quantitative experiments involving physical chemistry principles in areas such as thermodynamics, electrochemistry, molecular structure and equilibria using modern instrumentation. **Prerequisite:** CHEM 321, or CHEM 327 or concurrent enrollment.

CHEM 326 Physical Chemistry Laboratory II

Credit 1. 3 Lab Hours. Quantitative experiments involving physical chemistry principles in such areas as kinetics, properties of gases, phase equilibria and macromolecules using modern instrumentation. **Prerequisite:** CHEM 321, or CHEM 328 or concurrent enrollment.

CHEM 327 Physical Chemistry I

Credits 3. 3 Lecture Hours. Introduction to quantum mechanics, exactly solvable model problems; many electron systems and approximate methods; chemical bonding and the electronic structure of molecules; rotational, vibrational, and electronic spectroscopy; molecular symmetry. **Prerequisite:** MATH 152 or MATH 172; MATH 221, MATH 251 or MATH 253 encouraged; PHYS 207 or equivalent.

CHEM 328 Physical Chemistry II

Credits 3. 3 Lecture Hours. A rigorous treatment of first, second, and third laws of thermodynamics; applications to gases (both ideal and real), liquids, solutions and phase equilibria; statistical thermodynamics; kinetic theory of gases; introduction to chemical kinetics. **Prerequisite:** CHEM 327. Replaces CHEM 323 in previous catalogs.

CHEM 362 Descriptive Inorganic Chemistry

Credits 3. 3 Lecture Hours. Introduction to inorganic chemistry with a focus in descriptive inorganic chemistry, bonding theories in inorganic molecules and in the solid state, redox chemistry, descriptive main group and transition metal chemistry; ligand field theory, molecular magnetism and electronic spectra in transition metal complexes. **Prerequisites:** CHEM 102 or CHEM 120.

CHEM 383 Chemistry of Environmental Pollution

Credits 3. 3 Lecture Hours. Chemical pollutants in the air, in water and on land; their generation, chemical reactivity, action on environment and disappearance through chemical mechanisms; chemistry of existing pollution abatement. **Prerequisites:** CHEM 120; junior or senior classification; also taught at Galveston campus.

CHEM 415 Analytical Chemistry

Credits 3. 3 Lecture Hours. Theory and practical aspects of modern instrumental methods of quantitative analysis; instrumental approaches to selectivity and sensitivity; examples of major, minor and trace component analysis. **Prerequisite:** CHEM 315.

CHEM 433 Advanced Inorganic Chemistry Laboratory

Credits 2. 6 Lab Hours. Preparation, characterization and properties of bioinorganic, organometallic and macromolecular inorganic compounds; special techniques (glove box manipulations and double-manifold Schlenk lines) for handling air-sensitive materials. **Prerequisite:** CHEM 362 or registration therein.

CHEM 434 Analytical Instrumentation Laboratory

Credits 2. 6 Lab Hours. Practical application of modern instrumental methods of quantitative analysis; atomic and molecular techniques to conduct chemical characterizations and analyses. **Prerequisites:** CHEM 318; CHEM 415 or concurrent enrollment.

CHEM 446 Organic Chemistry III

Credits 3. 3 Lecture Hours. Principles and applications of organic chemistry for students majoring in chemistry, chemical engineering, materials science, biological, and physical science: emphasis on chemical reactivity, mechanistic chemistry, and synthesis. **Prerequisites:** CHEM 228 or CHEM 258; or approval of instructor.

CHEM 456 Chemical Biology

Credits 3. 3 Lecture Hours. Application of chemical principles to biological phenomena; capstone course for advanced students, integrating organic or inorganic chemistry with biology. **Prerequisites:** CHEM 228 or CHEM 258 or equivalent; junior or senior classification.

CHEM 458 The Chemistry of Drug Discovery

Credits 3. 3 Lecture Hours. Application of organic chemistry concepts to drug design; emphasis on small molecule interaction with living systems; exploration of importance of molecular interactions in chemical biology of living systems. **Prerequisites:** CHEM 228 or CHEM 258; BICH 411, BICH 441, or BICH 409.

CHEM 462 Inorganic Chemistry

Credits 3. 3 Lecture Hours. Periodic relationship of elements, their compounds, principles of their bonding and applications. **Prerequisites:** CHEM 328 and CHEM 362.

CHEM 464 Nuclear Chemistry

Credits 3. 3 Lecture Hours. Properties of the nucleus; radioactivity; decay kinetics; nuclear masses; theory of radioactive decay; nuclear reactions; radiochemistry; nuclear energy; hands-on demonstrations; applications to non-nuclear problems. **Prerequisites:** CHEM 322 or CHEM 327; CHEM 315 or CHEM 316 recommended; also taught at Galveston campus.

CHEM 466 Polymer Chemistry

Credits 3. 3 Lecture Hours. Mechanisms of polymerization reactions of monomers and molecular weight distributions of products; principles, limitations and advantages of most important methods of molecular weight determination; relationship of physical properties to structure and composition; correlations of applications with chemical constitution. **Prerequisites:** CHEM 228 or CHEM 258; also taught at Galveston and Qatar campuses.

CHEM 468 Materials Chemistry of Inorganic Materials

Credits 3. 3 Lecture Hours. Structure, bonding and reactivity of inorganic solids developed from a perspective emphasizing models of chemical bonding, symmetry and electronic structure; methods for characterizing extended periodic solids; descriptions of band structure and contrasts to molecular orbital theory; synthetic routes, quantum confinement and finite size effects of relevance to nanoscale materials. **Prerequisites:** Grade of C or better in CHEM 102 or CHEM 120; PHYS 207 or equivalent; junior or senior classification.

CHEM 470 Industrial Chemistry

Credits 3. 3 Lecture Hours. Applications of organic and inorganic chemical reactions in the manufacture of commercial products; chemistry of petroleum refining and petrochemical processing; industrial polymerization processes; commodity and fine chemical production; influence of kinetics and thermodynamics on economics of industrial chemical production; pollution abatement technology. **Prerequisites:** CHEM 228 or CHEM 258; junior or senior classification.

CHEM 481 Seminar

Credits 2. 2 Lecture Hours. Preparation of oral and written reports on selected topics from recent technical publications.

CHEM 483 Green Chemistry

Credits 3. 3 Lecture Hours. Environmentally benign chemistry; the design of chemical products and processes that reduce or eliminate the use and generation of hazardous substances; twelve principles of Green Chemistry; atom economy; use of renewable resources; catalysis for Green Chemistry; alternative solvents and reaction media; energy and the environment. **Prerequisites:** CHEM 228 or CHEM 258; junior or senior classification; also taught at Galveston campus.

CHEM 484 Internship

Credits 0 to 3. 0 to 3 Other Hours. Directed internship in a private firm or public agency to provide experience appropriate to the student's degree program and career objectives. May be repeated one time for credit. Must be taken on a satisfactory/unsatisfactory basis. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisite:** Chemistry majors; approval of internship agency and advising office.

CHEM 485 Directed Studies

Credits 1 to 16. 1 to 16 Other Hours. Introduction to research, library and laboratory work. **Prerequisites:** Senior classification and approval of chemistry advisor; also taught at Galveston campus.

CHEM 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of chemistry; also taught at Galveston campus. May be repeated for credit.

CHEM 491 Research

Credits 0 to 10. 0 to 10 Other Hours. Active research of basic nature under the supervision of Department of Chemistry faculty member. Registration in multiple sections of this course is possible within a given semester provided that the per semester credit hour limit is not exceeded. **Prerequisites:** Chemistry major; junior classification or approval of chemistry advisor.

CHEN - Chemical Engineering (CHEN)

CHEN 201 Elementary Chemical Engineering Lab

Credit 1. 3 Lab Hours. Introduction to engineering accounting, basic statistics, dynamic systems, Excel spreadsheets, problem solving, and engineering graphics. **Prerequisites:** Grade of C or better in ENGR 102 and MATH 151 or approval of department.

CHEN 204 Elementary Chemical Engineering

Credits 3. 3 Lecture Hours. Solution of elementary problems by application of mass balances, energy balances and equilibrium relationships. **Prerequisite:** Grade of C or better in CHEM 120, ENGR 102, and MATH 152; grade of C or better in CHEN 201 or concurrent enrollment; grade of C or better in PHYS 206, and PHYS 216/ENGR 216 or ENGR 216/PHYS 216; admission to chemical engineering major or approval of department.

CHEN 205 Chemical Engineering Thermodynamics I

Credits 3. 3 Lecture Hours. First and second laws of thermodynamics; volumetric properties of pure fluids; heat effects; applications to flow processes, power cycles, refrigeration. **Prerequisites:** Grade of C or better in CHEN 201 and CHEN 204.

CHEN 285 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Directed study of special projects or studies in chemical engineering processes or operations, for lower division students. Credit not applicable to degree requirements in chemical engineering. **Prerequisites:** Freshman or sophomore classification; approval of department head.

CHEN 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of chemical engineering for lower division students. May be repeated for credit. Credit not applicable to degree requirements in chemical engineering. **Prerequisite:** Approval of instructor.

CHEN 291 Research

Credits 0 to 3. 0 Lecture Hours. 0 Lab Hours. 0 to 3 Other Hours. Research conducted under the direction of faculty member in chemical engineering. May be repeated two times for credit. **Prerequisites:** Approval of instructor.

CHEN 304 Chemical Engineering Fluid Operations

Credits 3. 3 Lecture Hours. Fundamentals of fluid mechanics with applications to design and analysis of process equipment. **Prerequisites:** CHEN 204 with a grade of C or better; CHEN 205 or concurrent enrollment; MATH 308 with a grade of C or better.

CHEN 320 Numerical Analysis for Chemical Engineers

Credits 3. 3 Lecture Hours. Applications of numerical analysis techniques to mathematical models of processes common to chemical and associated industries; computational methods and software for analysis of chemical engineering processes. **Prerequisites:** CHEN 205 with a grade of C or better; MATH 308 with a grade of C or better; or approval of department.

CHEN 322 Chemical Engineering Materials

Credits 3. 3 Lecture Hours. Overview of materials science with particular emphasis on classes of materials relevant to chemical engineers. **Prerequisite:** Grade of C or better in CHEN 204, MATH 251 or concurrent enrollment, and CHEN 205 or concurrent enrollment; or approval of department.

CHEN 323 Chemical Engineering Heat Transfer Operations

Credits 3. 3 Lecture Hours. Heat transfer operations. **Prerequisite:** Grade of C or better in CHEN 205 and CHEN 304.

CHEN 324 Chemical Engineering Mass Transfer Operations

Credits 3. 3 Lecture Hours. Mass transfer operations with applications to design and analysis of process equipment. **Prerequisites:** Grade of C or better in CHEN 354; grade of C or better in CHEN 323 or concurrent enrollment; or approval of department.

CHEN 354 Chemical Engineering Thermodynamics II

Credits 3. 3 Lecture Hours. Applications of thermodynamics to pure and mixed fluids; phase equilibria and chemical reaction equilibria. **Prerequisites:** CHEN 205 and MATH 308 with a grade of C or better; or approval of department.

CHEN 364 Kinetics and Reactor Design

Credits 3. 3 Lecture Hours. Kinetics of reactions and application of fundamental principles to design and operation of commercial reactors. **Prerequisites:** Grade of C or better in CHEN 320; grade of C or better in CHEN 323 and CHEN 324, or concurrent enrollment, or approval of department.

CHEN 374 Chemical Engineering Process Industries

Credits 2. 2 Lecture Hours. Overview of the major chemical process and related industries including key sectors, history, operating principles, supply chains; focus on technical, market, sustainability, and safety aspects. **Prerequisites:** Grade of C or better in CHEN 304 and CHEN 354.

CHEN 399 Mid-Curriculum Professional Development

Credits 0. 0 Other Hours. Participation in an approved high-impact learning practice; reflection on professional outcomes from engineering body of knowledge; documentation and self-assessment of learning experience at mid-curriculum point. **Prerequisites:** CHEN 204 and ENGL 210; junior or senior classification or approval of instructor.

CHEN 410 Humanitarian Engineering

Credits 3. 3 Lecture Hours. Basic concepts of humanitarian engineering; application of engineering and technology for the benefit of humanity and especially disadvantaged communities; understanding the role of engineers in achieving sustainable development goals; identification, formulation and solution of related engineering and design problems considering historical, cultural, ethical and practical perspectives. **Prerequisite:** Junior or senior classification in the College of Engineering; approval of instructor.

CHEN 422/BAEN 422 Unit Operations in Food Processing

Credits 3. 2 Lecture Hours. 2 Lab Hours. Design of food process engineering systems; basic concepts of rheology and physical properties of foods; fundamentals of heat and mass transfer and process control. **Prerequisites:** Grade of C or better in CHEN 205 and CHEN 304, or MEEN 221. **Cross Listing:** BAEN 422/CHEN 422.

CHEN 425 Process Integration, Simulation and Economics

Credits 3. 2 Lecture Hours. 3 Lab Hours. Integration, simulation, and economic methods involved in the design of chemical processes and equipment. **Prerequisites:** Grade of C or better in CHEN 320, CHEN 323, CHEN 354, and CHEN 324 or concurrent enrollment.

CHEN 426 Chemical Engineering Plant Design

Credits 3. 1 Lecture Hour. 6 Lab Hours. Integration of material from other chemical engineering courses with applications to the design of plants and processes representative of the chemical and related process industries. **Prerequisites:** Grade of C or better in CHEN 322, CHEN 364, CHEN 374 and CHEN 425.

CHEN 430/SENG 430 Risk Engineering

Credits 3. 3 Lecture Hours. Concepts of risk and risk assessment, including use of all available information to provide a foundation for risk-informed and cost-effective engineering practices; examples and exercises from a variety of engineering areas. **Prerequisite:** Junior or senior classification. **Cross Listing:** SENG 430/CHEN 430.

CHEN 432 Chemical Engineering Laboratory I

Credits 2. 1 Lecture Hour. 3 Lab Hours. Laboratory work based on CHEN 304 and CHEN 323. **Prerequisites:** Grade of C or better in CHEN 323 and ENGL 210.

CHEN 433 Chemical Engineering Laboratory II

Credits 2. 1 Lecture Hour. 3 Lab Hours. Laboratory work based on CHEN 324, CHEN 364, CHEN 432, and CHEN 461. **Prerequisites:** Grade of C or better in CHEN 324, CHEN 364, CHEN 432, and CHEN 461.

CHEN 449 Nanomaterials for Energy Conversion

Credits 3. 3 Lecture Hours. Instruction in ultra-small materials useful for fabricating next-generation energy conversion devices (e.g., thermoelectrics, and photovoltaics) synthesized in various forms including nanoparticles and quantum dots, nanowires and nanotubes, and thin films; exploration of the fabrication and assembly of these materials; involves the use of both traditional materials syntheses approaches (e.g., chemical vapor deposition) and newer syntheses approaches (e.g., template-assisted syntheses of nanomaterials); materials syntheses, characterization and assembly of these nanomaterials; exploration of the basics of crystal structures, necessary for understanding structure-property relationships in materials. **Prerequisites:** Junior or senior classification.

CHEN 450 Microfabrication and Microfluidics Technology

Credits 3. 3 Lecture Hours. Micro Electro Mechanical Systems (MEMS) technology; study the fundamentals of fluidics, heat and mass transfer, surface chemistry, and electrochemical interactions. **Prerequisite:** Junior or senior classification.

CHEN 451 Introduction to Polymer Engineering

Credits 3. 3 Lecture Hours. Fundamentals of polymer reaction kinetics, morphology, chemical and rheological properties with applications to polymer synthesis, production and processing operations. **Prerequisite:** Senior classification in chemical engineering or approval of instructor.

CHEN 455/SENG 455 Process Safety Engineering

Credits 3. 3 Lecture Hours. Applications of engineering principles to process safety and hazards analysis, mitigation, and prevention, with special emphasis on the chemical process industries; includes source modeling for leakage rates, dispersion, analysis, relief valve sizing, fire and explosion damage analysis, hazards identification, risk analysis, accident investigations. **Prerequisites:** Grade of C or better in CHEN 322; senior classification; engineering majors. **Cross Listing:** SENG 455/CHEN 455.

CHEN 456 Advanced Chemical Process Optimization I

Credits 3. 3 Lecture Hours. State-of-the-art optimization based techniques for process synthesis, process design and process operability; emphasis on mathematical modeling via mixed integer and continuous optimization formulations and application to heat integration problems; use modeling/optimization software systems. **Prerequisites:** Senior classification or approval of instructor.

CHEN 457 Environmental Engineering

Credits 3. 3 Lecture Hours. Overview of environmental engineering for chemical engineers; analyzing and solving environmental problems associated with engineered systems; emphasis on water/wastewater quality and treatment, air pollution control, and soil and hazardous waste management; includes guest lectures and field trips. **Prerequisites:** CHEN 304 and CHEN 354 or approval of instructor; junior or senior classification; Qatar campus.

CHEN 459 Gas and Petroleum Processing

Credits 3. 3 Lecture Hours. Design and operation of petroleum and gas processing facilities including hydrate suppression, dehydration, sweetening, sulfur recovery, LPG and liquid recovery, refining operations; analysis of the design and operations involving a large degree of process simulation. **Prerequisites:** Grade of C or better in CHEN 323.

CHEN 460/SENG 460 Quantitative Risk Analysis in Safety Engineering

Credits 3. 3 Lecture Hours. Fundamental concepts, techniques, and applications of risk analysis and risk-informed decision making for engineering students; practical uses of probabilistic methods are demonstrated in exercises and case studies from diverse engineering areas. **Prerequisite:** Senior or graduate classification. **Cross Listing:** SENG 460/CHEN 460.

CHEN 461 Process Dynamics and Control

Credits 3. 3 Lecture Hours. Analysis of process dynamics and methods for the design of automatic control systems for chemical process plants. **Prerequisite:** Grade of C or better in CHEN 320 and CHEN 364 or concurrent enrollment.

CHEN 463 Systems Biology

Credits 3. 3 Lecture Hours. Experimental and computational techniques in systems biology; includes high throughput experiments, data analysis, modeling and simulation; discussed in the context to specific applications such as signal transduction. **Prerequisite:** CHEN 482 or approval of instructor.

CHEN 465 Sustainable Design of Chemical Processes

Credits 3. 3 Lecture Hours. Sustainability in chemical engineering; including sustainable approaches to design and development of processes, products, energy usage, renewable energy system and emission reduction; systems thinking, process performance and mathematical tools. **Prerequisites:** Grade of C or better in CHEN 425.

CHEN 468 Zymology

Credits 3. 3 Lecture Hours. Zymology and the application of fundamental principles of chemical engineering in the production of fermented foods, specifically the beer brewing process; exploration of the basics of food fermentation and fermented beverage preparation technology as well as providing fundamental knowledge in beer production methods and processes. **Prerequisites:** Must be 21 years of age; junior or senior classification; chemical engineering major.

CHEN 469 Chemical Engineering Car Design

Credit 1. 1 Lecture Hour. Application of chemical, physical and engineering principles in design process, idea generation and development of design concepts, economic, safety and performance analysis. May be taken four times for credit. **Prerequisites:** CHEN 204, CHEN 205; junior or senior classification or approval of instructor.

CHEN 471/BAEN 471 Bioreactor Engineering

Credits 3. 3 Lecture Hours. Fundamentals of microbial and enzyme kinetics; basic biochemical reaction theory and reactor systems; heterogeneous reactions and transport considerations in enzyme and cell reactors, and immobilized systems; bioreactor design considerations in bioprocessing. **Prerequisite:** Grade of C or better in CHEN 282, CHEN 482, or BAEN 302; junior or senior classification or approval of instructor. **Cross Listing:** BAEN 471/CHEN 471.

CHEN 473 Electrochemical Science and Engineering

Credits 3. 3 Lecture Hours. Examination of basic principles of electrochemistry, electroanalytical characterization, and electrochemical devices; exploration of electrochemical processes in the context of kinetics, thermodynamics, and transport. **Prerequisites:** CHEN 205; junior or senior classification.

CHEN 475 Microelectronics Process Engineering

Credits 3. 3 Lecture Hours. State-of-the-art process engineering principles on microelectronics, especially for the fabrication of very large scale integrated circuits (VLSICs); fundamental unit processes, such as thin film deposition, thermal growth, lithography, etching and doping, material structures and properties, and basic device operation principles. **Prerequisites:** CHEN 354 and CHEN 364 or approval of instructor; CHEM 322.

CHEN 476 Applied Catalysis

Credits 3. 3 Lecture Hours. Principles of catalysis and applications to industrial reactions; catalyst preparation, methods for catalyst characterization, deactivation mechanisms and regeneration techniques, catalyst testing (laboratory and industrial reactors), fundamentals of kinetics of heterogeneous reactions; applications to selected industrial processes. **Prerequisites:** Grade of C or better in CHEN 354; Grade of C or better in CHEN 364 or concurrent enrollment; junior or senior classification; Qatar campus.

CHEN 478 Advanced Process Economics and Finance for Chemical Engineers

Credits 3. 3 Lecture Hours. Application of economic principles and valuation techniques from projects to entire companies; background in debt, equity, cost of capital, and determination of a company-specific discount rate; development of financial models which include risk and uncertainty; foundation for consideration in a career in management with significant financial responsibility. **Prerequisites:** Grade of C or better in CHEN 425 or approval of instructor and Department Head.

CHEN 479 Process Synthesis, Integration and Intensification

Credits 3. 3 Lecture Hours. Systematic methods for the synthesis, integration and intensification of chemical processes; special focus given to systematic process intensification for energy and the environment with applications to carbon capture and storage, energy systems, gas separation, and utility networks. **Prerequisites:** Grade of C or better in CHEN 425 or approval of instructor.

CHEN 481 Seminar

Credit 1. 2 Lab Hours. Preparation of oral and written reports on selected topics from recent technical publications, done in the context of consideration of the ethical ramifications of engineering decisions. **Prerequisites:** Grade of C or better in CHEN 205 and ENGL 210; grade of C or better in CHEN 304 or current enrollment; junior classification in chemical engineering.

CHEN 482 Bioprocess Engineering

Credits 3. 3 Lecture Hours. Application of engineering principles to design of biocatalysts and bioprocesses. **Prerequisite:** Grade of C or better in CHEN 205, CHEN 324, and CHEN 364.

CHEN 484 Internship

Credits 0-1. 0 Lecture Hours. 0-1 Other Hours. Professional internship in a private company, government agency or laboratory, university, or organization to provide work and research experience related to chemical engineering. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisite:** CHEN 204 and ENGL 210; junior or senior classification or approval of instructor.

CHEN 485 Directed Studies

Credits 1 to 5. 1 to 5 Other Hours. Work covers one or more problems in chemical engineering processes or operations. **Prerequisite:** Approval of department head.

CHEN 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of chemical engineering. May be repeated for credit. **Prerequisite:** Senior classification in chemical engineering or approval of instructor.

CHEN 491 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in chemical engineering. May be repeated 2 times for credit. **Prerequisites:** Junior or Senior classification and approval of instructor.

CHIN - Chinese (CHIN)

CHIN 101 Beginning Chinese I

Credits 4. 3 Lecture Hours. 2 Lab Hours. (CHIN 1411) Beginning Chinese I. Introduction to Chinese language, culture and history; development of communicative skills in daily conversation; ability to read and write some commonly used Chinese characters.

CHIN 102 Beginning Chinese II

Credits 4. 3 Lecture Hours. 2 Lab Hours. (CHIN 1412) Beginning Chinese II. Further development of communicative skills in different aspects of daily Chinese conversation; ability to read and write about 150 commonly used characters. **Prerequisite:** CHIN 101 with a grade of C or better.

CHIN 201 Intermediate Chinese I

Credits 3. 3 Lecture Hours. (CHIN 2311) Intermediate Chinese I. Development of comprehension and production of spoken Chinese, with emphasis on connected discourse; acquisition of advanced language points; ability to read and write 250 or more characters. **Prerequisite:** CHIN 102 with a grade of C or better.

CHIN 202 Intermediate Chinese II

Credits 3. 3 Lecture Hours. (CHIN 2312) Intermediate Chinese II. Continued development of effective communication skills in different daily situations; ability to read and write simple, short paragraphs in Chinese. **Prerequisite:** CHIN 201 with a grade of C or better.

CHIN 250 Popular Culture in Modern China

Credits 3. 3 Lecture Hours. Introduction to and exploration of modern life in China through the lens of popular culture, from food and music to street fashion, media, and social trends; investigation of the diverse and rapidly changing cultural landscape of China through engaging classroom discussions, interactive assignments, and unique hands-on experiences; course taught in English.

CHIN 285 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Individual supervision of readings or assigned projects in Chinese, selected for each student individually; written or oral reports. **Prerequisite:** Approval of instructor and Director of AALO.

CHIN 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of Chinese studies. May be repeated for credit. **Prerequisite:** Approval of instructor.

CHIN 301 Reading and Composition

Credits 3. 3 Lecture Hours. Development of advanced proficiency in reading and writing through contact with various written and spoken styles of modern Chinese as reflected in newspaper reports, radio and TV broadcasts. **Prerequisites:** CHIN 202; junior or senior classification or approval of instructor.

CHIN 302 Reading and Composition II

Credits 3. 3 Lecture Hours. Advanced proficiency in reading comprehension through contact with various written materials; development of cultural proficiency; development of writing skills with emphasis on new characters, new vocabulary and new sentence structures. **Prerequisites:** CHIN 301; junior or senior classification or approval of instructor.

CHIN 316 Business Chinese

Credits 3. 3 Lecture Hours. Development of proficiencies in business communication skills in Chinese for global contexts; exploration of business-related vocabulary, real-world case studies, business document writing, and the cultural nuances of business practices in China and beyond; preparation for effective communication in business settings through an examination of multinational companies' operations in China. **Prerequisite:** CHIN 202 or approval of instructor.

CHIN 405 Modern Chinese Fiction

Credits 3. 3 Lecture Hours. Analysis of major Chinese literary and other prose works of the twentieth and twenty-first centuries; taught in English. May be taken two times for credit. **Prerequisite:** Junior or senior classification or approval of instructor.

CHIN 465/FILM 465 Chinese Film

Credits 3. 3 Lecture Hours. Consideration and analysis of major works and directors of Chinese film; interpretation of culture through film; relationship of film to history, literature and other arts; taught in English. May be taken two times for credit. **Prerequisite:** Junior or senior classification or approval of instructor. **Cross Listing:** FILM 465/CHIN 465.

CHIN 485 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Individual supervision of readings or assigned projects selected for each student individually; written or oral reports. **Prerequisite:** Approval of instructor and Director of AALO.

CHIN 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of Chinese studies. May be repeated for credit. **Prerequisite:** Approval of instructor.

CHIN 491 Research

Credits 1 to 4. 1 to 4 Other Hours. Research in Chinese studies conducted under the direction of faculty member approved by the Director of AALO. May be taken 2 times for credit. **Prerequisites:** Junior or senior classification and approval of instructor.

CLAS - Classics (CLAS)

CLAS 101 Beginning Classical Greek I

Credits 4. 4 Lecture Hours. Introduction to the language and culture of Greece; basic grammar and vocabulary; readings and slide lectures designed to place language study in its cultural and artistic context.

CLAS 102 Beginning Classical Greek II

Credits 4. 4 Lecture Hours. Continuation of CLAS 101; basic grammar and vocabulary; readings and slide lectures designed to place language study in its cultural and artistic context. **Prerequisite:** CLAS 101.

CLAS 121 Beginning Latin I

Credits 4. 4 Lecture Hours. (LATI 1411) Beginning Latin I. Introduction to grammar and vocabulary with a contrastive approach; reading of graded material.

CLAS 122 Beginning Latin II

Credits 4. 4 Lecture Hours. (LATI 1412) Beginning Latin II. Completion of elementary grammatical structures; introduction to Latin historians.
Prerequisite: CLAS 121.

CLAS 211 Intermediate Greek

Credits 3. 3 Lecture Hours. Completion of study of grammar and syntax; introduction to reading ancient Greek authors in the original language.
Prerequisite: CLAS 102.

CLAS 220 History of Christianity: Origins to the Reformation

Credits 3. 3 Lecture Hours. History of Christian doctrine, ecclesiastical organization, and religious practice, origins through Reformation, with emphasis on religion and society; life and teachings of Jesus; apostolic church; patristic period; Christianization of Roman Empire and northern Europe; monasticism; medieval church; Gregorian reform; heresy; papal monarchy; schism and conciliarism; reformations of the sixteenth century. **Cross Listing:** HIST 220 and RELS 220.

CLAS 221 Intermediate Latin I

Credits 3. 3 Lecture Hours. (LATI 2311) Intermediate Latin I. Practice in reading Latin prose writings, especially historical writings and letters.
Prerequisite: CLAS 122.

CLAS 222 Intermediate Latin II

Credits 3. 3 Lecture Hours. (LATI 2312) Intermediate Latin II. Practice in reading Latin poetry writings, especially Virgil, Horace and Ovid.
Prerequisite: CLAS 221.

CLAS 236/HIST 236 War and Violence in the Ancient World

Credits 3. 3 Lecture Hours. Equipment, organization, tactics and strategy on land and sea in the wars of the Ancient World, including the Near East, Greece and Rome; use of force and violence in the furtherance of political objectives and social control; winners, losers and survivors. **Cross Listing:** HIST 236/CLAS 236.

CLAS 250 Greek and Roman Civilization

Credits 3. 3 Lecture Hours. Introduction to the civilizations of classical antiquity from Bronze Age Greece to the dissolution of the Roman Empire; examination of major social, intellectual, and political developments in ancient Greece and Rome.

CLAS 251/RELS 251 Classical Mythology

Credits 3. 3 Lecture Hours. Introduction to the most important myths of the Greeks and Romans; ancient and modern methods of interpreting myths; the role of myths in ancient literature; readings in English. **Cross Listing:** RELS 251/CLAS 251.

CLAS 261 Great Books of the Classical Tradition

Credits 3. 3 Lecture Hours. Survey of important and enduring works of literature, history and philosophy from Classical Antiquity (8th century BC to 2nd century AD), with emphasis on questions of morality and mentality.

CLAS 262 Great Books of Christian Antiquity and the Latin Middle Ages

Credits 3. 3 Lecture Hours. Survey of important and enduring works of literature, history, and philosophy from Christian Late Antiquity and the Latin Middle Ages (4th to 13th centuries AD) with emphasis on questions of morality, religion, and mentality.

CLAS 285 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Individual supervision of readings or assigned projects in Classical Languages, selected for each student individually. **Prerequisite:** Approval of instructor and department head.

CLAS 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of Classical Languages. May be repeated for credit. **Prerequisite:** Approval of instructor.

CLAS 291 Research

Credits 0 to 3. 0 to 3 Other Hours. Research conducted under the direction of faculty member in classical studies. May be taken three times for credit. **Prerequisites:** Freshman or sophomore classification and approval of department head.

CLAS 311 Advanced Greek: New Testament

Credits 3. 3 Lecture Hours. Readings of the New Testament and works contemporary with it in the original language; introduction to the linguistic, historical, literary and cultural background of the New Testament. May be repeated for credit with different readings.
Prerequisite: CLAS 211.

CLAS 312 Advanced Classical Greek Poetry

Credits 3. 3 Lecture Hours. Readings of selections from ancient Greek authors of poetry (lyric, epic, or drama) in the original language; discussion of the intellectual, historical, and literary background of the works, and of the lives and thought of the writers. May be repeated for credit with different readings. **Prerequisite:** CLAS 211.

CLAS 313 Advanced Classical Greek Prose

Credits 3. 3 Lecture Hours. Readings of selections from ancient Greek authors of prose (history, oratory, letters, philosophy) in the original language; discussion of the intellectual, historical, and literary background of the works, and of the lives and thought of the writers. May be repeated for credit with different readings. **Prerequisite:** CLAS 211.

CLAS 320 Survey of Latin Literature

Credits 3. 3 Lecture Hours. Latin literature from the republican through the imperial period; systematic overview of the development of literary genres and themes, to provide context for the intensive study of individual authors in other courses. **Prerequisite:** CLAS 222 or equivalent.

CLAS 321 Advanced Latin Prose

Credits 3. 3 Lecture Hours. Readings of selections from ancient Roman authors of prose (history, oratory, letters, philosophy) in the original language; discussion of the intellectual, historical and literary background of the works, and of the lives and thought of the writers. May be repeated for credit with different readings. **Prerequisite:** CLAS 222 or equivalent.

CLAS 322 Advanced Latin Poetry

Credits 3. 3 Lecture Hours. Readings of selections from ancient Roman authors of poetry (lyric, satire, epic, or drama) in the original language; discussion of the intellectual, historical, and literary background of the works, and the lives and thought of the writers. May be repeated for credit with different readings. **Prerequisite:** CLAS 222 or equivalent.

CLAS 330 Women in Ancient Greece and Rome

Credits 3. 3 Lecture Hours. Survey of women in classical Greece and Rome; emphases on female occupations and family relationships, legal and political status, traditional values, notorious women, how women were viewed and how they viewed themselves. **Prerequisite:** Junior or senior classification. **Cross Listing:** HIST 330 and WGST 330.

CLAS 352 Greek and Roman Drama

Credits 3. 3 Lecture Hours. Dramatic literature of Ancient Greece and Rome; works of the major classical playwrights; the origins of comedy and tragedy; visual and musical aspects of production; political and intellectual ideas as reflected in the plays; readings in English.

CLAS 353/ANTH 353 Archaeology of Ancient Greece

Credits 3. 3 Lecture Hours. Archaeology of ancient Greece from the Stone Age until the ascent of Rome in the Hellenistic Period; remains of ancient Greek art (sculpture, mosaic, painting), architecture (temples, homes, civic structures), religion (figurines, votive offerings), and social history (coins, inscriptions). **Prerequisite:** Junior or senior classification. **Cross Listing:** ANTH 353/CLAS 353.

CLAS 354/ANTH 354 Archaeology of Ancient Italy

Credits 3. 3 Lecture Hours. Archaeology of ancient Italy from the Stone Age until the collapse of the Roman Empire in the fourth century; remains of ancient Etruscan and Roman art (sculpture, mosaic, painting), architecture (temples, homes, civic structures), religion (figurines, votive offerings), and social history (coins, inscriptions). **Prerequisite:** Junior or senior classification. **Cross Listing:** ANTH 354/CLAS 354.

CLAS 371 In Search of Homer and the Trojan War

Credits 3. 3 Lecture Hours. The nature, background, authorship and historicity of the Iliad and the Odyssey; Aegean culture in the Stone, Bronze and early Iron ages; the value of Greek epics as historical documents; oral poetry; the Trojan War in Greek literature; readings in English; also taught at Galveston campus.

CLAS 372 Greek and Roman Epic

Credits 3. 3 Lecture Hours. Study of the ancient epic in its historical and cultural context; oral poetry; Homer, archaeology, and history; creation of Greek mythology; Alexandrian written epic; early Latin epic; Virgil's Aeneid as national epic; Virgil and the Homeric tradition; Silver Age Latin epics; readings in English. **Prerequisite:** Sophomore classification or approval of instructor.

CLAS 410 Seminar in Classical Studies

Credits 3. 3 Lecture Hours. Exploration of a significant topic, work, or period in Greek or Roman literature, culture, or history; emphasis on development of research skills in Classical Studies. May be taken three times for credit. **Prerequisite:** Junior or senior classification, or approval of instructor.

CLAS 415/FILM 415 The Ancient World in Film

Credits 3. 3 Lecture Hours. Study of modern films as they relate to ancient literary texts that inspired them or with which they share common themes; relationship between Greek epic, tragedy, and comedy and their cinematic adaptations; treatment of Rome as an idea or ideal in the work of both ancient Romans and modern filmmakers. **Prerequisite:** Junior or senior classification, or approval of instructor. **Cross Listing:** FILM 415/CLAS 415.

CLAS 417/ANTH 417 Naval Warfare and Warships in Ancient Greece and Rome

Credits 3. 3 Lecture Hours. Extensive survey of Greek and Roman warships, naval warfare, naval strategy and tactics drawing upon archaeological evidence, literary documentation and iconographic material, from the Bronze Age (Ancient Egypt and the mythical Trojan War) to the Imperial Roman Navy. **Prerequisite:** Junior or senior classification. **Cross Listing:** ANTH 417/CLAS 417.

CLAS 418 Intellectual History from the Ancient Near East to the Early Middle Ages

Credits 3. 3 Lecture Hours. Political, social, cultural and religious histories of significant figures, groups, schools of thought and movements in western Afro-Eurasia from the Assyrian Empire to the later Roman Empire; developments in political theory, literature, sociology, arts, architecture, music, philosophy, law, sciences and education. **Prerequisite:** Junior or senior classification. **Cross Listing:** HIST 418 and RELS 418.

CLAS 426/HIST 426 The Ancient Greeks

Credits 3. 3 Lecture Hours. Greek History and civilization from the Archaic Age to Alexander the Great (8th-late 4th century B.C.). **Prerequisite:** Junior or senior classification, or approval of instructor. **Cross Listing:** HIST 426/CLAS 426.

CLAS 427/HIST 427 The Roman Republic

Credits 3. 3 Lecture Hours. Major events and issues in Roman history from the beginnings of the Republic to its incipient disintegration. **Prerequisite:** Junior or senior classification, or approval of instructor. **Cross Listing:** HIST 427/CLAS 427.

CLAS 428/HIST 428 The Roman Empire: Principate

Credits 3. 3 Lecture Hours. Major events and issues in Roman history from the late Republic to the consolidation of the state of Late Antiquity.

Prerequisite: Junior or senior classification, or approval of instructor.

Cross Listing: HIST 428/CLAS 428.

CLAS 429/HIST 429 The Roman Empire: Transformations

Credits 3. 3 Lecture Hours. Major events and issues in Roman history from the rise of Christianity as an imperial religion to the end of Late Antiquity.

Prerequisite: Junior or senior classification, or approval of instructor.

CLAS 444/ANTH 444 Classical Archaeology

Credits 3. 3 Lecture Hours. History of the discipline through the individuals, organizations, excavations, theoretical models and ethical issues that have shaped it.

Prerequisites: Junior or senior classification.

Cross Listing: ANTH 444/CLAS 444.

CLAS 485 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Individual supervision of readings or assigned projects, selected for each student individually.

Prerequisite: Approval of instructor and department head.

CLAS 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an intensified area of classical languages and culture. May be repeated for credit.

Prerequisite: Approval of instructor.

CLAS 491 Research

Credits 0 to 3. 0 to 3 Other Hours. Research conducted under the direction of faculty member in classical studies. May be taken three times for credit.

Prerequisites: Junior or senior classification and approval of department head.

CLEN - College of Engineering (CLEN)

CLEN 101 Engineering Approaches to Problems

Credits 3. 3 Lecture Hours. Basic characteristics of the engineering profession and the process by which technology is developed for real application; engineering thinking and problem-solving processes; common engineering concepts; engineering disciplines and project types.

CLEN 181 Engineering Learning Community & Student Success Seminar

Credits 0-1. 0-1 Other Hours. Engineering Learning Community & Student Success Seminar. Welcoming seminar to the college of engineering to assist with transition to college; includes introduction to engineering majors, college and university resources; topics evolve as students advance through the engineering curriculum.

Prerequisite: Must be enrolled in the College of Engineering; also taught at Galveston and Qatar campuses.

CLEN 201 Tools for Engineering Analysis

Credits 3. 2 Lecture Hours. 2 Lab Hours. Introduction to prominent categories of engineering quantitative analysis; pattern finding in data; optimization; prediction of future states; modeling of physical systems; laboratory exercises to use computational tools as means of implementing mathematical concepts.

Prerequisites: CLEN 101; MATH 131, MATH 142, MATH 147, MATH 151, or MATH 171.

CLEN 261 The Engineering Profession

Credit 1. 1 Lecture Hour. Introduction to interdisciplinary aspects of engineering careers; work engineers perform in their field; engineering practice within realistic constraints, e.g., economic, environmental, ethical, health and safety, and sustainability; engineering design process; effective communication in engineering settings. Must be taken on a satisfactory/unsatisfactory basis.

Prerequisite: Enrollment in the college of engineering.

CLEN 289 Special Topics In...

Credits 0 to 4. 0 to 4 Other Hours. Selected topics in an identified area of engineering.

CLEN 301 Humanity and Materials

Credits 3. 3 Lecture Hours. Engineering processes for obtaining, shaping, fabricating and manufacturing materials for human use; changes in materials development and application through human history; important materials in contemporary society and their properties; emerging and future materials.

Prerequisite: CLEN 201.

CLEN 302 Survey of Nuclear Technology

Credits 3. 3 Lecture Hours. Overview of important discoveries in atomic and nuclear physics in 20th and 21st Centuries; basics of atomic and nuclear physics; radiation and its impact; nuclear reactors, fuel cycle, waste disposal and associated policy issues; nuclear safety, safeguards and security; applications of nuclear technology.

Prerequisite: CLEN 201.

CLEN 303 Renewable Energy and the Environment

Credits 3. 3 Lecture Hours. Overview of important renewable energy sources for human societies; role of thermodynamic principles in design of systems for capturing, storing, converting, delivering, and conserving energy; solar, wind, bioenergy, water, and geothermal energy sources; environmental effects of various energy sources; basic economics of energy systems.

Prerequisite: CLEN 201.

CLEN 304 Pushing the Limits of Construction - Taller, Stronger, Leaner

Credits 3. 3 Lecture Hours. Case studies in ambitious construction projects in contemporary society; project magnitude, unique challenges, environmental impact and innovations present in each case study; illustration of elementary structural design principles and life cycle cost analysis.

Prerequisite: CLEN 201.

COMM - Communication (COMM)

COMM 101 Introduction to Communication

Credits 3. 3 Lecture Hours. (SPCH 1311) Introduction to Communication. Survey of communication topics, research, and contexts of communicative practice; overview of communication from both humanities and social science perspectives.

COMM 107 Introduction to the Health Humanities

Credits 3. 3 Lecture Hours. Introduction to the methods and approaches of the health humanities; exposure to key scholarship in this field as well as major methods and approaches; application of such skills to the analysis of cultural case studies such as illness narratives or contemporary debates in scientific bioethics. **Cross Listing:** ENGL 107, HHUM 107, and PHIL 107.

COMM 203 Public Speaking

Credits 3. 3 Lecture Hours. (SPCH 1315) Public Speaking. Training in speeches of social and technical interest designed to teach students to develop and illustrate ideas and information and to inform, stimulate, and persuade their audiences; also taught at Galveston campus.

COMM 204 Public Speaking for Digital Platforms

Credits 3. 3 Lecture Hours. . Training for composition, delivery, recording, and editing of speeches specifically designed for sharing and distribution on online platforms and social media.

COMM 205 Communication for Technical Professions

Credits 3. 3 Lecture Hours. Design and presentation of oral reports for technical professions; incorporation of visual and graphic materials into presentation required; written reports required; also taught at Galveston campus.

COMM 210 Group Communication and Discussion

Credits 3. 3 Lecture Hours. (SPCH 2333) Group Communication and Discussion. Definition, structure, and functions of groups; group productivity, codes in verbal and nonverbal communication; problem-solving, role-playing, decision-making; leadership and organization; interview principles and techniques.

COMM 215/JOUR 215 Interviewing: Principles and Practice

Credits 3. 3 Lecture Hours. Theory and practice of methods in selected interview settings; emphasis on communication between two persons, questioning techniques, and the logical and psychological bases of interpersonal persuasion. **Cross Listing:** JOUR 215/COMM 215.

COMM 230/JOUR 230 Communication Technology Skills

Credits 3. 3 Lecture Hours. Introduction to interactive media and media literacy skills in the digital domain; survey of technology histories, standards, and markets for industries such as multichannel TV, digital radio, video games, streaming media, epublishing, teleconferencing, and social networking. **Prerequisite:** Enrollment in communication or telecommunication media studies majors, USLA-BA-JNS concentration, or JOUR minor. **Cross Listing:** JOUR 230/COMM 230.

COMM 240 Rhetorical Criticism

Credits 3. 3 Lecture Hours. Principles and practice of the analysis of speeches and other forms of public discourse; compares systems of rhetorical criticism, such as neo-classical analysis, mythic analysis, rhetorical genres and close textual analysis.

COMM 243 Argumentation and Debate

Credits 3. 3 Lecture Hours. (SPCH 2335) Argumentation and Debate. Principles of argumentation and skills of debate, including reasoning, evidence, refutation, and briefing.

COMM 245 Difficult Dialogues on Power, Privilege, and Difference

Credits 3. 3 Lecture Hours. Introduction to the practice of difficult dialogues; skills development in the use of the dialogical tools of active listening, perspective-taking, deliberation, collaborative decision-making, teamwork and collective problem-solving in the context of bias, prejudice, discrimination, power, equity and privilege.

COMM 248/JOUR 248 Podcasting and Audio Storytelling

Credits 3. 3 Lecture Hours. Basic audio storytelling techniques required for podcast production within the journalism and public media context; principles of podcast development, scripting, audio recording and editing, and promotion. **Cross Listing:** JOUR 248/COMM 248.

COMM 250/JOUR 250 New Media and the Independent Voice

Credits 3. 3 Lecture Hours. Examination of new media as independent voices for cultural and political movements; principles governing the design, presentation, and evaluation of blogs as a persuasive medium in society. **Cross Listing:** JOUR 250/COMM 250.

COMM 255/JOUR 255 Media Literacy in the Digital Age

Credits 3. 3 Lecture Hours. Criticism and analysis of the function, role, and responsibility of the mass media in contemporary society. **Cross Listing:** JOUR 255/COMM 255.

COMM 257/RELS 257 Communication, Religion and the Arts

Credits 3. 3 Lecture Hours. Introduction to artistic, religious communication; survey of communication art and media art practices across religious contexts; consideration of communication aesthetics that mediate religious experience. **Cross Listing:** RELS 257/COMM 257.

COMM 260 Introduction to Communication and Sports

Credits 3. 3 Lecture Hours. Introduction to the process of communicating sports to the public via television, blogging, online sites and print articles; evaluation of sportscasts; writing about sporting events; examination of the types of communication used within sporting teams.

COMM 265 Voices of Democracy - United States

Credits 3. 3 Lecture Hours. Survey of significant and diverse United States-American oratory pertaining to national identity; critical analysis of important speeches in their historical, political, social, and philosophical contexts.

COMM 275/JOUR 275 Introduction to Social Media

Credits 3. 3 Lecture Hours. Theoretical and practical approaches to social media; overview of social media, social media concepts and theories; social media applications and contexts. **Cross Listing:** JOUR 275/COMM 275.

COMM 280 Careers in Communication

Credit 1. 1 Lecture Hour. Introduction to careers in communication; emphasis on strengths and personality in selecting a profession, application letters, information interviews, mock interviews; must be taken on satisfactory/unsatisfactory basis. **Prerequisites:** Sophomore classification or approval of instructor; COMM and TCMS majors.

COMM 285 Directed Studies

Credits 1 to 3. 1 to 3 Other Hours. Individual supervision of readings or assigned projects in communication. May be taken two times for credit. **Prerequisites:** Approval of instructor and department head.

COMM 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of communication. May be repeated for credit. **Prerequisite:** Approval of instructor.

COMM 291 Research

Credits 0 to 3. 0 to 3 Other Hours. Research conducted under the direction of faculty member in the department of communication. May be repeated 3 times for credit. **Prerequisites:** GPA 2.5 or higher; freshman or sophomore classification and approval of instructor and department head.

COMM 301 Rhetoric in Western Thought

Credits 3. 3 Lecture Hours. Historical and critical evaluation of rhetorical theory from the classical era to the contemporary period—from Aristotle to Kenneth Burke; major theories of communication and persuasion developed in Europe and America. **Prerequisite:** Junior or senior classification.

COMM 302 The Mass Media and Politics

Credits 3. 3 Lecture Hours. Examination of mass media impact on politics and political behavior, and governmental impact on the mass media.

Prerequisite: POLS 206 or approval of department head; junior or senior classification. **Cross Listing:** JOUR 302 and POLS 302.

COMM 303/JOUR 305 Communication Data Applications

Credits 3. 3 Lecture Hours. Overview of communication using big data; data management, extraction and visualization; message construction, message critique; uses and applications in the field of communication and media for evidence-based arguments, persuasion, education and digital storytelling. **Prerequisite:** Junior or senior classification. **Cross Listing:** JOUR 305/COMM 303.

COMM 304/JOUR 306 Digital Communication Analytics and Metrics

Credits 3. 3 Lecture Hours. Digital communication analytics; extraction of information and knowledge from digital communication data; application of data-analytics to social media marketing, demographic analyses of web users, optimization and connection of results across digital tactics; applications of special interest to fields of strategic communication, public relations, advertising, integrated marketing communication, social media strategy and journalism. **Prerequisite:** Grade of B or better in COMM 275/JOUR 275, COMM 323, or JOUR 200; junior or senior classification. **Cross Listing:** JOUR 306/COMM 304.

COMM 305 Theories of Communication

Credits 3. 3 Lecture Hours. Theoretical approaches to human communication, including selected theories of language behavior, interpersonal, small group and organizational interaction, persuasion, technology and mass communication. **Prerequisite:** Junior or senior classification, or approval of instructor.

COMM 307/JOUR 301 Communication Law and Policy

Credits 3. 3 Lecture Hours. Law and policy that create the context and consequences for communication via mass media, social media, organizational, group and interpersonal communication, free speech, free press, libel, privacy, copyright, cybersecurity, constitutional principles, international law and human rights, fairness, equity and diversity in communication. **Prerequisite:** Junior or senior classification, or approval of instructor; COMM-307 also taught at Galveston campus. **Cross Listing:** JOUR 301/COMM 307.

COMM 308 Research Methods in Communication

Credits 3. 3 Lecture Hours. Survey of methods used in communication research including quantitative, interpretive and rhetorical methods; formulating research questions, determining the appropriate method, planning and designing the research, data collection, and data analysis and interpretation. **Prerequisite:** 6 hours of MATH 140, 142, 151, 152, PHIL 240, or STAT 201.

COMM 309 Research Method Projects

Credits 3. 3 Lecture Hours. Research methods in communication including experimental, survey, interpretive and critical methods; emphasis on research design, data collection, analysis, interpretation and presentation; project based. **Prerequisites:** Grade of C or better in COMM 308; STAT 201 or 303; junior or senior classification.

COMM 310 Communication Intervention

Credits 3. 3 Lecture Hours. Communication interventions for personal, organizational, and institutional change; survey of major communication intervention theories in contexts such as voting, purchasing, joining, or adopting; individual-level, interpersonal level, and community-level models of change; application of social science-based models to guide communication intervention strategies effectively. **Prerequisite:** Junior or senior classification.

COMM 315 Interpersonal Communication

Credits 3. 3 Lecture Hours. Speech interaction in person-to-person settings; concepts of perception, attraction, self-disclosure, listening, and conflict management through communication; speech interaction patterns and stages in the development of interpersonal communication. **Prerequisite:** Junior or senior classification.

COMM 316/PSYC 316 Media Psychology

Credits 3. 3 Lecture Hours. Examine the role of media and its impact on human behavior, emotions and thoughts; topics include mass media, social media and how they influence individual and societal functioning across a range of important psychological topics; e.g., self-image, sexual behavior, mental health, violence. **Prerequisites:** PBSI 107. **Cross Listing:** PSYC 316.

COMM 317/JOUR 317 Social Media Law

Credits 3. 3 Lecture Hours. Laws and regulations applied to social media, including communication law applied to enduring issues in the social media context; legal problems unique to social media; free speech, commercial speech and employment law as they affect individual users of social media as well as groups and organizations promoting points of view or products via social media, and employers. **Prerequisite:** Junior or senior classification or approval of instructor. **Cross Listing:** JOUR 317/ COMM 317.

COMM 320 Organizational Communication

Credits 3. 3 Lecture Hours. Speech communication behavior and networks within organizations; recent research on speech communication systems, communication climate, and communication barriers in organizational settings. **Prerequisite:** Junior or senior classification.

COMM 321 Strategic Communication Case Studies

Credits 3. 3 Lecture Hours. Strategic communication practice; application of skills including communication research, media writing and advanced media writing, visual media and public speaking; service-learning as not-for-fee consultant to a community organization. **Prerequisites:** Grade of C or better in COMM 323 and COMM 322; junior or senior classification or approval of instructor.

COMM 322 Communication Tactics

Credits 3. 3 Lecture Hours. Examination of strategic use of communication tactics; analysis of new and digital media in organizational and public communication; skill development in strategic use of communication tactics including writing for new media, researching, planning, integrating and evaluation effectiveness of traditional and new media tactics in strategic public communication.

Prerequisite: Grade of C or better in COMM 323, junior or senior classification.

COMM 323 Strategic Communication

Credits 3. 3 Lecture Hours. Application of strategic communication tools to create and influence policy, to improve profit and non-profit strategic communication planning. **Prerequisite:** Junior or senior classification.

COMM 324 Communication Leadership and Conflict Management

Credits 3. 3 Lecture Hours. Communication perspective of leadership, of conflict, of management of conflict in interpersonal, group and societal contexts; models of leadership as communication phenomenon; use of symbols by leaders to foster collaboration, systemic constructionist approach. **Prerequisite:** Junior or senior classification.

COMM 325 Persuasion

Credits 3. 3 Lecture Hours. Theory of effective persuasive communication in interpersonal, small group, and public settings; audience analysis, ethics of persuasion, motivational factors, psychological and rhetorical principles, source credibility, and theories of attitude change. **Prerequisite:** Junior or senior classification.

COMM 326 Event and Communication Planning

Credits 3. 3 Lecture Hours. Role of integrated communication in event planning; approaches for implementation in specific contexts such as conferences, professional meetings, celebratory events and programs for community outreach; professional, interpersonal and organizational coordination of information, people and budget; theory-informed action (praxis) approach. **Prerequisites:** Junior or senior classification, or approval of instructor.

COMM 330 Technology and Human Communication

Credits 3. 3 Lecture Hours. Nontechnical survey of how modern technologies influence human communication including an introduction to communication technologies; the influence of technology on interpersonal communication, group decision-making and public communication; an analysis of argumentation and persuasion in technological issues. **Prerequisite:** Grade of C or better in COMM 230/ JOUR 230.

COMM 335 Intercultural Communication

Credits 3. 3 Lecture Hours. Communication variables in intercultural contexts including culture and meaning, nonverbal styles across cultures, patterns of symbolic transfer, culture shock and communication, values in intercultural dialogue. **Prerequisite:** Junior or senior classification; also taught at Qatar campus.

COMM 338/AFST 338 Critical Race Discourse

Credits 3. 3 Lecture Hours. Critical analysis of communication and dialogue on race; causes and symptoms of structural racism; social/ racial hierarchies as they influence and are influenced by communication and dialogue. **Prerequisites:** Junior or senior classification or approval of instructor. **Cross Listing:** AFST 338/COMM 338.

COMM 340 Communication and Popular Culture

Credits 3. 3 Lecture Hours. Survey of theories and concepts of popular culture; dynamic relationships between pop culture and television, film, sports, politics and leisure. **Prerequisite:** Junior or senior classification or approval of instructor; also taught at Qatar campus.

COMM 342 The Rhetoric of Gender and Health

Credits 3. 3 Lecture Hours. Study of field of rhetoric of health and medicine with specific attention to the study of gender, including issues in reproduction, expertise and illness; range of methods and methodological approaches within the field. **Prerequisite:** Junior or senior classification. **Cross Listing:** ENGL 342 and WGST 342.

COMM 343 Communication in a Diverse World

Credits 3. 3 Lecture Hours. Examination of key concepts and theories relevant to communicating in an increasingly diverse world; consideration of the mutual constitution of culture and communication; investigation of multiple axes of identity; critical and cultural approach; critical investigation of topics concerning communication, diversity, equity and inclusion; public advocacy project. **Prerequisite:** Junior or senior classification or approval of instructor.

COMM 345 Media Industries

Credits 3. 3 Lecture Hours. Survey of the business organization, economic structures and processes, and regulations of the media industry. **Prerequisite:** Junior or senior classification or approval of instructor. **Cross Listing:** FILM 345 and JOUR 345.

COMM 346/JOUR 346 Media, Culture and Identity

Credits 3. 3 Lecture Hours. Media representations relating to power, privilege and difference; communication theories and concepts centered on how media and technology-use shape, and are shaped by, identity; critical analysis of media as sites for negotiation and construction of identities such as gender, race, ethnicity, sexuality, social class, physical/mental ability, nationality and religion; reflection on and analysis of bias, prejudice, discrimination, power, equity and privilege. **Prerequisites:** Junior or senior classification or approval of instructor. **Cross Listing:** JOUR 346/COMM 346.

COMM 350 Theories of Mediated Communication

Credits 3. 3 Lecture Hours. Survey of different theories of mediated communication processes and effects; functions of theories in social scientific research on media and mediated processes. **Prerequisite:** Junior or senior classification or approval of instructor.

COMM 354 Money, Power and Communication

Credits 3. 3 Lecture Hours. Interrelationships between money and power and communication; the influence of media and communication on power and money; communication law and policy; the political economy of local, national, and global communication networks. **Prerequisite:** Junior or senior classification or approval of instructor.

COMM 360 Cultural History of the Media

Credits 3. 3 Lecture Hours. Origins and development of the mass media; their influence on social, political, and cultural change; history of mass communication from historical, sociological, and cultural perspectives. **Prerequisite:** Junior or senior classification or approval of instructor.

COMM 365/JOUR 365 International Communication

Credits 3. 3 Lecture Hours. Mass media, international, and cross-cultural audiences; theoretical, pragmatic, political and ethical issues; including cultural differences, comparative media systems, development communication, patterns of world news flow, political propaganda, impact of international advertising and other issues. **Prerequisite:** Junior or senior classification; COMM-365 also taught at Qatar campus. **Cross Listing:** JOUR 365/COMM 365.

COMM 370 Health Communication

Credits 3. 3 Lecture Hours. Survey of theory and research in health communication, including interaction between patients and providers, communication in health care organizations, health care campaigns, and cultural meanings of health and illness. **Prerequisite:** Junior or senior classification or approval of instructor.

COMM 375 Media Audiences

Credits 3. 3 Lecture Hours. Media audiences; research and theory; processes and effects of mass communication; audience members' uses and interpretations of media; topics including political media, news, and entertainment, health and information campaigns, children and other special audiences. **Prerequisite:** Junior or senior classification or approval of instructor.

COMM 377 Entrepreneurship and New Media

Credits 3. 3 Lecture Hours. Communicative principles and skills necessary to launch future multimedia entrepreneurial endeavors in a saturated digital environment; exploration of shift in the entrepreneurial landscape; emphasis on collaborative communication methods as a means to free market success. **Prerequisite:** Grade of C or better in COMM 275/JOUR 275; junior or senior classification or approval of instructor.

COMM 403 Media, Children and Adolescents

Credits 3. 3 Lecture Hours. Critical analysis of popular culture and mass media issues related to children and adolescents; deconstruction of media created by, for and about children and youth. **Prerequisite:** Junior or senior classification or approval of instructor.

COMM 407/WGST 407 Gender, Race and Media

Credits 3. 3 Lecture Hours. The contributions of women and ethnic groups to the evolution of the media; the portrayal of women and ethnic groups in the mass media; issues resulting from the recognition of women and ethnic groups as media audiences. **Prerequisites:** Junior or senior classification and approval of instructor. **Cross Listing:** WGST 407/COMM 407.

COMM 410 Radio, Records, and Popular Music

Credits 3. 3 Lecture Hours. History of radio and record industries; communication technology and media industries related to American popular music; interaction of communication technologies, media industries, social and cultural processes in evolution of popular music.

Prerequisite: Junior or senior classification or approval of instructor.

COMM 411/WGST 411 Representations of Motherhood

Credits 3. 3 Lecture Hours. Examination of understandings of motherhood from a humanities perspective and over a variety of cultures and time periods, as reflected in written, media and/or oral texts.

Prerequisite: Junior or senior classification or approval of instructor.

Cross Listing: WGST 411/COMM 411.

COMM 415 New Media and Civil Society

Credits 3. 3 Lecture Hours. Critical analysis of new media technologies, civic participation, and social capital in democratic, non-democratic, and nascent civil societies around the world. **Prerequisite:** Junior or senior classification or approval of instructor.

COMM 420/WGST 420 Gender and Communication

Credits 3. 3 Lecture Hours. Survey of the role of gender in communication processes; focus on communication differences between men and women in contexts such as the family, school and work organizations; discussion of media influence in gender stereotypes. **Cross Listing:** WGST 420/COMM 420.

COMM 423/LMAS 423 Communicating Latinidad

Credits 3. 3 Lecture Hours. Examination of communication by and about Latinos; analysis of critical and historical orientation; topics include social movements, organizational and institutional discourse, and media.

Prerequisite: Junior or senior classification or approval of instructor.

Cross Listing: LMAS 423/COMM 423.

COMM 425/AFST 425 Communication and Black Freedom Dreams

Credits 3. 3 Lecture Hours. Examination of historical and contemporary communication practices of Black freedom activities, movements, and organizations in the United States and around the globe. **Prerequisite:** Junior or senior classification. **Cross Listing:** AFST 425/COMM 425.

COMM 428/WGST 428 Women's Rhetoric

Credits 3. 3 Lecture Hours. Examination of the historical imbrication of masculinity and rhetoric in relation to women's participation in political life, reception of women's rhetoric in the public sphere, and remembrance and representation of women as rhetorical agents throughout history; consideration of women's rhetoric in various cultural arenas. **Prerequisite:** Junior or senior classification. **Cross Listing:** WGST 428/COMM 428.

COMM 431 Rhetoric of Social Movements

Credits 3. 3 Lecture Hours. Survey of events and rhetorical documents of major U.S. social movements, including abolitionist, labor, socialist, women's rights, civil rights, pro-life, gay and lesbian, and student movements. **Prerequisites:** Junior or senior classification.

COMM 434 Topics in Rhetorical Theory

Credits 3. 3 Lecture Hours. Application of rhetorical theories and concepts to rhetorical problems and methods; emphasis on the relationship between theory and practice. **Prerequisite:** Junior or senior classification.

COMM 435/FILM 445 Rhetoric of Television and Film

Credits 3. 3 Lecture Hours. Critical analysis of television and film; close readings of such mediated texts; special attention to writing television and film criticism. **Prerequisite:** Junior or senior classification. **Cross Listing:** FILM 445/COMM 435.

COMM 437 Visual Communication

Credits 3. 3 Lecture Hours. Critical analysis of visual communication including photographs, advertising, memorials, tattoos, comics, public protest. **Prerequisite:** Junior or senior classification.

COMM 438 Propaganda

Credits 3. 3 Lecture Hours. Examination of common propaganda strategies in contemporary mass mediated environments. **Prerequisite:** Junior or senior classification.

COMM 440 Political Communication

Credits 3. 3 Lecture Hours. Rhetorical analysis of messages, media and speakers in political campaigns, institutions and movements.

COMM 443 Communication and Conflict

Credits 3. 3 Lecture Hours. Communication principles for addressing conflict situations through such practices as negotiation, mediation and arbitration; the study of strategies, influence and language in conflict management approaches. **Prerequisite:** Junior or senior classification or approval of instructor.

COMM 446 Communication, Organizations and Society

Credits 3. 3 Lecture Hours. Communicative processes through which organizations influence and are influenced by the societies from which they draw their members. **Prerequisites:** Junior or senior classification or approval of instructor.

COMM 447 Communication, Group Processes and Collaboration

Credits 3. 3 Lecture Hours. Communication processes in teamwork including collaboration in dyads, teams, and group processes that contribute to or detract from team effectiveness. **Prerequisites:** COMM 210; junior or senior classification.

COMM 450 Media Campaigns

Credits 3. 3 Lecture Hours. Principles of designing media campaigns as applied to commercial advertising, political advertising and health campaigns; processes that drive the planning and execution of these campaigns. **Prerequisite:** Junior or senior classification or approval of instructor.

COMM 452 Cultural Studies of Communication Technology

Credits 3. 3 Lecture Hours. Exploration of theories concerning technology; emphasis on technological culture; examination of the emergence of and societal reactions to technologies during modern era; consideration of utopian/dystopian discourse of technology in popular media narratives; contemplation of technology as constitutive of power and knowledge. **Prerequisite:** Junior or senior classification.

COMM 453 Communication and Video Games

Credits 3. 3 Lecture Hours. Business and industry aspects of video games; cultural and social aspects of gaming. **Prerequisite:** Junior or senior classification.

COMM 458/JOUR 458 Global Media

Credits 3. 3 Lecture Hours. Study of globalization through media ownership; content, flow, cultural values, political power and technological impact; implications of globalization for local economies and audiences. **Prerequisite:** Junior or senior classification or approval of instructor. **Cross Listing:** JOUR 458/COMM 458.

COMM 460 Communication and Contemporary Issues

Credits 3. 3 Lecture Hours. Rhetorical, critical or other approaches to study how communication practices influence the construction of social issues. **Prerequisites:** Junior or senior classification.

COMM 470 Communication in Health Care Contexts

Credits 3. 3 Lecture Hours. Principles of health communication applied in situations ranging from physician-patient communication to public health campaign theory, design, implementation and evaluation. **Prerequisites:** Junior or senior classification.

COMM 471 Media, Health and Medicine

Credits 3. 3 Lecture Hours. Analysis and evaluation of representations of health in media; examination of gender, class and race as they intersect with health issues. **Prerequisite:** Junior or senior classification.

COMM 476 Advanced Social Media

Credits 3. 3 Lecture Hours. Analysis of social media platforms and social media accounts used by organizations and individuals in professional contexts; production of individual posts for various purposes and goals; production of photos, videos and graphics for social sharing. **Prerequisites:** Grade of B or better in COMM 275/JOUR 275; junior or senior classification.

COMM 480/RELS 480 Religious Communication

Credits 3. 3 Lecture Hours. The role of religious communication as manifested in speeches, sermons, debates, campaigns, and social movements throughout history. **Prerequisite:** Junior or senior classification or approval of instructor. **Cross Listing:** RELS 480/COMM 480.

COMM 483 Health Communication Practicum

Credits 0-1. 0-1 Other Hours. Directed individual health communication practicum. **Prerequisites:** Junior or senior classification and approval of instructor.

COMM 484 Internship in Communication

Credits 0 to 23. 0 to 23 Other Hours. Directed internship in a public or private organization to provide students with on-the-job training and applied research experience; application of communication theory and practice in career settings; designed to enhance and clarify students' career objectives. May be repeated for credit. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisites:** Cumulative GPR of 2.5 or higher for credits taken in residence; approval of department head.

COMM 485 Directed Studies

Credits 0 to 3. 0 to 3 Other Hours. Directed individual study of identified topics in communication; may include specific research, readings or other approved project in any area of communication; written report is required. May be repeated for credit. **Prerequisites:** Cumulative GPR of 2.5 or higher; approval of instructor and department head.

COMM 487 Communication, Diversity and Social Justice Capstone Experience

Credits 0-1. 0-1 Other Hours. Directed individual communication, diversity, social justice capstone experience. **Prerequisites:** Junior or senior classification and approval of capstone director.

COMM 488 Global Media Practicum

Credits 0-1. 0-1 Other Hours. Directed global media experience. **Prerequisites:** Junior or senior classification and approval of instructor.

COMM 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of communication. May be repeated for credit.

COMM 491 Research

Credits 0 to 3. 0 to 3 Other Hours. Research conducted under the direction of faculty member in the department of communication. May be taken four times for credit. **Prerequisites:** GPA 2.5 or higher; junior or senior classification and approval of instructor and department head.

COMM 497 Independent Honors Studies

Credits 0 to 3. 0 to 3 Other Hours. Directed independent studies for upper division Honors students, regardless of academic major, in select aspects of communication. May be repeated for credit. **Prerequisites:** Junior or senior classification either as Honors student or with GPR of 3.25; letter of approval from head of student's department.

COSC - Construction Science (COSC)

COSC 153 Introduction to the Construction Industry

Credits 3. 3 Lecture Hours. Characteristics of the construction industry; types of construction companies; contracts; people involved in a project, their responsibilities and interrelationships; evolution of a project; interpreting working drawings; construction bonds; contract documents. **Prerequisite:** COSL majors only.

COSC 175 Construction Graphics Communication

Credits 3. 3 Lecture Hours. Visualization, interpretation and communication of graphical geometry in construction design and engineering; graphical analysis of problems; sketching applications, computer aided design and fundamentals of information modeling software; introduction to common quantitative tools in construction. **Prerequisite:** AREN and COSL majors only.

COSC 184 Construction Safety I

Credit 1. 1 Lecture Hour. Administration and application of the OSHA Act in the construction industry; includes standards, the general duty clause, competent person, and hazard identification; fulfills the requirements for the ten-hour OSHA certifications. **Prerequisite:** COSL majors.

COSC 202 Introduction to Housing

Credits 3. 3 Lecture Hours. Overview of the social, economic, environmental and cultural impacts of housing on communities and nations; varied perspectives to understand the different facets of housing and their impacts on the human experience; critical thinking skills to gain knowledge and to be informed of housing choices.

COSC 214 Introduction to Facilities Management

Credits 3. 3 Lecture Hours. Overview of facilities management principles; acquisition, operation, maintenance and disposition of the built environment; topics include construction documents, building systems (envelope, architectural, mechanical, electrical, plumbing), utility services, real estate and events and emergency management; owner's interaction with occupants, architects, engineers and contractors.

COSC 222 Social Issues in the History of the Construction Environment

Credits 3. 3 Lecture Hours. Introduction to cultural and social issues in the built environment; exploration of how individual and collective ideas, values and beliefs are expressed in the construction environment; how the field of construction internalizes and thinks about these values across cultures and how authority, majorities and privilege affect the creativity of the built environment; emphasizes civil discourse to help recognize positionality and work collaboratively in a multicultural society.

COSC 253 Construction Materials and Methods I

Credits 3. 3 Lecture Hours. (ARCH 2312) Construction Materials and Methods I. Overview of construction materials, methods, and sequences of the construction process; introduction to material specifications and construction drawings; focus of study includes wood, concrete, masonry, and steel.

COSC 275 Estimating I

Credits 3. 2 Lecture Hours. 3 Lab Hours. Systems approach to determining required quantities of construction materials; quantification of various types of foundation systems, structural systems and building envelope systems; excerpts of contract documents from a variety of different building projects. **Prerequisite:** COSC 253; concurrent enrollment in COSC 175.

COSC 284 Introduction to Applied Workplace Ethics, Etiquette and Communications

Credit 1. 1 Lecture Hour. Professional ethics, etiquette and communication for employment preparation with a construction or construction related company; various case studies emphasizing personal accountability, integrity and codes of conduct; etiquette and communication of all forms will be presented, applied and discussed in reflective writing assignments in order to prepare to meet the professional expectations of employers upon graduation. **Prerequisite:** COSL majors.

COSC 285 Directed Studies

Credits 1 to 3. 1 to 3 Other Hours. Special project in construction science. Project must be approved by the department. **Prerequisite:** Approval of department head.

COSC 291 Research

Credits 1 to 4. 1 to 4 Other Hours. Research conducted under the direction of faculty member in construction science. May be repeated 2 times for credit. **Prerequisites:** Freshman or sophomore classification; approval of instructor.

COSC 301 Construction Surveying

Credits 2. 1 Lecture Hour. 3 Lab Hours. Practical applications of surveying to the practice of construction project management; distance, grade and angular measurement; surveying equipment and its application to construction layout and control; surveying documentation and field work; introduction to other three dimensional measurement and positioning systems. **Prerequisite:** Admission to upper level in Construction Science.

COSC 303 High Performance Residential Building

Credits 3. 3 Lecture Hours. Exploration into the concepts of homebuilding operations using green building methods, tools to reach consumers, organizational and operational theories and market driven green building solutions; alignment with ICC 700 National Green Building Standard; operations of publicly traded and private production homebuilders and best practices; application for the professional designation of Certified Green Professional (CGP) given by the National Association of Home Builders (NAHB) upon completion. **Prerequisite:** Admission to upper level in Construction Science.

COSC 310 Design and Construction Leadership Education I

Credit 1. 1 Lecture Hour. Promotion of personal leadership skills utilized within the design and construction professions; primary understanding and developing management skills with specific attention to developing personal attributes and skills necessary for achieving organizational goals. **Prerequisite:** CARC majors only pursuing the minor in leadership in the design & construction professions; junior or senior classification.

COSC 314 Immersion in Facilities Management

Credits 3. 3 Lecture Hours. In-depth exploration of tasks required for acquisition, operation, maintenance, and disposition of the built environment; includes commercial, healthcare, education, performance, athletic and high-rise residential buildings; site visits to relevant facilities. **Prerequisites:** Grade of C or better COSC 214; junior or senior classification.

COSC 321 Structural Systems I

Credits 3. 3 Lecture Hours. Introduction to the physical principles that govern classical statics and strengths of materials through the design of architectural structures. **Prerequisite:** Admission to upper level in Construction Science.

COSC 322 Construction Discourse Leadership

Credits 3. 3 Lecture Hours. Practicum on leadership skills; leading and managing difficult discussions in a professional setting; mentorship of new students; presentation of difficult discussion topics, demonstration of constructive critique methods. **Prerequisite:** Grade of C or better in COSC 222.

COSC 325 Mechanical, Electrical and Plumbing Systems in Construction I

Credits 3. 3 Lecture Hours. Design, operation, materials and installation methods of mechanical, electrical and plumbing systems in construction. **Prerequisite:** Admission to upper level in construction science or minor in facility management.

COSC 326 Mechanical, Electrical and Plumbing Systems in Construction II

Credits 3. 3 Lecture Hours. In depth coverage of mechanical, electrical and plumbing (MEP) system operations, materials and installation methods; development of MEP drawings, specifications and contract documents as used in MEP specialty contracting industry. **Prerequisite:** COSC 325.

COSC 333 Project Management for Facility Managers

Credits 3. 3 Lecture Hours. Overview of project management for facility managers covering concepts and components of project management and their interrelationships in construction practice. **Prerequisite:** Minor in facility management; junior or senior classification or approval of instructor.

COSC 335 Life Cycle Assessment in Building Construction

Credits 3. 3 Lecture Hours. Life Cycle Assessment from a coupled energy-carbon-water (ECW) nexus perspective; key LCA concepts; the LCA process; LCA standards; application of LCA approaches and software to assess the energy, greenhouse gas (GHG) emissions, water, and other environmental impacts of building construction industry at the material and whole building levels; study and analysis of factors relating to material and assembly choices, site logistics, on-site and off-site construction and/or fabrication processes, additive construction (large-scale 3D printing), and construction and demolition waste to reduce the energy use, GHG emissions, and water use; analysis and comparison of LCA results of process-based and macro-economic model-based Life Cycle Inventory (LCI). **Prerequisites:** Junior or senior classification.

COSC 340 Building Codes and Construction

Credits 3. 3 Lecture Hours. Exploration of the complex interrelationship of building codes and their influence on construction projects; emphasis on building code organization, construction types, and occupancy classifications; examines the role and responsibilities of the construction professional, the permitting process, and the inspection process. **Prerequisites:** Admission to upper level in Construction Science.

COSC 353 Construction Project Management

Credits 3. 3 Lecture Hours. An introduction to construction project management covering concepts of project selection, estimating bidding, scheduling, subcontracting practices, cost controls, project documentation, construction bonds, insurance, payments and the elements of close out; development of professional communication skills through prepared multi-media presentations. **Prerequisite:** Admission to upper level in Construction Science.

COSC 354 Construction Materials and Methods II

Credits 3. 3 Lecture Hours. Continuation of COSC 253; emphasis on advanced building methods for the assembly of building systems; focus of study includes concrete, masonry, and steel. **Prerequisite:** COSC 253.

COSC 359 Industrial Construction

Credits 3. 3 Lecture Hours. Industry specific knowledge such as concepts of developing construction management strategies of industrial projects, materials and methods, structural and mechanical components; preparation to effectively resolve challenges faced in the industrial construction sector. **Prerequisites:** Admission to upper level in construction science.

COSC 375 Estimating II

Credits 3. 2 Lecture Hours. 3 Lab Hours. Quantification and pricing of direct field costs and general condition costs from construction documents; preparation of complete pricing proposal ready for project execution; completion of a response to a bid or request for proposal. **Prerequisites:** Admission to upper level in Construction Science; COSC 275.

COSC 381 Professional Ethics in the Construction Industry

Credit 1. 1 Lecture Hour. Principles of ethical behavior in preparation for a professional internship with a construction or construction-related company; various construction company case studies emphasizing personal accountability, integrity, moral courage, individual, association and company codes of conduct; accepted business practices, decision making, company cultures, peer pressure, public opinion. **Prerequisite:** Admission to upper level in Construction Science.

COSC 410 Design and Construction Leadership Education II

Credit 1. 1 Lecture Hour. Development of competencies in various leadership and management practices that are useful in an array of situations; emphasis on organizational leadership and management development with specific attention to intragroup relationships and techniques for achieving group goals. **Prerequisite:** COSC 310, CARC majors only pursuing the minor in leadership in the design and construction professions; junior or senior classification.

COSC 411 Seminar in Design and Construction Executive Leadership

Credit 1. 1 Lecture Hour. Promotes an understanding of leadership and builds the capacity to understand and meet the challenges involved in developing and leading ethical and sustainable organizations in today's economy; examination of theory, conceptualizing, reflection and application; share experiences in everyday life and learn to predict outcomes based on theoretical models. **Prerequisite:** COSC 410; CARC majors only pursuing the minor in leadership in the design and construction; junior or senior classification.

COSC 414 Contracted Services Management

Credits 3. 3 Lecture Hours. Overview of contracted services management for facilities design, construction, operations, and maintenance; topics include scope of work development, A/E and vendor selection and procurement, contract administration (insurance, payment, communication, scope execution, field oversight, closeout), and common tools, equipment, and material. **Prerequisites:** Grade of C or better COSC 214; Minor in Facilities Management; junior or senior classification or approval of instructor.

COSC 421 Soil and Structural Analysis.

Credits 3. 3 Lecture Hours. Advanced structural analysis of steel and concrete members with an introduction to soil properties and constituents; utilizations of computer analysis tools. **Prerequisite:** COSC 321.

COSC 427 Project Execution and Administration - Constructionarium United Kingdom

Credits 3. 3 Lecture Hours. Development of project execution and management of a mock commercial construction project; includes aspects of estimating, bidding, schedule development, real time scheduling, job-site safety plans, project execution plans, material procurement, cost controls, construction management, owner, and architect presentations, close out, and post-construction requirements; includes multiple day field trip during the mock construction project. **Prerequisites:** Admission to upper level in Construction Science.

COSC 428 Preconstruction - the Art of the Project

Credits 3. 3 Lecture Hours. Instruction in the pre-construction processes that are necessary in construction project evolution; exploration of alternative project delivery options from the traditional design-bid-build linear approach; focus on engagement of Construction Professionals at earliest project phase; familiarization with the roles of professionals in all phases of construction including design, construction, and ownership. **Prerequisites:** Admission to upper level in Construction Science.

COSC 433 Immersion in Facilities Management

Credits 3. 3 Lecture Hours. 1 Lab Hour. In-depth exploration of the varied tasks required for the acquisition, operation, maintenance and disposition of the built environment including commercial, healthcare, education, performance, athletic, high-rise residential buildings; exploration that entails site visits to appropriate buildings and their operational systems. **Prerequisites:** COSC 214; minor in Facilities Management or admission to upper level in Construction Science.

COSC 440 Interdisciplinary Capstone

Credits 3. 3 Lecture Hours. A senior capstone for students preparing to enter the designbuild sector of the construction industry; integration of the design and construction processes into a single, cohesive project delivery system, starting with project inception, and carrying through construction, operation and maintenance of various types of construction projects. **Prerequisite:** COSC 475; must be taken in graduating semester.

COSC 441 Residential Capstone

Credits 3. 3 Lecture Hours. A senior capstone course for students preparing to enter the residential construction industry; project management of residential projects, including market analysis, site analysis, residential design, building codes, estimating, scheduling, financing, subcontracting, marketing, business planning and current trends in design and construction. **Prerequisite:** COSC 475; must be taken in graduating semester.

COSC 442 Commercial Capstone

Credits 3. 3 Lecture Hours. A senior capstone course for students preparing to enter the commercial construction sector; project management of commercial construction projects, including aspects of design, bidding/estimating; presentation, value engineering, contracts/negotiation, subcontractor relations, cost controls, management during construction, close out, and post-construction requirements. **Prerequisite:** COSC 475; must be taken in graduating semester.

COSC 443 Industrial Capstone

Credits 3. 3 Lecture Hours. A senior capstone course for students preparing to enter the industrial construction sector; project management of industrial construction projects including project acquisition, planning and staffing, engineering, procurement, construction, start-up, close out, operations and maintenance, and turn-arounds. **Prerequisite:** COSC 475; must be taken in graduating semester.

COSC 446 Specialty Capstone

Credits 3. 3 Lecture Hours. Senior capstone course for students preparing to enter the mechanical, electrical or other specialty construction company; project management of specialty contracts including project acquisition, schematic system design, estimating/bidding, scheduling, systems integration, value engineering, management during construction of crews and procurement, contract administration, business planning and current industry issues. **Prerequisite:** COSC 475; must be taken in graduating semester.

COSC 461 Building Information Modeling System

Credits 3. 3 Lecture Hours. Exploration of a data-rich, object-oriented, and parametric digital representation of the facility, from which views and information can be extracted and analyzed for construction project acquisition, planning, and control. **Prerequisite:** Admission to upper level in Construction Science.

COSC 463 Introduction to Construction Law

Credits 3. 3 Lecture Hours. Introduction to basic contract and tort issues and their application in the construction industry; delineation of the various types of contracts and remedies available to parties involved in a construction project; additional related topics including bidding, delays, mechanics liens, site conditions, warranties and the Uniform Commercial Code as it relates to the construction industry, introduction to legal research and reasoning as used by professional constructors. **Prerequisite:** Admission to upper level in Construction Science.

COSC 464 Construction Safety

Credits 3. 3 Lecture Hours. Administration and application of the Occupational Safety and Health Administration Act in the construction industry; includes OSHA standards, the general duty clause, competent person and hazard identification; fulfills the requirements for the thirty-hour OSHA, CPR and First Aid certifications. **Prerequisite:** Admission to upper-level in construction science.

COSC 465 Advanced Topics in Construction Law

Credits 3. 3 Lecture Hours. Legal issues affecting construction, including the parties to construction work, contracting, responsibilities and risk, risk management, damages, handling of claims and disputes, indemnification, bonds, insurance, bankruptcy, labor and employment, and subcontract management; litigation and alternative dispute resolution methods regularly used in the construction industry. **Prerequisite:** COSC 463.

COSC 468 Risk Management in the Built Environment

Credits 3. 3 Lecture Hours. Decision-making and risk analysis concepts in the context of the built environment and construction projects; major categories and tools of risk management regularly used in the construction industry such as contracts, insurance and bonds. **Prerequisites:** Admission to upper level in construction science and COSC 463 or concurrent enrollment.

COSC 473 Built Environment in International Setting

Credits 3. 3 Lecture Hours. Survey of the built environment and how changing global societies have adapted in design, labor and materials used; exposure to to opinions and practices in the areas of politics, culture, gender and religion. **Prerequisite:** Junior or Senior construction science majors or instructor approval.

COSC 474 Facility Management Internship

Credits 3. 3 Lecture Hours. An internship (10 weeks, 400 hours) in a facility management related position that exposes the student to facility management activities; daily logs, monthly reports, final report and completion letter required; distance education off-campus course; does not satisfy College of Architecture semester away requirement. **Prerequisites:** COSC 333; approval of internship faculty coordinator.

COSC 475 Construction Project Planning

Credits 3. 2 Lecture Hours. 3 Lab Hours. Development of parameter cost estimates for activities that relate to the construction of a building project; work packages sequenced, planned and leveled to develop a working project execution document; development of procedures to monitor actual field progress. **Prerequisite:** COSC 353, COSC 375.

COSC 477 Construction Project Controls

Credits 3. 3 Lecture Hours. Introduction to construction related financial documents including schedule of values, labor and operations cost reports, income statements, balance sheets and construction budgets; emphasis on the development of techniques required to effectively monitor the financial aspects of a construction project. **Prerequisite:** COSC 353 and COSC 494.

COSC 481 Seminar

Credit 1. 1 Lecture Hour. Seminar discussion of construction equipment selection, utilization maintenance and operating cost. **Prerequisite:** Admission to upper level in Construction Science.

COSC 484 Internship - 10 Week

Credits 3. 3 Other Hours. An internship (10 weeks, 400 hours) with a construction or construction-related company that exposes the student to construction-related activities; daily logs, monthly reports, final report and completion letter required; distance education course with non-resident status; does not satisfy the College of Architecture semester away requirement unless taken while on Construction Science Spring Study Abroad. **Prerequisites:** COSC 284, COSC 353, and COSC 375; approval of internship faculty coordinator.

COSC 485 Directed Studies

Credits 1 to 5. 1 to 5 Other Hours. Special problems in building construction. **Prerequisite:** Admission to upper-level in Construction Science.

COSC 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified field of construction science. May be repeated for credit. **Prerequisite:** Admission to upper-level in Construction Science.

COSC 491 Research

Credits 1 to 4. 1 to 4 Other Hours. Research conducted under the direction of faculty member in construction science. May be repeated 2 times for credit. Registration in multiple sections of this course is possible within a given semester provided that the per semester credit hour limit is not exceeded. **Prerequisites:** Admission to upper level in Construction Science and approval of instructor.

COSC 494 Internship

Credits 6. 6 Other Hours. An internship (15 weeks, 600 hours) with a construction or construction-related company that exposes the student to construction-related activities, daily logs, monthly reports, final report and completion letter required; distance education course with non-resident status. No other Texas A&M Construction Science courses may be taken while enrolled in COSC 494. **Prerequisites:** COSC 284, COSC 353, and COSC 375; approval of internship faculty coordinator.

CSCE - Computer Sci & Engr (CSCE)

CSCE 110 Programming I

Credits 4. 3 Lecture Hours. 2 Lab Hours. Basic concepts in using computation to enhance problem solving abilities; understanding how people communicate with computers, and how computing affects society; computational thinking; representation of data; analysis of program behavior; methods for identifying and fixing errors in programs; understanding abilities and limitation of programs; development and execution of programs.

CSCE 111 Introduction to Computer Science Concepts and Programming

Credits 4. 3 Lecture Hours. 2 Lab Hours. Computation to enhance problem solving abilities; understanding how people communicate with computers, and how computing affects society; computational thinking; software design principles, including algorithm design, data representation, abstraction, modularity, structured and object oriented programming, documentation, testing, portability, and maintenance; understanding programs' abilities and limitations; development and execution programs.

CSCE 120 Program Design and Concepts

Credits 3. 3 Lecture Hours. 1 Lab Hour. Extension of prior programming knowledge and creation of computer programs that solve problems; use of the C++ language; application of computational thinking to enhance problem solving; analysis of, design of and implementation of computer programs; use of basic and aggregate data types to develop functional and object oriented solutions; development of classes that use dynamic memory and avoid memory leaks; study of error handling strategies to develop more secure and robust programs. **Prerequisite:** Grade of C or better in ENGR 102, CSCE 110, CSCE 111, CSCE 206 or PHYS 150.

CSCE 121 Introduction to Program Design and Concepts

Credits 4. 3 Lecture Hours. 2 Lab Hours. Computation to enhance problem solving abilities; computational thinking; understanding how people communicate with computers, how computing affects society; design and implementation of algorithms; data types, program control, iteration, functions, classes, and exceptions; understanding abstraction, modularity, code reuse, debugging, maintenance, and other aspects of software development; development and execution of programs.

Prerequisite: Programming course (high school or college); also taught at Galveston campus.

CSCE 181 Introduction to Computing

Credit 1. 1 Lecture Hour. Introduction to the broad field of computing; presentations from industry and academia about how computer science concepts are used in research and end products; includes a major writing component.

CSCE 201/CYBR 201 Fundamentals of Cybersecurity

Credits 3. 3 Lecture Hours. Basic terminology, concepts, technology, and trends of cybersecurity; foundations of cybersecurity to include cryptography, public key infrastructure, standards and protocols, physical security, network fundamentals; workings of systems, networks, infrastructure; legal and ethical issues in cybersecurity. **Cross Listing:** CYBR 201/CSCE 201.

CSCE 206 Structured Programming in C

Credits 4. 3 Lecture Hours. 2 Lab Hours. (COSC 1420) Structured Programming in C. Basic concepts, nomenclature and historical perspective of computers and computing; internal representation of data; software design principles and practice; structured and object-oriented programming in C; use of terminals, operation of editors and executions of student-written programs.

CSCE 221 Data Structures and Algorithms

Credits 4. 3 Lecture Hours. 2 Lab Hours. Specification and implementation of basic abstract data types and their associated algorithms including stacks, queues, lists, sorting and selection, searching, graphs, and hashing; performance tradeoffs of different implementations and asymptotic analysis of running time and memory usage; includes the execution of student programs written in C++.

Prerequisite: Grade C or better in CSCE 120 or CSCE 121; grade of C or better in CSCE 222/ECEN 222 or ECEN 222/CSCE 222, or concurrent enrollment.

CSCE 222/ECEN 222 Discrete Structures for Computing

Credits 3. 3 Lecture Hours. Mathematical foundations from discrete mathematics for analyzing computer algorithms, for both correctness and performance; introduction to models of computation, including finite state machines and Turing machines. **Prerequisite:** Grade of C or better in MATH 142, MATH 147, MATH 151, or MATH 171. **Cross Listing:** ECEN 222/CSCE 222.

CSCE 285 Directed Studies

Credits 0 to 4. 0 to 4 Lecture Hours. Special project in computer science; project must be approved by the department. **Prerequisite:** Approval of department head; also taught at Galveston campus.

CSCE 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of computer science. May be repeated for credit. **Prerequisite:** Approval of instructor.

CSCE 291 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in computer science. May be taken three times for credit. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

CSCE 305 Computational Data Science

Credits 3. 3 Lecture Hours. Computational practice of data science through a sequence of interactive modules that provides an integrated hands-on approach to its methods, tools, applications and supporting technologies including high performance and cloud computing platforms. **Prerequisites:** Grade of C or better in ENGR 102, CSCE 110, CSCE 111, or CSCE 206; grade of C or better in MATH 251, MATH 253, or STAT 211; junior or senior classification. **Cross Listing:** ECEN 360 and STAT 315.

CSCE 310 Database Systems

Credits 3. 3 Lecture Hours. File structures and access methods; database modeling, design and user interface; components of database management systems; information storage and retrieval, query languages, high-level language interface with database systems. **Prerequisites:** CSCE 221 with a grade of C or better; junior or senior classification.

CSCE 312 Computer Organization

Credits 4. 3 Lecture Hours. 2 Lab Hours. Computer systems from programmer's perspective including simple logic design, data representation and processor architecture, programming of processors, memory, control flow, input/output, and performance measurements; hands-on lab assignments. **Prerequisite:** Grade of C or better in CSCE 221, or concurrent enrollment.

CSCE 313 Introduction to Computer Systems

Credits 4. 3 Lecture Hours. 2 Lab Hours. Introduction to system support for application programs, both on single node and over network including OS application interface, inter-process communication, introduction to system and network programming, and simple computer security concepts; hands-on lab assignments. **Prerequisite:** CSCE 221 with a grade of C or better; grade of C or better in CSCE 312 or concurrent enrollment in CSCE 350/ECEN 350 or ECEN 350/CSCE 350.

CSCE 314 Programming Languages

Credits 3. 3 Lecture Hours. Exploration of the design space of programming languages via an in-depth study of two programming languages, one functional and one object-oriented; focuses on idiomatic uses of each language and on features characteristic for each language. **Prerequisite:** Grade of C or better in CSCE 221, or concurrent enrollment.

CSCE 315 Programming Studio

Credits 3. 2 Lecture Hours. 2 Lab Hours. Intensive programming experience that integrates core concepts in Computer Science and familiarizes with a variety of programming/development tools and techniques; students work on 2 or 3 month-long projects each emphasizing a different specialization within Computer Science; focuses on programming techniques to ease code integration, reusability, and clarity. **Prerequisite:** CSCE 312 and CSCE 314, or CSCE 350/ECEN 350 or ECEN 350/CSCE 350; concurrent enrollment in CSCE 313.

CSCE 320/STAT 335 Principles of Data Science

Credits 3. 3 Lecture Hours. Theoretical foundations, algorithms and methods of deriving valuable insights from data; includes foundations in managing and analyzing data at scale, e.g. big data; data mining techniques and algorithms; exploratory data analysis; statistical methods and models; data visualization. **Prerequisites:** STAT 211 or ECEN 303; STAT 212 or CSCE 222/ECEN 222; MATH 304. **Cross Listing:** STAT 335/CSCE 320.

CSCE 331 Foundations of Software Engineering

Credits 4. 3 Lecture Hours. 2 Lab Hours. Intensive programming experience and provision of the fundamentals needed for larger-scale software development; integration of concepts in computer science and familiarization with a variety of programming and development tools and techniques; team projects each with an emphasis on a different specialization within computer science; emphasis on programming techniques to ease code integration and clarity; practical exposure to software-engineering processes through large-scale projects and specification and documentation. **Prerequisite:** Grade of C or better in CSCE 314, CSCE 350/ECEN 350, or ECEN 350/CSCE 350; grade of C or better or concurrent enrollment in CSCE 313.

CSCE 350/ECEN 350 Computer Architecture and Design

Credits 4. 3 Lecture Hours. 3 Lab Hours. Computer architecture and design; use of register transfer languages and simulation tools to describe and simulate computer operation; central processing unit organization, microprogramming, input/output and memory system architectures. **Prerequisites:** Grade of C or better in ECEN 248 and CSCE 120; junior or senior classification. **Cross Listing:** ECEN 350/CSCE 350.

CSCE 399 High-Impact Experience

Credits 0. 0 Other Hours. Participation in an approved high-impact learning practice; documentation and self-assessment of learning experience. **Prerequisite:** Junior or senior classification; also taught at Galveston campus.

CSCE 402 Law and Policy in Cybersecurity

Credits 3. 3 Lecture Hours. Examination of law and policy issues related to cybersecurity for the spectrum of cybersecurity jobs; includes procurement, operations and maintenance, governance and oversight, protection and defense, analysis, intelligence collection and operation and investigation cybersecurity jobs. **Prerequisites:** Junior or senior classification; MARA-403 taught at Galveston campus. **Cross Listing:** MARA 403 and CYBR 402.

CSCE 410 Operating Systems

Credits 3. 3 Lecture Hours. Hardware/software evolution leading to contemporary operating systems; basic operating systems concepts; methods of operating systems design and construction including algorithms for CPU scheduling, memory and general resource allocation, process coordination and management; case studies of several operating systems. **Prerequisites:** Grade of C or better in CSCE 313; grade of C or better in CSCE 315 or CSCE 331.

CSCE 411 Design and Analysis of Algorithms

Credits 3. 3 Lecture Hours. Study of computer algorithms for numeric and non-numeric problems; design paradigms; analysis of time and space requirements of algorithms; correctness of algorithms; NP-completeness and undecidability of problems. **Prerequisite:** Grade of C or better in CSCE 221 and CSCE 222/ECEN 222; junior or senior classification or approval of instructor.

CSCE 412 Cloud Computing

Credits 3. 3 Lecture Hours. Operating system and distributed systems fields that form the basis of cloud computing such as virtualization, key-value storage solutions, group membership, failure detection, peer to peer systems, datacenter networking, resource management and scalability; popular frameworks such as MapReduce and HDFS and case studies on failure determination. **Prerequisite:** Grade of C or better in CSCE 315 or CSCE 331.

CSCE 416/ECEN 416 Hardware Design Verification

Credits 3. 3 Lecture Hours. Hardware functional verification; case studies on verification in integrated circuit design; introduction to industry best practices; introduction to logic functional verification. **Prerequisites:** CSCE 312, CSCE 350/ECEN 350, or ECEN 350/CSCE 350, or equivalent in computer architecture; familiarity with C/C++/Verilog/VHDL programming. **Cross Listing:** ECEN 416/CSCE 416.

CSCE 420 Artificial Intelligence

Credits 3. 3 Lecture Hours. Fundamental concepts and techniques of intelligent systems; representation and interpretation of knowledge on a computer; search strategies and control; active research areas and applications such as notational systems, natural language understanding, vision systems, planning algorithms, intelligent agents and expert systems. **Prerequisite:** CSCE 411 or approval of instructor.

CSCE 421 Machine Learning

Credits 3. 3 Lecture Hours. Theoretical foundations of machine learning, pattern recognition and generating predictive models and classifiers from data; includes methods for supervised and unsupervised learning (decision trees, linear discriminants, neural networks, Gaussian models, non-parametric models, clustering, dimensionality reduction, deep learning), optimization procedures and statistical inference. **Prerequisite:** Grade of C or better in MATH 304, MATH 311, or MATH 323; Grade of C or better in STAT 211, and STAT 404 or CSCE 221, or ECEN 303, and CSCE 121 or CSCE 120. **Cross Listing:** ECEN 427 and STAT 421.

CSCE 426/ECEN 426 Security of Embedded Systems

Credits 3. 3 Lecture Hours. Security principles; common security features and flaws in day-to-day embedded systems; security analysis, vulnerability exploits and security fixes for embedded systems.

Prerequisite: Grade of C or better in ECEN 350/CSCE 350, CSCE 350/ECEN 350, or CSCE 312; junior or senior classification. **Cross Listing:** ECEN 426/CSCE 426.

CSCE 429 Software Development, Globalization and Culture Abroad

Credits 3. 3 Lecture Hours. Software development cycle; software outsourcing model, execution and practices; software industries on products, services and consultancy; software globalization; and offshore development culture; travel abroad required. **Prerequisite:** CSCE 315 or approval of instructor.

CSCE 430 Problem Solving Programming Strategies

Credits 3. 2 Lecture Hours. 3 Lab Hours. Methods for analyzing fundamental programming problems from a variety of domains and implementing solutions quickly and efficiently; problems based on competitive programming contests to develop skills in problem analysis, coding and testing; solving problems will involve identifying and applying a range of algorithmic solutions; includes dealing with combinatorics, dynamic programming, graphs, numerical calculations, string processing and geometry, along with other specialized algorithms. **Prerequisites:** CSCE 411 or approval of instructor.

CSCE 431 Software Engineering

Credits 3. 2 Lecture Hours. 2 Lab Hours. Application of engineering approach to computer software design and development; life cycle models, software requirements and specification; conceptual model design; detailed design; validation and verification; design quality assurance; software design/development environments and project management. **Prerequisite:** Grade of C or better in CSCE 315 or CSCE 331 or approval of instructor.

CSCE 432 Accessible Computing

Credits 3. 3 Lecture Hours. Exploration of the characteristics of traditionally disenfranchised user populations due to disability including discrimination; universal design concepts; exploration of ethical and legal motivations for creating accessible technology; development, evaluation, design, and implementation of equitable and inclusive software and computer based solutions; study of multiple existing accessibility standards. **Prerequisite:** Grade of C or better in CSCE 315 or CSCE 331.

CSCE 433 Formal Languages and Automata

Credits 3. 3 Lecture Hours. Basic types of abstract languages and their acceptors; the Chomsky hierarchy; solvability and recursive function theory; application of theoretical results to practical problems. **Prerequisite:** CSCE 315 or CSCE 331 or approval of instructor.

CSCE 434 Compiler Design

Credits 3. 3 Lecture Hours. Programming language translation; functions and general organization of compiler design and interpreters; theoretical and implementation aspects of lexical scanners; parsing of context free languages; code generation and optimization; error recovery.

Prerequisite: Grade of C or better in CSCE 315 or CSCE 331.

CSCE 435 Parallel Computing

Credits 3. 3 Lecture Hours. Overview of parallel computing technology and programming methods; includes multiprocessor architectures, programming tools, parallel performance, parallel algorithms, and applications of parallel computing. **Prerequisite:** Grade of C or better in CSCE 315 or CSCE 331; junior or senior classification or approval of instructor.

CSCE 436 Computer-Human Interaction

Credits 3. 3 Lecture Hours. Comprehensive study of the Computer-Human Interaction (CHI) area; includes history and importance of CHI; CHI design theories; modeling of computer users and interfaces; empirical techniques for task analysis and interface design; styles of interaction and future directions of CHI including hypermedia and computer-supported collaborative work. **Prerequisites:** Grade of C or better in CSCE 315 or CSCE 331 or concurrent enrollment; or approval of instructor.

CSCE 438 Distributed Systems

Credits 3. 3 Lecture Hours. Principles and techniques for engineering distributed systems with topics including communication, concurrency, programming paradigms, naming, managing shared state, caching, synchronization, reaching agreement, fault tolerance, security, middleware and distributed applications; design, implement and debug large software systems. **Prerequisite:** CSCE 313; junior or senior classification, or approval of instructor.

CSCE 439 Data Analytics for Cybersecurity

Credits 3. 3 Lecture Hours. Theoretical foundations, algorithms and methods of data analytics for cybersecurity; study of data analytics including cluster analysis, supervised machine learning, anomaly detection, and visualization applied to cyber attacks, anomaly detection, vulnerability analysis, strategic manipulation, propaganda and other topics. **Prerequisites:** Grade of C or better in CSCE 221; grade of C or better in ECEN 303, STAT 211, STAT 301, STAT 302, or STAT 303.

CSCE 440 Quantum Algorithms

Credits 3. 3 Lecture Hours. Introduction to the design and analysis of quantum algorithms; basic principles of the quantum circuit model; gives a gentle introduction to basic quantum algorithms; reviews recent results in quantum information processing. **Prerequisites:** Grade of C or better in CSCE 315 or CSCE 331 or approval of instructor.

CSCE 441 Computer Graphics

Credits 3. 3 Lecture Hours. Principles of interactive computer graphics; 2-D and 3-D rendering pipelines, including geometric object and view transformations, projections, hidden surface removal, and rasterization; lighting models for local and global illumination; hierarchical models of 3-D objects; systems and libraries supporting display and user interaction.

Prerequisite: CSCE 221; junior or senior classification or approval of instructor.

CSCE 442 Scientific Programming

Credits 3. 3 Lecture Hours. Introduction to numerical algorithms fundamental to scientific and engineering applications of computers; elementary discussion of error; algorithms, efficiency; polynomial approximations, quadrature and systems of algebraic and differential equations. **Prerequisites:** CSCE 221 with a grade of C or better; MATH 304 or MATH 308 or concurrent enrollment.

CSCE 443/VIST 487 Game Development

Credits 3. 2 Lecture Hours. 2 Lab Hours. Aesthetic and technical aspects of computer game development, including game mechanics, story development, content creation and game programming; includes game design, interface design, 3D modeling and animation, graphics algorithms, shader programming and artificial intelligence; group project includes the design and development of a game from start to finish.

Prerequisites: Grade of C or better in VIST 386 or CSCE 441, or approval of instructor. **Cross Listing:** VIST 487/CSCE 443.

CSCE 444 Structures of Interactive Information

Credits 3. 2 Lecture Hours. 2 Lab Hours. A systems approach to the programming, design, authoring and theory of hypermedia; object-oriented visual and interactive programming; visual design, including color, space, text and layering; the reference as a metadisciplinary structure; collecting and sampling; ontologies, maps and navigation as means of structuring information; create dynamic hypermedia that is expressive and interpretive. **Prerequisite:** CSCE 315 or approval of instructor.

CSCE 445 Computers and New Media

Credits 3. 3 Lecture Hours. Potential and realized impact of computers in the design of new media; relationship between authors and readers of interactive material; influence of media design on the content expressed. **Prerequisite:** CSCE 221 or approval of instructor.

CSCE 446/VIST 477 Virtual Reality

Credits 3. 2 Lecture Hours. 2 Lab Hours. Theory and practice of virtual reality; interactive 3D virtual environments; input/output devices, 3D interaction techniques, augmented reality, role of realism in VR, navigation techniques, design guidelines and evaluation methods.

Prerequisite: Grade of C or better in VIST 272, CSCE 221, or CSCE 441.

Cross Listing: VIST 477/CSCE 446.

CSCE 447/VIST 476 Data Visualization

Credits 3. 3 Lecture Hours. Visual representation and design of data and information; 3D visualization, infographics, data narratives, principles of visual data encoding and interaction techniques. **Prerequisite:** Grade of C or better in VIST 272, or CSCE 221, or CSCE 441. **Cross Listing:** VIST 476/CSCE 447.

CSCE 448 Computational Photography

Credits 3. 3 Lecture Hours. Cameras and the image formation process; basic image and video processing tools like sampling, filtering and pyramids; several image-based algorithms, including panorama creation, lightfields, image retargeting, high dynamic range imaging and texture synthesis. **Prerequisite:** CSCE 315 or CSCE 331; MATH 304 or MATH 311.

CSCE 449 Applied Cryptography

Credits 3. 3 Lecture Hours. Applied cryptography; secure multi-party computations; zero knowledge proofs; blockchain and machine learning. **Prerequisite:** CSCE 221.

CSCE 450 Computer Animation

Credits 3. 3 Lecture Hours. Investigation of computational problems in computer animation; study of the mathematical and algorithmic foundations behind various techniques used for computer animation for real-time and offline use. **Prerequisite:** Grade of C or better in CSCE 315 or CSCE 331; grade of C or better in or concurrent enrollment in CSCE 441.

CSCE 451 Software Reverse Engineering

Credits 3. 2 Lecture Hours. 2 Lab Hours. Overview of the compilation mechanism to generate executable files and raw binary codes from source codes; executable file formats for an operating system to run the binary code; disassembly algorithms and control graph analysis; static and dynamic analyses; case studies on code obfuscation, codebreaking, malware analysis. **Prerequisite:** Grade of C or better in CSCE 313 or approval of instructor.

CSCE 452 Robotics and Spatial Intelligence

Credits 3. 3 Lecture Hours. Algorithms for executing spatial tasks; path planning and obstacle avoidance in two- and three-dimensional robots—configuration space, potential field, free-space decomposition methods; stable grasping and manipulation; dealing with uncertainty; knowledge representation for planning—geometric and symbolic models of the environment; task-level programming; learning. **Prerequisite:** CSCE 315 or CSCE 331; MATH 304 or MATH 311.

CSCE 461/BMEN 428 Embedded Systems for Medical Applications

Credits 3. 2 Lecture Hours. 3 Lab Hours. Principles of embedded system architecture and programming; fundamentals and theoretical foundations of wireless communication systems; hands-on experiences of how an embedded system could be used to solve problems in biomedical engineering; projects on wireless sensors and imaging for medical devices. **Prerequisite:** Grade of C or better in BMEN 321, CSCE 350/ECEN 350, or CSCE 315, or approval of instructor. **Cross Listing:** BMEN 428/CSCE 461.

CSCE 462 Microcomputer Systems

Credits 3. 2 Lecture Hours. 1 Lab Hour. Microcomputers as components of systems; VLSI processor and coprocessor architectures, addressing and instruction sets; I/O interfaces and supervisory control; VLSI architectures for signal processing; integrating special purpose processors into a system. **Prerequisite:** CSCE 313.

CSCE 463 Networks and Distributed Processing

Credits 3. 3 Lecture Hours. Basic hardware/software, architectural components for computer communications; computer networks, switching, routing, protocols and security; multiprocessing and distributed processing; interfacing operating systems and networks; case studies of existing networks and network architectures. **Prerequisite:** CSCE 313 or approval of instructor.

CSCE 464 Wireless and Mobile Systems

Credits 3. 3 Lecture Hours. Introduction to wireless and mobile systems; wireless communication fundamentals; wireless medium access control design; transmission scheduling, network and transport protocols over wireless design, simulation and evaluation; wireless capacity; telecommunication systems; vehicular, adhoc, and sensor network systems; wireless security; mobile applications. **Prerequisites:** CSCE 313; junior or senior classification or approval of instructor.

CSCE 465 Computer and Network Security

Credits 3. 3 Lecture Hours. Fundamental concepts and principles of computer security, operating system and network security, secret key and public key cryptographic algorithms, hash functions, authentication, firewalls and intrusion detection systems, IPSec and VPN, wireless and web security. **Prerequisites:** Grade of C or better in CSCE 315 or CSCE 331, and CSCE 313; junior or senior classification; approval of instructor.

CSCE 469/ECEN 469 Advanced Computer Architecture

Credits 3. 3 Lecture Hours. Advanced computer architectures including memory designs, pipeline techniques, and parallel structures such as vector computers and multiprocessors. **Prerequisite:** Grade of C or better in ECEN 350/CSCE 350 or CSCE 350/ECEN 350; junior or senior classification. **Cross Listing:** ECEN 469/CSCE 469.

CSCE 470 Information Storage and Retrieval

Credits 3. 3 Lecture Hours. Representation of, storage of and access to very large multimedia document collections; fundamental data structures and algorithms of current information storage and retrieval systems and relates various techniques to design and evaluation of complete retrieval systems. **Prerequisite:** Grade of C or better in CSCE 315 or CSCE 331 or approval of instructor.

CSCE 477/CYBR 403 Cybersecurity Risk

Credits 3. 3 Lecture Hours. Risks in cybersecurity; avoidance, acceptance, mitigation, or transference strategies; developing reliable cybersecurity risk assessments to include analysis, categorization, and evaluation; cybersecurity risk audit frameworks. **Prerequisite:** Grade of C or better in CYBR 201/CSCE 201, CSCE 201/CYBR 201, or CSCE 221; junior or senior classification. **Cross Listing:** CYBR 403/CSCE 477.

CSCE 481 Seminar

Credit 1. 1 Lecture Hour. Investigation and report by students on topics of current interest in computer science. **Prerequisite:** Junior or senior classification.

CSCE 482 Senior Capstone Design

Credits 3. 1 Lecture Hour. 6 Lab Hours. Development of system integration skills for solving real-world problems in computer science; significant team software project that uses integration of advanced concepts across computer science specializations; projects require design, implementation, documentation and demonstration, as well as design methodology, management process and teamwork. **Prerequisite:** Grade of C or better in CSCE 411, and CSCE 315 or CSCE 331; senior classification; also taught at Galveston campus.

CSCE 483 Computer Systems Design

Credits 3. 1 Lecture Hour. 6 Lab Hours. Engineering design; working as a design-team member, conceptual design methodology, design evaluations, total project planning and management techniques, design optimization, systems manufacturing costs considerations; emphasis placed upon students' activities as design professionals. **Prerequisites:** Grade of C or better in CSCE 315 or CSCE 331, and CSCE 462 or ECEN 449, and ECEN 325; senior classification.

CSCE 485 Directed Studies

Credits 0 to 6. 0 to 6 Other Hours. Permits work on special project in computer science; project must be approved by the department. **Prerequisite:** Senior classification; also taught at Galveston campus.

CSCE 489 Special Topics in...

Credits 1 to 4. 1 to 4 Other Hours. Special topics in computer science that are new or unique that are not covered in existing courses.

CSCE 491 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in computer science. May be taken four times for credit. **Prerequisites:** Junior or senior classification and approval of instructor.

CULN - Culinology (CULN)

CULN 305 Culinary Health

Credits 4. 3 Lecture Hours. 3 Lab Hours. Integration of nutrition science principles, dietary recommendations, and food and cooking skills to facilitate healthy eating behaviors for health promotion; application to recipe development and modification to meet specific dietary needs and sensory acceptability. **Prerequisites:** NUTR 301; enrollment in culinary health certificate program; junior or senior classification.

CULN 483 Culinary Health Practicum

Credits 2. 5 Lab Hours. Demonstration and application of culinary nutrition skills learned in CULN 305 to prepare and critically evaluate recipes and meals for health promotion and disease prevention interventions; planning and implementation of a culinary nutrition education program. **Prerequisites:** CULN 305; enrollment in culinary health certificate program; junior or senior classification.

CVEN - Civil Engineering (CVEN)

CVEN 207 Introduction to the Civil Engineering Profession

Credits 2. 1 Lecture Hour. 2 Lab Hours. Introduction to the study and practice of civil engineering; specialized subdisciplines of civil engineering; professionalism and professional registration; engineering ethics; exercises in engineering technical communications. **Prerequisite:** Grade of C or better in ENGL 103 or ENGL 104; admitted to major degree sequence in civil engineering.

CVEN 221 Engineering Mechanics: Statics

Credits 3. 2 Lecture Hours. 2 Lab Hours. General principles of mechanics; concurrent force systems; statics of particles; equivalent force/moment systems; centroids and center of gravity; equilibrium of rigid bodies; trusses, frames, and machines; internal forces in structural members; friction; second moments of areas. **Prerequisites:** Grade of C or better in MATH 251 or MATH 253, or concurrent enrollment; grade of C or better in PHYS 206 and ENGR 216/PHYS 216 or PHYS 216/ENGR 216; admitted to major degree sequence in civil engineering.

CVEN 250 Introduction to Graphics and Visualization Applications in Civil Engineering Design

Credits 2. 1 Lecture Hour. 3 Lab Hours. Graphical communication in the civil engineering design process; introduction to industry standard software; construction documents and contract drawings in civil engineering applications; data analysis; introduction to project visualization. **Prerequisites:** Admitted to major degree sequence in civil engineering.

CVEN 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified area of civil engineering. May be repeated for credit. **Prerequisite:** Approval of department head.

CVEN 291 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in civil engineering. May be taken four times for credit. **Prerequisites:** Freshman or sophomore classification or approval of instructor.

CVEN 301/EVEN 301 Environmental Engineering

Credits 3. 3 Lecture Hours. Water quality; material balances; chemical, physical and biological processes; water quality modeling; water and wastewater treatment; air quality; solid and hazardous waste management. **Prerequisites:** Grade of C or better in CHEM 107; Grade of C or better in CVEN 302 and MATH 308, or concurrent enrollment. **Cross Listing:** EVEN 301/ CVEN 301.

CVEN 302 Computer Applications in Engineering and Construction

Credits 3. 3 Lecture Hours. Application of computers to solution of civil engineering problems using various numerical methods; structured computer programming; mathematical modeling and error analysis; solution of algebraic and differential equations; numerical differentiation and integration; curve-fitting; root-finding. **Prerequisites:** Grade of C or better in ENGR 102 and PHYS 206; grade of C or better in MATH 308 or concurrent enrollment; admitted to major degree sequence in civil and environmental engineering.

CVEN 303 Civil Engineering Measurement

Credits 3. 2 Lecture Hours. 3 Lab Hours. Introduction to geodetic positions, datums, map projections; theory of civil engineering measurements and errors applied to horizontal and vertical control, curves, earthwork and mapping using state-of-the-art technology for data capture; processing and presentation of result. **Prerequisite:** Grade of C or better in MATH 151; admitted to major degree sequence in civil engineering.

CVEN 304/EVEN 304 Environmental Engineering Lab

Credit 1. 3 Lab Hours. Environmental measurements on physical, chemical, biological and biotechnological parameters of water.

Prerequisites: CVEN 301/EVEN 301 or EVEN 301/CVEN 301, or concurrent enrollment; CVEN 311/EVEN 311 or concurrent enrollment; or approval of instructor. **Cross Listing:** EVEN 304/CVEN 304.

CVEN 305 Mechanics of Materials

Credits 3. 3 Lecture Hours. Applications of conservation principles and stress/deformation relationships for continuous media to structural members; axially loaded members; thin-walled pressure vessels; torsional and flexural members; shear; moment; deflection of members; combined loadings; stability of columns; nonsymmetrical bending, shear center; indeterminate members; elastic foundations. **Prerequisites:** Grade of C or better in CVEN 221, MEEN 221 or MEEN 225; also taught at Qatar campus.

CVEN 306 Materials Engineering for Civil Engineers

Credits 3. 2 Lecture Hours. 2 Lab Hours. Scientific concepts of civil engineering materials; relationship between macroscopic material properties and response and microscopic properties; physical, mechanical, surface, fracture, and rheological properties of civil engineering materials including metals, composites, and polymers.

Prerequisites: Grade of C or better in CHEM 107 and CVEN 221; grade of C or better in PHYS 207, and ENGR 217/PHYS 217 or PHYS 217/ENGR 217; grade of C or better in CVEN 305 and MATH 308, or concurrent enrollment.

CVEN 307 Transportation Engineering

Credits 3. 3 Lecture Hours. Fundamental principles and methods in planning, design, and operation of transportation systems; driver and vehicle performance capabilities; highway geometric and pavement design principles; traffic analysis and transportation planning.

Prerequisites: Grade of C or better in PHYS 206 and STAT 211.

CVEN 311/EVEN 311 Fluid Dynamics

Credits 3. 3 Lecture Hours. Fluid properties; statics; kinematics; basic conservation principles of continuity, energy and momentum; similitude and hydraulic models; incompressible flow in pipes; fluid dynamic drag.

Prerequisites: Grade of C or better in MATH 251 or MATH 253; grade of C or better in CVEN 221; grade of C or better in CVEN 302, or concurrent enrollment; also taught at Galveston campus. **Cross Listing:** EVEN 311/CVEN 311.

CVEN 314 Sensor Technology in Civil Engineering

Credits 2. 2 Lecture Hours. Fundamentals of sensor technology and its application in civil engineering; investigation of data acquisition systems and sensors used in the civil engineering field; examples and hands-on demonstrations relevant to the natural and built environment.

Prerequisite: Grade of C or better in CVEN 302, or approval of instructor.

CVEN 315 Sensor Technology for the Built Environment

Credits 3. 2 Lecture Hours. 3 Lab Hours. Fundamentals of sensor technology including laboratory safety, error analysis, statistical analysis, electric circuits, data acquisition, signal conditioning, signal analysis, strain gages, laser technology, image acquisition and analysis, fiber optic sensors, wireless sensors; its applications in civil engineering; and hands-on demonstrations relevant to the natural and built environment.

Prerequisites: Grade of C or better in CVEN 302, junior or senior classification, or approval of instructor.

CVEN 322 Civil Engineering Systems

Credits 3. 3 Lecture Hours. Fundamentals of engineering economics; economic analysis and evaluation of engineering projects; application of systems analysis to civil engineering problems; optimization modeling and solution techniques; introduction to sustainability; simulation and statistical methods. **Prerequisites:** Grade of C or better in ENGR 102; grade of C or better in MATH 251 or MATH 253; grade of C or better in STAT 211 or concurrent enrollment; admitted to major degree sequence in civil or environmental engineering or approval of instructor.

CVEN 336 Fluid Dynamics Laboratory

Credit 1. 2 Lab Hours. Basic fluid mechanics instrumentation; flow visualization and measurements; experimental verification and reinforcement of the principles and concepts introduced in CVEN 311/EVEN 311 and EVEN 311/CVEN 311. **Prerequisites:** Grade of C or better in CVEN 311/EVEN 311 or EVEN 311/CVEN 311, or concurrent enrollment.

CVEN 339/EVEN 339 Water Resources Engineering

Credits 3. 3 Lecture Hours. Quantitative hydrology, precipitation, hydrograph analysis, reservoir and stream routing; groundwater, Darcy equation, well equation, well design; probability concepts in design; water law; dams; reservoirs; spillways; open channel and pipe network hydraulics; pumps; urban stormwater drainage; flood damage mitigation.

Prerequisite: Grade of C or better in CVEN 311/EVEN 311 or EVEN 311/CVEN 311. **Cross Listing:** EVEN 339/CVEN 339.

CVEN 342 Materials of Construction

Credits 3. 2 Lecture Hours. 3 Lab Hours. Physical, mechanical and rheological properties and behavior of components and composite construction materials including aggregates, Portland cement concrete, bituminous materials, wood and masonry; production processes and proportioning of composite construction materials used in civil engineering. **Prerequisites:** Grade of C or better in CVEN 302 or concurrent enrollment; grade of C or better in CVEN 305 and CVEN 306; grade of C or better in CVEN 207, ENGL 210, or COMM 205; or approval of instructor.

CVEN 343 Portland Cement Concrete Materials for Civil Engineers

Credits 3. 2 Lecture Hours. 3 Lab Hours. Physical and chemical characteristics of Portland cement concrete systems; constituent materials; mixture proportioning; fresh concrete characteristics; hardened concrete properties; durability characteristics; and concrete construction methods. **Prerequisites:** Grade of C or better in CVEN 302 or concurrent enrollment; grade of C or better in CVEN 305 and CVEN 306; grade C or better CVEN 207, ENGL 210, or COMM 205; or approval of instructor.

CVEN 345 Theory of Structures

Credits 3. 3 Lecture Hours. Structural engineering—functions of structure, design loads, reactions and force systems; analysis of statically determinate structures including beams, trusses and arches; energy methods of determining deflections of structures; influence lines and criteria for moving loads; analysis of statically indeterminate structures including continuous beams and frames. **Prerequisites:** Grade of C or better in CVEN 221 and CVEN 305; grade of C or better in CVEN 302 or concurrent enrollment; also taught at Galveston campus.

CVEN 349 Civil Engineering Project Management

Credits 3. 3 Lecture Hours. Basic elements of management of civil engineering projects; roles of all participants in the process—owners, designers, contractors and suppliers; emphasis on contractual aspect of the process—project estimating, planning and controls. **Prerequisites:** Grade of C or better in CVEN 322, or concurrent enrollment; or approval of instructor.

CVEN 363 Engineering Mechanics: Dynamics

Credits 3. 2 Lecture Hours. 2 Lab Hours. Application of first principles to model dynamic particles and rigid body systems with ordinary differential equations; solutions to models using analytical and numerical approaches; interpreting solutions/performance measures; linear vibrations; modeling of civil engineering systems and evaluating dynamic response to natural hazards. **Prerequisites:** Grade of C or better in CVEN 302, CVEN 305 and MATH 308.

CVEN 365 Introduction to Geotechnical Engineering

Credits 3. 2 Lecture Hours. 3 Lab Hours. Physical properties of soils, classification systems, soil exploration, permeability, consolidation, compaction, and shear strength; laboratory tests conducted to determine the physical and engineering soil properties needed for application in geotechnical engineering design. **Prerequisites:** Grade of C or better in CVEN 302 or concurrent enrollment; grade of C or better in CVEN 305; grade of C or better in CVEN 207, ENGL 210, or COMM 205.

CVEN 399 Mid-Curriculum Professional Development

Credits 0. 0 Lecture Hours. 0 Lab Hours. 0 Other Hours. No Credit. Participation in an approved high-impact learning practice; reflection on professional outcomes from civil engineering body of knowledge; documentation of experience appropriate to eventual professional licensure; self-assessment of learning at mid-curriculum point. **Prerequisites:** Grade of C or better in CVEN 207, CVEN 250, CVEN 303, CVEN 306, CVEN 311/EVEN 311, CVEN 322, CVEN 345; grade of C or better in CVEN 363, CVEN 342, CVEN 343, or CVEN 365.

CVEN 400 Design Problems in Civil Engineering

Credits 3. 2 Lecture Hours. 3 Lab Hours. Applications of civil engineering principles to the design and preparation of the plans and specifications of civil engineering projects. **Prerequisite:** Grade of C or better in CVEN 303, CVEN 322, CVEN 345 and CVEN 399; Grade of C or better in CVEN 304/EVEN 304, CVEN 336, CVEN 342, CVEN 343 or CVEN 365; Grade of C or better in CVEN 402/EVEN 402, CVEN 418, CVEN 435, CVEN 444, CVEN 446, CVEN 455, CVEN 457, CVEN 458/EVEN 458, CVEN 462/EVEN 462, CVEN 465 or CVEN 473; senior classification; or approval of instructor.

CVEN 402/EVEN 402 Engineered Environmental Systems

Credits 3. 3 Lecture Hours. Unit operations and processes in environmental engineering; physical, chemical and biological treatment of water and wastewater; treatment system analysis and design. **Prerequisite:** Grade of C or better in CVEN 301/EVEN 301 or EVEN 301/CVEN 301. **Cross Listing:** EVEN 402/CVEN 402.

CVEN 403 Applied Civil Engineering Surveying

Credits 2. 6 Lab Hours. Application of land surveying principles; topographic surveying, boundary surveying, and construction staking through field exercises using state-of-the-art equipment and data capture/analysis techniques; preparation of topographic and boundary maps with related documents; presentation of results. **Prerequisites:** Grade of C or better in CVEN 303; junior or senior classification.

CVEN 405 Construction Management of Field Operations

Credits 3. 3 Lecture Hours. Effects of industrialization on construction methods and resultant construction management problems. **Prerequisite:** Grade of C or better in CVEN 349.

CVEN 406/EVEN 406 Environmental Protection and Public Health

Credits 3. 3 Lecture Hours. Communicable and noncommunicable diseases; environmental risk assessment; environmental assessments; comprehensive environmental planning; small water and wastewater systems; solid waste management; hazardous spills and waste management; vector control; environmental administration. **Prerequisite:** Grade of C or better in CVEN 301/EVEN 301 or EVEN 301/CVEN 301; or approval of instructor. **Cross Listing:** EVEN 406.

CVEN 413/EVEN 413 Natural Environmental Systems

Credits 3. 3 Lecture Hours. Water quality assessment of natural environmental systems; development and calibration of models to describe fate and transport of contaminants in aquatic systems; application of models to design of water quality control facilities. **Prerequisite:** Grade of C or better in EVEN 301/CVEN 301 or CVEN 301/EVEN 301. **Cross Listing:** EVEN 413/CVEN 413.

CVEN 417 Bituminous Materials

Credits 3. 2 Lecture Hours. 3 Lab Hours. Origin, production, specifications and tests of bituminous materials and mixtures used in flexible pavements including mix design, construction, maintenance and quality assurance processes. **Prerequisite:** Senior classification in engineering; grade of C or better in CVEN 342 or CVEN 343 or approval of instructor.

CVEN 418 Highway Materials and Pavement Design

Credits 3. 3 Lecture Hours. Theory and practice in pavement design; pavement performance; structural design of pavement layers; types of materials used in pavement layers; characterization of pavement layer materials; introduction to pavement management concepts.

Prerequisites: Grade of C or better in CVEN 307; grade of C or better in CVEN 342 or CVEN 343.

CVEN 423 Geomatics for Civil Engineering

Credits 3. 2 Lecture Hours. 3 Lab Hours. Use of GIS, GPS, Survey and Remotely-sensed data integrated with predictive models for infrastructure management systems. **Prerequisite:** Grade of C or better in CVEN 303 or EVEN 339/CVEN 339; or approval of instructor.

CVEN 424 Civil Engineering Professional Practice

Credits 2. 1 Lecture Hour. 2 Lab Hours. Professional practice issues; current civil engineering issues that impact design, construction, and operation of the civil engineer facilities; developing engineering solutions that better serve society; business and public policy concerns; life-long learning; problem solving; professional licensure. **Prerequisites:** Grade of C or better in CVEN 322; satisfactory grade in CVEN 399; senior classification in civil engineering.

CVEN 435 Geotechnical Engineering Design

Credits 3. 2 Lecture Hours. 3 Lab Hours. A design course covering prediction of settlement, analysis of the stability of slopes, prediction of bearing capacity of shallow and deep foundations and determination of earth pressures acting on retaining structures; a general course in geotechnical engineering design for undergraduates and for graduate students not primarily interested in the geotechnical field, but desiring additional study beyond the introductory undergraduate level.

Prerequisite: Grade of C or better in CVEN 365.

CVEN 436 Case Histories in Geotechnical Engineering

Credits 3. 2 Lecture Hours. 2 Lab Hours. Examination of geotechnical problems through the use of case studies associated with foundations, waste disposal, slope stability, retaining structures, soil improvement and other civil engineering works. **Prerequisite:** Grade of C or better in CVEN 365.

CVEN 444 Structural Concrete Design

Credits 3. 3 Lecture Hours. Behavior, design, and detailing of reinforced concrete structural members according to the ACI Building Code Requirements; design for ultimate limit states (flexure, shear, and axial loads) and serviceability requirements (cracking and deflection); applications include continuous beams and moment frames.

Prerequisites: Grade of C or better in CVEN 345; grade of C or better in CVEN 342 or CVEN 343, or concurrent enrollment.

CVEN 445 Matrix Methods of Structural Analysis

Credits 3. 2 Lecture Hours. 2 Lab Hours. Analysis of framed structures using linear algebra concepts; matrix algebra and solution of linear algebraic equations; energy principles and virtual work; stiffness; coordinate transformations; use of commercial software for structural analysis. **Prerequisites:** Grade of C or better in CVEN 345 and CVEN 363.

CVEN 446 Structural Steel Design

Credits 3. 3 Lecture Hours. Design of structural steel elements found in building structures, including tension members, compression members, beams, beam-columns and base plates; design of bolted and welded simple connections; design of bolted eccentric connections; design of bolted and welded partially and fully restrained connections. **Prerequisite:** Grade of C or better in CVEN 345; also taught at Galveston campus.

CVEN 449 Visualization and Building Information Modeling in Structural Engineering Design

Credit 1. 1 Lecture Hour. Graphical communication in the structural engineering design process; introduction to Building Information Modeling (BIM); construction documents and contract drawings in structural engineering applications, data analysis and project visualization. **Prerequisites:** Grade of C or better in CVEN 250 and CVEN 345.

CVEN 450 AutoCAD in Civil Engineering

Credit 1. 3 Lab Hours. Review and application of basic commands and operations in AutoCAD; overview of civil engineering design projects and land surveying; use of AutoCAD Civil 3D or proprietary packages for reduction of land surveying data. **Prerequisites:** Grade of C or better in CVEN 250; junior or senior classification.

CVEN 451 Public Works Engineering

Credits 3. 3 Lecture Hours. Public works engineering; service demand estimates; water, wastewater and solid waste collection systems; urban drainage; code enforcement and public decision making. **Prerequisites:** Grade of C or better in CVEN 301/EVEN 301 or EVEN 301/CVEN 301; grade of C or better in CVEN 339/EVEN 339 or EVEN 339/CVEN 339.

CVEN 454 Urban Planning for Engineers

Credits 3. 2 Lecture Hours. 3 Lab Hours. Urban planning from an engineering point of view; determinants of land use patterns, planning data collection and analysis; location and design requirements for various land uses; interrelationship of transportation and land use; and methods of plan development. **Prerequisite:** Grade of C or better in CVEN 307.

CVEN 455 Urban Stormwater Management

Credits 3. 3 Lecture Hours. Hydrologic, hydraulic, and general civil engineering design and implementation of stormwater systems including drainage and detention storage facilities, floodplain regulation measures, and flood control structures; stormwater aspects of land development and public works engineering; flood hydrology and hydraulics; institutional aspects of urban stormwater management. **Prerequisite:** Grade of C or better in CVEN 339/EVEN 339 or approval of instructor.

CVEN 456 Highway Design

Credits 3. 2 Lecture Hours. 3 Lab Hours. Theory and practice in highway design; highway classification and design criteria, location studies, design of vertical and horizontal alignment, cross section, pavement, intersections and highway drainage elements. **Prerequisites:** Grade of C or better in CVEN 307; satisfactory grade in CVEN 399; grade of C or better in CVEN 342 or CVEN 343; grade of C or better in CVEN 418, CVEN 444 or CVEN 457; senior classification; or approval of instructor.

CVEN 457 Urban Traffic Facilities

Credits 3. 3 Lecture Hours. Driver, vehicle and roadway characteristics related to design and operation of traffic facilities; selection and design of traffic control devices and information systems for streets and highways; accident analysis and tort liability related to traffic engineering. **Prerequisite:** Grade of C or better in CVEN 307.

CVEN 458/EVEN 458 Hydraulic Engineering of Water Distribution Systems

Credits 3. 3 Lecture Hours. Pressure conduit hydraulics; design, modeling, and analysis of water conveyance and distribution systems including pipelines, pipe networks, and pumps. **Prerequisite:** Grade of C or better in CVEN 339/EVEN 339 or EVEN 339/CVEN 339 or approval of instructor. **Cross Listing:** EVEN 458/CVEN 458.

CVEN 462/EVEN 462 Engineering Hydrogeology

Credits 3. 3 Lecture Hours. Groundwater in the hydrologic cycle; aquifer properties; well hydraulics, testing, and design; groundwater quality; and groundwater management and sustainability. **Prerequisites:** Grade of C or better in CVEN 311/EVEN 311 or EVEN 311/CVEN 311; Grade of C or better in CVEN 301/EVEN 301, EVEN 301/CVEN 301, CVEN 339/EVEN 339, or EVEN 339/CVEN 339; junior or senior classification; or approval of instructor. **Cross Listing:** EVEN 462/CVEN 462.

CVEN 463/EVEN 463 Engineering Hydrology

Credits 3. 3 Lecture Hours. Occurrence, distribution and properties of natural waters of the earth; measurement and engineering analysis of hydrologic phenomena including precipitation, streamflow and groundwater, hydrologic design of water resources development and management projects. **Prerequisite:** Grade of C or better in CVEN 339/EVEN 339 or EVEN 339/CVEN 339. **Cross Listing:** EVEN 463/CVEN 463.

CVEN 464 Environmental Fluid Mechanics

Credits 3. 3 Lecture Hours. Examination of fluid and mass transport in naturally occurring flows; includes Navier-Stokes equations; molecular and turbulent diffusion; advective, reacting transport equation; dispersion; river, lake, estuary and atmospheric mixing; dissolution boundary layers; wastewater outfalls; introduction to environmental quality numerical modeling. **Prerequisites:** Grade of C or better in CVEN 311/EVEN 311, or approval of instructor.

CVEN 465 Coastal Resilience

Credits 3. 3 Lecture Hours. Mechanics of wave motion, coastal water level fluctuations, wave transformation, coastal processes, wave forecasting, coastal structures, and coastal development and management, planning and design of coastal engineering projects. **Prerequisites:** Grade of C or better in CVEN 311/EVEN 311 or EVEN 311/CVEN 311, or approval of instructor.

CVEN 473 Engineering Project Estimating and Planning

Credits 3. 2 Lecture Hours. 3 Lab Hours. Application of cost estimating and planning techniques for civil engineering projects; introduction to labor, materials and equipment costing; productivity analysis; indirect and general overhead costs; preparation of approximate and definitive estimates; and integration of time/cost relationships through critical path method and resource leveling. **Prerequisites:** Grade of C or better in CVEN 349; senior classification.

CVEN 483 Analysis and Design of Structures

Credits 3. 2 Lecture Hours. 3 Lab Hours. Overall procedure of analysis and design including functions, loads, layouts of force systems; analysis, specifications, cost comparisons, and maintenance as applied to typical building structures. **Prerequisites:** Grade of C or better in CVEN 365 or concurrent enrollment; satisfactory grade in CVEN 399; grade of C or better in CVEN 444 and CVEN 446; senior classification; or approval of instructor.

CVEN 485 Directed Studies

Credits 0 to 3. 0 to 3 Other Hours. Research and design problems of limited scope approved on an individual basis intended to promote independent study; results of study presented in writing. **Prerequisite:** Approval of department head.

CVEN 489 Special Topics in...

Credits 1 to 4. 0 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified area of civil engineering. May be repeated for credit. **Prerequisite:** Approval of department head.

CVEN 491 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty members in civil engineering. May be taken three times for credit. **Prerequisites:** Junior or senior classification and approval of instructor.

CYBR - Cybersecurity (CYBR)

CYBR 201/CSCE 201 Fundamentals of Cybersecurity

Credits 3. 3 Lecture Hours. Basic terminology, concepts, technology, and trends of cybersecurity; foundations of cybersecurity to include cryptography, public key infrastructure, standards and protocols, physical security, network fundamentals; workings of systems, networks, infrastructure; legal and ethical issues in cybersecurity. **Cross Listing:** CSCE 201/CYBR 201.

CYBR 285 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Directed individual study in cybersecurity. May be repeated for credit.

CYBR 289 Special Topics in...

Credits 0 to 4. 0 to 4 Other Hours. Selected topics in an identified area of cybersecurity. May be repeated for credit.

CYBR 291 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in cybersecurity topics. May be repeated for credit.

CYBR 402 Law and Policy in Cybersecurity

Credits 3. 3 Lecture Hours. Examination of law and policy issues related to cybersecurity for the spectrum of cybersecurity jobs; includes procurement, operations and maintenance, governance and oversight, protection and defense, analysis, intelligence collection and operation and investigation cybersecurity jobs. **Prerequisites:** Junior or senior classification; MARA-403 taught at Galveston campus. **Cross Listing:** CSCE 402 and MARA 403.

CYBR 403/CSCE 477 Cybersecurity Risk

Credits 3. 3 Lecture Hours. Risks in cybersecurity; avoidance, acceptance, mitigation, or transference strategies; developing reliable cybersecurity risk assessments to include analysis, categorization, and evaluation; cybersecurity risk audit frameworks. **Prerequisite:** Grade of C or better in CYBR 201/CSCE 201, CSCE 201/CYBR 201, or CSCE 221; junior or senior classification. **Cross Listing:** CSCE 477/CYBR 403.

CYBR 405 Applied Digital Forensics and Incident Response

Credits 3. 3 Lecture Hours. Collection of digital evidence; digital evidence analytics; analysis of log data; malware triage; recover damaged digital evidence; write technical reports on malware and incidents; legal and ethical components of digital forensic science. **Prerequisites:** Junior or senior classification.

CYBR 466/ECEN 466 Unconditionally Secure Electronics

Credits 3. 3 Lecture Hours. Data security; cryptography; key exchange; conditional security; unconditional (information-theoretic) security; quantum key distribution; the Kirchhoff-law-Johnson-noise (KLJN) key exchange, electronic noise; advanced issues of KLJN; schemes, protocols, attacks, defense, privacy amplification, credit cards, PUF, autonomous vehicles and smart grids. **Prerequisites:** Grade of C or better in ECEN 214; grade of C or better in ECEN 303 or STAT 211; junior or senior classification. **Cross Listing:** ECEN 466/CYBR 466.

CYBR 484 Professional Internship

Credits 0 to 6. 0 to 6 Other Hours. Directed internship in an organization to provide students with a learning experience supervised by professionals in organizational settings appropriate to the student's professional objectives.

CYBR 485 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Directed individual study in cybersecurity. May be repeated for credit.

CYBR 489 Special Topics in...

Credits 0 to 4. 0 to 4 Other Hours. Selected topics in an identified area of cybersecurity. May be repeated for credit.

CYBR 491 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in cybersecurity topics. May be repeated for credit.

DAEN - Data Engineering (DAEN)

DAEN 210 Uncertainty Modeling

Credits 3. 3 Lecture Hours. Models and methods for exploration of data based on probability and statistics; random variables, expectation, data collection, distribution fitting, goodness of fit tests, point estimates and interval estimates and central limit theorem. **Prerequisite:** Grade of C or better STAT 211.

DAEN 300 Data Engineering Coding Experience I

Credit 1. 0 Lecture Hours. 3 Lab Hours. Application of computational tools to model and solve data engineering problems primarily involving machine learning and optimization techniques. **Prerequisite:** Grade of C or better in ECEN 360; concurrent enrollment in DAEN 321 and DAEN 331; junior or senior classification.

DAEN 301 Data Engineering Coding Experience II

Credit 1. 0 Lecture Hours. 3 Lab Hours. Application of computational tools to model and solve data engineering problems involving stochastic systems, reinforcement learning, ensemble learning and data visualization. **Prerequisites:** Grade of C or better in DAEN 300; concurrent enrollment in DAEN 323 and DAEN 328; junior or senior classification.

DAEN 321 Quantitative Models for Statistical and Machine Learning

Credits 3. 3 Lecture Hours. Principles of parameter estimation, confidence interval, p-values, hypothesis testing, design of experiments, model building, multiple regression, ANOVA, statistical quality control, Shewhart charts, CUSUM, EWMA, and residual-based control charts. **Prerequisite:** Grade of C or better DAEN 210; junior senior classification.

DAEN 323 Statistical Learning and Decisions

Credits 3. 3 Lecture Hours. Stochastic systems components; stochastic process models using Markov chains; Markov-decision processes; use of multi-armed bandit problems; exploration and exploitation; reinforcement learning; Bayesian updates; ensemble learning with bagging, boosting and stacking. **Prerequisite:** Grade of C or better in DAEN 321; junior or senior classification.

DAEN 328 Data Engineering for Humans

Credits 3. 3 Lecture Hours. Human considerations and constraints for data engineering, including human factors of data visualization; data processing and analysis of human physiological, psychological and performance data; the role of human biases in model development, analysis and interpretation; human factors of interactions with machine learning-based artificial intelligence tools in complex systems such as healthcare, manufacturing and transportation. **Prerequisites:** Junior senior classification.

DAEN 331 Optimization of Analytics

Credits 3. 3 Lecture Hours. Mathematical optimization algorithms with applications to data analytics; primary topics include convexity, gradient and subgradient methods and their variants, Newton's and quasi-Newton methods, Frank-Wolfe, duality, derivative-free optimization. **Prerequisites:** Grade of C or better in MATH 251 or MATH 253; grade of C or better in MATH 304 or MATH 323.

DAEN 399 Professional Development

Credits 0. 0 Lecture Hours. Participation in an approved high-impact learning practice; reflection on professional outcomes from the National Society of Professional Engineers' Engineering Body of Knowledge; documentation and self-assessment of learning experience at mid-curriculum point. Must be taken on a satisfactory/unsatisfactory basis.

Prerequisite: Junior or senior classification.

DAEN 400 Case Studies in Data Engineering

Credits 3. 3 Lecture Hours. Exploration of a set of diverse case studies; application of analytical and computational tools to model and develop solutions to open ended problems from different application areas; development of writing capabilities through the writing of case study reports. **Prerequisite:** Grade of C or better DAEN 301.

DAEN 410 Optimization Algorithms for Data Engineering

Credits 3. 3 Lecture Hours. . Development of optimization skills for solving problems faced in data engineering; introduction to quantitative solution of optimization problems; exploration of branch and bound, and other IP techniques; methodologies for network flow algorithms, dynamic programming, and nonlinear optimization algorithms, and their applications in data engineering problems. **Prerequisite:** Grade of C or better in DAEN 331; junior or senior classification.

DAEN 420 Smart Manufacturing

Credits 3. 3 Lecture Hours. Hands-on learning experiences of sensing, measurement and elementary prognostic technologies for modern manufacturing operations; introduction to the emerging challenges and opportunities for harnessing information to substantially improve quality assurance, process design and discovery resulting from advances in sensors, machine tool and plant-floor and a range of system-wide sensor technologies. **Prerequisites:** Grade of C or better DAEN 321; junior or senior classification.

DAEN 427/ISEN 427 Decision and Risk Analysis

Credits 3. 3 Lecture Hours. Overview of the state of the art in descriptive and prescriptive theories of decision making under uncertainty with emphasis on the ways in which human decisions depart from normative models of rationality; analytical foundations stemming from several disciplines, economics, psychology, management science; application in engineering systems will be considered. **Prerequisites:** Grade of C or better in ISEN 310, DAEN 321, or STAT 212. **Cross Listing:** ISEN 427/DAEN 427.

DAEN 429 Data Analytics II

Credits 3. 3 Lecture Hours. Deep learning, including basic machine learning, supervised learning, logistic regression, loss functions, neural networks, optimization, error back-propagation, regularization and generalization, convolutional neural networks, recurrent neural networks, attention models, applications to natural language processing and computer vision. **Prerequisites:** Grade of C or better in DAEN 301 and DAEN 323; junior or senior classification.

DAEN 430 Forecasting Using Machine-Learning Approaches

Credits 3. 3 Lecture Hours. Forecasting principles and methods, including point and interval forecasts; accuracy; statistical methods in the context of forecasting, including exponential smoothing and Auto Regressive Integrated Moving Average (ARIMA), exogenous variables, seasonality and trends; tree-based models for predictions, prophet models, probabilistic forecasts and predictive and prescriptive analytics. **Prerequisites:** Grade of C or better in DAEN 321; junior or senior classification.

DAEN 459 Capstone Senior Design Planning

Credits 3. 2 Lecture Hours. 3 Lab Hours. First in a two-course sequence for the capstone senior design experience; formation of a senior design team, visitation with the team sponsor, preparation of the groundwork for the project, preparation of the project charter and collection or acquisition of initial set of data; provision of instructions on different aspects of capstone design, including ethics, design constraints, applicable standards, project management, report writing specifications and requirements, and oral and visual presentations. **Prerequisite:** Grade of C or better in DAEN 301; concurrent enrollment in DAEN 400, ISEN 427/DAEN 427, and DAEN 429.

DAEN 460 Capstone Senior Design

Credits 3. 1 Lecture Hour. 6 Lab Hours. Second course in a two-course sequence for the capstone senior design experience; continuation of work on the senior design project in teams; data collection, analysis, application of data engineering methods and tools and development of recommendations considering design constraints, evaluation of alternative design, and application of relevant standards; engagement in oral presentations and creation of the project report, with relevant feedback provided during the semester. **Prerequisite:** Grade of C or better in DAEN 459.

DAEN 489 Special Topics in...

Credits 1 to 4. 0 Lecture Hours. 1 to 4 Other Hours. Selected topics in an identified area of data engineering. May be repeated for credit. **Prerequisite:** Junior or senior classification; approval of instructor.

DAEN 491 Research

Credits 1 to 4. 1 to 4 Other Hours. Research conducted under the direction of faculty member in data engineering. May be repeated for credit. **Prerequisites:** Junior or senior classification and approval of instructor.

DASC - Dairy Science (DASC)

DASC 418 Dairy Science Consortium

Credits 4. 3 Lecture Hours. 2 Lab Hours. Advanced topics including concepts of herd dynamic modeling, advanced dairy nutrition and forage production, human resource development, OSHA safety concepts and training for dairy, advanced reproductive programs, young-stock and heifer management, precision management, facilities and heat stress reduction programs. **Prerequisites:** Grade of C or better in ANSC 305, ANSC 307, ANSC 318, and ANSC 333; junior or senior classification or approval of instructor.

DASC 485 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Special problems in dairy production or dairy manufacturing. **Prerequisites:** Junior or senior classification; written approval of professor supervising the activity; 2.0 GPR in major and overall.

DCED - Dance Education (DCED)

DCED 165 Fundamentals of Ballet

Credits 2. 5 Lab Hours. Basic mechanics of ballet movements and appropriate terminology; exploration of historical background, and cultural heritage; focuses on refined body alignment, and cross-training exercises to increase physical performance in ballet. **Prerequisites:** Dance science majors; dance minors; or approval of instructor.

DCED 201 Dance History

Credits 3. 3 Lecture Hours. Overview of current dance scene, career fields, education; development of theatrical, social, educational dance from lineage based to contemporary cultures; emphasis on dance in America, genres, roots, heritage, pioneers, crusading artists; impacts, influences, growth, development, trends and continual metamorphosis in the art world.

DCED 202 Dance Appreciation

Credits 3. 3 Lecture Hours. (DANC 2303) Dance Appreciation. Survey of dance as a cultural and artistic form in numerous countries; exploration of the development and influence of dance in various cultures; analysis of various genres of artistic dance and their development; discussion of aesthetic principles of dance as an art form and how choreographers are influenced by society to create work.

DCED 203 Dance Production

Credits 3. 3 Lecture Hours. Overview of philosophy, major aspects and common elements in producing dance concerts; lighting, sound, stage design, terminology, costuming, management, production designs, practical experience with on-stage performances. **Prerequisites:** Dance science majors, dance concentration majors and dance minors; or approval of instructor.

DCED 205 Fundamentals of Pilates

Credits 2. 1 Lecture Hour. 3 Lab Hours. Study of Contrology; fundamentals of the Pilates Method; mat exercises beginner through advanced; historical background and philosophy; developing modifications of exercises based on individual needs.

DCED 210 Functional Anatomy for Pilates

Credits 3. 3 Lecture Hours. Examination of major muscles, bones and joints as they relate to Pilates exercises and fundamentals; anatomical analysis of Pilates exercises and identification of supplemental movements to improve performance; practice-based anatomy lessons.

DCED 215 Pilates Apparatus I

Credits 2. 1 Lecture Hour. 3 Lab Hours. Study of beginner Pilates apparatus work as designed by Joseph H. Pilates; basic principles of Pilates including breathing, pelvic and ribcage placement, scapulae stabilization, head and cervical alignment; uses apparatuses such as reformer, cadillac, chair, and barrel; incorporates the use of props such as rollers, mini balls, physioballs, blocks, therabands and pinky balls into apparatus work. May be taken two times for credit. **Prerequisites:** DCED 205 or approval of instructor.

DCED 216/VIST 216 Performance Documentation and Editing

Credits 3. 3 Lecture Hours. Exploration of the technical and artistic skills required for filming and documenting performance; fundamental techniques of camera movement and frame composition; hands-on experience learning and operating various cameras, movement apparatuses and camera rigs, lighting equipment, and professional editing programs to produce archival and promotional documentation of live performances. **Cross Listing:** VIST 216/DCED 216.

DCED 217 Musicality and Movement for Performers

Credits 3. 3 Lecture Hours. Study of music terminology, rhythm, music embodiment, music history, and compositional approaches; exploration of how music, sound, and musicality impact performance; topics include understanding how to communicate with collaborating with musicians and composers; understanding musicality and how it relates to dance practice.

DCED 222 Introduction to Dance Science

Credits 2. 2 Lecture Hours. Introduction to the field of dance science including history, related professions and organizations, post graduate work and current research in the field; exploring basic anatomy and kinesiology concepts relevant to dance; injury prevention, common injuries in dance and return to dance procedures; wellness concepts directly related to dance nutrition, physiological and psychological issues for dancers. **Prerequisites:** Dance science majors or approval of instructor.

DCED 230 Conditioning for Dancers

Credits 2. 1 Lecture Hour. 2 Lab Hours. Introduction to the fitness and conditioning needs of dancers; explanation of physical demands of different dance genres; understanding stretching mechanics and techniques for dancers with and without hypermobility; exploration of strengthening exercises to specific areas of the body; identification of individual conditioning needs; design and implement conditioning program for dancer needs.

DCED 240 Improvisation and Partnering

Credits 2. 1 Lecture Hour. 3 Lab Hours. Description of movement principles of space, time, and force experiment with exploration of these principles through dance improvisation and partnering; development of movement sequences individually from various stimuli such as poetry, pictures, sculpture, and other art; experimentation with concepts of leading and following others through movement, and explore properties of momentum, weight sharing, contact improvisation, timing and trust.

DCED 242 Contact Improvisation

Credits 2. 1 Lecture Hour. 3 Lab Hours. Introduction to and exploration of the principles of improvisational partnering including touch, trust, weight sharing, and non-verbal communication; experiment with non-codified/free movement in collaboration with peers including concepts of listening, responding, leading, following, pushing, and pulling; understanding principles of safe alignment and lifting; learning about the history of contact improvisation from creation to present day and understanding the social/cultural influences which shape the form.

DCED 250 Contemporary Ballet

Credits 2. 1 Lecture Hour. 3 Lab Hours. Introduction to contemporary ballet technique for dancers; series of barre exercises progressing to center work, explanation of positions of the body and port de bras; understand proper body alignment as it relates to ballet and integrated contemporary techniques; exploration of choreographic phrases of movement; identifying and appreciating contemporary ballet as a sub-genre of ballet. **Prerequisites:** Grade of B or better in DCED 260 or DCED 261; Dance Science majors; Dance minors; University Studies: Dance Concentration students; approval of instructor.

DCED 260 Ballet I

Credits 2. 5 Lab Hours. (DANC 1241) Ballet I. Introduction to ballet technique for dancers; series of barre exercises progressing to center work, explanation of positions of the body and port de bras; understand proper body alignment as it relates to ballet technique; appreciation of ballet as an instrument of expression. May be taken 3 times for credit. **Prerequisites:** Dance science majors, dance concentration majors and dance minors; or approval of instructor.

DCED 261 Movement Lab: Ballet I

Credits 2. 5 Lab Hours. Understand body alignment through ballet technique; assess individual muscular and skeletal imbalances during a ballet technique class; video references of proper body alignment; anatomical explanation and assessment of individual's use of lateral rotation in ballet technique. May be taken three times for credit. **Prerequisite:** Dance science majors; university studies dance concentration majors; dance minors; or approval of instructor.

DCED 265 Dance Performance Practicum

Credit 1. 3 Lab Hours. Dance repertory to engage in dance practice through the process of rehearsals and performance; collaborating in choreographic processes with varying approaches; understanding of rehearsal processes including studio practice, performance spacing, and technical and dress rehearsals; execution of performance in various settings including the stage, community, and other various professional engagements. May be taken three times for credit. **Prerequisite:** Approval of instructor.

DCED 271 Modern Dance I

Credits 2. 5 Lab Hours. Study and understanding of modern dance concepts; lateral curve, contraction, spiral, high curve, high release, rotation versus parallel, body alignment, moving in and out of the floor, fluidity of phrase work, musicality and kinesthetic awareness. May be taken 3 times for credit. **Prerequisites:** Dance science majors, dance concentration majors and dance minors; or approval of instructor.

DCED 272 Movement Lab: Modern Dance I

Credits 2. 5 Lab Hours. Understand body alignment through modern dance; assess individual muscular and skeletal body imbalances during a modern dance class; introduction of how to work with imbalances in the body while executing proper dance technique; understand the structural and muscular alignment of parallel versus lateral rotation. May be taken three times for credit. **Prerequisite:** Dance Science majors and minors; approval of instructor.

DCED 286 Jazz Dance I

Credits 2. 1 Lecture Hour. 3 Lab Hours. Introduction to the study of jazz dance; includes basic steps, locomotor and axial phrases of movement, concepts, and techniques to develop motor and rhythmical skills for jazz movement; development of coordination, stamina, flexibility, and proper alignment; fostering of individual style and creativity towards performing various combinations; historical background and cultural heritage of jazz dance including various styles and choreographers.

DCED 289 Special Topics in...

Credits 0 to 4. 0 to 4 Other Hours. Selected topics in an identified area of dance. May be repeated for credit.

DCED 292 Tap Dance I

Credits 2. 1 Lecture Hour. 3 Lab Hours. Fundamentals of tap dance; introductory exploration of rhythms and basic steps, concepts, vocabulary, and techniques used to develop motor skills; historical background of the development of tap dance and its cultural heritage throughout the 20th century. May be taken three times for credit. **Prerequisites:** BS Dance Science Majors; Performance Minors; approval of instructor.

DCED 297 Hip Hop Dance I

Credits 2. 1 Lecture Hour. 3 Lab Hours. Fundamentals of street dance styles primarily performed to hip hop music or that have evolved as part of hip hop culture; styles may include breaking, locking, and popping; basic steps, concepts, and techniques used to develop motor and rhythmical skills; historical background of the development of hip hop dance and its cultural heritage.

DCED 303 Health Practices for Dancers

Credits 3. 2 Lecture Hours. 3 Lab Hours. Focuses on health issues common to the dancer such as overtraining, drug use and performance anxiety, anatomy in relation to proper dance technique, misalignments, imbalances and injuries common to the dancer. **Prerequisites:** Dance science majors only or approval of instructor; junior or senior classification.

DCED 304 Creative Dance for Children

Credits 3. 3 Lecture Hours. Theory and practice of creative movement classes for children; the development stages and learning outcomes of creative movement; incorporation of creative movement into children's classes; dance elements and benefits of creative movement; lesson plans and student assessment. **Prerequisite:** Junior or senior classification or approval of instructor.

DCED 306 Choreographic Principles

Credits 3. 2 Lecture Hours. 3 Lab Hours. Introduces choreographic devices in solo and duet movement studies; exploration of design principles; creating multiple movement studies using various elements of choreography. **Prerequisites:** Grade of C or better in DCED 240 or DCED 242; junior or senior classification; approval of instructor.

DCED 307 Artificial Intelligence in Dance Composition

Credits 3. 2 Lecture Hours. 3 Lab Hours. Exploration and application of Artificial Intelligence (AI) in dance through multifaceted perspectives; including dance making, investigating the impact of AI on originality, the role of the artist in an AI-driven process, the ethical and social implications of AI in dance making. **Prerequisites:** PVFA 201 or concurrent enrollment; junior or senior classification or approval of instructor.

DCED 308 Safe Practices in Teaching Dance

Credits 3. 3 Lecture Hours. Effectively teach a dance technique class safely; explore scientific research and evidence through three areas including environmental, physical and psychological components of a dance class for a multitude of genres and ages; create a safe supportive dance environment; application of relevant anatomical principles; develop a safe dance class.

DCED 310 Research Methods in Dance

Credits 2. 2 Lecture Hours. Understanding of basic research methods and statistical analysis techniques used in dance science research; development of basic skills in reading, reviewing and understanding publications in dance research; topics include research design, ethics in research, information retrieval, data collection methods, subject selection, sources of error, types of research; demonstration of knowledge by analyzing, interpreting, and summarizing research writing in professional journals and by planning a research study. **Prerequisites:** Junior and senior classification.

DCED 315 Special Populations in Dance

Credits 3. 3 Lecture Hours. Explanation of how dance influences other populations including children, the elderly, people with learning and physical disabilities, Parkinson's patients, and other populations; understanding the specific needs of children and adults in special populations; exploration of teaching techniques and movement designed for the specific needs of varied populations and possible physical and/or mental limitations; design movement class based on the needs of a specific group of people with specific physical needs and limitations. **Prerequisites:** Junior and senior classification.

DCED 320 Pilates Apparatus II

Credits 2. 1 Lecture Hour. 3 Lab Hours. Study of intermediate Pilates apparatus work; use of apparatuses such as reformer, cadillac, chair, and barrel; incorporating the use of props such as rollers, mini balls, physioballs, blocks, therabands, and pinky balls into intermediate apparatus work. **Prerequisites:** DCED 215 or approval of instructor.

DCED 325 Screendance

Credits 3. 2 Lecture Hours. 3 Lab Hours. Practical application to establish a working knowledge for creating art within screendance; choreographic principles are transposed from stage to screen; production from conception to dissemination; utilizes technologies to forward artistic and creative vision; use of software and equipment specific to screendance. **Prerequisites:** Junior or senior classification; DCED 216/VIST 216 or VIST 216/DCED 216 recommended.

DCED 351 Pointe and Variations

Credits 2. 1 Lecture Hour. 3 Lab Hours. Technical study of foundational ballet pointe work; learning and performing choreographed ballet variations; understanding the history and evolution of pointe work and the pointe shoe as it applies to classroom exercises and choreography; strengthening the feet and ankles for pointe work and refining alignment and ballet technique; cultivating a deep appreciation and knowledge of choreographic works throughout history and embodying those works through physical performance. **Prerequisites:** Grade of B or better in DCED 260, DCED 261, DCED 361, DCED 362, DCED 462, or DCED 463; junior or senior classification; Dance Science or Dance Concentration major or Dance minor; or approval of instructor.

DCED 361 Ballet II

Credits 2. 5 Lab Hours. Intermediate study of ballet; historical background and the knowledge and understanding of its cultural heritage; increased level of difficulty in barre, center and across the floor; concentration and continual refinement of body/spatial awareness, musicality, alignment and execution of correct classical technique. May be taken 3 times for credit. **Prerequisite:** Dance science majors, dance concentration majors and dance minors; or approval of instructor.

DCED 362 Movement Lab: Ballet II

Credits 2. 5 Lab Hours. Self evaluation of correct body alignment and imbalances while executing proper ballet technique; observation and assessment of the student's progression throughout the semester in regards to proper alignment and technique. May be taken three times for credit. **Prerequisite:** Dance Science majors and minors; approval of instructor.

DCED 372 Modern Dance II

Credits 2. 5 Lab Hours. Intermediate study of modern dance; reviews, historical background and its development within society; continual study and understanding of modern dance concepts; fall/recovery, contract/release, use of breath and weight, spine work, inversion and spatial awareness. May be taken 3 times for credit. **Prerequisite:** Dance science majors, dance concentration majors and dance minors; or approval of instructor.

DCED 373 Movement Lab: Modern Dance II

Credits 2. 5 Lab Hours. Self evaluation of correct body alignment and imbalances while executing proper modern dance technique; observation and assessment of the student's progression throughout the semester in regards to proper alignment and technique. May be taken three times for credit. **Prerequisite:** Dance Science majors and minors; approval of instructor.

DCED 387 Jazz Dance II

Credits 2. 1 Lecture Hour. 3 Lab Hours. Intermediate study of jazz dance; review of historical background and cultural heritage; includes several jazz styles; proper body mechanics and alignment; placement exam required on the second day of class. May be taken three times for credit. **Prerequisite:** Grade of B or better in DCED 286 or approval of instructor.

DCED 392 Tap Dance II

Credits 2. 1 Lecture Hour. 3 Lab Hours. Intermediate study of tap dance; continuation of the development of tap technique and fundamentals with a focus on speed, transitions, complex rhythms, and improvisation; exploration of the historical background of the development of tap dance in the 21st century. May be taken three times for credit. **Prerequisites:** Grade of B or better in DCED 286 or approval of instructor.

DCED 398 Hip Hop Dance II

Credits 2. 1 Lecture Hour. 3 Lab Hours. Advanced study of street dance styles primarily performed to hip hop music or that have evolved as part of hip hop culture; styles may include breaking, locking, and popping; advanced steps, concepts, and techniques used to enhance motor and rhythmical skills; study of the current culture of hip hop dance and its social impact. **Prerequisites:** Grade of B or better in DCED 297 or approval of instructor.

DCED 400 Group Choreography

Credits 3. 2 Lecture Hours. 3 Lab Hours. Introduces choreographic devices related to group movement studies; explore and create movement studies as a means of first and second function art, use choreographic tools in the dance making process as it relates to group work. **Prerequisites:** Grade of C or better in DCED 306 or approval of instructor.

DCED 401 Dance Pedagogy

Credits 3. 2 Lecture Hours. 3 Lab Hours. Study of dance pedagogy; major aspects of a dance teacher including knowledge of injury prevention, correct technique, preparation, presentation, evaluation of dance materials, levels and technique class; focus on various teaching methods, tools, planning, communication/instructional skills and learning experiences/styles. **Prerequisite:** Approval of instructor; junior or senior classification.

DCED 402 Concert Choreography and Production

Credits 3. 2 Lecture Hours. 3 Lab Hours. Choreograph, design, and produce a concert; accumulation of previous course work in composition should be used to bring the elements of the choreographic process to a final concert including the choreography, costumes, lighting and stage management. **Prerequisites:** Junior or senior classification, grade of C or better in DCED 400 or approval of instructor.

DCED 403 Dance Movement Analysis

Credits 3. 3 Lecture Hours. Using scientific methods to evaluate the dancer's body; implementation of dance screening process and creation of programs to address specific dance related injuries, imbalances or misalignments; study of current research in dance medicine/science and application of this knowledge to increase longevity of movement. **Prerequisite:** Grade of C or better in BIOL 319 and BIOL 320; Dance Science majors or approval of instructor; junior or senior classification.

DCED 405 Career Preparation in Dance

Credit 1. 1 Lecture Hour. Preparation for entering desired career field within dance after graduation, including areas of dance performance, dance science, and dance pedagogy; development of materials for self-promotion for jobs or graduate school; develop original portfolio of work. **Prerequisite:** Grade of C or better in DCED 306 or concurrent enrollment; approval of instructor.

DCED 410 Dance Teams in Secondary Education

Credits 3. 3 Lecture Hours. Development of the skills necessary to direct a dance team in secondary education; budgeting, scheduling and interpersonal relationships; examination of the the different seasons and their unique needs, including football, contest, spring show and summer camps; definition of injury protocols and discussion of return to dance procedures; examination of work and life balance; creation of a professional portfolio specific to directing dance. **Prerequisite:** Junior or senior classification; approval of instructor.

DCED 411 Wellness and the Performing Artist

Credits 3. 3 Lecture Hours. Issues related to the mental health and wellness of the performing artist; dealing with emotions, creating healthy habits, perfectionism, motivation, and performance anxiety; introduction to the scientific study of behavior and mental processes related to performing artists; broad overview of human development, learning, and memory for all performing artists. **Prerequisites:** DCED 222 and DCED 315; junior or senior classification; approval of instructor.

DCED 413 Pilates Apparatus III

Credits 3. 2 Lecture Hours. 3 Lab Hours. Study of advanced Pilates apparatus work; exploration of modification and transitional exercises to achieve the advanced; uses apparatuses such as reformer, cadillac, chair, and barrel; incorporates the use of props such as rollers, mini balls, physioballs, blocks, therabands and pinky balls into advanced apparatus work. **Prerequisites:** DCED 320 or approval of instructor.

DCED 415 Teaching Pilates

Credits 3. 3 Lecture Hours. Study of teaching methods used in Pilates mat and apparatus work; exploration of special considerations in teaching Pilates; implementation of appropriate modifications for all exercises. **Prerequisites:** DCED 413 or approval of instructor.

DCED 416 Conducting Dance Science Research

Credit 1. 1 Lecture Hour. Application of knowledge and skills in dance science; design and implement dance science research; develop research skills and lead a research project; includes data collection, analysis, and drawing conclusions from results; presenting research and engaging in discussions. **Prerequisites:** DCED 305.

DCED 419 Supervised Student Teaching

Credits 6. 6 Other Hours. Experience a practicum in an accredited public school classroom where techniques of instruction are developed for identified teaching field(s); observing implementation of appropriate instructional strategies for assigned student population. **Prerequisites:** Grade of C or better in DCED 304 or DCED 411 and DCED 401.

DCED 462 Ballet III

Credits 2. 5 Lab Hours. Technical study of classical and contemporary ballet; elevated barre work, traditional components including turns, footwork, adagios, advanced center and floor phrases; study of Cecchetti, Vaganova and collaborative methods; focus on strength, concentration and correct technique on performance combinations. May be taken 3 times for credit. **Prerequisite:** Dance science majors, dance concentration majors and dance minors; or approval of instructor.

DCED 463 Movement Lab: Ballet III

Credits 2. 5 Lab Hours. Peer evaluation of body alignment, imbalances and biomechanics of movement; explanation of kinesthetic principles and injury prevention through ballet technique; conditioning programs for a peer's imbalances and improper technique in a ballet class. May be taken three times for credit. **Prerequisite:** Dance Science majors and minors; approval of instructor.

DCED 473 Modern Dance III

Credits 2. 5 Lab Hours. Physical and artistic exploration of both traditional and contemporary training methods; three dimensional spine work, inversion, floor work and dynamics. May be taken 3 times for credit. **Prerequisite:** DCED 372 or approval of instructor.

DCED 474 Movement Lab: Modern Dance III

Credits 2. 5 Lab Hours. Peer evaluation of body alignment, imbalances and biomechanics of movement; explanation of kinesthetic principles and injury prevention through modern dance technique; develop conditioning program for a peer's imbalances and improper technique in a modern dance class. May be taken three times for credit. **Prerequisite:** Junior or senior classification; Dance Science majors and minors; approval of instructor.

DCED 485 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Special problems in dance assigned to individual students or to groups. May be repeated for credit. **Prerequisites:** Junior or senior classification; approval of instructor.

DCED 488 Jazz Dance III

Credits 2. 1 Lecture Hour. 3 Lab Hours. Advanced study of jazz dance; locomotor and axial phrases of movement, concepts, and techniques to challenge and refine motor and rhythmical skills for jazz movement; increase coordination, stamina, flexibility, and proper alignment; historical background and cultural heritage of jazz dance including various styles and choreographers. May be taken three times for credit. **Prerequisite:** Grade of B or better in DCED 387 or approval of instructor.

DCED 489 Special Topics in...

Credits 0 to 4. 0 to 4 Other Hours. Selected topics in an identified area of dance. May be repeated for credit.

DCED 491 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in dance. May be taken four times for credit. **Prerequisites:** Junior or senior classification and approval of instructor.

DDHS - Dental Hygiene (DDHS)

DDHS 3020 Theory of Dental Hygiene Practice I

Credits 2. 2 Lecture Hours. Emphasis on advanced dental hygiene skills and services; provision of services to medically compromised patients.

DDHS 3110 Introduction To Dentistry

Credit 1. 1 Lecture Hour. Introduction to dental hygiene as it relates to the dental specialties. Guest lecturers will describe what their specialty encompasses and the dental hygienist's role in that field of dentistry.

DDHS 3120 Dental Anatomy

Credits 2. 2 Lecture Hours. Form and function of the primary and permanent human dentition; laboratory and seminar emphasis on morphology and comparisons of teeth.

DDHS 3160 Preclinical Dental Hygiene

Credits 6. 4 Lecture Hours. 0.5 Lab Hours. 8 Other Hours. This course introduces the student to the foundational knowledge and skills needed to provide basic dental hygiene services. With faculty guidance, the student learns how to assess a patient's oral health needs, plan dental hygiene services to meet those needs, and implement and evaluate newly learned preventive and therapeutic procedures.

DDHS 3220 Oral Radiology

Credits 0 to 2. 2 Lecture Hours. 1 Lab Hour. 1 Other Hour. This course is intended to provide the student with an understanding of the generation, properties, and techniques for use of X-rays in dentistry. The principles of radiation safety and health physics, interpretative recognition techniques and clinical patient management.

DDHS 3250 Biomedical Sciences I

Credits 5. 5 Lecture Hours. 0 Lab Hours. Structure of the human body, including its anatomy, biochemistry, histology and physiology. Emphasis is placed on the structures of the head and neck region that surrounds the oral cavity.

DDHS 3310 Health Education and Behavioral Science

Credit 1. 1 Lecture Hour. This course is designed to introduce the student to health education and behavioral science as it relates to educating patients and changing behaviors. Students will gain knowledge in evaluating and delivering educational services to culturally diverse populations.

DDHS 3325 Microbiology

Credits 2.5. 2.5 Lecture Hours. 0 Lab Hours. A lecture course designed to teach the basic principles of medical microbiology, immunology and the infectious disease process.

DDHS 3340 Biomedical Sciences II

Credits 4. 4 Lecture Hours. 0 Lab Hours. Structure of the human body, including its anatomy, bio-chemistry, histology and physiology. Emphasis is placed on the structures of the head and neck region that surrounds the oral cavity.

DDHS 3410 Introduction to Pathology

Credit 1. 1 Lecture Hour. Introduction to Pathology is primarily a didactic lecture oriented course. Although clinically oriented, it is designed to provide a base of knowledge about pathologic processes and specific disease entities. Emphasis is on concepts and vocabulary essential to understanding basic pathologic process; systemic pathology of organ systems and tissues; clinical manifestations that result from biological cellular alterations.

DDHS 3425 Health Promotion and Disease Prevention

Credits 2.5. 2.5 Lecture Hours. This course introduces the student to the etiology and prevalence of oral diseases and oral problems. The emphasis of the course is on the role of the dental hygienist in the promotion of optimal oral health, the prevention of oral diseases, and the importance of achieving and maintaining excellent personal oral health habits. The importance of and the techniques for educating the patient in self-care skills will also be examined.

DDHS 3530 Applied Dental Materials

Credits 3. 2 Lecture Hours. 2.5 Lab Hours. Didactic, laboratory and clinical instruction in the principles of the science of dental materials and in procedures within the scope of dental hygiene practice.

DDHS 3830 Clinical Dental Hygiene I

Credits 3. 9 Other Hours. Comprehensive dental hygiene care through clinical application of procedures. Includes intramural dental hygiene and dental school rotations.

DDHS 4010 National Board Review

Credit 1. 1 Lecture Hour. Reviews applications of previous course content using a seminar format in preparation for the National Board Dental Hygiene Exam.

DDHS 4015 Pharmacology

Credit 1.5. 1.5 Lecture Hour. Actions, indications and contraindications of drugs; emphasis on drugs frequently encountered in dentistry.

DDHS 4025 Oral Pathology

Credits 2.5. 2.5 Lecture Hours. A didactic lecture oriented course. The lecture portion of the course, although, clinically oriented is designed to provide a base of knowledge about pathologic processes and specific disease entities. Diseases unique to the oral regions as well as oral manifestations of systemic disease will be covered. The Clinical Pathologic Conference (CPC) attempts to assimilate that information and apply it to relevant clinical situations in a case-based PDL format. Cases which illustrate a variety of clinical signs and symptoms will be presented with clinical histories. Students will be given the opportunity to develop a differential diagnosis and discuss the implications of this relevant to the patient's treatment.

DDHS 4110 Medical Emergencies

Credits 0-1. 0-1 Lecture Hours. Discussions on the preparations for handling emergencies; prevention, recognition and management of various emergencies. The course includes case scenario presentations and mock hands-on drills.

DDHS 4140 Clinical Dental Hygiene III

Credits 4. 12 Other Hours. Comprehensive dental hygiene care through clinical application of procedures. Includes intramural dental hygiene and dental school rotations and extramural site rotations.

DDHS 4210 Professional Ethics

Credit 1. 1 Lecture Hour. The didactic lecture course and case-based small group decision making exercises draw from general ethics, bioethics, dental-specific ethics and obligations of health-care professionals.

DDHS 4220 Comprehensive Care Seminar

Credits 0 to 2. 0 to 2 Lecture Hours. Topics and activities designed to integrate dental hygiene care with total patient care; includes a case presentation.

DDHS 4240 Clinical Dental Hygiene IV

Credits 4. 12 Other Hours. Comprehensive dental hygiene care through clinical application of procedures. Includes intramural dental hygiene and dental school rotations and extramural site rotations.

DDHS 4310 Oral Radiography

Credits 0-1. 0-1 Other Hours. Provides the student with clinical experience in the application of the principles, procedures and techniques of oral radiography.

DDHS 4320 Perspectives in Dental Hygiene

Credits 2. 2 Lecture Hours. In addition to preparing the student for private practice dental hygiene positions, this course introduces other potential career options including hospital/clinic administration, sales, consulting, public health, insurance and education. The importance of the dental team concept, résumé writing and interviewing skills will be discussed. Legal, ethical and professional issues involving record keeping, licensing, informed consent, sexual harassment and the standard of care will be explored. The business aspects of dental hygiene, personal financial planning, and insurance options will also be addressed. In addition, this course will prepare students for the Texas Jurisprudence Exam required for state licensure.

DDHS 4410 Gerontology

Credit 1. 1 Lecture Hour. This course will examine the unique considerations a dental professional will encounter when providing care to a geriatric patient. Social, psychological and biological aspects of aging will be discussed. Strategies for patient care will be outlined and discussed. Appropriate community referral agencies will be explored to aid the hygienist in providing assistance to the elderly patient.

DDHS 4510 Pediatric Dentistry

Credit 1. 1 Lecture Hour. Child development as the basis for management of behavior in the dental environment.

DDHS 4530 Public and Community Health

Credits 0 to 3. 0 to 3 Other Hours. This course examines dental public health and pro-motes a greater understanding of the important role of the dental hygienist within the community. The student is exposed to opportunities to promote oral health and prevent dental diseases in the community through organized community-based programs versus the traditional clinical approach.

DDHS 4610 Periodontics

Credit 1. 1 Lecture Hour. Characteristics, etiology and treatment of inflammatory diseases of the supporting tissues of the teeth and their substitutes. Emphasis is placed on the relationship of periodontics to the practice of dental hygiene.

DDHS 4620 Theory of Dental Hygiene Practice II

Credits 2. 2 Lecture Hours. Fundamental knowledge and techniques in managing patients with special needs.

DDHS 4710 Applied Research Methods

Credit 1. 1 Lecture Hour. Practical experience in applying principles of research methodology; includes preparation of a formal proposal and table clinic under mentorship of individual faculty.

DDHS 4715 Research Methods

Credit 1.5. 1.5 Lecture Hour. Identification of research problems and variables; sampling; research design; statistical testing of data; critical review of dental literature; table clinic development for presentation to the public and professional groups.

DDHS 4810 Local Anesthesia and Nitrous Oxide/Oxygen Sedation

Credit 1. 1 Lecture Hour. The primary method of presentation is lecture, a detailed outline is provided to each student to facilitate the lecture or textbook notes to supplement the outline. Students are given outside assignments to practice dose calculations for each local anesthetic and for a variety of patients. The lecture material is supplemental with videotapes designed to show the correct administration techniques, the neural innervations of each area of the oral cavity and the area anesthetized.

DDHS 4820 Clinical Dental Hygiene II

Credits 2. 6 Other Hours. Comprehensive dental hygiene care through clinical application of procedures. Includes intramural dental hygiene and dental school rotations and extramural site rotations.

DIVE - Diving Tech and Methods (DIVE)

DIVE 250 SCUBA Diving I

Credits 4. 3 Lecture Hours. 3 Lab Hours. Fundamental academic knowledge and practical application of SCUBA diving practices and theory; introduction to diving tables and diving physiology. **Prerequisite:** Must complete a medical statement showing no contraindications to diving, or have a recreational SCUBA diver's physical examination.

DIVE 251 SCUBA Diving II

Credits 3. 2 Lecture Hours. 2 Lab Hours. Methods to promote safe, self-reliant diving and improve the diver's comfort, coordination and strength in the water; to build competency in dive planning and organization. **Prerequisite:** Must complete a medical statement showing no contraindications to diving, or have a recreational SCUBA diver's physical examination; open water certification from a nationally recognized agency; Divers Alert Network (DAN) insurance or equivalent.

DIVE 260 Scuba Diving III

Credits 4. 3 Lecture Hours. 3 Lab Hours. Methods to promote safe, self-reliant diving and improve the diver's comfort, coordination and strength in the water; build competency in dive planning and organization; practice accident prevention and effective accident management. **Prerequisites:** Must complete a medical statement showing no contraindication to diving or have a recreational scuba diver's physical examination; open water certification from a nationally recognized training agency; Diver's Alert Network (DAN) diving accident insurance or equivalent.

DIVE 310 Techniques in Boat and Wreck Diving

Credits 3. 2 Lecture Hours. 2 Lab Hours. 0 Other Hours. Overview of different types of boat diving and the skills needed to plan and conduct boat dives safely; discussion of the equipment and techniques commonly employed while performing external survey of and limited penetration of wrecks. **Prerequisites:** Must complete a medical statement showing no contraindications to diving, or have a recreational SCUBA diver's physical examination; Advanced Open Water certification from a nationally recognized training agency, and must have completed a deep diver specialty certification or be able to provide proof of experience in order to dive deeper than 60 feet in this course, or approval of instructor; Enriched Air Nitrox certification; Divers Alert Network (DAN) diving accident insurance or equivalent for course duration; junior or senior classification.

DIVE 330 Rescue Diving

Credits 3. 2 Lecture Hours. 2 Lab Hours. Relates skills necessary to perform basic life support, administer dive first aid, evacuate victim, assist and rescue other divers in water; illustrate proper dive planning; practice accident prevention and effective accident management. **Prerequisites:** Must complete a medical statement showing no contraindications to diving, or have a recreational SCUBA diver's physical examination; certification as a SDI SCUBA diver or equivalent; Divers Alert Network (DAN) diving accident insurance or equivalent.

DIVE 331 Alternative Diving Technology

Credits 3. 2 Lecture Hours. 2 Lab Hours. Illustrates the realities of operating in the scientific, public safety and military diving disciplines; practice real world training scenarios involving multiple aspects of each of the three fields. **Prerequisites:** Must complete a medical statement showing no contraindications to diving, or have a recreational SCUBA diver's physical examination (or AAUS physical if rating with AAUS); certification as an Advanced and Rescue Diver or equivalent; Divers Alert Network (DAN) diving accident insurance or equivalent; junior or senior classification or approval of instructor.

DIVE 357 Dive Leadership – Divemaster

Credits 4. 3 Lecture Hours. 3 Lab Hours. Examines divemaster level dive knowledge, dive leadership theory and application, presentation and instructional skills, physical diving skills, logistics and planning, risk management and emergency response, and operational execution; develops a multi-environment capable diving leader. **Prerequisites:** Minimum of 18 years of age; current certification in CPR, AED, First Aid for Dive Professionals or Equivalent; current certification in Oxygen Provider or equivalent; a minimum of verifiable 40 logged open water scuba dives to begin the course and 60 by the end of the course, dives shall be varied in environment, depth, and activities; verification of good physical condition as documented by a medical examination and unconditional approval in the last 12 months; water skills and ability equivalent to that of a divemaster; must hold certifications as a Rescue Diver, Advanced Open Water Diver and Nitrox diver; junior or senior classification or approval of instructor.

DIVE 405 Expedition Planning

Credits 2. 2 Lecture Hours. Overview of the background knowledge to successfully plan, coordinate and execute diving-based research expeditions; topics include dive planning, travel logistics, health and safety requirements, and research parameter development. **Prerequisites:** Certification as an Advanced Diver or equivalent; junior or senior classification; or approval of instructor.

DIVE 410 AAUS Scientific Diving

Credits 4. 3 Lecture Hours. 3 Lab Hours. Information and training necessary to qualify as Scientific Divers under the auspices of American Academy of Underwater Sciences and the Scientific Diving Program; implementation of project design, advanced study of diving physics and physiology, diving risk management and risk mitigation. **Prerequisites:** Must have a current Science Diving physical examination; Master Level Diver's Alert Network (DAN) diving accident insurance or equivalent; open water, advanced open water certifications and Nitrox, or approval of instructor; current certification in First Aid, AED, CPR and Emergency Oxygen Administration; Scientific Diving Swim Test.

DIVE 411 Offshore Research Diving

Credits 4. 3 Lecture Hours. 4 Lab Hours. Application of research methods and techniques to collect data using scuba diving; opportunities to dive with non-Texas A&M-Galveston dive programs, increase depth ratings under American Academy of Underwater Sciences and Texas A&M-Galveston auspices and to conduct safe, efficient dives to collect and record data underwater. **Prerequisites:** DIVE 410 or approval of instructor; must hold nitrox certification, must be active Scientific Divers under Texas A&M University Galveston auspices; current and complete Texas A&M University Galveston Science Diving physical examination on file; minimum of 12 logged dives in the previous 12 months; current certification in First Aid, AED, O2 Administration and CPR, including hands-on skill evaluations, prior to any open-water work; Master Level or higher Divers Alert Network (DAN) diving accident insurance or equivalent; see the Texas A&M University Galveston Diving Manual for additional specifications.

DIVE 430 Techniques in Overhead Environment Diving

Credits 4. 3 Lecture Hours. 3 Lab Hours. Instruction in overhead environment diving, technical diving skills, technical diving configurations, dive risk assessment; emphasis on building competency in dive planning, techniques and execution. **Prerequisites:** DIVE 410 or proof of equivalent experience with approval of instructor; must complete a medical statement showing no contraindication to diving or have a recreational scuba diver's physical examination; open water certification from a nationally recognized training agency; Master level or higher or equivalent Diver's Alert Network (DAN) diving accident insurance; 25 logged dives; SDI Deep Diver or equivalent certification or proof of equivalent experience with approval of instructor.

DIVE 440 Decompression and Mixed Gas Procedures

Credits 3. 2 Lecture Hours. 3 Lab Hours. Extension of allowable dive time and depth through staged decompression; examination of the theory, methods, and procedures for planning and executing staged decompression dives utilizing helium in the breathing mixture to reduce the effects of inert gas narcosis and using decompression breathing gases containing up to 100 percent oxygen. **Prerequisites:** Must complete a scuba training agency medical evaluation form showing no contradictions to diving, or complete a scuba training agency medical evaluation and physician approval form indicating that a physician has advised and approved a student to participate in the activity of scuba diving; certification as an Advanced Diver with Deep specialty or TDI Intro to Tech Diver; DIVE 410 strongly recommended; proof of 50 logged dives; Divers Alert Network (DAN) diving accident insurance (Master Level) or equivalent; junior or senior classification; or approval of instructor.

DIVE 489 Special Topics In...

Credits 0 to 4. 0 to 4 Other Hours. Selected topics in an identified area of diving technology and methods. **Prerequisite:** Junior or senior classification or approval of instructor.

DIVE 491 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in the Dive program. May be taken three times for credit. **Prerequisites:** Junior or senior classification and approval of instructor.

ECCB - Eco & Conservation Biol (ECCB)

ECCB 101 Introduction to Ecology and Conservation Biology

Credit 1. 1 Lecture Hour. Introduction to professional opportunities and activities in the areas of ecology and conservation biology; presentation of a variety of career options focusing on job descriptions, educational and training requirements, challenges, professional societies and opportunities for advancement; overview of departmental and campus resources that will assist with their collegiate goals including research, internships, resumé building and professional writing. **Prerequisite:** Freshman classification and ECCB major, or approval of instructor.

ECCB 105 Secondary Education in Ecology and Conservation Biology

Credit 1. 1 Lecture Hour. Introduction to a career as a secondary science teacher and classroom activities in the areas of ecology and conservation biology; presentation of education and certification requirements, exploration of the structure of schools and districts, classroom and professional expectations; overview of departmental and campus resources that will assist with collegiate and career goals.

ECCB 203 Forest Trees of North America

Credits 3. 2 Lecture Hours. 2 Lab Hours. Taxonomy, phylogeny, and identification of the important forest trees of North America and their ecological and social uses and benefits.

ECCB 205 Fundamentals of Ecology

Credits 3. 3 Lecture Hours. Principles of ecology using a holistic approach treating plants, animals and humans as one integrated whole; composition, structure, nutrient cycles and energetics of biotic communities; adaptations to environmental factors; biotic relationships; and problems of environmental quality and resource use.

ECCB 215 Fundamentals of Ecology--Laboratory

Credit 1. 3 Lab Hours. Sampling and estimating plant-animal populations, measuring environmental factors and recognizing and studying morphological, physiological and behavioral adaptations of plants and animals to biotic or abiotic influences.

ECCB 285 Directed Studies

Credit 1. 0 Lecture Hours. 1 Other Hour. Directed study of selected problems in an area of ecology and conservation biology not covered in other courses. **Prerequisite:** ECCB 101, ECCB 205, ECCB 215.

ECCB 291 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in ecosystem science and management. May be repeated 2 times for credit. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

ECCB 300/ENTO 300 Field Studies

Credits 3. 3 Other Hours. Integration of principles of animal and plant ecology with environmental factors to characterize wildlife populations; intensive analysis of specific areas will emphasize either the development of a wildlife management plan or a general vertebrate natural history survey. **Prerequisites:** Prior approval of instructor and concurrent enrollment in ECCB 450/ENTO 450 and ECCB 451/ENTO 451. **Cross Listing:** ENTO 300/ECCB 300.

ECCB 301 Diversity and Evolution of Plants

Credits 3. 2 Lecture Hours. 2 Lab Hours. Interpretation of plant morphology for keying and identification of important flowering rangeland plants; vegetative and floral characters for important plant families including toxic compounds affecting domestic livestock. Plant collection required.

ECCB 302 Diversity and Evolution of Vertebrates

Credits 3. 2 Lecture Hours. 2 Lab Hours. Life histories of fishes, amphibians, reptiles, birds and mammals; lecture covers vertebrate groups on a worldwide scale and emphasizes a comparative approach to the study of adaptation to the environment; lecture topics include behavior, reproduction, feeding specializations, evolutionary history, locomotion, hibernation, migration, endangered species, zoogeography and importance to man; laboratory emphasizes the recognition of Texas vertebrates. Designed for both science and non-science majors. **Prerequisites:** Grade of C or better in BIOL 111 and BIOL 112 or BIOL 101 and BIOL 107 or equivalent.

ECCB 303 Fire Ecology and Biogeochemistry

Credits 3. 3 Lecture Hours. Cycling of the elements like carbon, nitrogen and phosphorus, and their influence on ecosystem functions and the climate system; human impacts on biogeochemistry; global changes that threaten the sustainability of ecosystem services; wildland fire science and fire ecology showing the interrelated nature of the climate system, vegetation and human activities; classic and current scientific literature. **Prerequisites:** Grade of a C or better in ECCB 205, BIOL 111, or BIOL 112; junior or senior classification or instructor approval.

ECCB 304 Conservation Biology

Credits 3. 3 Lecture Hours. Ecological principles used to conserve and manage wildlife and fisheries resources at the individual, population and community levels; topics include conservation biology, species interactions, animal-habitat relationships, population dynamics and harvesting, habitat management and restoration and human dimensions of fish and wildlife conservation. **Prerequisites:** Grade of C or better in ECCB 205 and junior or senior classification or approval of instructor.

ECCB 307 Forest Protection

Credits 3. 2 Lecture Hours. 3 Lab Hours. Destructive agents in forestry as related to importance, identification, cause, extent of losses and protective measures. **Prerequisites:** ECCB 205, or equivalent, junior or senior classification or approval of instructor.

ECCB 308 Fundamentals of Environmental Decision-Making

Credits 3. 3 Lecture Hours. Introduction to environmental issues in natural resources management; fundamental principles and methods for understanding biosocial interdependencies in complex environmental issues; use of computer-aided group decision-making techniques to develop cooperative strategies for resolving local or global environmental issues. **Prerequisites:** Junior or senior classification or approval of instructor.

ECCB 309 Forest Ecology

Credits 3. 3 Lecture Hours. Life history and general characteristics of trees; structure and function of forest ecosystems; fundamental principles of forest tree physiology and ecology applied to an analysis of tree growth in relation to environmental factors and present day forest management; global changes and forests. **Prerequisites:** Junior or senior classification or approval of instructor; introductory courses in ecology and chemistry recommended.

ECCB 310 Forest Tree Physiology and Breeding

Credits 3. 3 Lecture Hours. Genetic improvement or manipulation of forest trees through breeding or transformation; regeneration of forests including reproduction, nursery production, stand establishment, natural regeneration and problems affecting regeneration. **Prerequisites:** Grade of a C or better in BIOL 111; junior or senior classification or approval of instructor.

ECCB 311 Ichthyology

Credits 3. 2 Lecture Hours. 3 Lab Hours. Introduction to the study of fishes, their biology, classification, evolution, distribution, ecology and economic importance. **Prerequisites:** Grade of C or better in ECCB 302 or BIOL 318.

ECCB 312 Diversity, Evolution, and Ecology of Grasses

Credits 3. 1 Lecture Hour. 6 Lab Hours. Classification and identification of grasses based on macro- and micromorphological variations of spikelets; interpretation of spikelet variation and use of diagnostic keys to identify important species of North America including range, forest and other natural resources; a grass collection required. **Prerequisites:** Junior or senior classification or approval of instructor.

ECCB 313 Diversity and Evolution of Invertebrates

Credits 3. 3 Lecture Hours. Survey of invertebrate animal diversity focusing on phylogeny, body patterns, ecology, ethology, zoogeography, anatomy, physiology and adaptations to the environment. **Prerequisites:** Grade of C or better in BIOL 111 and 112.

ECCB 314 Down River: Biology of Gulf Coastal Fishes

Credits 3. 2 Lecture Hours. 3 Lab Hours. Understanding the biological complexity of Gulf coast river systems while gaining hands-on experience in field and museum ichthyological techniques; sampling of the Guadalupe and San Antonio rivers; participation in lectures, museum preparation and archiving specimens at the Biodiversity Research and Teaching Collections (BRTC). **Prerequisites:** ECCB 311 with a grade of B or better and approval of instructor.

ECCB 315 Herpetology

Credits 3. 2 Lecture Hours. 2 Lab Hours. Evolutionary ecology of reptiles and amphibians and conservation biology of the major groups; labs concentrate on the global diversity of herps and the herpetofauna of Texas; foundation for students in wildlife science and biology. **Prerequisites:** Grade of C or better in ECCB 302 or BIOL 318, or approval of instructor.

ECCB 316 Field Herpetology

Credit 1. 3 Lab Hours. Field work involving collection and preservation of herpetological specimens; natural history, ecological relations; available for students enrolled in ECCB 315 who would like to have field trips. **Prerequisites:** ECCB 315 or concurrent enrollment.

ECCB 318 Coupled Social and Ecological Systems

Credits 3. 3 Lecture Hours. Resilience-based stewardship of social-ecological systems including range, forest and other natural resources; ecological concepts of resilience, sustainability, ecosystem services and vulnerability; investigation of linkages among social and ecological system components; contribution to sustainability and provisioning of ecosystem services; evaluation of multiple knowledge sources as the basis for adaptive ecosystem management. **Prerequisites:** Grade of C or better in ECCB 205 and AGE 105, ECON 202, or ECON 203; junior or senior classification, or approval of instructor.

ECCB 319 Principles of Forestry

Credits 3. 2 Lecture Hours. 2 Lab Hours. Theory and practice of forestry in controlling forest establishment, composition, structure and growth; principles of natural and artificial regeneration; intermediate cultural operations; silvicultural systems; use and control of fire in forests; principles of sustainable stand management. **Prerequisites:** ECCB 309 or instructor approval.

ECCB 320 Ecosystem Restoration and Management

Credits 3. 3 Lecture Hours. A basic conceptual framework for restoration ecology and ecological restoration including range, forest and other natural resources; major principles of ecology related to practical problems confronting humankind, such as, environmental pollution and degradation, exotic species invasions, land use and management trade-offs and consequences; importance of biological diversity. **Prerequisites:** ECCB 205 or approval of instructor.

ECCB 324 Forest Measurements

Credits 2. 4 Lab Hours. Measures and measurement of the dimensions and attributes of forested areas including the diameters, heights, volume and biomass of trees within a well-defined area; tools used for forest measurement; the conduct of forest inventories; summary measures and reports of inventory results; remote sensing and related technologies that assist forest measurements. **Prerequisites:** Junior or senior classification or approval of instructor.

ECCB 325 Field Studies in Forest Ecosystems

Credits 3. 1 Lecture Hour. 6 Lab Hours. Field-oriented focus on forest ecosystem science and management; problem-solve management questions through data collection and team-based research; investigate the relationships between landowner objectives, mensuration, silviculture, ecology, soils, and regeneration-focused harvesting systems; foster the development of student-faculty relationships; enhance professional knowledge and skills. **Prerequisites:** Junior or senior classification or approval of instructor.

ECCB 351 Geographic Information Systems for Resource Management

Credits 3. 2 Lecture Hours. 2 Lab Hours. Geographic Information Systems (GIS) approach to solving spatial problems and managing natural resources, including the acquisition, management, manipulation, analysis, and mapping of spatial and non-spatial databases; identification of natural and relevant features from various data sources; integration of relevant technologies and data; extensive use of GIS software to solve real-world problems. Only one of the following will satisfy the requirements for a degree: AGSM 461, ECCB 351, ECCB 651, BAEN 651, or RENR 651. **Prerequisites:** Junior or senior classification or approval of instructor. **Cross Listing:** AGSM 461 and RWFM 351.

ECCB 385 Communication in Ecology and Conservation Biology

Credit 1. 1 Other Hour. Formal development and delivery of scientific poster on topic related to ecology or conservation biology. **Prerequisites:** Grade of C or better in ECCB 101 and 205.

ECCB 400 Molecular Ecology

Credits 3. 3 Lecture Hours. Fundamentals of molecular ecology applied to conservation and management of wildlife and fisheries; presentation and discussion of scientific papers on wildlife and fisheries molecular ecology; topics in conservation, management and aquaculture. **Prerequisites:** Grade of a C or better in BIOL 112; MATH 142, MATH 151, or MATH 171; STAT 301, STAT 302, or STAT 303; junior or senior classification or approval of instructor.

ECCB 401 General Mammalogy

Credits 3. 2 Lecture Hours. 3 Lab Hours. Mammalian biology; evolution, classification, biogeography, reproduction, physiology, ecology, and behavior; focuses on basic concepts necessary for a foundation in both wildlife science and biology. **Prerequisites:** Grade of C or better in ECCB 302 or BIOL 318; junior classification.

ECCB 402 General Ornithology

Credits 3. 2 Lecture Hours. 3 Lab Hours. Introduction to study of birds, their structure, classification, geographic distribution, ecological relations and economic status; foundation of wildlife science, also for museum work. **Prerequisites:** Grade of C or better in ECCB 302 or BIOL 318; junior classification.

ECCB 403 Population and Community Ecology

Credits 3. 3 Lecture Hours. Concepts in animal ecology; topics include population dynamics, competition, predator-prey interactions, biodiversity, infectious disease, and harvesting. **Prerequisites:** Grade of C or better in ECCB 205 or approval of instructor; junior classification.

ECCB 405 Forest Resource Assessment and Management

Credits 3. 1 Lecture Hour. 4 Lab Hours. Integration of biophysical, economic and social factors in forest resource analysis, management planning and decision making; applications of interdisciplinary knowledge and multiple-use principles to practical forest management problems. **Prerequisites:** Senior classification or approval of instructor.

ECCB 406/GEOG 462 Advanced GIS Analysis for Natural Resources Management

Credits 3. 2 Lecture Hours. 2 Lab Hours. Advanced topics in geographic information systems (GIS) to solve natural resource problems; manipulation of raster data types; three-dimensional modeling; emphasis on geoprocessing as it relates to applied projects particularly with habitat suitability models; field and lab use of global positioning systems (GPS); internet-based GIS modeling. **Prerequisites:** ECCB 351, RWFM 351, or AGSM 461, or equivalent, or approval of instructor; junior or senior classification. **Cross Listing:** GEOG 462/ECCB 406.

ECCB 407 Programming for Spatial Data Applications with R

Credits 3. 3 Lecture Hours. 0 Lab Hours. Integration of geospatial data and R programming to support analyses in ecology and conservation biology; emphasis on managing and mapping spatial data, applying geocomputation to vector and raster data, conducting spatiotemporal analysis, and creating incident maps. **Prerequisites:** STAT 301, STAT 302, or STAT 303, or approval of instructor.

ECCB 408 Arboriculture

Credits 3. 2 Lecture Hours. 2 Lab Hours. Tree selection and planting to fit climatic, space and edaphic conditions; diagnosing tree abnormalities and practicing intensive tree care. Frequent field work and demonstrations. **Prerequisite:** Senior classification or approval of instructor.

ECCB 416 Fire Ecology and Natural Resource Management

Credits 3. 3 Lecture Hours. Behavior and use of fire in the management of natural resources including range, forest and other natural resources; principles underlying the role of weather, fuel characteristics and physical features of the environment related to the development and implementation of fire management plans. **Prerequisites:** ECCB 205 or equivalent, junior or senior classification or approval of instructor.

ECCB 417 Prescribed Fire

Credits 4. 2 Lecture Hours. 5 Lab Hours. Use of prescribed fire to achieve ecosystem management objectives; understanding of how to plan and implement prescribed fires; coursework on fire behavior, fuel properties and the social aspects of prescribed fire and wildfire; how to safely use fire to achieve multiple outcomes including biodiversity conservation, reduced hazardous fire risk, livestock production and timber management. **Prerequisites:** Junior or senior classification or approval of instructor.

ECCB 420 Ecological Restoration of Wetland and Riparian Systems

Credits 3. 2 Lecture Hours. 2 Lab Hours. How wetland and riparian areas link terrestrial and aquatic systems and function hydrologically and ecologically within watersheds; integrated approaches for restoration of degraded wetland and riparian systems; improving water resources through vegetation management with a special interest in rangelands. **Prerequisites:** ECCB 205, junior or senior classification or approval of instructor.

ECCB 422 Behavioral Ecology

Credits 3. 3 Lecture Hours. Survey of the control, ontogeny, function and natural selection of behavior in a variety of vertebrate and invertebrate species; interaction between the organism and its environment with regard to the mechanisms and adaptive significance of behavior; evolution of anti-predator, feeding, reproductive and cooperative traits. **Prerequisites:** Grade of C or better in BIOL 112 or equivalent.

ECCB 430 Advanced Restoration Ecology

Credits 3. 3 Lecture Hours. A dynamic discipline relying heavily on the fundamentals of ecology; practice translating and communicating key ecological concepts to advanced case studies in ecological restoration; enhance skills for professional applications. **Prerequisites:** ECCB 205 and ECCB 320; or approval of instructor.

ECCB 444 Remote Sensing of the Environment

Credits 3. 2 Lecture Hours. 3 Lab Hours. Principles and techniques necessary for applying remote sensing to diverse issues in studying and mapping land uses and land covers of the terrestrial environment; emphasizes a hands-on learning approach with theoretical foundations and applications in both aerial and satellite remote sensing, using optical and lidar datasets. **Prerequisites:** Junior or senior classification or approval of instructor.

ECCB 446 Drones for Environmental Remote Sensing

Credits 3. 2 Lecture Hours. 2 Lab Hours. Fundamental components of small unmanned aerial systems (sUAS), sensors and platforms, UAS operational concepts, the principles of UAS data collection, legal framework within which UAS should be operated and applied, data processing software and the generation of orthomosaics and 3D point clouds; emphasis on the use of UAS in a broad spatial sciences, technology and applications context, including vegetated ecosystems. **Prerequisites:** ECCB 444; junior or senior classification.

ECCB 448 Fish Ecophysiology

Credits 3. 3 Lecture Hours. Ecological domains and demands placed on physiological performance; physiological mechanisms and control in fishes, interaction of physiological mechanisms with environment, emphasis in adaptive value of physiological traits; analysis of physiology and adaptation with models; process and functional modeling. **Prerequisite:** Junior or senior classification or approval of instructor.

ECCB 450/ENTO 450 Caribbean Conservation

Credits 2. 6 Lab Hours. Provide experience in and appreciation for diverse tropical habitats and the problems associated with conserving these habitats; design and conduct individual research projects on topics of their choice with approval from the instructors on project design and feasibility. **Prerequisites:** Concurrent enrollment in ENTO 300/ECCB 300 and ENTO 451/ECCB 451; junior or senior classification. **Cross Listing:** ENTO 450/ECCB 450.

ECCB 451/ENTO 451 Caribbean Research Seminar

Credit 1. 1 Other Hour. Document research activities; keep a journal of activities and research methods during study abroad trips. **Prerequisites:** Concurrent enrollment in ENTO 300/ECCB 300 and ENTO 450/ECCB 450; junior or senior classification. **Cross Listing:** ENTO 451/ECCB 451.

ECCB 452/RWFM 400 Study Abroad in Natural Resources

Credits 2 to 12. 2 to 12 Lecture Hours. Focus on an individual student effort assessing the ecological and human dimensions of biodiversity conservation and nature tourism; exposure to the ecological aspects of managing natural resources, especially wildlife populations and their habitat, as well as the economic, social, and cultural factors affecting biodiversity conservation and nature tourism in a developing country. May be taken two times for credit. **Prerequisite:** Junior or senior classification or approval of instructor. **Cross Listing:** RWFM 400/ECCB 452.

ECCB 454 Amazon Field School

Credits 4. 4 Lecture Hours. Investigation of social and ecological complexities of biodiversity conservation in tropical ecosystems; biological and social science approaches to evaluate causes, consequences and solutions to biodiversity loss through ecology, culture and governance. **Prerequisites:** Junior or senior classification with a minimum GPA of 2.0 and approval of instructor.

ECCB 460/RPTS 460 Nature, Values, and Protected Areas

Credits 3. 3 Lecture Hours. Writing-intensive discussion of the ways in which protected areas reflect human values about nature; identify stakeholders in and around protected areas, exploring how interests either conflict or coincide; evaluate social, economic, cultural, and ecological trade-offs of different approaches to conservation. **Prerequisites:** Junior or senior classification or approval of instructor. **Cross Listing:** RPTS 460/ECCB 460.

ECCB 462 Amazon River Tropical Biology

Credits 3. 3 Lecture Hours. History, ecology, evolutionary-biology, geography and culture of the Amazon River and Rio Negro; exploration of the world's most bio-diverse river during a 10-day expedition from Manaus, Brazil; survey biota, record observations about the ecosystem, select research topics, development of presentations. **Prerequisites:** BIOL 107, BIOL 111, BIOL 357, or ECCB 205; or approval of instructor.

ECCB 481 Seminar

Credit 1. 1 Other Hour. Oral discussion of selected topics from technical literature on recent advances in the field. **Prerequisites:** Senior classification in wildlife and fisheries sciences; 6 hours of 300- or 400-level wildlife and fisheries sciences courses. May be repeated for credit.

ECCB 484 Internship

Credits 0 to 4. 0 to 4 Other Hours. Supervised experience program conducted in the student's area of specialization. **Prerequisites:** Approval of student's advisor.

ECCB 485 Directed Studies

Credits 0 to 3. 0 to 3 Other Hours. Individual study and research upon a selected range problem. **Prerequisites:** Approval of student's advisor.

ECCB 489 Special Topics in...

Credits 1 to 4. 1 to 4 Other Hours. Selected topics in an identified area of rangeland ecology and management. May be repeated for credit.

Prerequisites: Approval of instructor.

ECCB 491 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in ecosystem science and management. May be repeated for credit. **Prerequisites:** Junior or senior classification and approval of instructor.

ECDE - Early Chldhd Devl & Educ (ECDE)

ECDE 352 Partnering with Families in Early Childhood

Credits 3. 3 Lecture Hours. Application of an ecological model to the understanding of variation in family roles, perspectives, approaches, strengths, and goals; effective communication and partnership approaches for families of young children; family education programming. **Prerequisites:** Junior or senior classification.

ECDE 382 Supporting Diverse Learners and Their Families

Credits 3. 3 Lecture Hours. Historical background and current educational policies in relation to diverse learners' instruction in classrooms; sociocultural dimensions of teaching and learning central to diversity; implications of inclusion and the integration of research-based practices in the classroom for early childhood teachers; engaging families. **Prerequisites:** Junior or senior classification.

ECDE 472 Evaluation of Human Service Programs

Credits 3. 3 Lecture Hours. Theory, methods and skills used to evaluate human services programs; programs aimed at improving the quality of life of individuals and families; prepare beginning human service professionals for the task of evaluating the effectiveness of programs. **Prerequisites:** Junior or senior classification.

ECDE 473 Administration and Supervision in Early Childhood Settings

Credits 3. 3 Lecture Hours. Administration of early childhood programs including identification of community needs; analysis of business opportunities; evaluation and appropriate use of space and quality programming; consideration of policy and legal responsibilities; professionalism in the field; examination of best practices in staff selection, training, coaching, and supervision. **Prerequisites:** EDCI 353 and EDCI 364.

ECDE 484 Internship

Credits 6. 6 Other Hours. Professional experience in a community organization; provide a 270 hour, on-site learning experience in an agency working directly with families and professionals; work under the direct supervision of agency personnel and connect the theoretical concepts learned in course work to a practical setting. **Prerequisites:** Senior classification.

ECEN - Electrical & Comp Engr (ECEN)

ECEN 209 Introduction to Computer Programming and Algorithms

Credits 3. 3 Lecture Hours. 1 Lab Hour. Introduction to C language programming and common algorithms; computer systems; simple C programs; basic language constructs; file I/O; modular programming and functions; arrays and matrices; pointers and strings; simple data structures; searching, sorting, and numerical algorithms; algorithmic complexity. **Prerequisites:** Grade of C or better in ENGR 102.

ECEN 210 Computer Programming and Algorithms

Credits 4. 3 Lecture Hours. 3 Lab Hours. Introduction to C language and common algorithms; computer systems; simple C programs; basic language constructs; file I/O; modular programming and functions; arrays and matrices; pointers and strings; simple data structures; searching, sorting, and numerical algorithms; algorithmic complexity. **Prerequisite:** Sophomore classification in an engineering major; Qatar campus.

ECEN 214 Electrical Circuit Theory

Credits 4. 3 Lecture Hours. 3 Lab Hours. Resistive circuits including circuit laws, network reduction, nodal analysis, mesh analysis; introduction to operational amplifiers; circuit analysis with inductors and capacitors; sinusoidal steady state circuit analysis; AC power calculations; magnetically coupled circuits; the ideal transformer; resonance; introduction to circuit simulation. **Prerequisites:** Grade of C or better in PHYS 207; grade of C or better in PHYS 217/ENGR 217 or ENGR 217/PHYS 217; grade of C or better in CHEM 107, CHEM 102, or CHEM 120; grade of C or better in MATH 308, or concurrent enrollment.

ECEN 215 Principles of Electrical Engineering

Credits 3. 2 Lecture Hours. 2 Lab Hours. Fundamentals of electric circuit analysis and introduction to electronics for engineering majors other than electrical and computer engineering. **Prerequisites:** Grade of C or better in MATH 251 or MATH 253; Grade of C or better in PHYS 207 or PHYS 208.

ECEN 222/CSCE 222 Discrete Structures for Computing

Credits 3. 3 Lecture Hours. Mathematical foundations from discrete mathematics for analyzing computer algorithms, for both correctness and performance; introduction to models of computation, including finite state machines and Turing machines. **Prerequisite:** Grade of C or better in MATH 142, MATH 147, MATH 151, or MATH 171. **Cross Listing:** CSCE 222/ECEN 222.

ECEN 248 Introduction to Digital Systems Design

Credits 4. 3 Lecture Hours. 3 Lab Hours. Combinational and sequential digital system design techniques; design of practical digital systems. **Prerequisite:** Grade of C or better in MATH 152; grade of C or better in PHYS 207 or PHYS 208, or concurrent enrollment.

ECEN 250 Machine Learning for Electrical Engineering

Credits 3. 2 Lecture Hours. 3 Lab Hours. Engineering application-focused introduction to machine learning covering key machine learning concepts, guidance on selecting machine learning models, and application of python-based tools for data preparation, model development, and performance evaluation; practical engineering use-cases for machine learning from electronics, energy, motors, robotics, security, computer systems, and health; machine learning laboratory project including dataset management, ML model development, visualization, and deployment to an IoT platform showcasing ML expertise. **Prerequisites:** Grade of C or better in ENGR 102; grade of C or better in MATH 251 or MATH 253.

ECEN 285 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Problems of limited scope approved on an individual basis intended to promote independent study. **Prerequisite:** Approval of department head.

ECEN 289 Special Topics in...

Credits 1 to 4. 1 to 4 Other Hours. Selected topics in an identified area of electrical engineering. May be repeated for credit. **Prerequisite:** Approval of instructor.

ECEN 291 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in electrical engineering. May be repeated 3 times for credit. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

ECEN 303 Random Signals and Systems

Credits 3. 3 Lecture Hours. Concepts of probability and random variables necessary for study of signals and systems involving uncertainty; applications to elementary problems in detection, signal processing and communication. **Prerequisites:** Grade of C or better in MATH 251 or MATH 253; Grade of C or better in ECEN 248.

ECEN 314 Signals and Systems

Credits 3. 3 Lecture Hours. Introduction to the continuous-time and discrete-time signals and systems; time domain characterization of linear time-invariant systems; Fourier analysis; filtering; sampling; modulation techniques for communication systems. **Prerequisites:** Grade of C or better in ECEN 214 or ECEN 215; grade of C or better in MATH 308; junior or senior classification.

ECEN 322 Electric and Magnetic Fields

Credits 3. 3 Lecture Hours. Vector analysis, Maxwell's equations, wave propagation in unbounded regions, reflection and refraction of waves, transmission line theory; introduction to waveguides and antennas. **Prerequisites:** Grade of C or better in ECEN 214, PHYS 207 or PHYS 208, and MATH 311; junior or senior classification.

ECEN 325 Electronics

Credits 4. 3 Lecture Hours. 3 Lab Hours. Electronic systems; linear circuits; operational amplifiers and applications; diodes, field effect transistors, bipolar transistors; amplifiers and nonlinear circuits. **Prerequisite:** Grade of C or better in MATH 311; grade of C or better in ECEN 314, or concurrent enrollment.

ECEN 326 Electronic Circuits

Credits 4. 3 Lecture Hours. 3 Lab Hours. Basic circuits used in electronic systems; differential and multistage amplifiers; output stages and power amplifiers; frequency response, feedback circuits, stability and oscillators, analog integrated circuits, active filters. **Prerequisites:** Grade of C or better in ECEN 314 and ECEN 325; junior or senior classification.

ECEN 333 At the Interface of Engineering and Life Sciences

Credits 3. 3 Lecture Hours. Broad overview of electrical and computer engineering principles applied to various areas of life sciences; medical imaging and biomedical signal processing; micro/nano devices and systems; computational biology and genomic signal processing; recent trends in interfacing engineering and life science that address emerging grand challenge problems in health, bio-energy and bio-security; taught in a team approach. **Prerequisites:** Grade of C or better in ECEN 214; junior or senior classification.

ECEN 338 Electromechanical Energy Conversion

Credits 4. 3 Lecture Hours. 3 Lab Hours. Introduction to magnetic circuits, transformers, electromechanical energy conversion devices such as dc, induction and synchronous motors; equivalent circuits, performance characteristics and power electronic control. **Prerequisite:** ECEN 214.

ECEN 340 Electric Energy Conversion

Credits 3. 3 Lecture Hours. Fundamental topics in power and energy systems; phasors; three-phase circuits; self and mutual inductance; transformers; electromechanical systems; synchronous and induction machines; advanced concepts in electric energy conversion; DC-DC converters; inverters and rectifiers; solar and wind energy systems; DC and single-phase machines. **Prerequisites:** Grade of C or better in ECEN 214; junior or senior classification.

ECEN 350/CSCE 350 Computer Architecture and Design

Credits 4. 3 Lecture Hours. 3 Lab Hours. Computer architecture and design; use of register transfer languages and simulation tools to describe and simulate computer operation; central processing unit organization, microprogramming, input/output and memory system architectures. **Prerequisites:** Grade of C or better in ECEN 248 and CSCE 120; junior or senior classification. **Cross Listing:** CSCE 350/ECEN 350.

ECEN 360 Computational Data Science

Credits 3. 3 Lecture Hours. Computational practice of data science through a sequence of interactive modules that provides an integrated hands-on approach to its methods, tools, applications and supporting technologies including high performance and cloud computing platforms. **Prerequisites:** Grade of C or better in ENGR 102, CSCE 110, CSCE 111, or CSCE 206; grade of C or better in MATH 251, MATH 253, or STAT 211; junior or senior classification. **Cross Listing:** CSCE 305 and STAT 315.

ECEN 370 Electronic Properties of Materials

Credits 3. 3 Lecture Hours. Introduction to basic physical properties of solid materials; some solid state physics employed, but major emphasis is on engineering applications based on semiconducting, magnetic, dielectric and superconducting phenomena. **Prerequisite:** Grade of C or better in PHYS 222 or PHYS 309; junior or senior classification.

ECEN 399 High Impact Professional Development

Credits 0. 0 Other Hours. Participation in an approved high-impact learning practice; reflection on professional outcomes from engineering body of knowledge; documentation and self-assessment of learning experience at mid-curriculum point. **Prerequisites:** Grade of C or better in ECEN 484, ECEN 491, ENGR 484, ENGR 491, or ENGR 385; junior or senior classification.

ECEN 403 Electrical Design Laboratory I

Credits 3. 2 Lecture Hours. 3 Lab Hours. Application of design process and project engineering as practiced in industry; team approach to the design process; development of a project proposal; documentation of the proposal, implementation and project; development of execution and validation plan; project execution will begin in ECEN 403 and continue through to ECEN 404. **Prerequisites:** Grade of C or better in COMM 205 or COMM 243 or ENGL 210; grade of C or better in ECEN 314, ECEN 325, and ECEN 350/CSCE 350 or CSCE 350/ECEN 350; grade of C or better in ECEN 303, ECEN 322, and ECEN 370, or grade C or better in CSCE 315 or CSCE 331, and ECEN 303 or STAT 211, and ECEN 449 or CSCE 462, or concurrent enrollment; senior classification.

ECEN 404 Electrical Design Laboratory II

Credits 3. 2 Lecture Hours. 3 Lab Hours. Continuation of ECEN 403; application of the design process and project engineering as practiced in industry; team approach to the design process; completion of project based on proposal from ECEN 403; includes testing, evaluation and report writing. **Prerequisites:** Grade of C or better in ECEN 403; senior classification.

ECEN 410 Medical Imaging

Credits 4. 3 Lecture Hours. 2 Lab Hours. Fundamentals of physics and the engineering principles of medical imaging systems; focus on magnetic resonance imaging, x-ray computer tomography, ultrasonography, optical imaging and nuclear medicine; includes systems, sources, energy tissue interaction, image formation and clinical examples; virtual labs, on- and off-campus lab tours. **Prerequisites:** Grade of C or better in MATH 251 or MATH 253; ECEN 444 or grade of C or better in ECEN 314; junior or senior classification.

ECEN 411 Introduction to Magnetic Resonance Imaging and Magnetic Resonance Spectroscopy

Credits 3. 2 Lecture Hours. 3 Lab Hours. Introduction to the basic physics of magnetic resonance, the principles of MR imaging and spectroscopy, the major contrast mechanisms in MRI and MR imaging system hardware; development of pulse sequences for different imaging methods, including flow and spectroscopic imaging; will build RF coils. **Prerequisites:** Grade of C or better in MATH 251 or MATH 253; grade of C or better in PHYS 207 or PHYS 208; junior or senior classification.

ECEN 412 Ultrasound Imaging

Credits 3. 3 Lecture Hours. Mathematical analysis of wave propagation, scattering of ultrasound in biological tissues, electronic transducer arrays for the beam forming, models of the received signals and signal processing methods for medical ultrasound imaging of tissues; includes discussions of research related to fundamental ultrasound imaging concepts. **Prerequisites:** Grade of C or better in ECEN 314; junior or senior classification.

ECEN 414 Biosensors

Credits 3. 2 Lecture Hours. 2 Lab Hours. Hands-on lab experience in the development of miniaturized biosensors; includes microfluidic devices for biosensing. **Prerequisite:** Grade of C or better in ECEN 214; senior classification.

ECEN 415 Physical and Economical Operations of Sustainable Energy Systems

Credits 3. 3 Lecture Hours. Operational issues for sustainable electric energy systems; basic relevant topics in engineering, optimization and economic concepts; modular view of individual electric energy processing components; physical and market operations in electricity industry in support of sustainable energy integration; computer simulations and demonstrations to create and evaluate examples of power systems. **Prerequisites:** Grade of C or better in ECEN 340, and ECEN 420 or ECEN 460; junior or senior classification.

ECEN 416/CSCE 416 Hardware Design Verification

Credits 3. 3 Lecture Hours. Hardware functional verification; case studies on verification in integrated circuit design; introduction to industry best practices; introduction to logic functional verification. **Prerequisites:** CSCE 312, CSCE 350/ECEN 350, or ECEN 350/CSCE 350, or equivalent in computer architecture; familiarity with C/C++/Verilog/VHDL programming. **Cross Listing:** CSCE 416/ECEN 416.

ECEN 419 Genomic Signal Processing

Credits 3. 3 Lecture Hours. Fundamentals of molecular biology; application of engineering principles to systems biology; topics include unearthing intergene relationships, carrying out genebased classification of disease, modeling genetic regulatory networks, and altering their dynamic behavior. **Prerequisites:** Grade of C or better in ECEN 314; junior or senior classification.

ECEN 420 Linear Control Systems

Credits 3. 3 Lecture Hours. Application of state variable and frequency domain techniques to modeling, analysis and synthesis of single input, single output linear control systems. **Prerequisites:** Grade of C or better in ECEN 314 and MATH 308; junior or senior classification.

ECEN 423 Computer and Wireless Networks

Credits 3. 3 Lecture Hours. Fundamentals of wired and wireless computer networks, design and performance evaluations of wired and wireless networks, various unguided media characterizations and classifications/ comparisons, digital-data representations/transmissions, error control, MAC protocols, routing, TCP/UDP/IP, wireless TCP, queuing-delay/loss modeling, IEEE 802.11 and its interconnections with Internet, and QoS provisioning over wired/wireless networks. **Prerequisite:** Grade of C or better in MATH 311; junior or senior classification.

ECEN 424 Fundamentals of Networking

Credits 3. 3 Lecture Hours. 1 Lab Hour. Foundations of computer networking; layered architecture of the Internet, analysis of protocols, new-age networks such as the Web and social networks; computer network programming and offline analysis of real network data. **Prerequisites:** Grade of C or better in ECEN 303 or STAT 211; junior or senior classification.

ECEN 425 Radio Frequency and Microwave Engineering

Credits 3. 3 Lecture Hours. Fundamental Radio Frequency (RF) and microwave circuit analysis including scattering and ABCD matrices, return loss, insertion loss; transmission lines, lumped elements, impedance matching; theory, analysis and design of basic RF and microwave passive circuits; use of commercial CAD programs for RF and microwave circuit design and simulation. **Prerequisites:** Grade of C or better in ECEN 322; junior or senior classification.

ECEN 426/CSCE 426 Security of Embedded Systems

Credits 3. 3 Lecture Hours. Security principles; common security features and flaws in day-to-day embedded systems; security analysis, vulnerability exploits and security fixes for embedded systems. **Prerequisite:** Grade of C or better in ECEN 350/CSCE 350, CSCE 350/ ECEN 350, or CSCE 312; junior or senior classification. **Cross Listing:** CSCE 426/ECEN 426.

ECEN 427 Machine Learning

Credits 3. 3 Lecture Hours. Theoretical foundations of machine learning, pattern recognition and generating predictive models and classifiers from data; includes methods for supervised and unsupervised learning (decision trees, linear discriminants, neural networks, Gaussian models, non-parametric models, clustering, dimensionality reduction, deep learning), optimization procedures and statistical inference. **Prerequisites:** Grade of C or better in MATH 304, MATH 311, or MATH 323; Grade of C or better in STAT 211, and STAT 404 or CSCE 221, or ECEN 303, and CSCE 121 or CSCE 120. **Cross Listing:** CSCE 421 and STAT 421.

ECEN 428 Field Programmable Gate Arrays Information Processing Systems

Credits 4. 3 Lecture Hours. 2 Lab Hours. Signal processing and neural network implementations on field programmable gate arrays (FPGA); FPGA designs of digital filters, Fourier transform, JPEG decoding, fast convolution, Kalman filter and Viterbi decoding; circuit design techniques commonly used in signal processing and neural network, such as pipelining, parallel processing, folding, unfolding and systolic array. **Prerequisites:** Grade of C or better in ECEN 248 and ECEN 314; junior or senior classification.

ECEN 429 Machine Learning for Signal Processing

Credits 3. 3 Lecture Hours. Principles of pattern recognition and machine learning and electrical and computer engineering applications in signal estimation, detection and classification, detection of patterns in engineering systems and communications networks, assessment of normality and abnormality patterns in biomedical engineering applications and cyber security of power systems. **Prerequisites:** Grade of C or better in ECEN 314; grade of C or better in ECEN 303 or STAT 211; junior or senior classification.

ECEN 430 Automotive Electronics

Credits 4. 3 Lecture Hours. 3 Lab Hours. Vehicular electronic systems, electric powertrain, motors and motor control, battery management power management, driver assistance systems (ADAS), LIDAR/Radar/ Camera modules, sensing and actuator devices for anti-collision systems, automotive communication, vehicle-to-vehicle and vehicle to infrastructure communication systems, autonomous and driverless vehicles. **Prerequisites:** Grade of C or better in ECEN 325; junior or senior classification.

ECEN 431 RF Circuits for Wireless Communications

Credits 4. 3 Lecture Hours. 3 Lab Hours. Radio Frequency (RF) circuits for wireless communications applications; RF systems and their applications, noise, distortion, analog and digital modulations and radio architectures; transistor-level implementation of super-heterodyne AM/FM radios, RF/IF amplifiers, mixers, oscillators, demodulators, and baseband amplifiers. **Prerequisites:** Grade of C or better in ECEN 325; senior classification.

ECEN 432 Data Conversion Systems and Circuits

Credits 4. 3 Lecture Hours. 3 Lab Hours. Sampling theory and sampling circuit implementations, quantization architectures and interpolation techniques for data conversion interfaces such as analog-to-digital and digital-to-analog converters, noise modeling of sampled and quantized data, performance metrics, modeling of circuits errors (capacitor mismatch, gain mismatches, etc.) basic linear calibration techniques and compensation techniques. **Prerequisites:** Grade of C or better in ECEN 314 and ECEN 325; junior or senior classification.

ECEN 433 Advanced Micromachining Technologies for the Informational Era

Credits 3. 3 Lecture Hours. In-depth discussion of state-of-the-art fabrication and assembly techniques for micro sensors and actuators to be used in today and future's smart electronics and intelligent systems. **Prerequisites:** Grade of C or better in ECEN 370; junior or senior classification.

ECEN 434 Optimization for Electrical and Computer Engineering Applications

Credits 3. 3 Lecture Hours. Principles of optimization including linear and nonlinear optimization as well as electrical and computer engineering applications in signal estimation, routing in communication networks, flows in wireless networks, wafer fabrication plants, and economic dispatch in power systems. **Prerequisites:** Grade of C or better in MATH 304 or MATH 309 or MATH 311; grade of C or better in MATH 251 or MATH 253; junior or senior classification.

ECEN 438 Power Electronics

Credits 4. 3 Lecture Hours. 3 Lab Hours. Electric power conditioning and control; characteristics of solid state power switches; analysis and experiments with AC power controllers, controlled rectifiers, DC choppers and DC-AC converters; applications to power supplies, airborne and spaceborne power systems. **Prerequisites:** Grade of C or better in ECEN 340; junior or senior classification.

ECEN 440 Thin Film Technology and Device Application

Credits 3. 3 Lecture Hours. 1 Lab Hour. Thin film fundamentals, processing and industrial applications; topics include crystal structures in thin films, deposition techniques, thin film characterizations and several advanced topics related to electrical and optical devices; lab or tour sessions provided to promote teaching and learning. **Prerequisite:** Grade of C or better in ECEN 370; junior or senior classification.

ECEN 441 Electronic Motor Drives

Credits 4. 3 Lecture Hours. 3 Lab Hours. Application of semiconductor switching power converters to adjustable speed DC and AC motor drives; steady state theory and analysis of electric motion control in industrial, robotic and traction systems; laboratory experiments in power electronic motor drives and their control. **Prerequisite:** Grade of C or better in ECEN 340; junior or senior classification.

ECEN 442 DSP Based Electromechanical Motion Control

Credits 3. 2 Lecture Hours. 3 Lab Hours. Overview of energy conversion and basic concepts on electromechanical motion devices; different control strategies including the solid-state drive topologies; for every electromechanical motion device, its DSP control implementation discussed and implemented in the lab. **Prerequisites:** Grade of C or better in ECEN 314; junior or senior classification.

ECEN 444 Digital Signal Processing

Credits 4. 3 Lecture Hours. 3 Lab Hours. Digital signal processing; discrete-time signals and systems, linear shift-invariant systems, the discrete Fourier transform and fast Fourier transform algorithm, and design of finite impulse response and infinite impulse response digital filters. **Prerequisites:** Grade of C or better in ECEN 314; junior or senior classification.

ECEN 445 Applied Electromagnetic Theory

Credits 3. 3 Lecture Hours. Guided wave and wireless methods; applications of Maxwell's equations and electromagnetic wave phenomena to radiation, antennas and microwave circuit design; digital transmission line analysis and design. **Prerequisites:** Grade of C or better in ECEN 322; junior or senior classification.

ECEN 446 Information Theory, Inference and Learning Algorithms

Credits 3. 3 Lecture Hours. Basic concepts and techniques on data compression, error control codes, and information theoretic measures; basic concepts and techniques in statistical inference such as clustering, maximum likelihood, exact marginalization, Monte Carlo methods, importance sampling, and Markov chain Monte Carlo; introduction to neuron and neural networks; support vector machines. **Prerequisites:** Grade of C or better in MATH 311; grade of C or better in ECEN 303 or STAT 211; junior or senior classification.

ECEN 447 Digital Image Processing

Credits 4. 3 Lecture Hours. 3 Lab Hours. Improvement of pictorial information using spatial and frequency domain techniques; two-dimensional discrete Fourier transform; image filtering, enhancement, restoration, compression; image processing project. **Prerequisites:** Grade of C or better in ECEN 314; junior or senior classification.

ECEN 449 Microprocessor Systems Design

Credits 3. 2 Lecture Hours. 2 Lab Hours. Introduction to microprocessors; 16/32 bit single board computer hardware and software designs; chip select equations for memory board design, serial and parallel I/O interfacing; ROM, static and dynamic RAM circuits for no wait-state design; assembly language programming, stack models, subroutines and I/O processing. **Prerequisites:** Grade of C or better in ECEN 248; junior or senior classification.

ECEN 451 Antenna Engineering

Credits 3. 3 Lecture Hours. Antenna theory and design; including antenna performance parameters, analysis of radiation from sources using Maxwell's equations, theory and design of wire antennas, arrays and frequency independent antennas; computer methods for antenna design. **Prerequisite:** Grade of C or better in ECEN 322; junior or senior classification.

ECEN 453 Microwave Solid-State Circuits and Systems

Credits 4. 3 Lecture Hours. 3 Lab Hours. Microwave solid-state devices and circuits; theory and design of various types of active circuits; applications of these devices and circuits in radar, communication, and surveillance systems; hands-on lab activities covering basics of microwave measurements. **Prerequisites:** Grade of C or better in ECEN 322; junior or senior classification.

ECEN 454 Digital Integrated Circuit Design

Credits 3. 2 Lecture Hours. 2 Lab Hours. Analysis and design of digital devices and integrated circuits using MOS and bipolar technologies and computer aided simulation. **Prerequisites:** Grade of C or better in ECEN 214 and ECEN 248; junior or senior classification.

ECEN 455 Digital Communications

Credits 4. 3 Lecture Hours. 3 Lab Hours. Digital transmission of information through stochastic channels; analog-to-digital conversion, entropy and information, Huffman coding; signal detection, the matched filter receiver, probability of error; baseband and passband modulation, signal space representation of signals, PAM, QAM, PSK, FSK; block coding, convolutional coding; synchronization; communication through fading channels; spread-spectrum signaling; simulation of digital communication systems. **Prerequisites:** Grade of C or better in ECEN 314 and ECEN 303 or STAT 211; junior or senior classification.

ECEN 457 Operational Amplifiers

Credits 4. 3 Lecture Hours. 3 Lab Hours. Analysis of basic operational amplifier and operational transconductance amplifier (OTA) circuits; noise analysis in Op amp and OTA circuits; nonlinear OTA and Op amp circuits; instrumentation amplifiers; transducer circuits; function generators; oscillators and D/A converters and basics of switched-capacitor circuits. **Prerequisite:** Grade of C or better in ECEN 325; junior or senior classification.

ECEN 459 Power System Fault Analysis and Protection

Credits 4. 3 Lecture Hours. 2 Lab Hours. General considerations in transmission and distribution of electrical energy as related to power systems; calculation of electric transmission line constants; general theory of symmetrical components and application to analysis of power systems during fault conditions. **Prerequisites:** Grade of C or better in ECEN 340; junior or senior classification.

ECEN 460 Power System Operation and Control

Credits 4. 3 Lecture Hours. 2 Lab Hours. Load flow studies; power system transient stability studies; economic system loading and automatic load flow control. **Prerequisites:** Grade of C or better in ECEN 340; junior or senior classification.

ECEN 461 Electronic Noise

Credits 3. 3 Lecture Hours. Surveying the elements of electronic noise including concept, theory, measurements, analysis and design; focusing on creative pictures, examples and problems. **Prerequisites:** Grade of C or better in ECEN 325; grade of C or better in ECEN 303 or STAT 211; junior or senior classification.

ECEN 462 Optical Communication Systems

Credits 3. 3 Lecture Hours. Principles of optical communication systems; characteristics of optical fibers, lasers and photodetectors for use in communication systems; design of fiber-optic digital systems and other optical communication systems. **Prerequisites:** Grade of C or better in ECEN 322 and ECEN 370; junior or senior classification.

ECEN 463 Magnetic Resonance Engineering

Credits 3. 2 Lecture Hours. 3 Lab Hours. Design, construction and application of instrumentation for MR imaging; fundamentals of the architecture of an MR spectrometer and the gradient subsystem used for image localization; emphasis on the radiofrequency sensors and systems used for signal generation and reception. **Prerequisites:** Grade of C or better in ECEN 322 or BMEN 420; junior or senior classification.

ECEN 464 Optical Engineering

Credits 3. 3 Lecture Hours. Ray optics; wave optics; propagation, reflection, refraction and diffraction of light; passive optical components, polarization, optical modulators, interferometers and lasers.

Prerequisites: Grade of C or better in ECEN 322 and ECEN 370; junior or senior classification.

ECEN 465 Experimental Optics

Credits 4. 2 Lecture Hours. 7 Lab Hours. In-depth study of experimental optic techniques; opto-mechanical assemblies; passive optics; interferometers; opto-electronics; basic op-amp circuits; feedback and control of optics with electronics. **Prerequisite:** Grade of C or better in ECEN 370; junior or senior classification.

ECEN 466/CYBR 466 Unconditionally Secure Electronics

Credits 3. 3 Lecture Hours. Data security; cryptography; key exchange; conditional security; unconditional (information-theoretic) security; quantum key distribution; the Kirchhoff-law-Johnson-noise (KLJN) key exchange, electronic noise; advanced issues of KLJN; schemes, protocols, attacks, defense, privacy amplification, credit cards, PUF, autonomous vehicles and smart grids. **Prerequisites:** Grade of C or better in ECEN 214; grade of C or better in ECEN 303 or STAT 211; junior or senior classification. **Cross Listing:** CYBR 466/ECEN 466.

ECEN 467 Harnessing Solar Energy: Optics, Photovoltaics and Thermal Systems

Credits 4. 3 Lecture Hours. 3 Lab Hours. Solar radiation characteristics and measurement; optical coatings including reflection, transmission, absorption and emissivity; concentrating optics, tracking and etendue limit; photovoltaic cells, modules and systems overview; introduction to solar thermal systems. **Prerequisites:** Grade of C or better in ECEN 322 and ECEN 370; junior or senior classification.

ECEN 468 Advanced Digital System Design

Credits 4. 3 Lecture Hours. 3 Lab Hours. Design, modeling and verification of complex digital systems using hardware description language and electronic system level language. **Prerequisite:** Grade of C or better in ECEN 248; junior or senior classification.

ECEN 469/CSCE 469 Advanced Computer Architecture

Credits 3. 3 Lecture Hours. Advanced computer architectures including memory designs, pipeline techniques, and parallel structures such as vector computers and multiprocessors. **Prerequisite:** Grade of C or better in ECEN 350/CSCE 350 or CSCE 350/ECEN 350; junior or senior classification. **Cross Listing:** CSCE 469/ECEN 469.

ECEN 470 Laser Principles and Applications

Credits 3. 3 Lecture Hours. Working understanding of the basic principles of laser science, the major components of laser system and their function; examples of laser applications to science, engineering, medicine and industry. **Prerequisites:** Grade of C or better in ECEN 322 and ECEN 370; junior or senior classification.

ECEN 471 Power Management Circuits and Systems

Credits 4. 3 Lecture Hours. 3 Lab Hours. Overview of modern semiconductor power devices, DC-DC linear regulators, switching regulators and battery chargers; emphasis on mathematical foundations, feedback theory, stability and root locus, multi-stage amplifiers, analysis and design of power electronic circuits including DC-DC and AC-DC converters and power supplies; applications on power electronics and power management circuits. **Prerequisites:** Grade of C or better in ECEN 325; junior or senior classification.

ECEN 472 Microelectronic Circuit Fabrication

Credits 4. 3 Lecture Hours. 3 Lab Hours. Fundamentals of MOS and bipolar microelectronic circuit fabrication; theory and practice of diffusion, oxidation, ion implantation, photolithography, etch; yield and reliability considerations; statistical process control; integrated process design, simulation and characterization. **Prerequisites:** Grade of C or better in ECEN 325 and ECEN 370; junior or senior classification.

ECEN 473 Microelectronic Device Design

Credits 3. 3 Lecture Hours. General processes for the fabrication of microelectronic devices and integrated circuits; a review of the electronic properties of semiconductors and carrier transport and recombination; analysis and characterization of p-n junctions, bipolar transistors, and MOS capacitors and transistors; design considerations for achieving optimum performance and practical structures are discussed. **Prerequisites:** Grade of C or better in ECEN 325 and ECEN 370; junior or senior classification.

ECEN 474 VLSI Circuit Design

Credits 4. 3 Lecture Hours. 3 Lab Hours. Analysis and design of monolithic analog and digital integrated circuits using NMOS, CMOS and bipolar technologies; device modeling; CAD tools and computer-aided design; design methodologies for LSI and VLSI scale circuits; yield and economics; test and evaluation of integrated circuits. **Prerequisite:** ECEN 326.

ECEN 475 Introduction to VLSI Systems Design

Credits 4. 3 Lecture Hours. 3 Lab Hours. Introduction to design and fabrication of microelectronic circuits; emphasis on very large scale integration (VLSI) digital systems; use of state-of-the-art design methodologies and tools; design of small to medium scale integrated circuits for fabrication. **Prerequisites:** Grade of C or better in ECEN 454; junior or senior classification.

ECEN 477 Photonics: Fiber and Integrated Optics

Credits 4. 3 Lecture Hours. 3 Lab Hours. Photonics lab including optical power and spectral measurements of singlemode and multimode optical fibers, hands-on arc fusion splicing, lasers, amplifiers, interferometers, photodetectors, integrated optics, fiber-optic devices, optical modulators. **Prerequisite:** Grade of C or better in ECEN 322 and ECEN 370; junior or senior classification.

ECEN 478 Wireless Communications

Credits 3. 3 Lecture Hours. Overview of wireless applications, models for wireless communication channels, modulation formats for wireless communications, multiple access techniques, wireless standards.

Prerequisites: Grade of C or better in ECEN 314; junior or senior classification.

ECEN 480 RF and Microwave Wireless Systems

Credits 3. 3 Lecture Hours. Introduction to various RF and microwave system parameters, architectures and applications; theory, implementation, and design of RF and microwave systems for communications, radar, sensor, surveillance, navigation, medical and optical applications. **Prerequisite:** Grade of C or better in ECEN 322; junior or senior classification.

ECEN 484 Professional Internship

Credits 0-1. 0-1 Lecture Hours. Professional internship in a private company, government agency or laboratory, university or organization to provide work and/or research experience related to the student's major and career objectives. May be taken three times for credit.

Prerequisites: Grade of C or better in ECEN 214 or ECEN 248; junior or senior classification; approval of instructor and internship agency.

ECEN 485 Directed Studies

Credits 0 to 6. 0 to 6 Other Hours. Problems of limited scope approved on an individual basis intended to promote independent study. **Prerequisites:** Senior classification; approval of department head.

ECEN 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 7 Lab Hours. Selected topics in an identified area of electrical engineering. May be repeated for credit.

Prerequisite: Approval of instructor.

ECEN 491 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in electrical engineering. May be repeated 3 times for credit. **Prerequisites:** Junior or senior classification and approval of instructor.

ECFB - Early Chldhd Ed Fld Based (ECFB)

ECFB 321 Curriculum Design for Early Childhood Programs SEL and Literacy

Credits 3. 3 Lecture Hours. 1 Lab Hour. Focus on child development principles and accreditation standards for designing social emotional learning (SEL), language, and literacy curricula for early childhood programs and planning and evaluating learning activities and programs; supervised learning activities for individual children and groups; emphasis on planning, implementing, and evaluating activities; field trips may be required. **Prerequisites:** EDCI 353, INST 210, and EDCI 364.

ECFB 421 Curriculum Design for Early Childhood Programs II

Credits 3. 3 Lecture Hours. 1 Lab Hour. Focus on child development principles and accreditation standards for designing curricula for early childhood programs and planning and evaluating learning activities and programs; supervised learning activities for individual children and groups; emphasis on planning, implementing, and evaluating activities; concurrently taken with a lab component; field trips may be required.

Prerequisites: Grade of C or better in EDCI 353, INST 210, EDCI 364, and ECFB 321.

ECFB 422 Infant Development and Program Planning and Infant/Toddler Lab

Credits 3. 3 Lecture Hours. 1 Lab Hour. Typical and atypical infant and toddler development; sources of variation in learning and development; developmentally appropriate expectations; markers of quality child care for infants and toddlers; family systems and relationship dynamics; early intervention and support programs; issues in curriculum and environments of childcare; skills for applying knowledge through specific professional roles. **Prerequisites:** EDCI 353.

ECFB 424 Capstone Teaching in an Early Childhood Program

Credits 6. 6 Other Hours. Culmination of early childhood teaching track program; integration and application of knowledge and skills learned from program of study while observing and participating in early childhood settings with supervision. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisites:** Grade of C or better in ECFB 421; ECFB 422.

ECHE - Early Chldhd Ed Fld Based (ECHE)

ECHE 291 Research

Credits 1 to 4. 1 to 4 Other Hours. Research conducted under the direction of faculty member in early childhood education. May be repeated 2 times for credit. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

ECHE 491 Research

Credits 1 to 4. 1 to 4 Other Hours. Research conducted under the direction of faculty member in early childhood education. May be repeated 2 times for credit. **Prerequisites:** Junior or senior classification and approval of instructor.

ECMT - Econometrics (ECMT)

ECMT 461 Economic Data Analysis

Credits 3. 3 Lecture Hours. Concepts of statistical description, probability theory and statistical inference as they apply to economic analysis; data management, data handling and data analysis; focus on economic statistics with emphasis on regression analysis. **Prerequisites:** Grade of C or better in MATH 142, MATH 151, or MATH 171; junior or senior classification, or approval of instructor.

ECMT 463 Introduction to Econometrics

Credits 3. 3 Lecture Hours. Application of mathematics and statistics to interpret economic phenomena; elementary econometric models and estimation techniques useful for estimating economic relationships and theories. **Prerequisites:** Grade of C or better in ECON 323; grade of C or better in ECMT 461, STAT 211 or STAT 303.

ECMT 475 Economic Forecasting

Credits 3. 3 Lecture Hours. Econometric approach to prediction and forecasting; data mining and in-sample overfitting; exploratory data analysis; model selection; recursive techniques; structural change; nonlinear models; causality; forecast evaluation and combination; practical issues in real world prediction and forecasting. **Prerequisites:** ECMT 463 with a grade of C or better; junior or senior classification.

ECON - Economics (ECON)

ECON 202 Principles of Economics

Credits 3. 3 Lecture Hours. (ECON 2302) Principles of Economics. Elementary principles of economics; the economic problem and the price system; theory of demand, theory of production and the firm, theory of supply; the interaction of demand and supply; also taught at Galveston campus.

ECON 203 Principles of Economics

Credits 3. 3 Lecture Hours. (ECON 2301) Principles of Economics. Measurement and determination of national income, employment and price; introduction to monetary and fiscal policy analysis; the effects of government deficits and debt, exchange rates and trade balances. **Prerequisite:** ECON 202 or approval of undergraduate advisor; also taught at Galveston campus.

ECON 285 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Directed studies in specific problem areas of economics. May be repeated for credit. **Prerequisite:** Freshman or sophomore classification; approval of instructor.

ECON 289 Special Topics in...

Credits 3. 3 Lecture Hours. Selected topics in an identified area of economics. May be repeated for credit. **Prerequisite:** Approval of undergraduate advisor.

ECON 291 Research

Credits 0 to 3. 0 to 3 Other Hours. Research conducted under the direction of faculty member in economics. May be taken three times for credit. **Prerequisites:** Freshman or sophomore classification.

ECON 311 Money and Banking

Credits 3. 3 Lecture Hours. Fundamental principles of money, credit, and banking; arbitrage conditions in domestic and international capital markets; theoretical and institutional analysis of money markets. **Prerequisite:** ECON 203 with a grade of C or better; also taught at Galveston campus.

ECON 312 Poverty, Inequality and Social Policy

Credits 3. 3 Lecture Hours. Determinants of inequality in market earnings; philosophical and economic reasons for redistributing income; issues in measurement of inequality and poverty; examination of major social insurance and welfare programs and how they affect income distribution and performance of the economy. **Prerequisite:** ECON 323 with a grade of C or better.

ECON 315 Sports Economics

Credits 3. 3 Lecture Hours. Application of economic concepts to the business and practice of sports; taxpayer funding of stadiums; applications of game theory to sports; impact of imperfect information; pricing strategies; testing models of discrimination in sports markets. **Prerequisite:** ECON 202 with a grade of C or better.

ECON 318/WGST 318 The Economics of Gender and Race

Credits 3. 3 Lecture Hours. Theories and evidence on gender and race differences in labor market outcomes; labor supply and the role of family formation; the effect of human capital and discrimination on earnings; analysis of government policies; international comparisons. **Prerequisites:** ECON 323 with a grade of C or better; junior or senior classification. **Cross Listing:** WGST 318/ECON 318.

ECON 320 Economic Development of Europe

Credits 3. 3 Lecture Hours. Development of wage system expansion of markets, Industrial Revolution, relation of industrial development to political policy. **Prerequisites:** ECON 202 and ECON 203 with a grade of C or better.

ECON 323 Microeconomic Theory

Credits 3. 3 Lecture Hours. Determination of prices and their role in directing consumption, production and distribution under both competitive and non-competitive market situations. **Prerequisite:** Grade of C or better in ECON 202; grade of C or better in MATH 142, MATH 151, or MATH 171; also taught at Galveston campus.

ECON 328 Economics of Education

Credits 3. 3 Lecture Hours. Application of economic analysis to education policy; theoretical basis for private and public investment in education; returns to education; the importance of school resources, school financing, school choice, and accountability. **Prerequisites:** Grade of C or better in ECON 202; Grade of C or better in ECMT 461, STAT 211, or STAT 303.

ECON 330 Economic Development

Credits 3. 3 Lecture Hours. A study of the less developed world; economic problems and solutions. **Prerequisites:** Grade of C or better in ECON 202 and ECON 203.

ECON 410 Macroeconomic Theory

Credits 3. 3 Lecture Hours. Theory of the determination of aggregate levels of national income, employment and prices; monetary and fiscal policy analysis, effects of government debt and deficits. **Prerequisite:** ECON 203 with a grade of C or better.

ECON 412 Public Finance

Credits 3. 3 Lecture Hours. Economic role of governments; the choice of public sector output in a democracy and the effects of various taxes on resource allocation and income distribution. **Prerequisite:** ECON 323 with a grade of C or better.

ECON 414 Health Economics

Credits 3. 3 Lecture Hours. Economics of health care in the U.S.; role of third party payers; supply and demand for health care; structure and consequences of public and private insurance; role of competition in health care markets among hospitals, insurance plans, physicians and pharmaceutical manufacturers; role of completion and regulation in medical innovation. **Prerequisite:** ECON 323 with a grade of C or better.

ECON 416 Economics of Microfinance

Credits 3. 3 Lecture Hours. Analysis of recent research in the economics of microfinance; fundamental issues with microfinance and wealth creation; study of both theory and empirical work of recent research on microfinance; use of academic research to see how relevant it is to the practical aspects of microfinance. **Prerequisite:** Grade of C or better in ECON 323.

ECON 418 Economics of Labor

Credits 3. 3 Lecture Hours. Economics of the labor market including factors affecting the economy's demand for labor and the supply of labor; labor market problems such as unemployment and poverty; the economics of trade unions and collective bargaining. **Prerequisite:** ECON 323 with a grade of C or better.

ECON 419 Personnel Economics

Credits 3. 3 Lecture Hours. Exploration of the economics of the workplace using the insights of economic models and behavioral economics; focus on incentives and information, motivation of workers through incentive pay, promotion tournaments and threats, design of the hiring process to recruit a talented and diverse workforce, attraction and retention of employees, downsizing. **Prerequisites:** Grade of C or better in ECON 323.

ECON 420 Law and Economics

Credits 3. 3 Lecture Hours. Mutual interaction of the prevailing legal system and economic phenomena; development of a series of testable hypotheses concerning the effects of laws and regulations on incentives and economic behavior, the allocation of resources and the distribution of income. **Prerequisite:** ECON 323 with a grade of C or better.

ECON 421 Economics of Crime

Credits 3. 3 Lecture Hours. Study of crime and crime-control policies using standard economic techniques; focus on the incentives for individuals to commit crimes and how those incentives can be changed by public policy; topics may include costs of crime to society, drug control, gun control, nonviolent and violent crime, gang-related crimes, punishment, incarceration and deterrence. **Prerequisite:** Grade of C or better in ECON 323.

ECON 425 The Organization of Industry

Credits 3. 3 Lecture Hours. Relationships between structure, conduct and performance of industries in the American economy using both theoretical and empirical material; antitrust regulation, pricing, product characteristics, advertising, technical change and environmental effects; the American experience contrasted with that of other countries; growth of international industries. **Prerequisite:** ECON 323 with a grade of C or better.

ECON 426 Economics of Antitrust and Regulation

Credits 3. 3 Lecture Hours. Bureaucratic and judicial impact of antitrust laws and other regulatory means on the American economy; efficiency gains and losses associated with price discrimination, predation, cartelization, horizontal merger, vertical integration, resale price maintenance; Supreme Court opinions delivered in landmark antitrust cases. **Prerequisite:** ECON 323 with a grade of C or better.

ECON 433 Energy Markets and Policy

Credits 3. 3 Lecture Hours. Economics of energy markets and energy regulation with emphasis on implications for optimal energy policy; sectors include gasoline, oil, electricity, natural gas, renewables, nuclear; economic theory integrated with empirical applications from American and international experience; new energy markets, energy trading, and interaction with environmental policy. **Prerequisites:** ECON 323 with a grade of C or better; junior or senior classification or approval of instructor.

ECON 436 Environmental Economics

Credits 3. 3 Lecture Hours. Economic theory and public policy as applied to environmental problems; role of market failure in explaining the existence of pollution; alternative strategies for pollution control and environmental management; global environmental issues. **Prerequisites:** ECON 323 with a grade of C or better.

ECON 440 Experimental Economics

Credits 3. 3 Lecture Hours. Experimental techniques in economics and survey of literature in experimental economics; credibility of experimental data and criteria for determining reliability; application of statistical treatment to experimental data. **Prerequisite:** ECON 323 with a grade of C or better.

ECON 441 Policy Economics

Credits 3. 3 Lecture Hours. Advanced instruction on field experimental methods used in economics to understand how individuals and organizations respond to changes in incentives in natural settings; emphasis on policies and programs implemented by or in collaboration with firms, government and NGOs both in developed and developing countries. **Prerequisite:** Grade of C or better in ECON 202 and ECMT 461.

ECON 445 Financial Economics

Credits 3. 3 Lecture Hours. Economic analysis of money and financial markets; market structures, efficiency, institutional features; international markets; arbitrage; derivative securities; asset pricing in complete and incomplete markets; relation to rest of economy. **Prerequisites:** Grade of C or better in ECON 323; grade of C or better in ECMT 461, STAT 211, or STAT 303; junior or senior classification.

ECON 449 Economics of Decision-Making Strategy

Credits 3. 3 Lecture Hours. Introduction to principles of decision-making and analysis of strategic interaction; formal modeling of decision problems involving one or more agents, integrating preferences, risk, and uncertainty into analysis, and using principles of game theory to advise choices; applications include search, signaling, design of contracts, agendas and repeated interaction. **Prerequisites:** ECON 323 with a grade of C or better.

ECON 452 International Trade Theory and Policy

Credits 3. 3 Lecture Hours. Basis for trade; theory of comparative advantage; determination of product and factor prices; gains from international trade; commercial policy and its implications for income distribution; concept of effective protection; market distortions, policy generated distortions and the arguments for tariffs. **Prerequisite:** ECON 323 with a grade of C or better; also taught at Galveston campus.

ECON 459 Games and Economic Behavior

Credits 3. 3 Lecture Hours. Introduction to game theory for advanced undergraduates; definition and existence of an equilibrium point for strategic, repeated and extensive form games; strategic and evolutionary equilibrium refinements; equilibrium selection; applications include auctions, bargaining, oligopoly, strategic market games, team production, voting and behavioral game theory. **Prerequisites:** Grade of C or better in ECON 323; MATH 142, MATH 131, MATH 151, or MATH 171.

ECON 460 Introduction to Mathematical Economics

Credits 3. 3 Lecture Hours. Introduction to mathematical economics; application of mathematical tools in economic theory; fundamental results from differential and integral calculus; duality theory in consumer and producer theory; classical optimization techniques, elementary differential equations and stability analysis. **Prerequisites:** Grade of C or better in ECON 323 and ECON 410.

ECON 465 Contemporary Economic Issues

Credits 3. 3 Lecture Hours. Application of microeconomic and macroeconomic analyses to evaluate contemporary economic issues. May be taken two times for credit when topics vary. **Prerequisite:** Grade of C or better in ECON 323 and ECON 410.

ECON 470 Data Science for Economic and Social Issues

Credits 3. 3 Lecture Hours. Economic and quantitative methods used to evaluate decisions made by individuals, firms, governments and other policymakers; implementation of these methods and how these methods overcome problems that often plague correlational analyses; conduction of retrospective analyses of choices, creation of and implementation of policies so that their effects can be measured, and prediction of the effects of potential policies on social issues like crime, poverty, etc. based on evidence; topics vary. May be taken two times for credit. **Prerequisites:** Grade of C or better in ECMT 463 or approval of instructor.

ECON 471 Data Science for Future Decision Makers

Credits 3. 3 Lecture Hours. Integration of fundamental economic concepts, such as the study of how economic incentives impact decision making, with skills and tools from data science that are necessary to work with the vast amounts of data that economic agents generate daily; topics vary. May be taken two times for credit. **Prerequisites:** Grade of C or better in ECMT 463 or approval of instructor.

ECON 484 Internship

Credits 0 to 6. 0 to 6 Other Hours. Directed internship in an organization to provide on-the-job training and applied research experience with professionals in settings appropriate to economics and student professional interest. Maximum 6 hours can count toward major. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisites:** Major in economics; 12 completed hours of economics including ECON 323 with a grade of C or better; 2.5 cumulative GPA; 3.0 GPA in economic courses; pre-approval of the director of economics internship programs.

ECON 485 Directed Studies

Credits 0 to 6. 0 to 6 Other Hours. Research and design of specific problem areas approved on an individual basis with the intention of promoting independent study and to supplement existing course offerings. Results of study presented in writing. **Prerequisites:** Major or minor in economics; approval of undergraduate advisor.

ECON 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of economics. May be repeated for credit. **Prerequisite:** Approval of undergraduate advisor.

ECON 491 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in economics. May be taken three times for credit. **Prerequisites:** Junior or senior classification; grade of C or better in ECON 323, ECON 410, and ECMT 463.

EDCI - Educ Curriculum & Dev (EDCI)

EDCI 285 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Research problems and readings in areas selected to supplement existing offerings; individual reports, oral and written, required. **Prerequisites:** Freshman or sophomore classification; approval of instructor.

EDCI 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of educational curriculum and instruction. May be repeated for credit. **Prerequisite:** Approval of department head.

EDCI 291 Research

Credits 1 to 4. 1 to 4 Other Hours. Research conducted under the direction of faculty members in the Department of Teaching, Learning and Culture. May be taken four times for credit. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

EDCI 353 Early Childhood through Adolescent Education

Credits 3. 3 Lecture Hours. (TECA 1311) Early Childhood through Adolescent Education. Early childhood through adolescent approaches and instructional materials appropriate for EC through middle school programs; impact of research and theory on child development from gestation to early adolescence on instructional practices. **Prerequisites:** Junior or senior classification.

EDCI 354 Early Childhood and Adolescent Curriculum and Lesson Design

Credits 3. 3 Lecture Hours. Examination of curriculum models used in educational environments designed for young children through adolescents and the organization of the curriculum; investigation of state-adopted curriculum knowledge and skills standards and materials as well as their use and expansion. **Prerequisites:** EDCI 353; TEFB 371 or concurrent enrollment.

EDCI 358 Instructional Methods in Engineering and Technology Education

Credits 3. 3 Lecture Hours. Instructional methods of teaching and instruction in engineering and technology at the secondary level. **Prerequisites:** Concurrent enrollment in TEFB 322 or TEFB 324; junior or senior classification.

EDCI 364 Interaction Processes with Children in Groups

Credits 3. 3 Lecture Hours. Instruction in application and adaptation of principles of effective verbal and non-verbal communication to their interactions with children in early childhood settings; training in interpersonal communication skills and positive guidance techniques such as how to listen and talk to children, how to prevent problems before they occur, methods of achieving positive discipline in early childhood programs, and scaffolding children's understandings and learning in all areas via effective interactions. **Prerequisites:** EDUC majors; junior or senior classification; concurrent enrollment in TEFB 273.

EDCI 365 Using Technology Classrooms

Credits 3. 3 Lecture Hours. Overview of technology as it relates to the design of instruction and practices that support effective teaching and learning; how learning theories are reflected in and supported by technology; design and implementation of virtual learning experiences, including assessment of student learning; implementation of effective digital literacy practices. **Prerequisite:** Junior or senior classification.

EDCI 485 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Research problems and readings in areas selected to supplement existing offerings; individual reports, oral and written, required. **Prerequisites:** Junior or senior classification; approval of instructor.

EDCI 489 Special Topics in...

Credits 0 to 4. 0 to 4 Lecture Hours. Study of selected topics in an identified area of curriculum and instruction. May be repeated for credit. **Prerequisite:** Approval of department head.

EDCI 491 Research

Credits 1 to 4. 1 to 4 Other Hours. Research conducted under the direction of faculty members in the Department of Teaching, Learning and Culture. May be taken four times for credit. **Prerequisites:** Junior or senior classification and approval of instructor.

EHRD - Ed Human Res Develop (EHRD)

EHRD 101 Learning Community of Leadership Development in Human Resource Development and Technology Management

Credit 1. 1 Lecture Hour. Exploration of leadership identity, reflection on lessons learned during the first year of college. Must be taken on a satisfactory/unsatisfactory basis.

EHRD 111 Learning Community - Foundations of Student Success

Credit 1. 1 Lecture Hour. Introduction to personal, academic and leadership identities; overview of highly effective strategies that increase the likelihood for success in academics and extracurricular activities; challenges to reflect and assess oneself academically and personally. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisite:** EHRD 101 or approval of instructor.

EHRD 203 Foundations of Human Resource Development

Credits 3. 3 Lecture Hours. Overview of the discipline and field of human resource development; focus on how individuals and groups learn and interact with organizations including motivation, group dynamics, systems theory, organizational culture, learning and change. **Prerequisite:** Sophomore classification.

EHRD 210 Legal and Ethical Environment of Human Resource Development

Credits 3. 3 Lecture Hours. Development of knowledge towards legal and ethical work environment in a corporate and educational setting in human resource development. **Prerequisite:** Sophomore classification.

EHRD 285 Directed Studies

Credits 0 to 12. 0 to 12 Lecture Hours. Directed readings or research problems in industrial education. **Prerequisites:** Freshman or sophomore classification; approval or directed studies application.

EHRD 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified area of industrial educational. May be repeated for credit. **Prerequisite:** Approval of instructor.

EHRD 291 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in educational human resource development. May be repeated 2 times for credit. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

EHRD 315 Applied Human Resource Development in the Workplace

Credits 3. 3 Lecture Hours. Training and development context and synthesis of general industry-standard human resource practices in workplace environments for human resource practitioners. **Prerequisites:** EHRD 203 and EHRD 210 with a grade of C or better; junior or senior classification.

EHRD 325 Human Capital Acquisition, Management, and Development

Credits 3. 3 Lecture Hours. Examination of the strategies and tools used to create organizational excellence by identifying and retaining high quality talent; the creation of strategies to recruit talent and systems of personal/professional development to grow the organization; exploration of systems and programs that will strengthen the organization as well as retention strategies to promote and reward high quality talent. **Prerequisites:** Grade of C or better in EHRD 315; junior or senior classification.

EHRD 371 Applied Learning Principles

Credits 3. 3 Lecture Hours. The overarching purpose of the course is to influence adult educators to make more intentional choices toward developmental growth in their work with adult learners; focus on adult learning theories and work strategies; meets writing intensive course requirement. **Prerequisites:** Junior or senior classification and approval of instructor.

EHRD 372 Learning and Development in HRD

Credits 3. 3 Lecture Hours. Concepts, knowledge and skills to access, design, develop, deliver and evaluate training programs; foundation of understanding roles of learning, training and development in organizations and systematic and evidence-based approach for designing and managing quality training programs in organizations. **Prerequisites:** Grade of C or better in EHRD 203 and EHRD 210; junior or senior classification; or approval of instructor.

EHRD 374 Organizational Development

Credits 3. 3 Lecture Hours. Introduction to major theories, concepts, skills and techniques for organization development in business and industry, education and the public sector. **Prerequisites:** Grade of C or better in EHRD 203 and EHRD 210; junior or senior classification; or approval of instructor.

EHRD 391 Measurement and Evaluation in Human Resource Development and Technology Management

Credits 3. 3 Lecture Hours. Measurement and evaluation techniques in the field of Human Resource Development and Technology Management; emphasis on understanding, calculation and application of basic testing, assessment and interpretation methods. **Prerequisites:** Junior or senior classification or approval of instructor; EHRD 203 with a grade of C or better; MATH 140 and MATH 142.

EHRD 402 Instructional Technology and Design

Credits 3. 3 Lecture Hours. Design principles; development of instruction; contemporary issues and trends; foundations in learning research; requirements for instruction, task and needs analysis; learning situations and instructional models; hardware and software innovations; assessing instructional outcomes; factors affecting utilization. **Prerequisites:** EHRD 371 with a grade of C or better; junior or senior classification or approval of instructor.

EHRD 405 Principles and Practices of Leadership in Human Resource Development and Technology Management

Credits 3. 3 Lecture Hours. Theories and concepts associated with learning in individuals and organizations; overview of leadership theories and learning theories within a context of developing leadership programs. **Prerequisites:** Junior or senior classification and approval of instructor.

EHRD 408 Globalization and Diversity in the Workplace

Credits 3. 3 Lecture Hours. Assist learners in the identification and understanding of globalization and diversity issues in learning, work and community; exploration of current issues, theories, trends and policy issues. **Prerequisites:** Junior or senior classification and approval of instructor.

EHRD 413 Conflict Management and Dialogue

Credits 3. 3 Lecture Hours. Conflict management principles and practices in the workplace; engagement in meaningful conflict from a training and development perspective. **Prerequisites:** Grade of C or better in EHRD 203 and EHRD 210; junior or senior classification; or approval of instructor.

EHRD 477 Project Management in Organizations

Credits 3. 3 Lecture Hours. Application of principles of project management in organizations; focus on the development of project proposals, project planning using project management software; management of project personnel and resources. **Prerequisite:** Junior or senior classification or approval of instructor.

EHRD 481 Seminar

Credits 3. 3 Other Hours. Seminar on significant issues of industry; transition from an academic environment to professional business environment; preparation of a multi-vector resume; salary negotiation; life skills and planning; steps in searching and securing an internship position. **Prerequisites:** Grade of C or better in EHRD 203; junior or senior classification, or approval of instructor.

EHRD 484 Professional Internship

Credits 6. 6 Other Hours. Directed internship in an organization to provide students with a learning experience supervised by professionals in organizational settings appropriate to the student's professional objectives. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisites:** Senior classification and approval of instructor, admitted to professional phase, EHRD 481, EHRD 490.

EHRD 485 Directed Studies

Credits 0 to 12. 0 to 12 Other Hours. Directed readings or research problems in industrial education. Term report required. **Prerequisite:** Approval of department head.

EHRD 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 1 to 4 Lab Hours. Selected topics in an identified area of industrial education. May be repeated for credit. **Prerequisite:** Approval of instructor.

EHRD 490 Research in Human Resource Development/Technology Management

Credits 3. 3 Lecture Hours. Investigative techniques currently employed in human resource development (HRD) and technology management (TCM) including the context of HRD/TCM research, planning HRD/TCM research, styles of HRD/TCM research, and strategies for data collection and researching. **Prerequisites:** Junior or senior classification; admitted to professional phase; EHRD 391 with a grade of C or better.

EHRD 491 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in human resource development. May be repeated for credit. **Prerequisite:** Junior or senior classification.

ENDG - Engr Design Graphics (ENDG)

ENDG 485 Directed Studies

Credits 1 to 3. 1 to 3 Other Hours. Special problems in engineering design graphics to fit needs of individual students. **Prerequisite:** Approval of instructor.

ENDG 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified field of engineering design graphics. **Prerequisite:** Approval of instructor.

ENDS - Environmental Design (ENDS)

ENDS 101 Design Process

Credits 3. 3 Lecture Hours. (ARCH 1311) Design Process. Fundamental design processes, issues and theories relevant to design resolution and the creation of new ideas; creative thought processes from the formation of ideas through incubation to final product and future impact on the physical environment and society.

ENGL - English (ENGL)

ENGL 103 Introduction to Rhetoric and Composition

Credits 3. 3 Lecture Hours. (ENGL 1301) Introduction to Rhetoric and Composition. Intensive study of and practice in writing processes, from invention and researching to drafting, revising and editing, both individually and corroboratively; emphasis on effective rhetorical choices including audience, purpose, arrangement and style; focus on writing the academic essay as a vehicle for learning, communicating and critical analysis.

ENGL 104 Composition and Rhetoric

Credits 3. 3 Lecture Hours. (ENGL 1302) Composition and Rhetoric. Focus on referential and persuasive researched essays through the development of analytical reading ability, critical thinking and library research skills. **Prerequisite:** Freshman or sophomore classification; also taught at Galveston and Qatar campuses.

ENGL 107 Introduction to the Health Humanities

Credits 3. 3 Lecture Hours. Introduction to the methods and approaches of the health humanities; exposure to key scholarship in this field as well as major methods and approaches; application of such skills to the analysis of cultural case studies such as illness narratives or contemporary debates in scientific bioethics. **Cross Listing:** COMM 107, HHUM 107, and PHIL 107.

ENGL 202 Environmental Literature

Credits 3. 3 Lecture Hours. Texts from various periods and locations and in various genres and media that focus on the relationship of human beings to the rest of the natural world; topics vary from each section; also taught at Qatar campus.

ENGL 203 Writing about Literature

Credits 3. 3 Lecture Hours. Exploration of literature by genre and/or theme; literary analysis and interpretation; intensive writing about literature; also taught at Galveston campus.

ENGL 204/AFST 204 Introduction to African-American Literature

Credits 3. 3 Lecture Hours. Introduction to the writings of African Americans from the 18th century to the present, emphasizing the major themes and traditions; ENGL-204 also taught at Galveston campus. **Cross Listing:** AFST 204/ENGL 204.

ENGL 205/AFST 205 Introduction to Africana Literature

Credits 3. 3 Lecture Hours. Works, literary movements and genres of authors of African descent in the Americas, Europe and Africa. **Cross Listing:** AFST 205/ENGL 205.

ENGL 206 Twenty-first Century Literature and Culture

Credits 3. 3 Lecture Hours. Exploration of the literary and cultural forms of the twenty-first century, focusing on a variety of national and transnational origins; also taught at Qatar campus.

ENGL 207 Human Thinking and Digital Culture

Credits 3. 3 Lecture Hours. Introduction to methodology, scope and practice of digital humanities; overview of digital research culture; evaluation of digital media as tools for thinking.

ENGL 209/LING 209 Introduction to Linguistics

Credits 3. 3 Lecture Hours. Nature of human language and of linguistics; includes an introduction to phonology, syntax, semantics and morphology and the role of spoken and written discourse in sustaining societal arrangements. **Cross Listing:** LING 209/ENGL 209.

ENGL 210 Technical and Professional Writing

Credits 3. 3 Lecture Hours. (ENGL 2311) Technical and Professional Writing. Focus on writing for professional rhetorical situations; correspondence and researched reports fundamental to the workplace — memoranda, letters, electronic correspondence, research proposals and presentations; use of visual rhetoric and document design in print and electronic mediums; emphasis on audience awareness, clarity of communication and collaborative team-work; also taught at Galveston and Qatar campuses.

ENGL 211/GLST 211 Foundations in Cultural Studies

Credits 3. 3 Lecture Hours. Introduction to history, influence and major ideas of Cultural Studies; use of culture as a means to critique social problems and understand social forces; analysis of culture in its relationship to power; participation in project investigating contemporary U.S. youth subcultures. **Cross Listing:** GLST 211/ENGL 211.

ENGL 212 Shakespeare

Credits 3. 3 Lecture Hours. Exploration of selected works of Shakespeare; also taught at Galveston campus.

ENGL 219 Literature and the Other Arts

Credits 3. 3 Lecture Hours. Imaginative literature in conversation with aesthetic principles and such other arts as painting, sculpture, architecture, film and music; also taught at Qatar campus.

ENGL 220 Graphic Novel

Credits 3. 3 Lecture Hours. An exploration of origins and development of the graphic novel.

ENGL 221/MODL 221 World Literature

Credits 3. 3 Lecture Hours. (ENGL 2332) World Literature. Survey of world literature from the ancient world through the sixteenth century in relation to its historical and cultural contexts; texts selected from a diverse group of authors, traditions and genres; ENGL-221 also taught at Qatar campus. **Cross Listing:** MODL 221/ENGL 221.

ENGL 222/MODL 222 World Literature

Credits 3. 3 Lecture Hours. (ENGL 2333) World Literature. Survey of world literature from the seventeenth century to the present in relation to its historical and cultural contexts; texts selected from a diverse group of authors, traditions and genres; ENGL-222 also taught at Galveston and Qatar campuses. **Cross Listing:** MODL 222/ENGL 222.

ENGL 227 American Literature: The Beginnings to Civil War

Credits 3. 3 Lecture Hours. (ENGL 2327) American Literature: The Beginnings to Civil War. Representative writers, genres and movements of the period.

ENGL 228 American Literature: Civil War to Present

Credits 3. 3 Lecture Hours. (ENGL 2328) American Literature: Civil War to Present. Expressions of the American experience in realism, regionalism and naturalism; varieties of modernist and contemporary writing; the rise of ethnic literature and experimental literary forms.

ENGL 229/ASIA 229 Asian American Literature and Culture

Credits 3. 3 Lecture Hours. Introduction to the historical scope of Asian American literature and culture. **Cross Listing:** ASIA 229/ENGL 229.

ENGL 231 Survey of English Literature I

Credits 3. 3 Lecture Hours. (ENGL 2322) Survey of English Literature I. Literature of England from Anglo-Saxon times through the 18th century.

ENGL 232 Survey of English Literature II

Credits 3. 3 Lecture Hours. (ENGL 2323) Survey of English Literature II. Literary works from the late 18th century to the 21st century by authors in Great Britain and its colonies; also taught at Qatar campus.

ENGL 234 Introduction to Speculative and Marvelous Literatures

Credits 3. 3 Lecture Hours. Introduction to the speculative and marvelous genres of literature; survey of different genres, such as science fiction, fantasy, horror, magical realism, utopian, or fairy tale; examination of different methodological approaches and historical contexts.

ENGL 235 Elements of Creative Writing

Credits 3. 3 Lecture Hours. (ENGL 2307) Elements of Creative Writing. Initiation into the craft of creative writing in prose and poetry; extensive reading in the genres; peer workshops.

ENGL 241 Advanced Composition

Credits 3. 3 Lecture Hours. Focuses on the writing of advanced academic and professional prose by integrating computer technology in the analysis and production of that prose; also taught at Galveston campus.

ENGL 251/FILM 251 Introduction to Film Analysis

Credits 3. 3 Lecture Hours. Fundamental aspects of film analysis and criticism; ENGL-251 also taught at Galveston and Qatar campuses. **Cross Listing:** FILM 251/ENGL 251.

ENGL 253 Introduction to Cultural Studies and Popular Culture

Credits 3. 3 Lecture Hours. Introduction to Cultural Studies and Popular Cultural. An introduction to the history, theories and methods of contemporary cultural studies. The course will explore key concepts in cultural theory to examine specific aspects of popular culture as well as cultural sites and practices so as to expand upon the analytical and critical thinking skills learned in ENGL 104 and 203. **Prerequisite:** ENGL 104; Galveston campus.

ENGL 262/HISP 262 Introduction to Latinx Literary Studies

Credits 3. 3 Lecture Hours. Introduction to Latinx literature; emphasis on methods and approaches, historical breadth and context and the diverse literary traditions of people of Hispanic and Latinx descent in the United States. **Cross Listing:** HISP 262/ENGL 262.

ENGL 285 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Readings selected for specific need of major or minor in English.

ENGL 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of English. May be repeated for credit.

ENGL 291 Research

Credits 0 to 3. 0 to 3 Lecture Hours. Research conducted under the direction of faculty member in English. **Prerequisites:** 3 hours of 200-level literature; freshman or sophomore classification and approval of instructor.

ENGL 292 Introduction To Literature And Medicine

Credits 3. 3 Lecture Hours. Introduction to methodology, scope and practice of literature and medicine studies; analysis of autobiographies, novels and poetry dealing with health and illness; evaluation of sources from different disciplinary perspectives as a tool for critical thinking.

ENGL 303 Approaches to English Studies

Credits 3. 3 Lecture Hours. A writing intensive exploration of the methodologies and major topics of English studies. **Prerequisite:** ENGL 104 or registration therein; junior or senior classification or approval of instructor.

ENGL 304 Topics in Digital Research

Credits 3. 3 Lecture Hours. Topics in the studies of digital humanities; introduction to making/interpreting digital materials, the surrogates of books, paintings, etc., that form our cultural heritage, as well as digitally-born literature, art and culture; reflection on digital cultures/digital archives; theory and practice of creating and research digital resources. May be taken three times for credit. **Prerequisite:** Junior or senior classification or approval of instructor.

ENGL 305 Texas Literature

Credits 3. 3 Lecture Hours. Examination of Texas literature, culture and multi-media; exploration of the development of Texas identities and responses to the rich cultural diversity within the state; topics vary from each section. **Prerequisite:** Junior or senior classification.

ENGL 306 Transnational Literature and Culture

Credits 3. 3 Lecture Hours. Examination of texts written in English that de-center the nation-state as the central way to organize cultural comparison; includes colonialism, economics, empire, globalization, migration, race and refugees. **Prerequisites:** 3 credits of literature at 200-level or above; junior or senior classification or approval of instructor; also taught at Qatar campus.

ENGL 308 History of Literary Criticism

Credits 3. 3 Lecture Hours. History of literary thought from antiquity to the present, including writers such as Plato, Aristotle, "Longinus," Sidney, Shelley, and Dryden; analysis of genres such as tragedy, lyric, and film; critical approaches such as new criticism, structuralism, deconstruction, Marxism, feminism, new historicism, and film studies. **Prerequisite:** 3 credits of literature at 200-level or above.

ENGL 309/GLST 311 Cultural Politics

Credits 3. 3 Lecture Hours. Exploration of the concept of cultural politics across several academic disciplines in the humanities and social sciences; broad interrogation of relationships that mediate culture and power in national and international contexts; focus on how culture shapes and is shaped by society, political perspectives and actions.

Prerequisites: Junior or senior classification; or approval of the instructor.

Cross Listing: GLST 311/ENGL 309.

ENGL 310/LING 310 History of the English Language

Credits 3. 3 Lecture Hours. Phonological, grammatical and lexical history of the English language; brief discussion of some other Indo-European languages; principles of linguistic change, as reflected in English.

Prerequisite: Junior or senior classification. **Cross Listing:** LING 310/ENGL 310.

ENGL 313 Medieval English Literature

Credits 3. 3 Lecture Hours. Old and Middle English literature exclusive of Chaucer, including such authors and works as Beowulf, The Dream of the Rood, Sir Gawain and the Green Knight, Piers Plowman, Malory, Julian of Norwich, Kempe, the mystery plays and the lyrics. **Prerequisite:** 3 credits of literature at 200-level or above.

ENGL 314 The English Renaissance

Credits 3. 3 Lecture Hours. Period course in the poetry, prose and drama of England in the 16th century. **Prerequisite:** 3 credits of literature at 200-level or above.

ENGL 315 Seventeenth-Century Literature

Credits 3. 3 Lecture Hours. Period course in English poetry, prose and drama of the 17th century. **Prerequisite:** 3 credits of literature at 200-level or above.

ENGL 316 Eighteenth-Century Literature and Culture

Credits 3. 3 Lecture Hours. Period course in English poetry, prose and drama of the 18th century. **Prerequisite:** 3 credits of literature at 200-level or above.

ENGL 317 Early British Drama

Credits 3. 3 Lecture Hours. Period course in early British, non-Shakespearean drama to 1642. **Prerequisite:** 3 credits of literature at the 200-level or above.

ENGL 318 Utopian Literature in the English Tradition

Credits 3. 3 Lecture Hours. Exploration of the theories and practices of historical and contemporary utopian literature through representative writers and texts. **Prerequisites:** 3 credits of literature at 200-level or above.

ENGL 320 Technical and Professional Editing

Credits 3. 3 Lecture Hours. Principles and techniques of technical editing for print and electronic media, including standards, style, copy-editing, comprehensive editing and project management. **Prerequisite:** ENGL 210.

ENGL 321 Nineteenth-Century Literature (Romantic)

Credits 3. 3 Lecture Hours. Representative texts in English generated throughout the British empire in the late-18th and early-19th centuries.

Prerequisite: 3 credits of literature at 200-level or above.

ENGL 322 Nineteenth-Century Literature (Victorian)

Credits 3. 3 Lecture Hours. Period course in English poetry and prose of major Victorian authors. **Prerequisite:** 3 credits of literature at 200-level or above.

ENGL 323 The American Renaissance

Credits 3. 3 Lecture Hours. Period course in the American Renaissance, covering such writers as Emerson, Hawthorne, Thoreau, Alcott, Fuller, Douglass, Melville, Poe, Stowe and Whitman. **Prerequisite:** 3 credits of literature at 200-level or above.

ENGL 324/FILM 324 Science Fiction and Film

Credits 3. 3 Lecture Hours. History and trajectory of science fiction film into the 21st century by filmmakers such as Kubrick, Jenkins, Cameron, Coogler and others. **Prerequisites:** 3 credits of literature at 200-level or above. **Cross Listing:** FILM 324/ENGL 324.

ENGL 329/AFST 329 African-American Literature Pre-1930

Credits 3. 3 Lecture Hours. Major works of the African-American literary tradition from the 18th century to 1930 studied within cultural and historical context. **Prerequisites:** 3 credits of literature at 200-level or above. **Cross Listing:** AFST 329/ENGL 329.

ENGL 330 Arthurian Literature

Credits 3. 3 Lecture Hours. Legend of King Arthur in English and American literature from its Medieval origins to the present. **Prerequisite:** Junior or senior classification; also taught at Galveston campus.

ENGL 331 Fantasy Literature

Credits 3. 3 Lecture Hours. An exploration of origins and development of fantasy literature, including representative writers, genres and texts. **Prerequisite:** Junior or senior classification.

ENGL 333/WGST 333 Lesbian, Gay, Bisexual, Transgender and Queer Literatures

Credits 3. 3 Lecture Hours. Representations of sexuality and gender from classical times to the present, studied in their historical and cultural contexts. **Prerequisites:** Junior or senior classification. **Cross Listing:** WGST 333/ENGL 333.

ENGL 334 Science Fiction Present and Past

Credits 3. 3 Lecture Hours. Origins and development of the science fiction genre. **Prerequisite:** Junior or senior classification; also taught at Galveston campus.

ENGL 335 Literature of the Sea

Credits 3. 3 Lecture Hours. Significance of the sea in fictional and factual accounts, such as novels, short stories, poems and narratives of sailors and seafaring life. **Prerequisites:** Three credits of literature at 200 level or above; junior or senior classification or approval of instructor; Galveston campus; also taught at College Station campus.

ENGL 336 Life and Literature of the Southwest

Credits 3. 3 Lecture Hours. Exploration of Southwestern literature, including such authors as Abbey, Anaya, Cabeza de Vaca, Cather, Krutch, McCarty, Momaday, Paz, Paredes and Porter. **Prerequisite:** Junior or senior classification.

ENGL 337 Life and Literature of the American South

Credits 3. 3 Lecture Hours. Study of writing and culture of the American South based on reading and analysis of key texts by representative authors. **Prerequisite:** Junior or senior classification.

ENGL 338 American Ethnic Literature

Credits 3. 3 Lecture Hours. Multi-ethnic study of American Literature, the writings of Black Americans, American Indians, Latinos/Latinas, Jewish Americans, as well as other ethnic groups. **Prerequisite:** Junior or senior classification; also taught at Galveston campus.

ENGL 339/AFST 339 African-American Literature Post-1930

Credits 3. 3 Lecture Hours. Major works of the African-American literary tradition from the 1930s to the present studied in their cultural and historical context. **Prerequisites:** 3 credits of literature at 200-level or above. **Cross Listing:** AFST 339/ENGL 339.

ENGL 340 Modern and Contemporary Drama

Credits 3. 3 Lecture Hours. Representative plays and performances from the late nineteenth century to the present. **Prerequisite:** 3 credits of literature at 200-level or above.

ENGL 342 The Rhetoric of Gender and Health

Credits 3. 3 Lecture Hours. Study of field of rhetoric of health and medicine with specific attention to the study of gender, including issues in reproduction, expertise and illness; range of methods and methodological approaches within the field. **Prerequisite:** Junior or senior classification. **Cross Listing:** COMM 342 and WGST 342.

ENGL 343 Fairy Tales in the English Tradition

Credits 3. 3 Lecture Hours. An exploration of the history, development, theory, and practice of fairy tales, including representative writers, sub-genres and texts. **Prerequisite:** 3 credits of literature at 200-level or above.

ENGL 345 Writers' Studies: Prose or Poetry

Credits 3. 3 Lecture Hours. A different topic for fiction writers or poets each term; may include historical development of genres; connection between biography and artistic production; study of writers' theories of the art of fiction or poetry. **Prerequisites:** ENGL 235; junior or senior classification.

ENGL 347 Writers' Workshop: Prose

Credits 3. 3 Lecture Hours. Production of advanced, complete stories; peer workshops; extensive reading. May be repeated 1 time for credit. **Prerequisite:** ENGL 235; junior or senior classification or approval of instructor.

ENGL 348 Writers' Workshop: Poetry

Credits 3. 3 Lecture Hours. Production of advanced, complete poems; peer workshops; extensive reading. May be repeated 1 time for credit. **Prerequisite:** ENGL 235; junior or senior classification or approval of instructor.

ENGL 350 Twentieth-Century Literature to World War II

Credits 3. 3 Lecture Hours. Novelists, poets and dramatists writing in English from the late nineteenth to mid-twentieth century. **Prerequisite:** Junior or senior classification.

ENGL 351/FILM 351 Advanced Film

Credits 3. 3 Lecture Hours. A different film topic each term; sample topics include major directors, historical periods, fiction into film, film genres. May be repeated for credit. **Prerequisite:** ENGL 251/FILM 251 or FILM 251/ENGL 251 or FILM 301 or approval of instructor; junior or senior classification. **Cross Listing:** FILM 351/ENGL 351.

ENGL 352 Literature, World War II to Present.

Credits 3. 3 Lecture Hours. Novelists, poets and dramatists from the World War II era to the present. **Prerequisite:** Junior or senior classification.

ENGL 353 History of Rhetoric

Credits 3. 3 Lecture Hours. Exploration of the major approaches to the theory and practice of oral and written rhetoric and discourse up to the end of the 19th century. **Prerequisites:** Junior or senior classification; also taught at Galveston campus.

ENGL 354 Modern Rhetorical Theory

Credits 3. 3 Lecture Hours. Study of 20th and 21st century rhetorical theories and theorists; focus on relationships among rhetoric and culture, such as rhetoric in oral and textual communities, rhetoric as a method of literary interpretation, rhetoric and linguistics, rhetoric as theorized and taught across academic communities. **Prerequisite:** Junior or senior classification.

ENGL 355 The Rhetoric of Style

Credits 3. 3 Lecture Hours. Fosters an appreciation for and better understanding of English prose style; the history of English prose; representative prose models for analysis and imitation; the impact of computer analysis. **Prerequisite:** Junior or senior classification.

ENGL 356/FILM 356 Literature and Film

Credits 3. 3 Lecture Hours. Novels and films based on them; writers and filmmakers such as Virginia Woolf, John Steinbeck, John Ford, Sally Potter, John Huston, Charlotte Bronte and Peter Bogdanovich. **Prerequisites:** Junior or senior classification or approval of instructor. **Cross Listing:** FILM 356/ENGL 356.

ENGL 357 Native American Rhetorics and Literatures

Credits 3. 3 Lecture Hours. Examination of Native American rhetorics and literatures with a focus on the relationship between composed, performed, and material rhetorics; covering Native American rhetors and writers from pre-colonization to the present and contextualizing them within contemporary Native issues. **Prerequisite:** Junior or senior classification or approval of instructor.

ENGL 358/FILM 358 Screenwriting

Credits 3. 3 Lecture Hours. Analysis of screenplay structure coupled with writing assignments illustrating principles of form. **Prerequisite:** Junior or senior classification. **Cross Listing:** FILM 358/ENGL 358.

ENGL 359 Forms of Creative Writing

Credits 3. 3 Lecture Hours. Major forms of writing in prose or poetry, depending on instructor; analysis of structure coupled with writing assignments illustrating principles of form in narrative and/or lyrical modes. May be taken three times for credit. **Prerequisites:** ENGL 235; junior or senior classification.

ENGL 360 Literature for Children

Credits 3. 3 Lecture Hours. Representative writers, genres, texts and movements. **Prerequisite:** Junior or senior classification.

ENGL 361 Young Adult Literature

Credits 3. 3 Lecture Hours. Survey of historical and contemporary literature for adolescents, including such forms as fantasy, domestic fiction, and the problem novel. **Prerequisite:** Junior or senior classification.

ENGL 362/HISP 362 Latino/a Literature

Credits 3. 3 Lecture Hours. Literature by U.S.-based Latino/a authors writing mostly in English; examination of historical and social contexts of cultural production; may include novels, poetry, short stories, plays, and films to gain understanding of aesthetic expression of diverse Latino/a authors, including but not limited to Mexican Americans, Puerto Ricans, Cuban Americans, and Dominican Americans. **Prerequisite:** Junior or senior classification. **Cross Listing:** HISP 362/ENGL 362.

ENGL 365/RELS 360 The Bible as Literature

Credits 3. 3 Lecture Hours. Narrative, structural, and thematic study of the Hebrew and Christian Scriptures in English translation. **Prerequisite:** Junior or senior classification. **Cross Listing:** RELS 360/ENGL 365.

ENGL 366/FILM 366 Horror Studies

Credits 3. 3 Lecture Hours. History, theories and major subgenre developments of contemporary horror studies in film and literature. **Prerequisites:** Junior or senior classification. **Cross Listing:** FILM 366/ENGL 366.

ENGL 369/WGST 369 Lesbian, Gay, Bisexual, Transgender, and Queer Authorship

Credits 3. 3 Lecture Hours. Exploration of LGBTQ+ authorship through film and literary criticism and theories of performing the self in the act of authoring. **Prerequisites:** Junior or senior classification. **Cross Listing:** WGST 369/ENGL 369.

ENGL 372 American Poetry

Credits 3. 3 Lecture Hours. Exploration of the development of American poetic traditions, with an emphasis on the major poetry of 19th and 20th centuries. **Prerequisite:** 3 credits of literature at 200-level or above.

ENGL 373 American Realism and Naturalism

Credits 3. 3 Lecture Hours. Exploration of the literature produced in the United States between the Civil War and World War I, such as works by Twain, James, Freeman, Jewett, Chesnutt, Crane, Dreiser, Wharton. **Prerequisites:** 3 credits of literature at 200-level or above.

ENGL 374/WGST 374 Women Writers

Credits 3. 3 Lecture Hours. History of literature by women in English; emphasis on continuity of ideas and on literary contributions; study of a variety of genres with particular attention to the significance of gender in the racial, social, sexual and cultural contexts of women writing in English. **Prerequisite:** Junior or senior classification; ENGL-374 also taught at Galveston campus. **Cross Listing:** WGST 374/ENGL 374.

ENGL 375 Nineteenth-Century American Novel

Credits 3. 3 Lecture Hours. An exploration of the development of the American novel; study of representative novels from the early national period, the American Renaissance, and realism and naturalism. **Prerequisite:** 3 credits of literature at 200-level or above.

ENGL 376 The American Novel Since 1900

Credits 3. 3 Lecture Hours. Representative novels of 20th and 21st century American writers; emphasis on varied literary movements and on thematic and formal innovations as reflections of/responses to social transformations in American society since 1900. **Prerequisite:** Junior or senior classification.

ENGL 377 The British Novel to 1870.

Credits 3. 3 Lecture Hours. Representative works illustrating the development of the novel, by writers resident in Great Britain and its colonies, from its beginnings to the late nineteenth century. **Prerequisite:** 3 credits of literature at 200-level or above.

ENGL 378 The British Novel, 1870 to Present.

Credits 3. 3 Lecture Hours. Representative works illustrating development of the novel by writers resident in Great Britain and its colonies from the late nineteenth century forward. **Prerequisite:** Junior or senior classification.

ENGL 379/AFST 379 Postcolonial Literatures

Credits 3. 3 Lecture Hours. Exploration of key terms, themes and debates within global literature written by colonized, occupied and diasporic peoples. **Prerequisites:** 3 credits of literature at the 200-level or above. **Cross Listing:** AFST 379/ENGL 379.

ENGL 385 Playwriting

Credits 3. 3 Lecture Hours. The craft of writing plays and practical experience in writing plays of various lengths; structure, building of ideas into dramatic situations, use of dialogue and movement. **Prerequisite:** ENGL 235; junior or senior classification or approval of instructor.

ENGL 386 Creative Nonfiction

Credits 3. 3 Lecture Hours. Practical study and application of literary nonfiction, the general audience essay, the memoir, and related nonfiction forms; with extensive workshop time and attention given to student writing, expert and peer review as well as readings from authors in the genre. **Prerequisites:** ENGL 235; junior or senior classification.

ENGL 390 Studies in British Literature

Credits 3. 3 Lecture Hours. Exploration of a significant topic or period in British literature; features current faculty research on such topics as Victorian fantasy literature, social identity in medieval Britain and Ireland and children in film. May be repeated 1 time for credit. **Prerequisites:** 3 credits of literature at 200-level or above; junior or senior classification.

ENGL 391 Folklore, Literature, and World Cultures

Credits 3. 3 Lecture Hours. Theories of folklore and vernacular culture; exploration of the relationship between oral literature and the forms of vernacular culture, including film, festival and dance. **Prerequisites:** Junior or senior classification.

ENGL 392/RELS 392 Studies in Literature, Religion and Culture

Credits 3. 3 Lecture Hours. Exploration of literature treating significant religious topics in the context of cultural setting; features current faculty research on such topics as Tolkien and the making of myth, C.S. Lewis, texts and cultures of the Middle East and Victorian women writers and religion. May be repeated one time for credit. **Prerequisites:** 3 credits of literature at 200-level or above; junior or senior classification. **Cross Listing:** RELS 392/ENGL 392.

ENGL 393/AFST 393 Studies in Africana Literature and Culture

Credits 3. 3 Lecture Hours. Literary movements, genres, groups of authors, topics or issues in the literature and culture of people of African descent. **Prerequisites:** 3 credits of literature at 200-level or above; junior or senior classification or approval of instructor. **Cross Listing:** AFST 393/ENGL 393.

ENGL 394 Studies in Genre

Credits 3. 3 Lecture Hours. Theory and practice of a single genre including analysis of its history and development; features current faculty research on such topics as women standup comics, British short stories and Irish history on stage and screen. May be repeated once for credit. **Prerequisites:** 3 credits of literature at 200-level or above; junior or senior classification.

ENGL 395 Topics in Literature and Medicine

Credits 3. 3 Lecture Hours. Examination of a particular period or genre within literature and medicine studies; analysis of autobiographies, novels and poetry dealing with health and illness; evaluation of sources from different disciplinary perspectives as a tool for critical thinking; topics will vary. **Prerequisite:** 3 credits of literature at the 200-level or above; junior or senior classification.

ENGL 396 Studies in American Literature

Credits 3. 3 Lecture Hours. Exploration of a significant topic or period in American literature; features current faculty research on such topics as Asian-American women writers, American music and literature and American Gothic. **Prerequisites:** 3 credits of literature at 200-level or above; junior or senior classification.

ENGL 401 Contemporary Literary Theory

Credits 3. 3 Lecture Hours. Exposure to the discourses of contemporary theory in engagement with other academic disciplines; study of major theoretical schools, debates, and critiques. **Prerequisites:** 3 credits of literature at the 300-level; junior or senior classification.

ENGL 403 Language and Gender

Credits 3. 3 Lecture Hours. Language and gender from a sociolinguistic perspective; gender in the words and structures of language; gender representation and gendered language use in the media, and a variety of sociocultural contexts; language use in intimate relationships; computer-mediated discourse; language, sexuality, and sexual orientation. **Prerequisite:** Junior or senior classification. **Cross Listing:** LING 403 and WGST 403.

ENGL 412 Studies in Shakespeare

Credits 3. 3 Lecture Hours. Advanced study of a significant topic in Shakespeare. **Prerequisites:** 3 credits of literature at the 300-level; junior or senior classification.

ENGL 414 Milton

Credits 3. 3 Lecture Hours. In-depth study of poetry and selected prose works of John Milton. **Prerequisite:** 3 credits of literature at the 300-level; junior or senior classification.

ENGL 415 Studies in a Major Author

Credits 3. 3 Lecture Hours. Exploration of a major author as a vehicle for emphasizing intensive analysis, scholarship and literary criticism. **Prerequisite:** 3 credits of literature at 300-level; junior or senior classification; also taught at Galveston campus.

ENGL 431 Chaucer

Credits 3. 3 Lecture Hours. Intensive analysis of Chaucer's works in Middle English, including engagement with published criticism and scholarship. **Prerequisite:** 3 credits of literature at 300-level; junior or senior classification; also taught at Galveston campus.

ENGL 433 Digital Humanities Theory and Practice

Credits 3. 3 Lecture Hours. The use of digital tools for conducting humanities research; theoretical ideas that inform the field; application of theory to the critical assessment of online digital projects in the field. **Prerequisite:** Junior or senior classification. **Cross Listing:** DHUM 433 and HIST 433.

ENGL 434 Advanced Studies in Science Fiction and Fantasy

Credits 3. 3 Lecture Hours. Exploration of significant topics, authors, movements, genres, and media in science fiction and fantasy. May be repeated one time for credit. **Prerequisite:** 3 credits of literature at the 300-level or above.

ENGL 435 Advanced Studies in Creative Writing

Credits 3. 3 Lecture Hours. Advanced study of specified topics in a creative writing genre or genres. May be repeated two times for credit. **Prerequisites:** 3 credits of creative writing at the 300-level; junior or senior classification.

ENGL 460 Digital Authoring Practices

Credits 3. 3 Lecture Hours. Analysis and practice of authoring in digital environments, including individual and collaborative approaches, audience concerns, theoretical, ethical and stylistic issues; environments and topics may include web design, content management system (CMS), text encoding, project management, usability, version tracking, content authoring and accessibility. **Prerequisites:** ENGL 210; junior or senior classification.

ENGL 461 Advanced Syntax and Rhetoric

Credits 3. 3 Lecture Hours. Points of view toward language study; traditional syntax; points of view toward rhetoric; Christensen's rhetoric of the paragraph; analysis of written discourse. **Prerequisite:** Senior classification or approval of instructor.

ENGL 462 Rhetoric in Cultural Context

Credits 3. 3 Lecture Hours. Theories concerning the influence of socio-cultural context on expressive forms and how such forms are used to achieve social and communicative aims; analysis of examples of written, verbal, and visual rhetorics from various cultures illustrating the impact that expressive forms have on social life. **Prerequisites:** Junior or senior classification.

ENGL 463 Science Writing

Credits 3. 3 Lecture Hours. Analysis and practice of writing about science in multiple genres for a variety of audiences; includes grant writing, scientific editing, medical writing, data visualization, environmental writing, information ethics and plagiarism, authorship and attribution, and ghostwriting. **Prerequisites:** Junior or senior classification or approval of instructor.

ENGL 467/GLST 467 Cultural Texts as Data

Credits 3. 3 Lecture Hours. Exploration of concepts, tools, methods, and approaches to computationally manipulating cultural texts and large text corpora such as academic databases and newspaper, periodical, and social media archives; identification of connections between cultural phenomena through analysis of patterns of meaning, linguistic etymologies, and cultural biases. **Prerequisites:** Junior or senior classification, or approval of instructor. **Cross Listing:** GLST 467/ENGL 467.

ENGL 474/WGST 474 Studies in Women Writers

Credits 3. 3 Lecture Hours. A different topic each term examining women's writing through historical period, genre, cross-cultural study and/or feminist literary theory. May be repeated for credit. **Prerequisites:** 3 credits of literature at the 300-level; junior or senior classification. **Cross Listing:** WGST 474/ENGL 474.

ENGL 481 Senior Seminar

Credits 3. 3 Lecture Hours. Capstone seminar on significant figures, movements or issues with special attention to methods and materials of scholarship. **Prerequisites:** ENGL 303; senior classification.

ENGL 482/HHUM 482 Advanced Studies in Health Humanities

Credits 3. 3 Lecture Hours. Capstone course; application of skills and knowledge acquired during health humanities concentration coursework; exposure to specialized methods of inquiry; development and execution of an individualized final project. **Prerequisites:** ENGL 107, COMM 107, HHUM 107, ENGL 292, ENGL 342, COMM 342, WGST 342, or ENGL 395; junior or senior classification. **Cross Listing:** HHUM 482/ENGL 482.

ENGL 484 Internship

Credits 0 to 3. 0 to 3 Lecture Hours. Directed internship in a public or private organization to provide students with on-the-job training and applied research experience appropriate to career objectives. May be taken three times for credit. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisites:** Approval of department head; junior or senior classification; also taught at Galveston campus.

ENGL 485 Directed Studies

Credits 0 to 3. 0 to 3 Other Hours. Readings selected for specific need of major or minor in English; also taught at Galveston campus.

ENGL 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of English language and literature; also taught at Galveston campus. May be repeated for credit.

ENGL 491 Research

Credits 0 to 3. 0 to 3 Lecture Hours. Research conducted under the direction of faculty member in English. May be taken three times for credit. **Prerequisites:** 12 credits of English, including 3 at 300-level; junior or senior classification and approval of instructor; also taught at Qatar campus.

ENGL 497 Independent Honors Studies

Credits 0 to 3. 0 to 3 Other Hours. Directed independent studies in the English language and English or American literature. **Prerequisites:** Junior or senior classification either as Honors student or with overall GPR of 3.5 and letter of approval from head of student's major department. May be repeated for credit.

ENGR - Engineering (ENGR)

ENGR 101 Energy: Resources, Utilization and Importance to Society

Credits 4. 3 Lecture Hours. 2 Lab Hours. Introductory course about current and potential energy sources, the link between energy and wealth, and the consequences of action or inaction concerning energy and the environment.

ENGR 102 Engineering Lab I - Computation

Credits 2. 1 Lecture Hour. 3 Lab Hours. Introduction to the design and development of computer applications for engineers; computation to enhance problem solving abilities; basic concepts of software design through the implementation and debugging of student-written programs; introduction to engineering majors, career exploration, engineering practice within realistic constraints, e.g. economic, environmental, ethical, health and safety, and sustainability; pathways to success in engineering. **Prerequisite:** Grade of C or better in MATH 151 or MATH 150, or concurrent enrollment; admission to the college of engineering.

ENGR 112 Foundations of Engineering II

Credits 2. 1 Lecture Hour. 3 Lab Hours. Continuation of ENGR 111. Topics include, depending on the major, emphasis on computer applications and programming and solids modeling using CAD tools or other software; fundamentals of engineering science; advanced graphic skills. **Prerequisite:** ENGR 111; MATH 151 or concurrent enrollment; admission to the College of Engineering; also taught at Galveston campus.

ENGR 181 Engineering Honors Seminar I

Credit 1. 1 Lecture Hour. Co-curricular experiences related to academic success, undergraduate research and service in preparation for careers in research and technology leadership. **Prerequisites:** Admitted to engineering honors; freshman or sophomore classification.

ENGR 216/PHYS 216 Experimental Physics and Engineering Lab II - Mechanics

Credits 2. 1 Lecture Hour. 3 Lab Hours. Description and application of laws of physical motion to the solution of science and engineering problems; using sensing, control and actuation for experimental verification of physics concepts while solving engineering problems. **Prerequisites:** Grade of C or better in MATH 151 or MATH 171 or equivalent; grade of C or better in ENGR 102; grade of C or better and concurrent enrollment in PHYS 206; also taught at Galveston campus. **Cross Listing:** PHYS 216/ENGR 216.

ENGR 217/PHYS 217 Experimental Physics and Engineering Lab III - Electricity and Magnetism

Credits 2. 1 Lecture Hour. 3 Lab Hours. Electromagnetism and electromechanical systems; use of sensing, control and actuation to demonstrate key physical relationships through the transducer relationships linking pressure, temperature and other physical stimuli to changes in electric and magnetic fields. **Prerequisites:** Grade of C or better in MATH 152 or MATH 172, or equivalent; grade of C or better in PHYS 206 or equivalent; grade of C or better in PHYS 216/ENGR 216 or ENGR 216/PHYS 216; grade of C or better and concurrent enrollment in PHYS 207; also taught at Galveston campus. **Cross Listing:** PHYS 217/ENGR 217.

ENGR 251 Creating a Self-Aware Leader

Credits 3. 2 Lecture Hours. 2 Lab Hours. Fundamentals of engineering leadership and business; organizational dynamics; self-awareness. **Prerequisites:** Grade of C or better in ENGR 102, and ENGR 216/PHYS 216 or PHYS 216/ENGR 216; acceptance into the Zachry Leadership Program.

ENGR 270 Engineering Projects in Community Service

Credit 1. 1 Lecture Hour. Project course using team approach to engage students in open-ended community service projects involving non-profit agencies; includes project management, understanding the complete design process, awareness of the customer in engineering design, and the ability to communicate effectively. May be taken six times for credit. **Prerequisites:** ENGR 102 or approval of instructor; freshman or sophomore classification in an engineering major.

ENGR 281 Engineering Honors Mentoring and Team Building Seminar

Credits 0-1. 0-1 Other Hours. Selected topics related to peer mentoring and team building while participating in co-curricular activities; emphasis on building supportive relationships on campus; provides practical experience in being a member of a project involving campus or community-based engagement; for those serving as a Coach (i.e., student leader providing light mentoring to the residents) in the Engineering Honors Living Learning Community (Engineering Honors Community of Scholars or ECOS). **Prerequisites:** Appointment to be a Coach in ECOS; approval of instructor.

ENGR 285 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Special problems in any area of engineering. **Prerequisites:** Freshman or sophomore classification; approval of department head.

ENGR 289 Special Topics in...

Credits 0 to 4. 0 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified area of engineering. May be repeated for credit. **Prerequisite:** Approval of instructor.

ENGR 291 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in the college of engineering. May be repeated three times for credit. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

ENGR 301 College of Engineering Study Abroad

Credits 0 to 18. 0 to 18 Other Hours. For students in approved programs abroad. May be repeated for credit. **Prerequisites:** Admission to approved program; approval of study abroad coordinator.

ENGR 302

Credits 0.

ENGR 350 Leading for Impact in Engineering, Business and Society

Credits 3. 2 Lecture Hours. 2 Lab Hours. Fundamental leadership and business topics relevant to engineering and technical careers; business model development; business strategy; leadership theory; empathy.

Prerequisites: Grade of C or better in ENGR 251; acceptance into the Zachry Leadership Program; junior or senior classification or approval by instructor.

ENGR 351 The Role of Engineering and Business in Society

Credits 3. 2 Lecture Hours. 2 Lab Hours. Exploration of engineering and business contributions to society; political, cultural, societal and economic forces' impact on engineering; using creativity and imagination to solve engineering and societal challenges. **Prerequisites:** Acceptance into the Zachry Leadership Program; ENGR 350; junior or senior classification or approval by instructor.

ENGR 381 Engineering Honors Community of Scholars Leadership Seminar

Credits 0-1. 0-1 Other Hours. Selected topics related to leadership and management theory and practice in the context of co-curricular activities, involving multidisciplinary teams; provides practical experience in leading projects involving community-based engagement and residence-based programming; for those serving as Fellows, student leaders in the Engineering Honors Living Learning Community (Engineering Honors Community of Scholars or ECOS). **Prerequisite:** Appointment to be a Fellow in ECOS; approval of instructor.

ENGR 385 Problems for Co-Op Students

Credits 1 to 3. 1 to 3 Other Hours. Special problems in engineering for cooperative education students; problems related to student's work assignment culminating in a research paper; three hours may be used as technical elective, and one additional hour may be used as free elective; a total of 4 hours may be used toward graduation. **Prerequisite:** Approval of department head.

ENGR 399 Engineering Honors Community of Scholars - Engineering Honors Residential Community

Credits 0. 0 Other Hours. Participation in an approved high-impact learning practice within the Engineering Honors (EH) program which includes the EH Living Learning Community (ECOS); reflection on professional outcomes; documentation and self-assessment of learning experience.

ENGR 401 Interdisciplinary Design

Credits 3. 2 Lecture Hours. 3 Lab Hours. Instruction and practice in the design process applied to an interdisciplinary design project including establish the customer need; determine requirements in terms of function (what) and performance (how well); develop alternative design concepts; perform trade-off studies among performance, cost and schedule; embodiment and detail design; iterate the above steps; major interdisciplinary design project. **Prerequisites:** Senior classification and approval of instructor.

ENGR 402 Interdisciplinary Design II

Credits 3. 2 Lecture Hours. 3 Lab Hours. Product detail and design development process including case studies; may include project management, marketing considerations, manufacturing detailed design specifications; failure modes, applications of codes and standards, selection of design margins; product (component) development guidelines; intellectual property, product liability and ethical responsibility. **Prerequisites:** ENGR 401; junior or senior classification.

ENGR 410 Global Engineering Design

Credits 3. 3 Lecture Hours. Intercultural models and their application to engineering design in diverse, multinational and multidisciplinary settings; engineering design project working in international teams of students, faculty and industry experts; applying engineering skills to the project; includes the study and application of intercultural models, global enterprise fundamentals and remote collaboration technologies; required for the International Engineering Certificate. **Prerequisite:** Junior or senior classification or approval of instructor.

ENGR 450 Finding Your Leadership Qualities

Credits 3. 2 Lecture Hours. 2 Lab Hours. Exploration of personal leadership qualities and perspective; case studies in leadership in engineering enterprises; business etiquette and personal marketing. **Prerequisites:** Grade of C or better in ENGR 351; acceptance into the Zachry Leadership Program; junior or senior classification or approval by instructor.

ENGR 451 Leading for a Lifetime: Continual Learning and Influence

Credits 3. 2 Lecture Hours. 2 Lab Hours. Intersection of engineering, business, citizenship and leadership. **Prerequisites:** Grade of C or better in ENGR 450; acceptance into the Zachry Leadership Program; junior or senior classification or approval by instructor.

ENGR 462 Engineering Entrepreneurship Hour

Credit 1. 1 Lecture Hour. Designed to engage with successful technology entrepreneurs from across the nation; learn about the characteristics of successful entrepreneurs and their strategies in launching and sustaining businesses on technology innovation; network with highly successful entrepreneurs and develop relations valuable to professional careers. **Prerequisites:** Junior or senior classification or approval of instructor.

ENGR 484 International Engineering Internship

Credits 0 to 6. 0 to 6 Other Hours. International Engineering Internship. May be taken for credit up to six hours. **Prerequisite:** Junior or senior classification.

ENGR 485 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Directed individual study of problems in any area of engineering. May be taken 3 times for credit. **Prerequisites:** Junior or senior classification; approval of the college.

ENGR 489 Special Topics in...

Credits 0 to 4. 0 to 4 Lecture Hours. 0 to 6 Lab Hours. Selected topics in an identified field of engineering. May be repeated for credit.

ENGR 491 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in the College of Engineering. May be repeated 3 times for credit. Registration in multiple sections of this course is possible within a given semester provided that the per semester credit hour limit is not exceeded. **Prerequisites:** Junior or senior classification and approval of instructor.

ENGR 499 Grand Challenge Scholars Program

Credits 0. 0 Other Hours. Participation in an approved high-impact learning practice within the Grand Challenge Scholars program (GCSP); reflection on professional outcomes; documentation and self-assessment of learning experience.

ENST-Environmental Studies (ENST)

ENST 291 Research

Credits 1 to 4. 1 to 4 Other Hours. Research conducted under the direction of faculty member in environmental studies. May be repeated 2 times for credit. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

ENST 491 Research

Credits 1 to 4. 1 to 4 Other Hours. Research conducted under the direction of faculty member in environmental studies. May be repeated 3 times for credit. Registration in multiple sections of this course are possible within a given semester provided that the per semester credit hour limit is not exceeded. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

ENTC - Engineering Technology (ENTC)

ENTC 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified area of engineering technology. May be repeated for credit. **Prerequisite:** Approval of instructor.

ENTC 399 High Impact Experience

Credits 0. 0 Other Hours. Participation in an approved high-impact learning practice; reflection on professional outcomes; documentation and self-assessment of learning experience at mid-curriculum point. **Prerequisites:** Grade of C or better in ESET 350, IDIS 343 or MMET 376; approval of instructor.

ENTC 481 Seminar

Credit 1. 1 Lecture Hour. Presentation of selected topics from current literature and related industrial operations in various technical areas; films showing practical application of manufacturing and industrial processes; lectures from industrial representatives. **Prerequisite:** Senior classification.

ENTC 484 Professional Internship

Credit 1. 1 Lecture Hour. Directed internship in a private firm, government agency/laboratory, or non-governmental organization to provide work and/or research experience related to the student's program and career objectives. May be taken two times for credit. **Prerequisites:** Junior and senior classification and approval of internship agency and instructor.

ENTC 485 Directed Studies

Credits 1 to 6. 1 to 6 Other Hours. Permits work in a special problem area on an individual basis with the intent of promoting independent reading, research and study; to supplement existing course offerings or subjects not presently covered. **Prerequisites:** Senior classification and approval of instructor.

ENTC 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified area of engineering technology. **Prerequisite:** Approval of instructor.

ENTC 491 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in the college of engineering. May be taken four times for credit. **Prerequisites:** Junior or senior classification and approval of instructor.

ENTO - Entomology (ENTO)

ENTO 101 Introduction to Academic Success in Entomology

Credit 1. 1 Lecture Hour. Orientation to academic success within higher education and specifically the Bachelor of Science degree in entomology; awareness of academic and campus support services available for student success; development of goals for academic and career planning, including creation and utilization of degree planner; awareness of personal self-management strategies, including learning styles, time management, goal setting, stress management and development of personal strategies for implementation of personal self-management into practice.

ENTO 102 Continuing Academic Success in Entomology

Credit 1. 1 Lecture Hour. Continued exploration to academic success within higher education and specifically the Bachelor of Science degree in Entomology; increase awareness of academic and campus support services available for student success; development of goals for academic and career planning, including creation and utilization of degree planner; awareness of personal self-management strategies, including learning styles, time management, goal setting, stress management, and development of personal strategies for implementation of personal self-management into practice. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisite:** ENTO 101.

ENTO 201 General Entomology

Credits 3. 2 Lecture Hours. 2 Lab Hours. Survey of the major classes of arthropods with special emphasis on species of economic or biological importance; general insect anatomy, physiology, metamorphosis and classification; survey of the biologies of insect orders and major families using common injurious and beneficial species to relate material to production agriculture and the urban environment.

ENTO 208 Veterinary Entomology

Credits 2. 2 Lecture Hours. Insects and their relatives causation of economic loss, impacts to well-being and transmission of disease pathogens to domestic and companion animals and wildlife as well as health and well-being of humans through occupational or recreational exposure; insect biology, economic importance and principles and methods of prevention and control. **Prerequisite:** Co-enrollment in ENTO 209.

ENTO 209 Veterinary Entomology Laboratory

Credit 1. 2 Lab Hours. Insects and their relatives causation of economic loss, impacts to well-being and transmission of disease pathogens to domestic and companion animals and wildlife, as well as health and well-being of humans through occupational or recreational exposure; laboratory emphasizes identification of major arthropod pests, use of microscopy and dissection equipment. **Prerequisite:** Concurrent enrollment with ENTO 208.

ENTO 210 Global Public Health Entomology

Credits 3. 3 Lecture Hours. Impacts of insects and insect-borne diseases on public health and well-being around the globe; insect biology, bloodfeeding, and transmission of human diseases; role of insect borne diseases on human history, socio-economic development, and public health infrastructure. **Prerequisite:** Freshman or sophomore classification or approval of instructor.

ENTO 285 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Directed individual study in entomology. **Prerequisites:** Freshman or sophomore classification; approval of instructor and department head.

ENTO 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of entomology. May be repeated for credit. **Prerequisite:** Approval of instructor.

ENTO 291 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in entomology. May be repeated for credit. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

ENTO 300/ECCB 300 Field Studies

Credits 3. 3 Other Hours. Integration of principles of animal and plant ecology with environmental factors to characterize wildlife populations; intensive analysis of specific areas will emphasize either the development of a wildlife management plan or a general vertebrate natural history survey. **Prerequisite:** Prior approval of instructor and concurrent enrollment in ECCB 450/ENTO 450 and ECCB 451/ENTO 451. **Cross Listing:** ECCB 300/ENTO 300.

ENTO 301 Biodiversity and Biology of Insects

Credits 4. 3 Lecture Hours. 3 Lab Hours. Introduction to orders and most important families of insects; order-level morphology and family-level natural history; collection of insects identified to family level provides introduction to collection methods and specimen preparation. **Prerequisites:** ENTO 201, or ENTO 208 and ENTO 209; BIOL 111 and BIOL 112; junior or senior classification or approval of instructor.

ENTO 305 Evolution of Insect Structure

Credits 3. 2 Lecture Hours. 3 Lab Hours. External morphology of insects; evolution of form and function. **Prerequisite:** ENTO 201, or ENTO 208 and ENTO 209; BIOL 111.

ENTO 306 Insect Structure and Function

Credits 4. 3 Lecture Hours. 3 Lab Hours. Physiology and morphology of insects; structure and function of internal organ systems and their role in insect success. **Prerequisite:** ENTO 201, or ENTO 208 and ENTO 209; BIOL 111 and BIOL 112; CHEM 101, CHEM 111, CHEM 102 and CHEM 112, or CHEM 119 and CHEM 120.

ENTO 320 Honey Bee Biology

Credits 3. 3 Lecture Hours. Introduction of honey bee biology and beekeeping practices to science and non-science majors; honey bees as the model insect to introduce general principles of biology and entomology. **Prerequisite:** Junior or senior classification or approval of instructor.

ENTO 321 Beekeeping

Credit 1. 3 Lab Hours. Basic Knowledge and techniques used in apiculture; tools and knowledge needed to keep bees responsibly and productively. **Prerequisites:** ENTO 320 or concurrent enrollment, junior or senior classification or approval of instructor.

ENTO 322 Insects and Human Society

Credits 3. 3 Lecture Hours. Emphasis on the role insects have played in the development of human cultures; aspects include health, food production and storage, art, music and architecture; overview of historic, present day, and future roles insects will have on environmental movements (green societies), and in underdeveloped, developing and developed societies. **Prerequisite:** Junior or senior classification.

ENTO 401 Principles of Integrated Pest Management

Credits 3. 2 Lecture Hours. 3 Lab Hours. Integrated pest management (IPM) concepts, principles, development and application; IPM constitutes a series of pest control tactics and strategies toward more sustainable agriculture, natural resources, and urban and rural health and well-being. **Prerequisite:** ENTO 201, or ENTO 208 and ENTO 209.

ENTO 402 Insects In Agriculture

Credits 3. 2 Lecture Hours. 3 Lab Hours. Examination of the biology and ecology of insect agricultural pests and the science underlying their management; exploration of the biology, taxonomy and management of insects as both pests and beneficial species in a range of agricultural systems. **Prerequisites:** Grade of C or better in ENTO 201 or approval of instructor.

ENTO 403 Urban Entomology

Credits 3. 2 Lecture Hours. 3 Lab Hours. Biology, economic importance and control strategies for arthropod pests commonly invading households and commercial structures in urban environments; laboratory consists of urban pest identification and special presentations and demonstrations covering topics related to urban pest problems and their control. Offered in 2011-2012 academic year and alternating years thereafter. **Prerequisites:** ENTO 201, or ENTO 208 and ENTO 209, or approval of instructor.

ENTO 423 Medical Entomology

Credits 2. 2 Lecture Hours. Biologies, disease relationships, and control of insects and other arthropods parasitic on or in humans; aspect of the fields of clinical and preventative medicine. **Prerequisites:** BIOL 111; ENTO 427 or concurrent enrollment; junior or senior classification.

ENTO 424 Insect Ecology

Credits 3. 2 Lecture Hours. 3 Lab Hours. Provides basic ecological background with an applied interpretation, emphasizing influences of insect populations and communities on ecosystem processes that influence landscape structure, function and change. **Prerequisites:** ENTO 201, or ENTO 208 and ENTO 209; BIOL 111; junior or senior classification or approval of instructor.

ENTO 425 Disease Ecology

Credits 3. 3 Lecture Hours. Ecological interactions that influence the distribution and abundance of pathogens, vectors, and hosts ultimately determine the spread of disease; impacts of urbanization, climate change, and other human influenced environmental changes on disease dynamics; integration of disease ecology into pathogen and vector monitoring and comprehensive strategies to reduce disease occurrence. **Prerequisite:** ENTO 208, ENTO 209 and ENTO 423; junior or senior classification, or approval of instructor.

ENTO 426/VIBS 426 Methods in Vector-Borne Disease Ecology

Credits 3. 1 Lecture Hour. 5 Lab Hours. Methodological understanding of how vector-borne diseases are studied in the field and laboratory; hands-on exploration of the ecology disease systems in a one health framework; concepts of design, execution and presentation of research projects; outdoor field work and bio-safety level 2 laboratory. **Prerequisites:** Junior or senior classification and approval of instructor. **Cross Listing:** VIBS 426/ENTO 426.

ENTO 427 Medical Entomology Laboratory

Credit 1. 2 Lab Hours. Morphological features of adults and immature stages of parasitic arthropods of medical importance; molecular techniques to determine infectious status of arthropod vectors. **Prerequisites:** BIOL 111; ENTO 423 or concurrent enrollment; junior or senior classification.

ENTO 428 Insect Biotechnology

Credits 3. 3 Lecture Hours. Applications of genetic engineering and biotechnology; specific problems dealing with insects and control of insect pests. **Prerequisites:** ENTO 429 or concurrent enrollment; GENE 301, GENE 315, GENE 320/BIMS 320, or FIVS 308; junior or senior classification or approval of instructor.

ENTO 429 Insect Biotechnology Laboratory

Credit 1. 3 Lab Hours. Basic technical experience in insect molecular biology and biotechnology, including genomic DNA isolation, PCR, cloning, sequencing and gene manipulation techniques; focus on insect applications for improvement of human health and agriculture. **Prerequisites:** ENTO 428 or concurrent enrollment; junior or senior classification or approval of instructor.

ENTO 431/FIVS 431 The Science of Forensic Entomology

Credits 3. 3 Lecture Hours. Explores the science, methodology and technology employed to gather, preserve and present information about insects and other arthropods in such a manner that this information can be used in courts of law as evidence and testimony to help resolve issues of a criminal or civil nature. **Prerequisite:** Junior or senior classification or approval of instructor. **Cross Listing:** FIVS 431/ENTO 431.

ENTO 432/FIVS 432 Applied Forensic Entomology

Credit 1. 3 Lab Hours. Laboratory-based offering practical experience using scientific information, methodology, technology, and legal procedures inherent to the field of forensic entomology; emphasis on collecting, preserving, and identifying information as evidence and expert witness testimony in courts of law. **Prerequisites:** Junior or senior classification or approval of instructor. **Cross Listing:** FIVS 432/ENTO 432.

ENTO 435 Case Studies in Problem Solving

Credits 3. 3 Lecture Hours. Development of reasoning strategies by examining a variety of case studies, science and scientific methods; solving real-world problems as part of an investigative team. **Prerequisite:** ENTO 201, or ENTO 208 and ENTO 209; ENTO 482; senior classification or approval of instructor.

ENTO 441 Engineering Vector Populations

Credits 3. 3 Lecture Hours. Genetic strategies developed and deployed to control vector-borne diseases; vector population replacement, reduction or elimination; CRISPR and Cas9, gene drive and sterile insect technique; social, regulatory, political and ecological factors concerning genetic technologies.

ENTO 442 Mosquito - A History of Humankind's Struggle for Survival with the Deadliest Animal on the Planet

Credits 3. 3 Lecture Hours. Mosquito-borne pathogens, human diseases; transmission cycles alternating replication susceptible vertebrate host, blood-feeding vector mosquito; biology of mosquitoes, historical approaches controlling mosquito-borne diseases, elimination of vectors; new approaches to disease control. **Prerequisites:** Grade of C or better in BIOL 111 and BIOL 112; junior or senior classification.

ENTO 450/ECCB 450 Caribbean Conservation

Credits 2. 6 Lab Hours. Provide experience in and appreciation for diverse tropical habitats and the problems associated with conserving these habitats; design and conduct individual research projects on topics of their choice with approval from the instructors on project design and feasibility. **Prerequisites:** Concurrent enrollment in ENTO 300/ECCB 300 and ENTO 451/ECCB 451; junior or senior classification. **Cross Listing:** ECCB 450/ENTO 450.

ENTO 451/ECCB 451 Caribbean Research Seminar

Credit 1. 1 Other Hour. Document research activities; keep a journal of activities and research methods during study abroad trips. **Prerequisites:** Concurrent enrollment in ENTO 300/ECCB 300 and ENTO 450/ECCB 450; junior or senior classification. **Cross Listing:** ECCB 451/ENTO 451.

ENTO 455 Field Entomology in the Tropics

Credits 3. 9 Other Hours. Intensive hands-on, field-based experiences in Costa Rica at the Texas A&M Soltis Center for Research and Education; study of insect diversity, behavior and natural history and insight into the challenges in conserving biodiversity; two-week course designed to provide authentic research experiences in a tropical rainforest; involvement in physically demanding fieldwork, extensive collecting and sampling, specimen sorting and preparation, as well as field observation of insect natural history and behavioral experiments; learn how to keep field notes, work in teams to solve research questions and communicate research through various media. **Prerequisites:** Grade of C or better in BIOL 111 and BIOL 112; or approval of instructor; any course in entomology recommended.

ENTO 481 Seminar

Credit 1. 1 Lecture Hour. Report of original investigations, current literature and special features of entomology. **Prerequisites:** ENTO 201, or ENTO 208 and ENTO 209; junior or senior classification.

ENTO 482 Occupational and Professional Development

Credits 2. 2 Lecture Hours. Organized instruction in written and oral communication; acquaint students with private and public-sector companies and agencies as well as leading professionals from these firms to reinforce academic instruction and prepare students for the transition to employment, graduate and professional schools. **Prerequisite:** ENTO 201, or ENTO 208 and ENTO 209; or approval of instructor.

ENTO 484 Professional Internship

Credits 0 to 4. 0 to 4 Other Hours. Independent study and supervised field experience related to a professional area of interest in entomology. May be taken two times for credit. **Prerequisite:** ENTO 201, or ENTO 208 and ENTO 209; junior or senior classification or approval of instructor.

ENTO 485 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Individual problems. **Prerequisites:** Approval of instructor and department head.

ENTO 489 Special Topics in...

Credits 1 to 4. 0 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified area of entomology. May be repeated for credit. **Prerequisite:** Approval of instructor.

ENTO 491 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in entomology. May be repeated for credit. **Prerequisites:** Junior or senior classification or approval of instructor.

EPFB - Educ Psyc Field Based (EPFB)

EPFB 210 Family Engagement and Empowerment

Credits 3. 2 Lecture Hours. 3 Lab Hours. Provision of information and skills necessary to work with diverse families; study of the need for positive school-family collaboration and characteristics of families throughout the life cycle, the collaboration of educators with families through the special education process, and the provision of family services through community agencies.

EPFB 301 Teaching Skills I

Credits 3. 1 Lecture Hour. 6 Lab Hours. Study and development of skills focusing on collaboration, instruction, classroom management and professionalism in P-12 schools; field experience in general education settings. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisite:** Admission to professional phase of program.

EPFB 401 Teaching Skills II

Credits 3. 1 Lecture Hour. 6 Lab Hours. Study and development of skills focusing on individual P-12 students' needs with emphasis on delivering complete lessons from a written plan to include Texas Essential Knowledge and Skills (TEKS) and Individualized Educational Program (IEP) objectives, incorporating modifications appropriately, setting behavioral expectations, and using questioning strategies for high level thinking; field experience in two special education settings. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisite:** Admission to professional phase of program.

EPSY - Educational Psychology (EPSY)

EPSY 284 Internship

Credits 0 to 7. 0 to 7 Other Hours. Directed internship in a community, public or private organization to provide on-the-job training and/or applied research experience appropriate to career objectives. May be repeated seven times for credit. Must be taken on a satisfactory/unsatisfactory basis.

EPSY 285 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Direct readings or research problems not covered by any other lower-division course in the curriculum. **Prerequisites:** Freshman and sophomore classification.

EPSY 289 Special Topics In...

Credits 1 to 4. 1 to 4 Other Hours. Selected topics in an identified area of educational psychology. May be repeated for credit.

EPSY 291 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in educational psychology. May be repeated 2 times for credit. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

EPSY 320 Child Development

Credits 3. 3 Lecture Hours. Growth and development of the normal child from infancy to adolescence; implications of children's cognitive, language and psychosocial development for success in academic and social interactions. **Prerequisite:** Junior or senior classification.

EPSY 321 Adolescent Development

Credits 3. 3 Lecture Hours. Characteristics of adolescent growth and development emphasizing behavior within secondary school setting; influences of prior development; home, family and community; peer group, as these affect school adjustment and success. **Prerequisite:** Junior or senior classification.

EPSY 322 Adult Development and Aging

Credits 3. 3 Lecture Hours. Examination of the physical, cognitive, social, and emotional domains of development from adulthood through death through a biopsychosocial lens; overview of the cultural, societal, interpersonal, biological, and cognitive processes that dynamically shape individuals as they progress through adulthood and navigate the inevitability of aging and death. **Prerequisites:** Junior or senior classification.

EPSY 430 Creativity Theories and Research

Credits 3. 3 Lecture Hours. Theoretical base of creativity and the research methodologies used to study creativity. **Prerequisite:** Junior or senior classification.

EPSY 431 Personal Creativity and Giftedness

Credits 3. 3 Lecture Hours. Study of personal creativity and giftedness and how it interrelates with development, relationships, and learning. **Prerequisites:** Junior or senior classification.

EPSY 432 Creativity and Creative Problem Solving

Credits 3. 3 Lecture Hours. Creativity research; historical background and application of the framework and tools of the Parnes/Osborn Creative Problem Solving Process. **Prerequisite:** Junior or senior classification.

EPSY 433 Lateral Thinking

Credits 3. 3 Lecture Hours. Edward deBono's theories and approach to creativity known as lateral thinking which is used throughout the world to increase creative thinking in individuals. **Prerequisite:** Junior or senior classification.

EPSY 435 Educational Statistics

Credits 3. 3 Lecture Hours. Statistical concepts and techniques and their application in behavioral sciences. **Prerequisite:** Junior or senior classification.

EPSY 441 Family Development and Relationships

Credits 3. 3 Lecture Hours. Exploration of the dynamic nature of family development and relationships; examination of the evolution of family structures, the impact of culture and society on family dynamics, and strategies for promoting healthy relationships within the family unit; combination of lectures, readings, discussions, and experiential activities to provide a comprehensive understanding of the complexities and challenges faced by families in today's world. **Prerequisites:** Junior or senior classification.

EPSY 442 Parenting and Family Caregiving

Credits 3. 3 Lecture Hours. Major theories and concepts in parenting and family caregiving; parenting and family caregiving in diverse family forms and cultures across the infancy, early childhood, middle childhood, and adolescent years; caregiving for elderly parents. **Prerequisites:** Junior or senior classification.

EPSY 443 Techniques of Coaching and Counseling

Credits 3. 3 Lecture Hours. Overview of family strengths and weaknesses and how family members relate to and interact with each other; overview of counseling and coaching techniques to support interpersonal relationships as well as display an analysis of personality and communication styles and the impact on relationships and families. **Prerequisites:** Junior or senior classification.

EPSY 444 Professional Ethics in Decision-Making

Credits 3. 3 Lecture Hours. Overview of the character and quality of human social conduct and the ability to critically examine ethical questions and issues as they relate to professional practice; research and theories related to the formation of social attitudes and values; recognition and respect of the diversity of values and the complexity of value choice in a pluralistic society; examination of value systems and ideologies systematically and objectively; social consequences of value choices; recognition of the ethical implications of social and technological changes; ethics of professional practice. **Prerequisites:** Junior or senior classification.

EPSY 459 Practicum in Educating the Gifted and Talented

Credits 3. 1 Lecture Hour. 6 Lab Hours. Theory and strategies for instruction and guidance of the gifted and talented through a supervised experience in a laboratory setting with gifted and talented children and/or adolescents. May be taken two times for credit. **Prerequisites:** Approval of department head and instructor; junior or senior classification.

EPSY 484 Field Experiences

Credits 0 to 6. 0 to 6 Other Hours. University-supervised experience in a professional employment setting related to specializations in guidance and special education. May be repeated to 6 hours total. **Prerequisites:** Approval of student's advisor and department head.

EPSY 485 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Research problems and readings in areas selected to supplement existing offerings; individual reports, oral and written, required. **Prerequisites:** Junior or senior classification; approval of instructor.

EPSY 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of educational psychology. May be repeated for credit. **Prerequisite:** Approval of instructor.

EPSY 491 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in educational psychology. May be repeated 2 times for credit. **Prerequisites:** Junior or senior classification and approval of instructor.

ESET - Electronic Sys Eng Tech (ESET)

ESET 210 Circuit Analysis

Credits 4. 3 Lecture Hours. 3 Lab Hours. Electric and magnetic principles of components used in DC and AC circuits; transient analysis; phasor analysis; Ohm's and Kirchhoff's laws, Thevenin's and Norton's theorems, mesh and nodal equations; measurement of current, voltage and waveforms with meters and oscilloscopes. **Prerequisite:** Grade of C or better in MATH 151.

ESET 211 Power Systems and Circuit Applications

Credits 3. 2 Lecture Hours. 3 Lab Hours. Fundamentals of energy systems; power generation/distribution; motors/generators; AC power analysis; power factor correction; application of Thevenin's and Norton's Theorems, Superposition Theorem, and Mesh and Nodal analysis; resonant circuits; passive filters; nonsinusoidal circuits; pulse waveforms; measurements of AC circuits; circuit analysis using Multisim. **Prerequisites:** Grade of C or better in ESET 210 and MATH 152; electronic systems engineering technology major.

ESET 219 Digital Electronics

Credits 4. 3 Lecture Hours. 3 Lab Hours. Survey of digital applications, number systems, digital logic devices and circuits, sequential logic.

ESET 269 Embedded Systems Development in C

Credits 3. 2 Lecture Hours. 3 Lab Hours. Introduction to programming using the C programming language and embedded microcontroller systems; fundamental language syntax and semantics, concentration of the application to embedded systems. **Prerequisites:** Grade of C or better in ESET 219 or concurrent enrollment; electronic systems engineering technology or multidisciplinary engineering technology majors.

ESET 300 Industrial Electricity

Credits 4. 3 Lecture Hours. 2 Lab Hours. Industrial applications of electrical theory, codes, circuitry, wiring devices, motors and controllers, switch gear and solid state controls. **Prerequisite:** Grade of C or better in PHYS 207; grade of C or better in ENGR 217/PHYS 217 or PHYS 217/ENGR 217; junior or senior classification in Industrial Distribution (IDIS) or Manufacturing and Mechanical Engineering Technology (MMET).

ESET 315 Local-and-Metropolitan-Area Networks

Credits 4. 3 Lecture Hours. 3 Lab Hours. Design, operation, application and management of LANs and MANs; topologies, cabling systems, protocols, bridges, routers, hubs, switches, security; media and transport systems; Internet and TCP/IP topics including the protocol stack, router operation and addressing issues. **Prerequisites:** Grade of C or better in ESET 219; electronic systems engineering technology major.

ESET 319 Engineering Leadership

Credits 3. 2 Lecture Hours. 3 Lab Hours. Exploration of and development of competency in multiple areas related to the practice of leadership in engineering, including emotional intelligence, communication, time management, personal mastery and effectiveness, team dynamics, team membership, motivation, servant leadership, application of systems thinking in an organization, understanding organizational function and culture and career management. **Prerequisite:** Grade of C or better in ENGL 103 or ENGL 104; electronic systems engineering technology major.

ESET 329 Six Sigma and Applied Statistics

Credits 3. 2 Lecture Hours. 3 Lab Hours. Concepts of probability and statistics, mean, variance, Gaussian/uniform/Student/Weibull distributions, and their applications in electronics design, analysis, and troubleshooting; Six Sigma process and tools including Gauge R&R, test of hypotheses, analysis of variance, linear regression, response surface method, control chart, and design of experiments. **Prerequisites:** Grade of C or better in ESET 210 and MATH 152; electronic systems engineering technology major.

ESET 333 Product Development

Credits 3. 2 Lecture Hours. 3 Lab Hours. Process of product development to create an idea; development of a business plan; market research; voice of customer; managing resources; project management; identifying product partners; creating a unique product and/or company. **Prerequisite:** Grade of C or better in ENGR 112, ENGR 217/PHYS 217, or PHYS 217/ENGR 217, or concurrent enrollment; electronic systems engineering technology major or embedded systems integration minor.

ESET 349 Microcontroller Architecture

Credits 4. 3 Lecture Hours. 3 Lab Hours. Microcontrollers including type of circuits and how they function; architecture of microcontrollers; instruction sets and how they are programmed. **Prerequisites:** Grade of C or better in ESET 219 and ESET 269; electronic systems engineering technology major.

ESET 350 Analog Electronics

Credits 4. 3 Lecture Hours. 3 Lab Hours. Study of semiconductor devices including diodes, field effect transistors, bipolar junction transistors, and operational amplifiers; applications include signal conditioning, power supplies, active filters, discrete transistor amplifiers, and transistor switching/driver circuits. **Prerequisites:** Grade of C or better in ESET 210; grade of C or better in CHEM 107 and CHEM 117, or CHEM 120; grade of C or better in ENGL 103 or ENGL 104, PHYS 218 or ENGR 216/PHYS 216 or PHYS 216/ENGR 216, and MATH 152, and PHYS 206 or PHYS 218; junior or senior classification in electronic systems engineering technology.

ESET 352 Electronics Testing I

Credits 4. 3 Lecture Hours. 3 Lab Hours. Testing of electronic devices and systems; including test planning, test reporting, test specifications, parametric testing, measurement accuracy, test hardware, sampling theory, digital signal processing based testing, and calibrations; both circuit analysis (2/3) and circuit design (1/3) with several analog and mixed-signal systems. **Prerequisites:** Grade of C or better in ENTC 329 and ESET 350; junior or senior classification in electronic systems engineering technology.

ESET 355 Electromagnetics and High Frequency Systems

Credits 4. 3 Lecture Hours. 3 Lab Hours. High frequency concepts including topics in basic electromagnetics, transmission lines, antennas, and RF circuit design; applications including wireless communication systems, fiber optic systems, and high frequency PCB layout. **Prerequisites:** Grade of C or better in ESET 211, PHYS 207, and ENGR 217/PHYS 217 or PHYS 217/ENGR 217; junior or senior classification in electronic systems engineering technology.

ESET 359 Electronic Instrumentation

Credits 4. 3 Lecture Hours. 3 Lab Hours. Fundamentals of controls, measurement systems, sensors, sampling theorem, analog to digital and digital to analog conversions; signal conditioning; bio-potentials and biomedical transducer characteristics; digital signal processing; computer-based data acquisition using graphical development environment; and digital communication protocols. **Prerequisites:** Grade of C or better in ESET 349 and ESET 350; grade of C or better in ENGL 103 or ENGL 104; junior or senior classification in electronic systems engineering technology.

ESET 369 Embedded Systems Software

Credits 4. 3 Lecture Hours. 3 Lab Hours. A study of the technical aspects of embedded computer software systems, with emphasis on embedded real-time systems, programming techniques and development methodologies. **Prerequisites:** Grade of C or better in ESET 349; junior or senior classification in electronic systems engineering technology.

ESET 400 Industrial Automation

Credits 4. 3 Lecture Hours. 2 Lab Hours. Industrial applications of electronic devices; instrumentation; AC and DC drives; local area networks; cell and area controllers and advanced applications of programmable controllers. **Prerequisites:** Grade of C or better in ESET 300; junior or senior classification in industrial distribution.

ESET 415 Advanced Network Systems and Security

Credits 3. 2 Lecture Hours. 3 Lab Hours. Advanced topics of the network systems and security including network design and protocol (BGP, IP Routing, IPv6, NAT, DNS); network security (ACLs, TCP/IP security, and VPN); socket programming and cryptographic protocols. **Prerequisites:** Grade of C or better in ESET 315; junior or senior classification in electronic systems engineering technology or approval of instructor.

ESET 419 Engineering Technology Capstone I

Credits 3. 2 Lecture Hours. 3 Lab Hours. Project management tools for a formal technical proposal; addresses scope, schedule, risk, cost, milestones and deliverables; planning and initial design of prototype implemented in ESET 420; teams must have sponsor and technical advisor. **Prerequisites:** Grade of C or better in ESET 319 or MXET 300, ESET 333 or MMET 361, ESET 350 and ESET 369; must be taken the fall or spring semester immediately prior to ESET 420; senior classification.

ESET 420 Engineering Technology Capstone II

Credits 2. 6 Lab Hours. Second semester course in capstone design sequence; focus on design implementation, testing, documentation, demonstration, and presentation of a fully functional prototype; professional design tools for schematic capture, printed circuit board layout and software development, integration and validation. **Prerequisite:** Grade of C or better in ESET 419; grade of C or better in ESET 352, ESET 415, ESET 455 and ESET 462, or concurrent enrollment; ENTC 399 or concurrent enrollment; senior classification in electronic systems engineering technology.

ESET 444 Building Energy Management Systems

Credits 3. 2 Lecture Hours. 3 Lab Hours. Essential elements of energy management from understanding energy production to consumption; identification of the major components of energy management of buildings, energy audit to business (strategy), Heating Ventilating Air Conditioning (HVAC), control systems, economics (ROI) and engineering system integration. **Prerequisites:** Senior classification.

ESET 452 Electronics Testing II

Credits 3. 2 Lecture Hours. 3 Lab Hours. Advanced testing techniques of electronic devices and systems; study of advanced electronics test methodologies; emphasis on circuits containing analog to digital converters (ADCs) and digital to analog converters (DACs); device interface board design and data analysis; both circuit analysis (2/3) and circuit design (1/3) using industry grade state-of-the-art equipment. **Prerequisites:** Grade of C or better in ESET 349 and ESET 352; junior or senior classification in electronic systems engineering technology.

ESET 453 Validation and Verification

Credits 3. 2 Lecture Hours. 3 Lab Hours. Validation of semiconductor devices; differences between validation and production testing; extensive use of Altium for simulation and layout of circuits; use of Spotfire to analyze data acquired as part of validation process; focus on acquisition of valid data and clear and concise presentation of data to stakeholders. **Prerequisites:** Grade of C or better in ESET 352; junior or senior classification in electronic systems engineering technology.

ESET 455 Wireless Transmission Systems

Credits 4. 3 Lecture Hours. 3 Lab Hours. System engineering aspects of microwave, satellite and cellular communication systems; power budget calculations, propagation analysis, systems descriptions; CNR, CIR; review of modulations practical engineering considerations. **Prerequisites:** Grade of C or better in ESET 315 and ESET 355; junior or senior classification in electronic systems engineering technology.

ESET 456 Embedded Sensors and Internet of Things (IoT) Systems

Credits 3. 2 Lecture Hours. 3 Lab Hours. Integration of off-the-shelf sensors and embedded intelligence components to form data acquisition, monitoring and control of remote equipment and systems through wired and wireless networks; algorithm development and implementation in interrupt-driven and RTOS-based firmware environments; collection, reduction, analysis and information extraction of data from multiple edge devices using industry-standard cloud-based software environments.

Prerequisites: Grade of C or better in ESET 355, ESET 359, and ESET 369; junior or senior classification in electronic systems engineering technology.

ESET 462 Control Systems

Credits 4. 3 Lecture Hours. 3 Lab Hours. Components, principles and techniques fundamental to automated control systems; study of transfer functions, network analysis using Laplace transforms, Z transforms, feedback control systems theory, digital computer simulation and computer-based controls systems. **Prerequisites:** Grade of C or better in ESET 359 and ESET 369; junior or senior classification in electronic systems engineering technology.

ESET 469 Embedded Real Time Software Development

Credits 3. 3 Lecture Hours. Survey of the operation and use of Real Time Kernels as the basis for embedded system firmware development; includes task operation, inter-task communications, synchronization, dynamic memory, multitask system design and defensive programming techniques; embedded RTOS applications. **Prerequisites:** Grade of C or better in ESET 369; junior or senior classification in electronic systems engineering technology.

ESET 485 Directed Studies

Credits 1 to 6. 1 to 6 Other Hours. Directed study of special problems in an in an area of electrical systems engineering technology not covered in other courses. May be repeated for credit. **Prerequisites:** Senior classification and approval of instructor.

ESET 491 Research

Credits 0 to 4. 0 Lecture Hours. 0 Lab Hours. 0 to 4 Other Hours. Research conducted under the direction of faculty member in the college of engineering. May be repeated three times for credit. **Prerequisites:** Junior or senior classification and approval of instructor.

EURO - European Studies (EURO)

EURO 285 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Individual supervision of readings or assigned projects in European studies selected for each student individually. **Prerequisites:** Approval of instructor and department head.

EURO 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of European studies. May be repeated for credit. **Prerequisite:** Approval of instructor.

EURO 291 Research

Credits 0 to 3. 0 to 3 Other Hours. Research conducted under the direction of faculty member in European languages and cultures. May be taken three times for credit. **Prerequisites:** Freshman or sophomore classification and approval of department head.

EURO 405/FILM 405 European Cinema

Credits 3. 3 Lecture Hours. Exploration of key movements in European cinema from 1895 to the present, including both national cinematic traditions, such as Italian Neorealism or French New Wave, and international trends such as Formalism, Expressionism, or Auteurism. **Prerequisite:** FILM 251/ENGL 251, FILM 299, or approval of instructor. **Cross Listing:** FILM 405/EURO 405.

EURO 441/RUSS 441 The Russian Novel I - Tolstoy and Dostoevsky

Credits 3. 3 Lecture Hours. Study of the major works of Tolstoy and Dostoevsky; discussion of the literary nature and purpose of novels, especially in the context of Russian culture; taught in English. **Prerequisites:** RUSS 201 or concurrent enrollment; junior or senior classification, or approval of instructor. **Cross Listing:** RUSS 441/EURO 441.

EURO 442/RUSS 442 The Russian Novel II - The Twentieth Century

Credits 3. 3 Lecture Hours. Study of major Russian novels from ca. 1900 to the end of Stalinism; exploration of topics relevant to Russia's experience in the 20th century; taught in English. **Prerequisites:** RUSS 201 or concurrent enrollment; junior or senior classification, or approval of instructor. **Cross Listing:** RUSS 442/EURO 442.

EURO 443/RUSS 443 Contemporary Russian Prose

Credits 3. 3 Lecture Hours. Study of Russian and Soviet 20th century prose literature, with emphasis on post-Stalinist and post-glasnost writers; taught in English. **Prerequisite:** Junior or senior classification, or approval of instructor. **Cross Listing:** RUSS 443/EURO 443.

EURO 444/RUSS 444 Russian Drama

Credits 3. 3 Lecture Hours. Introduction to the masterpieces of Russian drama from the 19th century to the present; includes such authors as Pushkin, Chekhov, Gorky, Arbuzov, Rozov and Petrushevskaya; taught in English. **Prerequisite:** Junior or senior classification, or approval of instructor. **Cross Listing:** RUSS 444/EURO 444.

EURO 446/RUSS 446 Russian Artistic Culture I - Beginnings to 1900

Credits 3. 3 Lecture Hours. Masterpieces of Russian art, including architecture, dance, theater, music, and literature, from its beginnings until ca. 1900; taught in English. **Prerequisites:** Junior or senior classification, or approval of instructor. **Cross Listing:** RUSS 446/EURO 446.

EURO 447/RUSS 447 Russian Artistic Culture II - 1890 to Present

Credits 3. 3 Lecture Hours. Masterpieces of Russian art, including architecture, dance, theater, music, film, and literature, from ca. 1890 to the present; taught in English. **Prerequisites:** Junior or senior classification, or approval of instructor. **Cross Listing:** RUSS 447/EURO 447.

EURO 484 Internship

Credits 1 to 3. 1 to 3 Other Hours. Directed Internship in a private firm or public agency to provide experience and learning appropriate to the student's degree program and career objectives. Must be taken on a satisfactory/unsatisfactory basis. May be taken two times for credit. **Prerequisite:** Junior or senior classification.

EURO 485 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Individual supervision of readings or assigned projects in European studies, selected for each student individually. **Prerequisite:** Approval of instructor and department head.

EURO 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of European studies. May be repeated for credit. **Prerequisite:** Approval of instructor.

EURO 491 Research

Credits 1 to 3. 1 to 3 Other Hours. Research conducted under the direction of faculty member in European languages and cultures. May be taken three times for credit. **Prerequisites:** Junior or senior classification and approval of department head.

EVEN - Environmental Engr (EVEN)

EVEN 201 Introduction to the Environmental Engineering Profession

Credit 1. 1 Lecture Hour. Introduction to the study and practice of environmental engineering; professionalism and professional registration; engineering ethics; exercises in technical communication. **Prerequisites:** Grade of C or better in ENGL 103 or ENGL 104; or approval of instructor.

EVEN 291 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in environmental engineering. May be taken four times for credit. **Prerequisites:** Freshman or sophomore classification or approval of instructor.

EVEN 301/CVEN 301 Environmental Engineering

Credits 3. 3 Lecture Hours. Water quality; material balances; chemical, physical and biological processes; water quality modeling; water and wastewater treatment; air quality; solid and hazardous waste management. **Prerequisites:** Grade of C or better in CHEM 107; Grade of C or better in CVEN 302 and MATH 308, or concurrent enrollment. **Cross Listing:** CVEN 301/EVEN 301.

EVEN 304/CVEN 304 Environmental Engineering Lab

Credit 1. 3 Lab Hours. Environmental measurements on physical, chemical, biological and biotechnological parameters of water. **Prerequisites:** CVEN 301/EVEN 301 or EVEN 301/CVEN 301, or concurrent enrollment; CVEN 311/EVEN 311 or concurrent enrollment; or approval of instructor. **Cross Listing:** CVEN 304/EVEN 304.

EVEN 311/CVEN 311 Fluid Dynamics

Credits 3. 3 Lecture Hours. Fluid properties; statics; kinematics; basic conservation principles of continuity, energy and momentum; similitude and hydraulic models; incompressible flow in pipes; fluid dynamic drag. **Prerequisites:** Grade of C or better in MATH 251 or MATH 253; grade of C or better in CVEN 221; grade of C or better in CVEN 302, or concurrent enrollment; also taught at Galveston campus. **Cross Listing:** CVEN 311/EVEN 311.

EVEN 320 Principles of Environmental Engineering Chemistry

Credits 3. 3 Lecture Hours. Fundamental chemical principles needed for the study of natural and engineered environmental systems including thermodynamics and kinetics of acid and base reactions, the carbonate system, reactivity of organic compounds and atmospheric systems. **Prerequisites:** Grade of C or better in CHEM 107; grade of C or better in EVEN 301/CVEN 301 or CVEN 301/EVEN 301 or concurrent enrollment; admitted to major degree sequence in civil engineering or environmental engineering, or approval of instructor.

EVEN 339/CVEN 339 Water Resources Engineering

Credits 3. 3 Lecture Hours. Quantitative hydrology, precipitation, hydrograph analysis, reservoir and stream routing; groundwater, Darcy equation, well equation, well design; probability concepts in design; water law; dams; reservoirs; spillways; open channel and pipe network hydraulics; pumps; urban stormwater drainage; flood damage mitigation. **Prerequisite:** Grade of C or better in CVEN 311/EVEN 311 or EVEN 311/CVEN 311. **Cross Listing:** CVEN 339/EVEN 339.

EVEN 399 Mid-Curriculum Professional Development

Credits 0. 0 Lecture Hours. Participation in an approved high-impact learning practice; reflection on professional outcomes from environmental engineering body of knowledge; documentation of experience appropriate to eventual professional licensure; self-assessment of learning at mid-curriculum point. **Prerequisites:** EVEN 301/CVEN 301 or CVEN 301/EVEN 301; EVEN 304/CVEN 304; EVEN 311/CVEN 311 or CVEN 311/EVEN 311; CVEN 302; CVEN 221; or approval of instructor.

EVEN 400 Design Problems in Environmental Engineering I

Credits 2. 1 Lecture Hour. 3 Lab Hours. . Capstone design project of an interdisciplinary or specialized nature involving both technical and non-technical aspects of an environmental engineering problem; managing a project through the evaluation, selection and preparation of an appropriate design solution for an open-ended problem; project to be completed in EVEN 401. **Prerequisite:** Grade of C or better in EVEN 301/CVEN 301 and EVEN 320; grade of C or better in EVEN 402 or CVEN 402/EVEN 402, and EVEN 413 or CVEN 413/EVEN 413, or concurrent enrollment; senior classification; environmental engineering major; or approval of instructor.

EVEN 401 Design Problems in Environmental Engineering II

Credits 2. 0 Lecture Hours. 6 Lab Hours. Continuation and completion of capstone environmental engineering project developed in EVEN 400; critical evaluation, revision, preparation and communication of final design solution. **Prerequisites:** Grade of C or better in EVEN 400; senior classification; environmental engineering major; or approval of instructor.

EVEN 402/CVEN 402 Engineered Environmental Systems

Credits 3. 3 Lecture Hours. Unit operations and processes in environmental engineering; physical, chemical and biological treatment of water and wastewater; treatment system analysis and design. **Prerequisites:** Grade of C or better in CVEN 301/EVEN 301 or EVEN 301/CVEN 301. **Cross Listing:** CVEN 402/EVEN 402.

EVEN 404 Environmental Unit Operations Laboratory

Credit 1. 3 Lab Hours. Applications of laboratory methods to measure fundamental aspects of behavior of environmental engineering processes; examination of critical chemical, physical and biological processes that control behavior of materials in multiple media (air, water, land) in natural and engineered systems; evaluation of effects of important process variables. **Prerequisites:** Grade of C or better in EVEN 304/CVEN 304 and EVEN 320; grade of C or better in EVEN 301 or CVEN 301/EVEN 301; grade of C or better in EVEN 402 or CVEN 402/EVEN 402 or concurrent enrollment; environmental engineering major; or approval of instructor.

EVEN 406 Environmental Protection and Public Health

Credits 3. 3 Lecture Hours. Communicable and noncommunicable diseases; environmental risk assessment; environmental assessments; comprehensive environmental planning; small water and wastewater systems; solid waste management; hazardous spills and waste management; vector control; environmental administration. **Prerequisites:** Grade of C or better in CVEN 301/EVEN 301 or EVEN 301/CVEN 301; or approval of instructor. **Cross Listing:** CVEN 402/EVEN 402.

EVEN 413/CVEN 413 Natural Environmental Systems

Credits 3. 3 Lecture Hours. Water quality assessment of natural environmental systems; development and calibration of models to describe fate and transport of contaminants in aquatic systems; application of models to design of water quality control facilities. **Prerequisite:** Grade of C or better in EVEN 301/CVEN 301 or CVEN 301/EVEN 301. **Cross Listing:** CVEN 413/EVEN 413.

EVEN 458/CVEN 458 Hydraulic Engineering of Water Distribution Systems

Credits 3. 3 Lecture Hours. Pressure conduit hydraulics; design, modeling, and analysis of water conveyance and distribution systems including pipelines, pipe networks, and pumps. **Prerequisite:** Grade of C or better in CVEN 339/EVEN 339 or EVEN 339/CVEN 339 or approval of instructor. **Cross Listing:** CVEN 458/EVEN 458.

EVEN 462/CVEN 462 Engineering Hydrogeology

Credits 3. 3 Lecture Hours. Groundwater in the hydrologic cycle; aquifer properties; well hydraulics, testing, and design; groundwater quality; and groundwater management and sustainability. **Prerequisites:** Grade of C or better in CVEN 311/EVEN 311 or EVEN 311/CVEN 311; Grade of C or better in CVEN 301/EVEN 301, EVEN 301/CVEN 301, CVEN 339/EVEN 339, or EVEN 339/CVEN 339; junior or senior classification; or approval of instructor. **Cross Listing:** CVEN 462/EVEN 462.

EVEN 463/CVEN 463 Engineering Hydrology

Credits 3. 3 Lecture Hours. Occurrence, distribution and properties of natural waters of the earth; measurement and engineering analysis of hydrologic phenomena including precipitation, streamflow and groundwater, hydrologic design of water resources development and management projects. **Prerequisite:** Grade of C or better in CVEN 339/EVEN 339 or EVEN 339/CVEN 339. **Cross Listing:** CVEN 463/EVEN 463.

EVEN 466 Sustainability and Life Cycle Analysis

Credits 3. 3 Lecture Hours. Definitions of sustainability and sustainable development from social, economic, political, and technical perspectives; life-cycle analysis and quantitative assessment of sustainability; industrial ecology; valuation of environmental goods and externalities; sustainable infrastructure design and management. **Prerequisites:** Junior or senior classification or approval of instructor.

EVEN 485 Directed Studies

Credits 0 to 3. 0 to 3 Other Hours. Research and design problems of limited scope approved on an individual basis intended to promote independent study; results of study presented in writing. May be taken for credit up to three hours. **Prerequisites:** Approval of department head.

EVEN 491 Research

Credits 0 to 3. 0 to 3 Other Hours. Research conducted under the direction of faculty members in environmental engineering. May be taken for credit up to three hours. **Prerequisites:** Junior or senior classification and approval of instructor.

FILM - Film Studies (FILM)

FILM 101/VIST 101 Introduction to Visual Studies

Credits 3. 3 Lecture Hours. Survey of topics in the interdisciplinary field of visual studies, including forms of art, media, and architecture, and visual culture in global and intercultural contexts; application of visual studies methods and techniques to art, media, and architecture; analysis of the visual in contemporary culture; in-class visual studies exercises and discussions. **Cross Listing:** VIST 101/FILM 101.

FILM 215/GLST 215 Global Cinema

Credits 3. 3 Lecture Hours. History and theory of global cinema; historical, socio-political, national and international contexts of film production and reception; transnational film; FILM-215 also taught at Galveston campus. **Cross Listing:** GLST 215/FILM 215.

FILM 245/RUSS 245 Contemporary Russia in Its Own Films

Credits 3. 3 Lecture Hours. Exploration of contemporary Russian and late Soviet films; focus on present-day cultural conditions in the Russian Federation and in the diaspora; taught in English. **Cross Listing:** RUSS 245/FILM 245.

FILM 251/ENGL 251 Introduction to Film Analysis

Credits 3. 3 Lecture Hours. Fundamental aspects of film analysis and criticism; ENGL-251 also taught at Galveston and Qatar campuses. **Cross Listing:** ENGL 251/FILM 251.

FILM 285 Directed Studies

Credits 0 to 3. 0 to 3 Other Hours. Selected fields of film studies not covered in depth by other courses. Reports and extensive reading required. May be repeated for credit. **Prerequisite:** Concurrent enrollment in FILM 251/ENGL 251 or FILM 299, and approval of instructor.

FILM 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Special topics in an identified area of film studies.

FILM 291 Research

Credits 0 to 3. 0 to 3 Other Hours. Research conducted under the direction of faculty member in film. **Prerequisites:** FILM 251/ENGL 251 or FILM 299 and freshman or sophomore classification and approval of instructor.

FILM 299 History of Film

Credits 3. 3 Lecture Hours. Historical development of major periods, movements and styles, including several different national cinemas.

FILM 302 Diversity and the Moving Image

Credits 3. 3 Lecture Hours. Survey of both positive and negative representations of human diversity in motion picture artifacts, broadly understood; forms of diversity addressed include race, gender, sexuality, ability, and class. **Prerequisites:** Grade of C or better in FILM 251/ENGL 251 or FILM 299.

FILM 315/JWST 315 Cinema in Israel

Credits 3. 3 Lecture Hours. Consideration and analysis of major works of film in Israel; interpretation of diverse cultures in Israel through film; relationship of film to Israeli history; taught in English. **Prerequisites:** Junior or senior classification or approval of instructor. **Cross Listing:** JWST 315/FILM 315.

FILM 324/ENGL 324 Science Fiction and Film

Credits 3. 3 Lecture Hours. History and trajectory of science fiction film into the 21st century by filmmakers such as Kubrick, Jenkins, Cameron, Coogler and others. **Prerequisites:** 3 credits of literature at 200-level or above. **Cross Listing:** ENGL 324/FILM 324.

FILM 333/VIST 333 Story for the Screen

Credits 3. 3 Lecture Hours. Exploration of the internal structure of stories; exploration of stories through emotion and action beats; narrative scripts in the visually kinetic language through which live-action and animated films and narratively-driven video games perform stories. **Prerequisites:** Junior or senior classification. **Cross Listing:** VIST 333/FILM 333.

FILM 343/WGST 343 Sex, Gender and Cinema

Credits 3. 3 Lecture Hours. Exploration of a significant topic at the intersection of women's/gender studies and film, such as cinema and sexuality studies, cinema and women, and cinema and masculinity; may include discussion of production, film content, and/or reception. **Prerequisites:** Junior or senior classification or approval of instructor. **Cross Listing:** WGST 343/FILM 343.

FILM 345 Media Industries

Credits 3. 3 Lecture Hours. Survey of the business organization, economic structures and processes, and regulations of the media industry. **Prerequisite:** Junior or senior classification or approval of instructor. **Cross Listing:** COMM 345 and JOUR 345.

FILM 349 Documentary Cinema

Credits 3. 3 Lecture Hours. History and theory of documentary cinema; examination of documentary film's ability to both reflect and shape the history of its time. May be taken two times for credit. **Prerequisite:** Junior or senior classification, or approval of instructor.

FILM 351/ENGL 351 Advanced Film

Credits 3. 3 Lecture Hours. A different film topic each term; sample topics include major directors, historical periods, fiction into film, film genres. May be repeated for credit. **Prerequisite:** ENGL 251/FILM 251 or FILM 251/ENGL 251 or FILM 301 or approval of instructor; junior or senior classification. **Cross Listing:** ENGL 351/FILM 351.

FILM 352/HISP 352 Hispanic Literature and Film

Credits 3. 3 Lecture Hours. Exploration of inter-media relationships between film and literature; investigation of the language of film, especially films as expressions of cultural realities through the adaptation of Hispanic literary works; taught in English. **Prerequisites:** Junior or senior classification, or approval of instructor. **Cross Listing:** HISP 352/FILM 352.

FILM 356/ENGL 356 Literature and Film

Credits 3. 3 Lecture Hours. Novels and films based on them; writers and filmmakers such as Virginia Woolf, John Steinbeck, John Ford, Sally Potter, John Huston, Charlotte Bronte and Peter Bogdanovich. **Prerequisites:** Junior or senior classification or approval of instructor. **Cross Listing:** ENGL 356/FILM 356.

FILM 358/ENGL 358 Screenwriting

Credits 3. 3 Lecture Hours. Analysis of screenplay structure coupled with writing assignments illustrating principles of form. **Prerequisite:** Junior or senior classification. **Cross Listing:** ENGL 358/FILM 358.

FILM 366/ENGL 366 Horror Studies

Credits 3. 3 Lecture Hours. History, theories and major subgenre developments of contemporary horror studies in film and literature. **Prerequisites:** Junior or senior classification. **Cross Listing:** ENGL 366/FILM 366.

FILM 376/PHIL 376 Philosophy, Film and Evil

Credits 3. 3 Lecture Hours. Application of philosophical methods and analyses to the medium of film; survey of various depictions and treatments of evil within the genre of science fiction; investigation of depictions and treatments of evil arising from consideration of human encounters with alien others. **Prerequisite:** Junior or senior classification or approval of instructor. **Cross Listing:** PHIL 376/FILM 376.

FILM 394 Studies in Film Genre

Credits 3. 3 Lecture Hours. Study of a specific film genre, such as Western, Gangster, Mystery, Science Fiction; genre varies each time course is taught; movies are screened and analyzed along with assigned readings that explore characteristics of the genre and its cultural importance. May be repeated for credit. **Prerequisite:** ENGL 251/FILM 251, FILM 251/ENGL 251, or FILM 299, or approval of instructor.

FILM 398/AFST 398 Africana Cinema

Credits 3. 3 Lecture Hours. Overview of African cinema; historical survey of cinema from Africa and the African Diaspora; introducing films produced in several geographical regions and reflecting different filmmaking traditions. May be taken two times for credit. **Prerequisite:** Junior or senior classification or approval of instructor. **Cross Listing:** AFST 398/FILM 398.

FILM 399/PERF 399 Star Studies

Credits 3. 3 Lecture Hours. Examination of stardom as a cultural, economic, creative, and performative force; may focus on national or global star industries; topics include examination of film, theater, television, sports, or social media stardom depending on the term. **Prerequisites:** Grade of C or better in FILM 251/ENGL 251 or FILM 299. **Cross Listing:** PERF 399/FILM 399.

FILM 401 National Cinema History

Credits 3. 3 Lecture Hours. Cinema History of a given film-producing nation other than the United States, such as Japanese Film, Swedish Film, South African Film. May be taken three times for credit. **Prerequisites:** ENGL 251/FILM 251, FILM 251/ENGL 251, or FILM 299, or approval of instructor.

FILM 405/EURO 405 European Cinema

Credits 3. 3 Lecture Hours. Exploration of key movements in European cinema from 1895 to the present, including both national cinematic traditions, such as Italian Neorealism or French New Wave, and international trends such as Formalism, Expressionism, or Auteurism. **Prerequisite:** FILM 251/ENGL 251, FILM 299, or approval of instructor. **Cross Listing:** EURO 405/FILM 405.

FILM 406 Propaganda and Dissidence

Credits 3. 3 Lecture Hours. Use of film as a medium to promote political ideology, government propaganda, political dissidence, and subversion, with focus on Europe. **Prerequisite:** Junior or senior classification or approval of instructor.

FILM 415/CLAS 415 The Ancient World in Film

Credits 3. 3 Lecture Hours. Study of modern films as they relate to ancient literary texts that inspired them or with which they share common themes; relationship between Greek epic, tragedy, and comedy and their cinematic adaptations; treatment of Rome as an idea or ideal in the work of both ancient Romans and modern filmmakers. **Prerequisite:** Junior or senior classification, or approval of instructor. **Cross Listing:** CLAS 415/FILM 415.

FILM 417 Film Authorship

Credits 3. 3 Lecture Hours. Exploration of a major film author (director, screenwriter or writer/director) as a vehicle for emphasizing intensive analysis, scholarship, film criticism and the question of individual authorship with the collective enterprise of filmmaking. **Prerequisites:** ENGL 251/FILM 251, FILM 251/ENGL 251, or FILM 299, or approval of instructor.

FILM 425/FREN 425 French Film

Credits 3. 3 Lecture Hours. Overview of French cinema from its origins to the present; interpretation of French cultural history and politics through film; taught in English. **Prerequisite:** Junior or senior classification, or approval of instructor. **Cross Listing:** FREN 425/FILM 425.

FILM 434/HIST 434 History and Film

Credits 3. 3 Lecture Hours. Relationship between film, historical events, and public memory; cinematic representation of political, social, and economic change in various contexts; analysis of movies as historical texts; topics covered will vary according to an individual instructor's discretion. **Prerequisites:** Junior or senior classification. **Cross Listing:** HIST 434/FILM 434.

FILM 435/GERM 435 German Film

Credits 3. 3 Lecture Hours. Consideration and analysis of major works and directors of German Film; interpretation of culture through film; relationship of film to history, literature, and other arts; taught in English. May be repeated for credit. **Prerequisite:** Junior or senior classification, or approval of instructor. **Cross Listing:** GERM 435/FILM 435.

FILM 445/COMM 435 Rhetoric of Television and Film

Credits 3. 3 Lecture Hours. Critical analysis of television and film; close readings of such mediated texts; special attention to writing television and film criticism. **Prerequisite:** Junior or senior classification. **Cross Listing:** COMM 435/FILM 445.

FILM 455/ITAL 455 Italian Cinema

Credits 3. 3 Lecture Hours. Consideration and analyses of major works and directors of Italian cinema, from its origin through Neorealism to the present; analysis of how its visual language relates to Italian history, culture and to other arts; taught in English. May be repeated two times for credit. **Prerequisite:** Junior or senior classification, or approval of instructor. **Cross Listing:** ITAL 455/FILM 455.

FILM 465/CHIN 465 Chinese Film

Credits 3. 3 Lecture Hours. Consideration and analysis of major works and directors of Chinese film; interpretation of culture through film; relationship of film to history, literature and other arts; taught in English. May be taken two times for credit. **Prerequisite:** Junior or senior classification or approval of instructor. **Cross Listing:** CHIN 465/FILM 465.

FILM 469 Cult Cinema

Credits 3. 3 Lecture Hours. Analysis of the concept of cult status; textual characteristics, historical context and audience reception practices that result in certain films receiving a cult status. **Prerequisites:** Junior or senior classification or approval of instructor.

FILM 470 Lesbian, Gay, Bisexual, Transgender, and Queer Cinemas

Credits 3. 3 Lecture Hours. Examination of cinema by and about LGBTQ individuals or communities; discussion of production, film content and reception. **Prerequisites:** Grade of C or better in WGST 200, FILM 215/GLST 215, FILM 251/ENGL 251, ENGL 251/FILM 251, or FILM 299, and junior or senior classification; or approval of instructor.

FILM 475/GLST 475 Film, Propaganda, and Dissidence

Credits 3. 3 Lecture Hours. Examination of films promoting well-defined political aims in various countries and historical periods; focus on dissident works produced under repressive regimes. **Prerequisites:** Junior or senior classification or approval of instructor. **Cross Listing:** GLST 475/FILM 475.

FILM 481 Seminar in Film Studies

Credits 3. 3 Lecture Hours. Seminar on a figure, theme, style, movement or theory in film studies, with practice in the methods of research in film studies, culminating in a substantial research paper. Open to seniors enrolled in the interdisciplinary minor in film studies and to others with approval of the Coordinator of Film Studies. May be taken two times for credit. **Prerequisite:** FILM 251/ENGL 251 or FILM 299, or approval of instructor; junior or senior classification.

FILM 484 Internship in Film Studies

Credits 0 to 4. 0 to 4 Other Hours. Directed internship in a public or private organization to provide students with applied experience in Film Studies; internship will be supervised by selected agency personnel and appropriate faculty; experiences and requirements will vary slightly according to placement and student interests. **Prerequisite:** FILM 251/ENGL 251 or FILM 299; approval of instructor.

FILM 485 Directed Studies

Credits 0 to 3. 0 to 3 Other Hours. Selected fields of film studies not covered in depth by other courses. Reports and extensive reading required. May be repeated for credit. **Prerequisite:** FILM 251/ENGL 251 or FILM 299, and approval of instructor.

FILM 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Special topics in an identified area of film studies. **Prerequisite:** Junior or senior classification or approval of instructor.

FILM 491 Research

Credits 0 to 3. 0 to 3 Other Hours. Research conducted under the direction of faculty member in film. **Prerequisites:** FILM 251/ENGL 251 or FILM 299; approval of instructor.

FINC - Finance (FINC)

FINC 210 Opportunities in Finance I

Credit 1. 1 Lecture Hour. Introduction to major career paths in finance and assessment of students' aptitudes and interests with respect to these career paths. **Prerequisite:** Freshman or sophomore classification in Mays Business School.

FINC 211 Opportunities in Finance II

Credit 1. 1 Lecture Hour. Exploration of specific career competencies in various financial workplaces via lectures, practitioner presentations, and field experiences. **Prerequisites:** FINC 210 and approval of instructor.

FINC 267 Introduction to Securities and Commodities Trading

Credit 1. 1 Lecture Hour. Introduction to financial markets and the instruments that trade in them; describes how financial markets operate; compare and contrast a wide variety of common financial instruments, including debt, equity, derivatives and commodities; basic functions of real-world data sources (especially Bloomberg and the Wall Street Journal); and career paths in the field of finance. **Prerequisite:** Freshman or sophomore classification in business.

FINC 285 Directed Studies

Credits 0 to 6. 0 to 6 Other Hours. Directed study of selected problems in the area of finance not covered in other courses. May be taken five times. **Prerequisites:** FINC 341 or concurrent enrollment and approval of department head.

FINC 341 Business Finance

Credits 3. 3 Lecture Hours. Financial practices and financial management of modern business corporations; cash flow, planning, procurement of funds, management of long-term funds and working capital. Only one of the following will satisfy the requirements for a degree: FINC 341 or FINC 342. **Prerequisites:** ACCT 229 and enrollment in upper division in Mays Business School, Agribusiness, or Maritime Business Administration; also taught at Galveston campus.

FINC 342 Introductory Finance for the Petroleum Ventures Program

Credits 3. 3 Lecture Hours. Basic principles of corporate finance, investments, financial institutions, and international finance; the Federal Reserve System; interest rates; time value of money; characteristics and valuation of stocks and bonds; securities markets; business organization; capital budgeting analysis. Only one of the following will satisfy the requirements for a degree: FINC 341 or FINC 342. **Prerequisites:** Admission to Petroleum Ventures Program and approval of instructor.

FINC 345 Success Factors in Corporate Finance

Credit 1. 1 Lecture Hour. Overview of tools and analytical techniques used in corporate finance functions, including analysis and presentation of financial information; one-week immersive experience. **Prerequisites:** Grade of C or better in FINC 341; admission to corporate finance certificate program or approval of instructor.

FINC 350 Ethics in Financial Decision-Making

Credit 1. 1 Lecture Hour. Recognition and avoidance of breaches of fiduciary duty in the financial workplace; integration of classical ethical codes of conduct into professional decision-making; analysis and application of practitioner standards of conduct. **Prerequisites:** Admission to upper division in Mays Business School; FINC majors only.

FINC 351 Investment Analysis

Credits 3. 3 Lecture Hours. Operation and functions of the organized security exchanges, fundamental security analysis and technical market analysis. **Prerequisites:** ACCT 327 or concurrent enrollment; FINC 210 or concurrent enrollment; FINC 341 with a grade of C or better; BUSN 203 or concurrent enrollment, or AP STAT 301 or AP STAT 302 or AP STAT 303.

FINC 361 Managerial Finance I

Credits 3. 3 Lecture Hours. Managerial problems of financial managers; financial analysis, current asset management, capital budgeting and capital structure. **Prerequisites:** ACCT 327 or concurrent enrollment; FINC 210 or concurrent enrollment; FINC 341 with a grade of C or better; BUSN 203 or concurrent enrollment, or AP STAT 301 or AP STAT 302 or AP STAT 303.

FINC 368 Trade Floor Dynamics

Credits 3. 3 Lecture Hours. Analysis of trade floor activities and behaviors; organizational and process structure of trade floors; characteristics of trade floors that vary by type of asset traded, trading objectives and contract structure; analysis of operational issues including credit constraints, trade strategies, and regulatory compliance. **Prerequisites:** FINC 341 or concurrent enrollment; admission to Trading, Risk and Investment Program (TRIP).

FINC 371 Real Estate Decision-Making

Credits 3. 3 Lecture Hours. Legal, physical and economic characteristics of real estate; overview of real estate market analysis, real estate valuation procedures and real estate production, marketing and financing methods. **Prerequisite:** FINC 341 or concurrent enrollment.

FINC 381 Money and Capital Markets

Credits 3. 3 Lecture Hours. Role of finance and financial institutions in the money and capital markets in the U.S. including supply of and demand for funds, interest rates and flow of funds analysis. **Prerequisite:** FINC 341 with a grade of C or better.

FINC 409 Survey of Finance Principles

Credits 3. 3 Lecture Hours. Finance survey for non-business majors; financial markets, the investment banking process, interest rates, financial intermediaries and the banking system, financial instruments, time value of money concepts, security valuation and selection, and international finance. May not be used to satisfy degree requirements for majors in business or agribusiness. **Prerequisites:** Junior or senior classification; for students other than business and agribusiness.

FINC 422 Applied Investment Analysis

Credits 3. 3 Lecture Hours. Theoretical and analytical developments in security selection and portfolio management; includes macroeconomic analysis, portfolio theory, and portfolio performance evaluation; concepts applied to the allocation of investments in a student-managed equity portfolio. May be taken three times for credit. **Prerequisites:** Approval of instructor; FINC 351 and FINC 361; ACCT 328 or concurrent enrollment.

FINC 423 Options and Financial Futures

Credits 3. 3 Lecture Hours. Valuation of options and financial futures; risk management and hedging applications using options and financial futures; primary focus on stock options, index options, stock index futures, interest rate futures, foreign exchange futures and futures options. **Prerequisites:** FINC 351 and FINC 361; ACCT 328 or concurrent enrollment.

FINC 424 Trading Risk Management

Credits 3. 3 Lecture Hours. Mid-office risk management strategies using the energy markets as a focus; develops understanding of commodity market behavior, use of forwards and options for risk management, risk management reporting, Greeks and simulation-based VaR analysis. **Prerequisites:** FINC 351 and FINC 361; ACCT 328 or concurrent enrollment.

FINC 425 Active Portfolio Management

Credits 3. 3 Lecture Hours. Analysis of investment tactics designed to earn abnormal returns; identification and evaluation of active strategies that exploit capital market anomalies and market inefficiencies; portfolio structuring, stock and sector selection, performance measurement, attribution analysis and benchmarks in inefficient markets. **Prerequisites:** FINC 351 and FINC 361; ACCT 328 or concurrent enrollment.

FINC 426 Trading Markets

Credits 3. 3 Lecture Hours. Issues related to securities trading and securities markets; why and how people trade; the operation, structure and regulation of securities markets; focus on equity markets; comparisons to the markets for derivatives and other securities. **Prerequisites:** FINC 351 and FINC 361; ACCT 328 or concurrent enrollment.

FINC 427 Titans of Investing

Credits 3. 3 Lecture Hours. Readings from the most influential theorists and practitioners of 20th and 21st century investing; case studies and portfolio sector exercises in an institutional context, based on detailed assessment of global investment risks. **Prerequisites:** FINC 341 or FINC 409, or concurrent enrollment in either course; approval of instructor.

FINC 428 Fixed Income Analysis

Credits 3. 3 Lecture Hours. Characteristics of fixed income securities including Treasury issues, federal agency issues, corporate and municipal bonds, mortgage-backed and asset-backed securities; institutional features fixed income markets; risks of bond investing; fixed income valuation; term structure; trade strategies; modeling and assessing credit risks; hedging with fixed income derivatives. **Prerequisites:** FINC 351 and FINC 361; ACCT 328 or concurrent enrollment.

FINC 430 Venture Capital Investing

Credits 3. 3 Lecture Hours. Identification of a venture fund; development of an investment portfolio; development and analysis of venture investments; presentation of investment findings; negotiation and closing of investment deals. **Prerequisites:** Admission to upper division in Mays Business School and approval of instructor.

FINC 435 Managerial Finance II

Credits 3. 3 Lecture Hours. Case studies in the administration of the financial affairs of business enterprises; working capital management, capital budgeting, capital structure, and mergers and acquisitions.

Prerequisites: FINC 351 and FINC 361; ACCT 328 or concurrent enrollment.

FINC 436 Corporate Finance Capstone

Credits 3. 3 Lecture Hours. Application of interdisciplinary techniques to identify and solve multi-faceted corporate finance problems through use of case studies. **Prerequisites:** FINC 351 and FINC 361; ACCT 328 or concurrent enrollment; admission to corporate finance certificate program or approval of instructor.

FINC 437 Systematic Trading Strategies

Credits 3. 3 Lecture Hours. Overview of quantitative investing using algorithmic trading for investment management; topics include exploration of collecting and preparing financial trading data, time series analysis, trend systems, momentum and mean reversal, arbitrage, backtesting, order execution, and reporting of risk and performance measures; tools, methods, and trading techniques are taught using the R programming language and using R Studio. **Prerequisites:** FINC 351 and FINC 361; ACCT 328 or concurrent enrollment.

FINC 440 Macro Finance

Credits 3. 3 Lecture Hours. Recent developments in the nature and causes of financial crises; the role of money; financial liquidity; financial leverage; financial stability regulation; unconventional monetary policy and macroprudential policy. **Prerequisites:** FINC 351 and FINC 361; FINC 381 or concurrent enrollment.

FINC 441 Private Equity - Insights, Industry Dynamics and Deal Making

Credits 3. 3 Lecture Hours. Roles of and interactions between private equity's main participants, the limited partners (LPs) and the general partners (GPs); history and growth of the private equity (PE) industry; business models of PE firms; performance metrics used by PE professionals; investment strategies of PE firms; study of deal-making, with special focus on leveraged buyout and venture capital funds. **Prerequisites:** FINC 351 and FINC 361; ACCT 328 or concurrent enrollment.

FINC 443 Valuation

Credits 3. 3 Lecture Hours. Theory and application of various approaches to corporate valuation; measuring and managing the value of companies; principles of value creation; fundamental valuation methodology; application of value creation principles to managerial problems; special cases and complex valuation issues. **Prerequisites:** FINC 351 and FINC 361; ACCT 328 or concurrent enrollment.

FINC 445/IBUS 446 International Finance

Credits 3. 3 Lecture Hours. International business transactions, balance of payments and exchange rate systems, exchange rate risk and hedging techniques, sources of funding, relation to international financial institutions and capital instruments; foreign direct investment; international asset and liability management. **Prerequisites:** FINC 351 and FINC 361; ACCT 328 or concurrent enrollment. **Cross Listing:** IBUS 446/FINC 445.

FINC 446 Technical Analysis of Financial Markets

Credits 3. 3 Lecture Hours. Use of price, volume and other non-fundamental, market and behavioral data to analyze and predict security prices; emphasis on pattern recognition and correlation analysis over theory and casual analysis; application of technical analysis as an investment discipline for institutional portfolio management; principles, terminology, techniques and emerging theories of technical analysis. **Prerequisites:** FINC 351 and FINC 361.

FINC 447/ACCT 447 Financial Statement Analysis

Credits 3. 3 Lecture Hours. Development of an analytical approach to financial statements, integrating relevant finance and accounting concepts and principles; current topics in financial analysis.

Prerequisites: Grade of C or better in ACCT 327 and FINC 341. **Cross Listing:** ACCT 447/FINC 447.

FINC 448 Advanced Investments

Credits 3. 3 Lecture Hours. Application of finance theory to complex investment problems; implementation of asset pricing models, portfolio theory and arbitrage strategies; implication of principles of market efficiency and behavioral finance for selection of individual securities and portfolios. **Prerequisites:** FINC 351 and FINC 361.

FINC 449 Financial Modeling

Credits 3. 3 Lecture Hours. Application of fundamental finance concepts to practical valuation problems and investment decisions; construction of Excel-based financial models in the context of specific situations such as company valuations, leveraged buyout (LBO) investments and mergers and acquisitions (M&As). **Prerequisite:** FINC 351 and FINC 361; ACCT 328 or concurrent enrollment.

FINC 462 Commercial Bank Management

Credits 3. 3 Lecture Hours. Problems confronting commercial banks such as development and application of credit standards, decisions on loan applications, liquidity management and profit sensitivity to varying levels of interest rates. **Prerequisite:** FINC 381 or concurrent enrollment.

FINC 463 Seminar in Commercial Banking

Credits 3. 3 Lecture Hours. Cases and problems on contemporary management challenges and problem-solving techniques in commercial banks. **Prerequisite:** Junior or senior classification and approval of instructor.

FINC 464 Commercial Credit Analysis

Credits 3. 3 Lecture Hours. Recognized techniques for assessing the ability and willingness of business firms to service debts as originally agreed; regulatory and ethical requirements for structuring and documenting commercial bank loans to protect interests of shareholders, depositors, and deposit insurers. **Prerequisites:** Junior or senior classification and approval of instructor.

FINC 465 Seminar in Investment Banking

Credits 3. 3 Lecture Hours. Cases and problems on fundamentals of valuing publicly and privately held firms, underwriting public and private offerings of debt and equity securities, managing capital market risks, complying with SEC and NASD regulations and managing other financial services commonly offered by investment banks. **Prerequisite:** Junior or senior classification and approval of instructor.

FINC 466 Wall Street, Investment Banking and the Financial Markets

Credits 3. 3 Lecture Hours. Experience, first-hand, the major financial markets of the United States; visits to major Wall Street firms, security and commodity exchanges, and other financial institutions. **Prerequisites:** FINC 351 and FINC 361 and approval of instructor.

FINC 468 Entrepreneurial Finance

Credits 3. 3 Lecture Hours. Analysis of financing for start-up or high-growth businesses; funding sources for early operations, including angel capital, private venture capital, corporate venture capital, strategic alliances and crowdfunding; exit strategies, including initial public offerings (IPO) and mergers and acquisition (M&A). **Prerequisites:** FINC 351 and FINC 361; ACCT 328 or concurrent enrollment.

FINC 472 Real Estate Finance

Credits 3. 3 Lecture Hours. Real estate financing instruments, institutions and techniques; trust deed financing, mortgage underwriting and risk analysis, primary and secondary mortgage markets and institutions.

Prerequisites: FINC 351 and FINC 361; ACCT 328 or concurrent enrollment.

FINC 475 Real Estate Investment Analysis

Credits 3. 3 Lecture Hours. Real estate market analysis, equity investor decision criteria, institutional investment constraints and investment valuation; case analysis of specific real estate investment decisions.

Prerequisite: FINC 351 and FINC 361; ACCT 328 or concurrent enrollment.

FINC 484 Professional Internship

Credits 1 to 6. 1 to 6 Other Hours. Professional internship with practicing professionals under the direction of a faculty member. Available for free elective only and must be taken on a satisfactory/unsatisfactory basis.

Prerequisites: Finance major and approval of instructor and department head.

FINC 485 Directed Studies

Credits 0 to 6. 0 to 6 Other Hours. Directed study on selected problems in the area of finance not covered in other courses. **Prerequisites:** Approval of department head; FINC 351 and FINC 361; ACCT 328 or concurrent enrollment.

FINC 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected area in finance. May include attention to aspects of real estate finance, corporate financial management, investments, or financial institutions and markets.

Prerequisites: Admission to upper division in Mays Business School and approval of instructor.

FINP - Financial Planning (FINP)

FINP 101 Introduction to Personal Finance

Credits 3. 3 Lecture Hours. Introduction to the Personal Financial Planning profession; overview of the process of financial planning; focus on using tools such as the financial calculator and Excel in the study of time value of money and household financial planning issues; overview of terminology and broad understanding of the practice of financial planning.

FINP 201 Professional Development in Financial Planning

Credit 1. 1 Lecture Hour. Introduction to the professional aspects of working in the financial planning industry to prepare for a successful internship and professional career.

FINP 235 Foundations of Money Education

Credits 3. 3 Lecture Hours. Preparation for a financially challenging world and introduction to concepts and methods of personal financial planning; financial planning process, time value of money, taxation, credit, housing, insurance, employee benefits, family economics and building a personal financial plan.

FINP 335 Financial Readiness

Credits 3. 3 Lecture Hours. Personal financial planning for those planning on joining the military; preparation for a financially challenging world and introduction to the concepts and methods of personal financial literacy, budgeting, cash management, debt, credit, deployment finances, insurance, retirement planning, investing, estate planning and taxation.

Prerequisites: Junior or senior classification.

FINP 435 Financial Planning for Professionals

Credits 3. 3 Lecture Hours. Financial planning from a professional perspective; applying basic financial, economic and institutional concepts to advise individuals, families and small businesses in achieving their financial goals; tools and topics include financial analysis, budgeting, credit management, time value of money, investment strategies, income taxes, risk management, and retirement and estate planning. **Prerequisites:** AGEC 330, FINC 409 or FINC 341; junior or senior classification.

FINP 436 Insurance Planning

Credits 3. 3 Lecture Hours. Insurance planning for individuals, families and small businesses; applies risk management principles to evaluate various insurance products, including life, disability, long-term care, health, homeowners, auto and liability. **Prerequisites:** Grade of C or better in FINP 435; junior or senior classification.

FINP 437 Tax Planning

Credits 3. 3 Lecture Hours. Applies the principles of income, gift and estate tax planning to enhance household income after taxes; understanding tax laws, reporting requirements and opportunities for planning; identify and implement useful tax planning strategies; focus on practical application for financial planning. **Prerequisites:** Grade of C or better in FINP 435; junior or senior classification.

FINP 438 Investment Planning

Credits 3. 3 Lecture Hours. Applying investment principles considering families' goals, time horizons, risk tolerance and tax implications to build investment portfolios; attributes of various asset classes; asset allocation, selecting securities and portfolio management; developing successful investment programs for personal investors and financial planners. **Prerequisites:** Grade of C or better in FINP 435 or concurrent enrollment; junior or senior classification.

FINP 439 Retirement Planning

Credits 3. 3 Lecture Hours. Retirement planning basics, qualified and nonqualified retirement plans, Social Security provisions and government healthcare plans along with the basics of employee benefits; focus on both quantitative (i.e., calculating retirement needs and plan limits) and qualitative (i.e., retirement age decisions, retirement income management) aspects of retirement. **Prerequisites:** Grade of C or better in FINP 435, AGE 330, FINC 409, or FINC 341; junior or senior classification.

FINP 441 Financial Planning Capstone

Credits 3. 3 Lecture Hours. Financial planning process, data gathering, approaches to financial planning, analysis of financial statements and client presentation; case analysis, ethics and professional conduct, use of financial planning software, advanced financial calculator usage, and Microsoft Excel applications. **Prerequisites:** Grade of C or better in FINP 435, FINP 436, FINP 437, FINP 438, and FINP 439; junior or senior classification.

FINP 442 Estate Planning

Credits 3. 3 Lecture Hours. Application and creation of complex estate planning methodologies and policies within financial planning; emphasis on both development of estate strategy and coordination of estate management with legal professionals required of a financial planner in advising clients. **Prerequisites:** Grade of C or better in FINP 435.

FINP 443 Technology Applications in Financial Planning

Credits 3. 3 Lecture Hours. Preparation of students for the financial planning capstone course through development of proficiency in professional software packages and completion of mini financial planning cases. **Prerequisites:** Grade of C or better in FINP 435 or FINP 438.

FINP 489 Special Topics in...

Credits 1 to 4. 1 to 4 Other Hours. Selected topics in an identified area of financial planning. May be repeated for credit. **Prerequisites:** Junior or senior classification.

FIVS - Forensic & Inv Science (FIVS)

FIVS 101 Introduction to Academic Success in Forensic and Investigative Sciences

Credit 1. 1 Lecture Hour. Orientation to academic success within higher education and specifically the Bachelor of Science degree in forensic and investigative sciences; awareness of academic and campus support services available for student success; development of goals for academic and career planning, including creation and utilization of degree planner; awareness of personal self-management strategies, including learning styles, time management, goal setting, stress management and development of personal strategies for implementation of personal self-management into practice.

FIVS 102 Continuing Academic Success in Forensic and Investigative Sciences

Credit 1. 1 Lecture Hour. 0 Lab Hours. 0 Other Hours. Continued exploration to academic success within higher education and specifically the Bachelor of Science degree in Forensic and Investigative Sciences; increase awareness of academic and campus support services available for student success; develop goals for academic and career planning, including creation and utilization of degree planner; awareness of personal self-management strategies, including learning styles, time management, goal setting, stress management, and development of personal strategies for implementation of personal self-management into practice. Must be taken on a satisfactory/unsatisfactory basis.

Prerequisite: Grade of C or better in FIVS 101.

FIVS 123 Forensic Investigations

Credits 3. 3 Lecture Hours. Overview of forensics from incident scene to court room verdict; principles, concepts, tools and methodologies used in the science and practice of forensics; examination of various forensic fields; evidence recognition, analysis, interpretation and presentation to diverse audiences.

FIVS 205 Introduction to Forensic and Investigative Sciences

Credits 3. 3 Lecture Hours. Overview of principles, procedures, and concepts of forensic and investigative sciences; instruction in the definitions, scope, and use of tools, techniques and protocols in forensic applications used to resolve social, regulatory, and legal disputes.

Prerequisite: Freshman or sophomore classification or approval of instructor.

FIVS 210 Forensic Photography

Credits 3. 2 Lecture Hours. 2 Lab Hours. Identification and application of techniques of the practice of photography as applied to forensics.

Prerequisite: Grade of C or better in FIVS 205; FIVL or FIVS major.

FIVS 215 Forensic Microscopy

Credits 3. 2 Lecture Hours. 2 Lab Hours. Identification and application of techniques of the practice of microscopy as applied to forensics.

Prerequisite: Grade of C or better in FIVS 205; FIVL or FIVS major.

FIVS 220 Impression Evidence

Credits 3. 2 Lecture Hours. 2 Lab Hours. Individual and class characteristics of footwear, tire track, impression evidence documentation, collection, test impression techniques, shoe and tire tread designs, sizing, manufacturing, wear characteristics, comparison techniques, courtroom preparation and testimony. **Prerequisites:** Grade of C or better in FIVS 210 or concurrent enrollment; FIVL or FIVS majors.

FIVS 282 Occupational and Professional Development

Credits 2. 2 Lecture Hours. Organized instruction in written and oral communication; acquaint students with private and public-sector companies and agencies as well as leading professionals from these firms to reinforce academic instruction and prepare students for the transition to employment, graduate and professional schools. **Prerequisites:** Grade of C or better in FIVS 205; FIVS majors only.

FIVS 285 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Directed individual study in forensic and investigative sciences. May be repeated for credit. **Prerequisites:** Freshman or sophomore classification; approval of instructor and department head.

FIVS 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified area of forensic and investigative sciences. May be repeated for credit.

FIVS 291 Research

Credits 0 to 4. 0 to 12 Lab Hours. Research conducted under the direction of a faculty member in forensic and investigative sciences. May be repeated for credit. **Prerequisite:** Freshman or sophomore classification.

FIVS 308 Forensic Implications of Inheritance

Credits 4. 3 Lecture Hours. 3 Lab Hours. Forensic genetics with an emphasis on human molecular genetics, population genetics, and genetic application in the forensic sciences. **Prerequisites:** Grade of C or better in BIOL 112; FIVS-SCE and FIVS-LWE majors; junior or senior classification.

FIVS 316 Biotechnology and Forensics

Credits 4. 3 Lecture Hours. 3 Lab Hours. Illustration of the use of a variety of biotechnology methods for forensic applications; appreciation and understanding of the underlying molecular biology techniques that are used in a diverse array of settings including blood analysis, blood typing, DNA fingerprinting and genetic testing; potential future use of advanced sequencing technologies for forensic applications; consideration of social, ethical and legal implications of these procedures and applications. **Prerequisites:** Grade of C or better in FIVS 308; FIVS-LWE or FIVS-SCE majors.

FIVS 401/SCSC 401 Forensic Soil Science

Credits 3. 2 Lecture Hours. 2 Lab Hours. Examination of soils biology, chemistry and physical attributes to solve crimes; soil and geologic characteristics associated with crime scene examination; physical, biological and chemical characteristics and use of trace evidence. **Prerequisite:** Grade of C or better in FIVS 282. **Cross Listing:** SCSC 401/ FIVS 401.

FIVS 405/CYBR 405 Applied Digital Forensics and Incident Response

Credits 3. 3 Lecture Hours. Collection of digital evidence; digital evidence analytics; analysis of log data; malware triage; recover damaged digital evidence; write technical reports on malware and incidents; legal and ethical components of digital forensic science. **Prerequisites:** Junior or senior classification. **Cross Listing:** CYBR 405.

FIVS 415 Practice and Principles of Science and Law

Credits 3. 3 Lecture Hours. Introduction to series of practitioners of forensic science and the justice system; receive instruction on principles, procedures, and practices used in solving legal and societal issues; examine scientific method and scientific knowledge as applied through expert testimony; enhance critical thinking and reasoning skills in studying and debating different positions of current issues of science and law. **Prerequisites:** Grade of C or better in FIVS 205 and FIVS 481; grade of C or better in FIVS 316 and FIVS 435, or concurrent enrollment; FIVS-LWE and FIVS-SCE majors.

FIVS 420 Controlled Substances

Credits 2. 2 Lecture Hours. Classification of effects of controlled substances in impaired individuals, sampling procedures and presumptive testing; history of the controlled substances act of 1970, federal drug scheduling, penalty groups in Texas, legislative complexity and challenges with new psychoactive substances, physiological, sociological, legal and societal aspects of controlled substance abuse. **Prerequisites:** Grade of C or better in FIVS 308; FIVS-LWE and FIVS-SCE majors.

FIVS 422 Crime Scene Investigation

Credits 3. 2 Lecture Hours. 3 Lab Hours. Principles, procedures, processes and hands-on experience for conducting investigations ranging from general crime scene to death investigations. **Prerequisites:** Grade of C or better in FIVS 205 or concurrent enrollment; FIVS-LWE and FIVS-SCE majors.

FIVS 431/ENTO 431 The Science of Forensic Entomology

Credits 3. 3 Lecture Hours. Explores the science, methodology and technology employed to gather, preserve and present information about insects and other arthropods in such a manner that this information can be used in courts of law as evidence and testimony to help resolve issues of a criminal or civil nature. **Prerequisites:** Junior or senior classification or approval of instructor. **Cross Listing:** ENTO 431/FIVS 431.

FIVS 432/ENTO 432 Applied Forensic Entomology

Credit 1. 3 Lab Hours. Laboratory-based offering practical experience using scientific information, methodology, technology, and legal procedures inherent to the field of forensic entomology; emphasis on collecting, preserving, and identifying information as evidence and expert witness testimony in courts of law. **Prerequisites:** Junior or senior classification or approval of instructor. **Cross Listing:** ENTO 432/ FIVS 432.

FIVS 435 Case Studies in Problem Solving

Credits 3. 3 Lecture Hours. Development of reasoning strategies by examining a variety of case studies; science and scientific method solving real-world problems as part of an investigative team.

Prerequisites: Grade of C or better in FIVS 316 and FIVS 481; grade of C or better in FIVS 415 or concurrent enrollment; FIVS-LWE and FIVS-SCE majors or approval of instructor.

FIVS 440 Forensic Communications

Credit 1. 1 Lecture Hour. Scientific writing and communication, critical thinking, reading, research, writing and oral skills. **Prerequisite:** Grade of C or better in FIVS 308.

FIVS 481 Seminar

Credit 1. 1 Other Hour. Analysis of research topics related to the fields of forensic science and law. May be taken 4 times for credit. **Prerequisites:** Grade of C or better in FIVS 282; FIVS-LWE and FIVS-SCE majors.

FIVS 484 Internship

Credits 0 to 4. 0 to 4 Other Hours. Independent study and supervised field experience related to a professional area or interest in forensic science. May be repeated for credit. **Prerequisite:** Junior or senior classification and approval of instructor.

FIVS 485 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Directed individual study in forensic and investigative sciences. May be repeated for credit. **Prerequisites:** Junior or senior classification; upper-division FIVS only; approval of instructor and department head.

FIVS 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified area of forensic and investigative sciences. May be repeated for credit.

FIVS 491 Research

Credits 0 to 4. 0 to 12 Lab Hours. Research conducted under the direction of a faculty member in forensic and investigative sciences. May be repeated for credit. **Prerequisite:** Junior or senior classification and approval of instructor.

FREN - French (FREN)

FREN 101 Beginning French I

Credits 4. 3 Lecture Hours. 2 Lab Hours. (FREN 1411) Beginning French I. Elementary language study with oral, written, and reading practice. Preparation for conversation. Part of class preparation will be done in language laboratory.

FREN 102 Beginning French II

Credits 4. 3 Lecture Hours. 2 Lab Hours. (FREN 1412) Beginning French II. Continuation of FREN 101. Part of class preparation will be done in language laboratory. **Prerequisite:** FREN 101.

FREN 201 Intermediate French I

Credits 3. 3 Lecture Hours. (FREN 2311) Intermediate French I. Readings of average difficulty. Review of grammar; practice in conversation and composition. **Prerequisite:** FREN 102.

FREN 202 Intermediate French II

Credits 3. 3 Lecture Hours. (FREN 2312) Intermediate French II. Continuation of FREN 201 with more advanced material. **Prerequisite:** FREN 201.

FREN 221 Field Studies I

Credits 3. 3 Other Hours. French language and culture taught in France; supervised travel of cultural interest; living with local families; participation in the activities and courses of a French university or institute; written and oral reports, exams. **Prerequisite:** FREN 102 with a grade of B or higher or approval of instructor; concurrent enrollment in FREN 222.

FREN 222 Field Studies II

Credits 3. 3 Other Hours. French language and literature taught in France in cooperation with a French university or institute; exams, written reports. **Prerequisite:** FREN 102 with a grade of B or higher or approval of instructor; concurrent enrollment in FREN 221.

FREN 285 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Individual supervision of readings or assigned projects in French, selected for each student individually. **Prerequisite:** Approval of instructor and department head.

FREN 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of French. May be repeated for credit. **Prerequisite:** Approval of instructor.

FREN 300 Written Communication in the French-Speaking World

Credits 3. 3 Lecture Hours. Strategies for effective communication in the written language; active production of a variety of narrative, expository, analytical, persuasive and epistolary texts with special attention to language appropriate to various social, professional and cultural contexts both in French and in the Francophone world; conducted in French. **Prerequisite:** FREN 202 or FREN 222.

FREN 301 French Society and Culture in Evolution

Credits 3. 3 Lecture Hours. Events, figures, monuments, laws and cultural productions, texts and events participating in the evolution of French institutions, religion, socio-economic structures, marriage, sexuality and identities from the Gallo-Roman period through May 1968; conducted in French. **Prerequisite:** FREN 202 or FREN 222.

FREN 306 Technical and Business French

Credits 3. 3 Lecture Hours. Advanced-intermediate course to provide cross-cultural communication skills crucial to succeeding in a francophone business or technical environment, including topics on business and technical jargon, correspondence, résumés, interviewing, the European Union, telecommunications, technology and the French-speaking community. **Prerequisite:** FREN 202 or FREN 222 or approval of instructor.

FREN 311 Oral Communication in the French-Speaking World

Credits 3. 3 Lecture Hours. Strategies for effective communication in the spoken language; case studies in economic, political, cultural, social and environmental issues as presented through the press and audio-visual media of France and the Francophone world; conducted in French. **Prerequisite:** FREN 202 or FREN 222.

FREN 321 French Literature I

Credits 3. 3 Lecture Hours. Representative works of French poetry, theater, essays and novels in the historical, cultural and political context of French society from the Middle Ages through the 18th century; conducted in French. **Prerequisite:** FREN 202 or FREN 222.

FREN 322 French Literature II

Credits 3. 3 Lecture Hours. Representative works of French and Francophone novels, plays, poetry and essays reflecting the societies and cultural experience of French-speaking people in the 19th, 20th and 21st centuries; conducted in French. **Prerequisite:** FREN 202 or FREN 222.

FREN 336 Politics, Culture and Society in Contemporary France

Credits 3. 3 Lecture Hours. Contemporary France. Salient aspects of present-day French society and culture, including government, demographics, immigration, education, families, gender roles, entertainment and leisure, social classes and cross-cultural tensions; conducted in French. **Prerequisite:** FREN 202 or FREN 222.

FREN 375 The Francophone World

Credits 3. 3 Lecture Hours. The peoples, cultures and societies of French-speaking communities outside of France, with special attention to their colonial origins and current issues of politics, identities and migrations as represented in the press and media as well as in works of film and literature; conducted in French. **Prerequisite:** FREN 202 or equivalent; junior or senior classification.

FREN 418 Seminar in French Civilization

Credits 3. 3 Lecture Hours. Discussions and observation of particular events and institutions crucial to the development of French society and culture; analysis of literary, artistic and cinematic representations of events and phenomena such as the French revolution, May 1968, and church and state relations; conducted in French. May be repeated for credit. **Prerequisites:** FREN 300 and FREN 301, FREN 306, FREN 311, FREN 321, FREN 322, FREN 336, or FREN 375.

FREN 422 Studies in Gender and French Literature

Credits 3. 3 Lecture Hours. The role of gender in the production, dissemination, reception and interpretation of literary texts in the French tradition, including continental France as well as the Francophone literatures of West Africa, Canada, and elsewhere; taught in English. **Prerequisite:** Junior or senior classification or approval of instructor.

FREN 425/FILM 425 French Film

Credits 3. 3 Lecture Hours. Overview of French cinema from its origins to the present; interpretation of French cultural history and politics through film; taught in English. **Prerequisites:** Junior or senior classification, or approval of instructor. **Cross Listing:** FILM 425/FREN 425.

FREN 481 Seminar in French and Francophone Studies

Credits 3. 3 Lecture Hours. In-depth exploration of topics in French and Francophone literature, culture, and/or film, involving individual student research projects. May be taken two times for credit as topics change. **Prerequisite:** Junior or senior classification or approval of instructor.

FREN 485 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Individual supervision of readings or assigned projects, selected for each student individually; written and oral reports. **Prerequisite:** Approval of instructor and department head.

FREN 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of French. May be repeated for credit. **Prerequisite:** Approval of instructor.

FREN 491 Research

Credits 1 to 3. 1 to 3 Other Hours. Research conducted under the direction of faculty member in French. May be taken three times for credit. **Prerequisites:** Junior or senior classification and approval of department head.

FSCI - Foundational Sciences (FSCI)

FSCI 281 Oceans and One Health Sophomore Seminar

Credit 1. 1 Lecture Hour. Science communications; including compilation and discussion of current topics related to human, animal or environmental health issues associated with coastal communities through weekly literature searches and readings; emphasis on scientific communication with peers in both oral and written forms. **Prerequisite:** Sophomore classification or approval of instructor.

FSCI 285 Directed Studies

Credits 1 to 6. 1 to 6 Other Hours. Directed studies and problems suited to analysis by individuals or small groups concerning special aspects of the coastal environment and human health. **Prerequisite:** Approval of instructor.

FSCI 289 Special Topics in...

Credits 1 to 4. 1 to 4 Other Hours. Study of selected topics in an identified area of foundational sciences. May be taken for credit up to eight hours. **Prerequisite:** Approval of instructor.

FSCI 334 One Health in Coastal Regions

Credits 3. 3 Lecture Hours. Exploration of One Health issues and the human-animal-ecosystem interface affecting populations in coastal regions; study of how these topics can be applied to address regional and global health and environmental challenges. **Prerequisite:** BIOL 111.

FSCI 360 Biochemistry

Credits 4. 4 Lecture Hours. Structure, function and reactivity of proteins, carbohydrates, lipids and nucleic acids; role of pH in biochemical reactions; enzyme kinetics and regulation; membrane structure and function; overview of the metabolic pathways; carbohydrate metabolism; lipid metabolism; metabolism of nitrogen containing compounds; nucleic acid synthesis. **Prerequisites:** BIOL 112 or MARB 215, and CHEM 228; junior or senior classification.

FSCI 428 Coastal Development and Human Health

Credits 3. 2 Lecture Hours. 2 Lab Hours. Exploration of public environmental health issues associated with urbanization in coastal areas; topics address population pressures on coasts, infectious and chronic disease, the natural and built environment, toxicology, sanitation, forms and media of pollution, and the application of environmental health science to coastal zone management. **Prerequisites:** CHEM 120 or equivalent; BIOL 112; junior or senior classification or approval of instructor.

FSCI 485 Directed Studies

Credits 1 to 6. 1 to 6 Other Hours. Directed studies and problems suited to analysis by individuals or small groups concerning special aspects of the coastal environment and human health. **Prerequisite:** Approval of instructor.

FSCI 489 Special Topics in...

Credits 1 to 4. 1 to 4 Other Hours. Study of selected topics in an identified area of foundational sciences. May be taken for credit up to eight hours. **Prerequisite:** Junior or senior classification or approval of instructor.

FSCI 491 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in Foundational Sciences. Registration in multiple sections of this course is possible within a given semester provided that the per semester credit hour limit is not exceeded. May be taken for credit up to four hours. **Prerequisite:** Junior or senior classification or approval of instructor.

FSTC - Food Science & Tech (FSTC)

FSTC 201 Food Science

Credits 3. 3 Lecture Hours. (AGRI 1329) Food Science. The fundamental biological, chemical and physical scientific principles associated with the study of foods; topics include food composition and nutrition, food additives and regulations, food safety and toxicology, food processing, food engineering, food biotechnology, product development and sensory evaluation.

FSTC 210/NUTR 210 Horizons in Nutrition and Food Science

Credit 1. 1 Lecture Hour. Introduction to nutrition and food science career opportunities through presentations by nutrition and food science researchers and industry professionals; addresses issues of professionalism including portfolio development, teamwork, and critical thinking skills. **Cross Listing:** NUTR 210/FSTC 210.

FSTC 281 Introduction to Fermentation and Brewing Sciences

Credits 3. 3 Lecture Hours. Master fermentation and brewing science, from microbial selection to bio-separation, ensuring food safety and quality compliance.

FSTC 285 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Directed study of selected problems in the area of food science. **Prerequisites:** Approval of instructor; 2.0 GPR in major and overall.

FSTC 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of food science and technology. May be repeated for credit. **Prerequisite:** Approval of instructor.

FSTC 291 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in food science and technology. May be repeated 2 times for credit. **Prerequisites:** Freshman or sophomore classification and approval of department head.

FSTC 300/NUTR 300 Religious and Ethnic Foods

Credits 3. 3 Lecture Hours. Understanding religious and ethnic foods with application to product development, production, and nutritional practices; emphasis on different food rules and priorities with attention given to different religious and ethnic groups within the US and around the world. **Prerequisites:** Junior or senior classification or approval of instructor; basic knowledge of food science and nutrition helpful. **Cross Listing:** NUTR 300/FSTC 300.

FSTC 305 Fundamental Baking

Credits 3. 2 Lecture Hours. 3 Lab Hours. Fundamentals of baking; chemical and physical properties of ingredients, methods of baking all products, fundamental reactions of dough, fermentation and oven baking. **Prerequisite:** CHEM 222 or CHEM 227 or approval of department head.

FSTC 311 Principles of Food Processing

Credits 3. 2 Lecture Hours. 3 Lab Hours. Principles and practices of canning, freezing, dehydration, pickling and specialty food manufacture; fundamental concepts of various techniques of preparation, processing, packaging and use of additives; processing plants visited. **Prerequisite:** FSTC 201; junior or senior classification or approval of department head or instructor.

FSTC 312 Food Chemistry

Credits 3. 3 Lecture Hours. The fundamental and relevant chemistry and functionality of the major food constituents (water, carbohydrates, lipids, proteins, phytochemical nutraceuticals) and study of food emulsion systems, acids, enzymes, gels, colors, flavors and toxins. **Prerequisite:** FSTC 201; CHEM 227; CHEM 237 or approval of department head or instructor.

FSTC 313 Food Chemistry Laboratory

Credit 1. 3 Lab Hours. Laboratory exercises investigating specific molecules, such as food acids, enzymes, pigments and flavors, and chemical interactions in foods, such as oxidation reactions, emulsion systems, and functional properties from a fundamental chemistry rather than an analytical perspective. **Prerequisite:** FSTC 201; CHEM 227; CHEM 237 or approval of department head or instructor.

FSTC 314 Food Analysis

Credits 3. 1 Lecture Hour. 4 Lab Hours. Selected standard methods for assay of food components; principles and methodology of both classical and instrumental techniques for food analysis. **Prerequisite:** FSTC 201; FSTC 311; CHEM 227; CHEM 237 or approval of department head or instructor.

FSTC 315/AGSM 315 Food Process Engineering Technology

Credits 3. 2 Lecture Hours. 2 Lab Hours. Elementary mechanics, physical and thermal properties of food and processing materials, heat transfer, mass and energy balances, psychrometrics (properties of air), insulation. **Prerequisites:** Grade of C or better in PHYS 201 or PHYS 206, or approval of instructor. **Cross Listing:** AGSM 315/FSTC 315.

FSTC 316 Food Biomanufacturing and Cellular Agriculture

Credits 3. 3 Lecture Hours. Exploration of fermentation science, cellular agriculture, alternative proteins, and lab techniques for bioprocessing, microbial communities, and food safety. **Prerequisites:** Junior or senior classification.

FSTC 319 Molecular Methods for Microbial Detection and Characterization

Credits 3. 2 Lecture Hours. 2 Lab Hours. Exploration of vital molecular methods crucial for identifying and characterizing microbial communities across industries such as fermentation and brewing. **Prerequisites:** BIOL 111, BIOL 112 or BIOL 206; junior or senior classification.

FSTC 320/NUTR 320 Understanding Obesity - A Social and Scientific Challenge

Credits 3. 3 Lecture Hours. Perspectives of obesity in food science, nutrition, health and psychology; study of obesity factors in relation to genetics, exercise physiology and sociology with emphasis on food and nutrition. **Prerequisites:** Junior or senior classification or approval of instructor. **Cross Listing:** NUTR 320/FSTC 320.

FSTC 324 Food Safety and Preventive Controls for Human Food

Credits 3. 3 Lecture Hours. Microbiological food spoilage, fermentation and safety; U.S. Food and Drug Administration (FDA) recognized curriculum for "preventive controls qualified individual" within the FDA Hazard Analysis and Risk-based Preventive Controls for Human Food regulation. **Prerequisites:** Junior or senior classification or approval of instructor.

FSTC 326/ANSC 326 Food Bacteriology

Credits 3. 3 Lecture Hours. Microbiology of human foods and accessory substances; raw and processed foods; physical, chemical and biological phases of spoilage; standard industry techniques of inspection and control. **Prerequisite:** Junior or senior classification or approval of instructor. **Cross Listing:** ANSC 326/FSTC 326.

FSTC 327/ANSC 327 Food Bacteriology Lab

Credit 1. 3 Lab Hours. Laboratory to accompany ANSC 326/FSTC 326 or FSTC 326/ANSC 326. **Cross Listing:** ANSC 327/FSTC 327.

FSTC 330 Dairy and Food Technology

Credits 4. 3 Lecture Hours. 3 Lab Hours. Principles and practices involved in processing of milk into market milk, butter, cheese and cheese foods; fundamental principles of these processes as related to their design and control.

FSTC 331 Dairy and Food Technology

Credits 4. 3 Lecture Hours. 3 Lab Hours. Manufacture of frozen, freeze-dehydrated, concentrated and dehydrated dairy foods; fundamental aspects of freezing, concentration and dehydration of foods.

Prerequisite: FSTC 330 or approval of department head.

FSTC 401 Food Product Development

Credits 3. 2 Lecture Hours. 3 Lab Hours. Design and develop food products using principles of food chemistry, food processing, nutrition, sensory analysis and statistics; team collaborate to improve food product characteristics to meet the needs of a changing society.

Prerequisites: FSTC 201, FSTC 311, FSTC 312, FSTC 313, FSTC 314, FSTC 315/AGSM 315, FSTC 326/ANSC 326, or concurrent enrollment; senior classification or approval of instructor.

FSTC 410/NUTR 410 Nutritional Pharmacometrics of Food Compounds

Credits 3. 3 Lecture Hours. Nutritional pharmacokinetics and pharmacodynamics of food compounds; specific examples of toxicological and pharmacological effects of food compounds.

Prerequisites: NUTR 201, NUTR 202, NUTR 203, CHEM 222, or CHEM 227, or approval of instructor; junior or senior classification. **Cross Listing:** NUTR 410/FSTC 410.

FSTC 416 Precision Fermentation and Future of Foods

Credits 3. 3 Lecture Hours. Exploration of precision fermentation; bioprocessing to gene editing, and its applications in sustainable food production. **Prerequisites:** Junior or senior classification.

FSTC 420 Supervised Research in Mediterranean Nutrition and Food Processing in Italy

Credits 3. 3 Other Hours. Exploration of principles of Mediterranean diet, European nutrition regulatory aspects, wine-making and food processing in Italy. **Prerequisites:** FSTC 201, NUTR 202, or NUTR 203; must be 18 years of age; class and tours taught in English; priority given to majors in FSTC or NUTR.

FSTC 422 Food Processing for Sustainable Nutrition in Brazil

Credits 3. 3 Other Hours. Sustainable nutrition and food processing in Brazil; hands-on learning at the Federal University of Vicosa, the Amazon Biotechnology Center, food processing plants and other research centers in the Amazon, central Brazil and Rio De Janeiro. **Prerequisites:** FSTC 201, NUTR 202, or NUTR 203; must be 18 years of age; class and tours taught in English; priority given to majors in FSTC or NUTR.

FSTC 430 Innovative Functional Food Ingredients

Credits 3. 3 Lecture Hours. Exploration of the impact of functional food ingredients on human health and the microbiome, processing, quality control, and regulatory compliance under FDA and FTC guidelines.

Prerequisites: FSTC 201 and FSTC 311, or FSTC 314, or FSTC 313; or approval of instructor.

FSTC 444 Fundamentals of Food Law

Credits 3. 3 Lecture Hours. History, development of, and fundamental principles behind current food regulations, including food labeling, adulteration, food safety, food additives, dietary supplements, and import and export laws; overview of government agency jurisdiction, international law and ethics. **Prerequisite:** FSTC 201; junior or senior classification.

FSTC 457/ANSC 457 Hazard Analysis and Critical Control Point System

Credits 3. 3 Lecture Hours. Hazard Analysis and Critical Control Point (HACCP) principles specifically related to meat and poultry; microbiological and process overviews; good manufacturing practices and standard operating procedures development. **Prerequisite:** FSTC 326/ANSC 326 or ANSC 326/FSTC 326, or approval of instructor. **Cross Listing:** ANSC 457/FSTC 457.

FSTC 470/ANSC 470 Quality Assurance for the Food Industry

Credits 3. 3 Lecture Hours. Principles of food system process control including statistical process control (SPC) and the tools required to assure uniform communication and understanding of quality assurance systems. **Prerequisite:** Junior or senior classification. **Cross Listing:** ANSC 470/FSTC 470.

FSTC 481 Seminar

Credit 1. 1 Lecture Hour. Guidelines and practice in journal article review and making effective technical presentations; strategies for conducting a job search; development of résumés and letters and interviewing targeted for careers in the food industry or graduate school. **Prerequisite:** Senior classification in food science and technology.

FSTC 484 Internship

Credits 0 to 6. 0 to 6 Other Hours. Professional internship or practical food science experience in the food industry, non-profit organization, or other entity by instructor. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisites:** Junior or senior classification.

FSTC 485 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Directed study on selected problems in the area of food science not covered in other courses. **Prerequisites:** Junior or senior classification; approval of department head; 2.0 GPR in major and overall.

FSTC 487/ANSC 487 Sensory Evaluation of Foods

Credits 3. 2 Lecture Hours. 2 Lab Hours. Application of sensory science principles and practices to food systems including an understanding of discriminative, descriptive and consumer sensory techniques. **Prerequisites:** CHEM 222 or CHEM 228; junior or senior classification. **Cross Listing:** ANSC 487/FSTC 487.

FSTC 489 Special Topics in...

Credits 1 to 4. 1 to 4 Other Hours. Selected topics in an identified area of food science and technology. May be repeated for credit. **Prerequisite:** Junior or senior classification.

FSTC 491 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of a faculty member in food science. May be repeated 3 times for credit. Registration in multiple sections of this course are possible within a given semester provided that the per semester credit hour limit is not exceeded.

FYEX - First Year Experience (FYEX)

FYEX 101 First Year Experience

Credits 0. 0 Lecture Hours. Development of self-efficacy, self-awareness and a sense of purpose; active engagement in the learning environment inside and outside of the classroom; social integration within the university community; also taught at Galveston and Qatar campuses. Must be taken on a satisfactory/unsatisfactory basis.

GALV - TAMU-Galveston

GALV 101 Honors Seminar Connections

Credit 1. 1 Other Hour. Exploration of interdisciplinary connections between academic disciplines such as science and the humanities; focuses on the question to consider how science is embedded within culture; proposes the question on what it means to be human. **Prerequisites:** Acceptance to honors program.

GALV 201 Honors Research Methods

Credit 1. 1 Lecture Hour. Intensive interdisciplinary research; research practices, application of qualitative and quantitative research methods to questions; emphasis on social sciences and humanities. **Prerequisites:** Grade of C or better in GALV 101 or concurrent enrollment.

GALV 300 TAMUG Study Abroad

Credits 1 to 18. 1 to 18 Lecture Hours. For students in approved study abroad programs; may be repeated for credit.

GALV 301 TAMUG Study Abroad

Credits 1 to 18. 1 to 18 Lecture Hours. For students in approved study abroad programs, may be repeated for credit.

GALV 401 Honors Service Learning Seminar

Credit 1. 1 Other Hour. Focus on research on a particular issue; opportunity for discipline specific writing for publication. **Prerequisites:** Grade of C or better in GALV 101 or GALV 201, or approval of instructor.

GENE - Genetics (GENE)

GENE 101/BICH 101 Introduction to Biochemical and Genetics Research Methods

Credit 1. 1 Lecture Hour. Foundational concepts for biochemistry and genetics research methods; topics include principles of the scientific method, experimental design, analytical tools, and logical thinking, with a special focus on the use of emerging technologies such as artificial intelligence (AI) in biochemical and genetics research. **Prerequisite:** Freshman classification in biochemistry or genetics. **Cross Listing:** BICH 101/GENE 101.

GENE 102/BICH 102 Introduction to Biochemical and Genetic Techniques

Credit 1. 2 Lab Hours. Introduction to biochemistry and genetics essential techniques; concepts learned from BICH/GENE 101/BICH 101 utilized in practical laboratory situations to understand the relevance and use of these techniques in real-world research settings. **Prerequisites:** Grade of C or better in BICH 101/GENE 101 or GENE 101/BICH 101; freshman classification in biochemistry or genetics. **Cross Listing:** BICH 102/GENE 102.

GENE 201/BICH 201 Introduction to Information Literacy and Artificial Intelligence Tools for Biochemistry and Genetics

Credit 1. 1 Lecture Hour. Introduction to essential skills and knowledge for effective learning, information retrieval, evaluation, and utilization of AI tools in the fields of biochemistry and genetics; developing critical thinking abilities, learning to navigate scientific literature, evaluating the credibility of information sources, and leveraging AI tools to enhance their research and problem-solving capabilities. **Prerequisites:** Grade of C or better in BICH 102/GENE 102 or GENE 102/BICH 102; sophomore classification in biochemistry or genetics. **Cross Listing:** BICH 201/GENE 201.

GENE 202/BICH 202 Biochemical and Genetic Concepts in Medicine - Case Studies

Credit 1. 1 Lecture Hour. Exploration of the link between fundamental genetic and biochemical processes and disease states, using case studies of several human diseases; deeper comprehension and critical thinking about molecular causes of diseases and treatment strategies. **Prerequisites:** Grade of C or better in BICH 201/GENE 201 or GENE 201/BICH 201; sophomore classification in biochemistry or genetics. **Cross Listing:** BICH 202/GENE 202.

GENE 285 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Introduction to laboratory research. **Prerequisite:** Freshman or sophomore classification in genetics or approval of instructor.

GENE 301 Comprehensive Genetics

Credits 3. 3 Lecture Hours. Survey of the fundamental principles of genetics: Physical basis of Mendelian inheritance, expression and interaction of genes, linkage, sex linkage, biochemical nature of genetic material and mutation. Only one of the following will satisfy the requirements for a degree: GENE 301, GENE 302, GENE 315 or GENE 320/BIMS 320. Not open to biochemistry or genetics majors. **Prerequisite:** BIOL 111.

GENE 302 Principles of Genetics

Credits 3. 3 Lecture Hours. Mechanisms of inheritance, stressing the conservation of fundamental genetic processes throughout evolution, from bacteria to humans; mutations and phenotypes, Mendelian genetics, population genetics and evolution, and complex inheritance. Course designed for biochemistry, genetics and all majors in biology. Only one of the following will satisfy the requirements for a degree: GENE 301, GENE 302, GENE 315 or GENE 320/BIMS 320. **Prerequisite:** BIOL 112; concurrent enrollment in GENE 314.

GENE 303 Fundamentals of Genetics

Credits 3. 3 Lecture Hours. Exploration of mechanisms of inheritance and Mendelian genetics; topics include the conservation of fundamental genetic processes throughout evolution, the relationship between mutations and phenotypes, principles of population genetics and complex inheritance, along with other topics. **Prerequisites:** BIOL 112; grade of C or better in GENE 314 or concurrent enrollment; biochemistry or genetics majors.

GENE 310 Principles of Heredity

Credits 3. 3 Lecture Hours. Basic principles of classical genetics, molecular genetics, mutation theory and genetic engineering; emphasis on humans and society. Not open to biochemistry and genetics majors. **Prerequisite:** Junior classification.

GENE 312 Comprehensive Genetics Laboratory

Credit 1. 0 Lecture Hours. 3 Lab Hours. Exercises in Mendelian genetics, meiosis, probability theory in pedigrees, population and quantitative genetics, as well as interaction of genes and linkage; molecular techniques to examine DNA and analyze genetic outcomes **Prerequisite:** GENE 301 or concurrent enrollment.

GENE 314 Principles of Genetics Laboratory

Credit 1. 3 Lab Hours. Exercises in Mendelian genetics including population genetics, evolution from bacteria to humans, conservation of fundamental genetic processes, and mutations; molecular techniques to examine DNA and analyze outcomes including complex inheritance and diagnostics. **Prerequisites:** GENE 302, GENE 303, or concurrent enrollment; biochemistry, genetics and biology majors.

GENE 320/BIMS 320 Biomedical Genetics

Credits 3. 3 Lecture Hours. Fundamental genetic principles as applied to biomedical science; Mendelian inheritance, linkage and genetic mapping, mutagenesis and pedigree analysis; molecular basis of gene function and inherited disease; gene therapy and genetic counseling. Only one of the following will satisfy the requirements for a degree: GENE 301, GENE 302, GENE 315, GENE 320/BIMS 320, or BIMS 320/GENE 320. **Prerequisites:** Grade of C or better in CHEM 228 or CHEM 258; PHYS 207 or grade of C or better in PHYS 202; junior or senior classification. **Cross Listing:** BIMS 320/GENE 320.

GENE 405/BIMS 405 Mammalian Genetics

Credits 3. 3 Lecture Hours. Comparative mammalian genetic systems with emphasis on laboratory animals; organization and expression of mammalian genes; development and use of genetically defined animals in biomedical and genetic research. **Prerequisite:** GENE 301, BIMS 320/GENE 320 or GENE 320/BIMS 320; junior or senior classification. **Cross Listing:** BIMS 405/GENE 405.

GENE 406/BIOL 406 Bacterial Genetics

Credits 3. 3 Lecture Hours. A problem oriented course surveying the manipulation and mechanisms of genetic systems in bacteria; recombination, gene structure and regulation of bacterial genes, plasmids and phages. **Prerequisites:** GENE 302; BIOL 351. **Cross Listing:** BIOL 406/GENE 406.

GENE 411/SCSC 411 Biotechnology for Crop Improvement

Credits 3. 3 Lecture Hours. Use of biotechnology to improve agricultural, horticultural and forest crops; techniques and methods used and case studies where biotechnology has been used to alter traits such as pathogen resistance, protein or oil consumption, ripening, fertility and wood properties. **Prerequisite:** BIOL 111 or equivalent, or approval of instructor. **Cross Listing:** SCSC 411/GENE 411.

GENE 412 Population, Quantitative and Ecological Genetics

Credits 3. 3 Lecture Hours. Concepts of population, quantitative and ecological genetics including dynamics of natural populations with emphasis on quantitative effects and ecological interactions.

Prerequisites: GENE 301, GENE 302, or GENE 303.

GENE 416/BICH 416 Mechanisms of Cell Division

Credit 1. 1 Lecture Hour. Mitotic cell cycle; progression of biochemical and morphological phases and events; duplication of cellular constituents and segregation into daughter cells. **Prerequisites:** BICH 409, BICH 410, or BICH 440; junior or senior classification in biochemistry or genetics. **Cross Listing:** BICH 416/GENE 416.

GENE 419/BICH 419 Computational Techniques for Evolutionary Analysis

Credits 3. 3 Lecture Hours. Computational techniques for studying evolution; algorithms for construction and analysis of evolutionary relationships. **Prerequisite:** Junior or senior classification or approval of instructor. **Cross Listing:** BICH 419/GENE 419.

GENE 420/BICH 420 Bioethics

Credits 3. 3 Lecture Hours. The application of ethical theory to the use of modern genetics and biochemistry stressing the social implications of genetic engineering, agricultural manipulation and biotechnology.

Prerequisites: GENE 302 or GENE 303; BICH 409, BICH 410, or BICH 440. **Cross Listing:** BICH 420/GENE 420.

GENE 421/BIMS 421 Advanced Human Genetics

Credits 3. 3 Lecture Hours. A rigorous, analytical approach to genetic analysis of humans including diagnosis and management of genetic disease in humans; transmission of genes in human populations; human cytogenetics; the structure of human genes; human gene mapping; molecular analysis of genetic disease; genetics screening and counseling. **Prerequisites:** GENE 302; BICH 410 or BICH 440. **Cross Listing:** BIMS 421/GENE 421.

GENE 431/BICH 431 Molecular Genetics

Credits 3. 3 Lecture Hours. Molecular basis for inheritance; gene structure and function, chromosomal organization, replication and repair of DNA, transcription and translation, the genetic code, regulation of gene expression, genetic differentiation and genetic manipulations.

Prerequisite: BICH 409, BICH 410, or BICH 440; GENE 301, GENE 302, GENE 303, GENE 320/BIMS 320 or BIMS 320/GENE 320. **Cross Listing:** BICH 431/GENE 431.

GENE 432/BICH 432 Laboratory in Molecular Genetics

Credits 2. 6 Lab Hours. Laboratory for molecular genetics providing technical experience with tools of molecular biology. **Prerequisite:** GENE 301, GENE 302, GENE 303, BIMS 320/GENE 320 or GENE 320/BIMS 320; BICH 431/GENE 431 or GENE 431/BICH 431. **Cross Listing:** BICH 432/GENE 432.

GENE 464/BICH 464 Bacteriophage Genomics

Credits 3. 1 Lecture Hour. 4 Lab Hours. Examination of the latest technologies in genomic analysis by sequencing and annotating the genomes of novel bacterial viruses (phage); generates real data which will be submitted to the NIH/NCBI public database; includes phage biology and potential uses. **Prerequisites:** GENE 302 or GENE 303; BIOL 351 or concurrent enrollment. **Cross Listing:** BICH 464/GENE 464.

GENE 485 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Directed study in genetics not included in established courses. **Prerequisites:** Junior or senior classification; approval of instructor and department head.

GENE 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of genetics. May be repeated for credit. **Prerequisite:** Approval of instructor.

GENE 491 Research

Credits 0 to 4. 0 to 4 Other Hours. Laboratory research supervised by a faculty member. **Prerequisites:** Major in genetics; junior or senior classification in genetics or approval of instructor.

GEOG - Geography (GEOG)

GEOG 201 Introduction to Human Geography

Credits 3. 3 Lecture Hours. (GEOG 1302) Introduction to Human Geography. A survey of the major systems of man-land relations of the world and their dissimilar developments; the processes of innovation, diffusion, and adaptation stressed with regard to changing relationships between people and their environment; also taught at Galveston campus.

GEOG 202 Geography of the Global Village

Credits 3. 3 Lecture Hours. (GEOG 1303) Geography of the Global Village. Survey of world regions; globalization; environmental problems at multiple scales; human-environment interactions; cultural coherence and diversity; population and settlement; geopolitics; social and economic development; place identification; also taught at Galveston campus.

GEOG 203 Planet Earth

Credits 3. 3 Lecture Hours. (GEOG 1301) Planet Earth. Earth's physical environment including climate, water, landforms, and ecosystems; processes that control these systems and their global distributions; human effects on these processes.

GEOG 205 Environmental Change

Credits 3. 3 Lecture Hours. Systems perspective on important attributes, elements, and connections within earth's physical environment; dynamic nature of environment at multiple spatial and temporal scales.

GEOG 213 Planet Earth Lab

Credit 1. 3 Lab Hours. Exercises and maps to illustrate principles of physical geography.

GEOG 215 Geospatial Cornerstone

Credit 1. 1 Lecture Hour. Professional career options, methods, strategies and skills involved in successful career planning in the geospatial sciences; highlights high impact learning opportunities such as study abroad and internships and the development of scientific communication skills. **Prerequisites:** GEOG and GIST majors; sophomore classification or approval of instructor.

GEOG 232 Cartography and Visualization

Credits 3. 2 Lecture Hours. 3 Lab Hours. Introduction to science and art of map production; principles of thematic map compilation and design; history of thematic mapping; map projections; data management and symbolization; common types and styles of thematic maps.

GEOG 285 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Individually-supervised research or intensive study on topics not covered in regular courses. **Prerequisite:** Approval of department head.

GEOG 289 Special Topics In...

Credits 1 to 4. 1 to 4 Other Hours. Selected topics in an identified area of geography. May be repeated for credit. **Prerequisite:** GEOG, GIST or USGE majors, or approval of instructor.

GEOG 291 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in geography. May be taken 2 times for credit. Registration in multiple sections of this course is possible within a given semester provided that the per semester credit hour limit is not exceeded. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

GEOG 301 Geography of the United States

Credits 3. 3 Lecture Hours. Geographic personality (physical and cultural) of the United States; also taught at Galveston campus.

GEOG 303 Health Geography

Credits 3. 3 Lecture Hours. Overview of health-related issues within society, including diseases, healthcare services, access to healthcare, environmental health, food and nutrition, urban health, neighborhood health, climate and health using geographical approaches. **Prerequisites:** Junior or senior classification.

GEOG 304 Economic Geography

Credits 3. 3 Lecture Hours. Location of economic activities over the earth; distribution of agriculture, manufacturing, tertiary activities and transportation; economic growth of areas.

GEOG 305 Geography of Texas

Credits 3. 3 Lecture Hours. Exploration into the geographic personality of Texas: past and current physical and biotic environments; cultural pluralism, including ethnic origins and distinctive human ecologies; and the social, economic and political sources of environmental problems.

GEOG 306 Introduction to Urban Geography

Credits 3. 3 Lecture Hours. Reasons humankind tends to congregate in cities. Overview of patterns in the geographic distribution of cities, and in the geographic distribution of peoples and activities within cities, and the dynamics of these distributions.

GEOG 309 Geography of Energy

Credits 3. 3 Lecture Hours. Development of high-energy society; renewable and nonrenewable energy resources and systems; physical and social economies of energy use; geography of energy systems; energy problems and decisions; energy governance; dependence of other resources on energy; decarbonization policies and scenarios; alternative energy futures. **Prerequisite:** Junior classification or approval of instructor.

GEOG 311 Cultural Geography

Credits 3. 3 Lecture Hours. Human factors which affect man-land relationship; concept of culture, culture areas; population growth and migrations, types of economic activity, urban and transportation geography.

GEOG 312 Data Analysis in Geography

Credits 3. 3 Lecture Hours. Foundation for collection and analysis of quantitative and qualitative geographic data; emphasis on hands-on, practical experience with commonly used analysis software and qualitative methods including interviewing and archival research; problems commonly encountered in dealing with data. **Prerequisite:** STAT 303.

GEOG 320 The Middle East

Credits 3. 3 Lecture Hours. Regional geography of the Middle East; physical setting and the historical evolution of Middle Eastern landscapes; current issues. **Prerequisites:** Junior or senior classification.

GEOG 323 Geography of Latin America

Credits 3. 3 Lecture Hours. Physical and cultural characteristics of Latin America; physical landscape, cultural succession and the present cultural landscape; details on sub-regions.

GEOG 324 Global Climatic Regions

Credits 3. 3 Lecture Hours. Climatological processes and their consequences for spatial distributions of climates; survey of earth's climates; relationships among climate, landforms, vegetation, soils and humans. **Prerequisite:** GEOG 203 or ATM0 201 or approval of instructor.

GEOG 325 Geography of Europe

Credits 3. 3 Lecture Hours. Regional geography of European landmass; global, political and cultural characteristics of European geography in historical and ecological contexts. **Prerequisite:** Junior or senior classification.

GEOG 330 Resources and the Environment

Credits 3. 3 Lecture Hours. Changing demand for land and sea resources; international conditions of population growth, resource depletion and geopolitical control; resource perceptions and decision-making.

GEOG 331 Geomorphology

Credits 3. 2 Lecture Hours. 3 Lab Hours. Principles and fundamentals of landform analysis. Laboratory work in advanced map interpretation. **Prerequisite:** GEOL 101 or GEOG 203; also taught at Galveston campus.

GEOG 335 Pattern and Process in Biogeography

Credits 3. 3 Lecture Hours. Distribution of organisms across the earth and on environmental and cultural processes that have contributed to these patterns of distribution; dynamic nature of biogeographic patterns; impacts of contemporary and prehistoric humans on plant and animal distributions; methods for exploring biogeographic patterns and detecting change. **Prerequisite:** Junior or senior classification.

GEOG 352/GEOL 352 GNSS in the Geosciences

Credits 3. 2 Lecture Hours. 3 Lab Hours. Fundamentals of Global Navigation Satellite Systems (GNSS); basic geodesy, figure of the earth; frames of reference, map projection, datums, ellipsoids; GPS accuracy and precision; applications in earth resource mapping and database creation; elementary GPS phase data processing. **Prerequisite:** Junior or senior classification or approval of instructor. **Cross Listing:** GEOL 352/ GEOG 352.

GEOG 360 Natural Hazards

Credits 3. 3 Lecture Hours. Introduction to the types and causes of natural events that pose risk to society; an examination of prevailing concepts and theories of human response and vulnerability; characteristics of natural events; natural hazard paradigms; case studies. **Prerequisites:** GEOG 203 or GEOL 101; junior or senior classification; also taught at Galveston campus.

GEOG 361 Remote Sensing in Geosciences

Credits 4. 3 Lecture Hours. 2 Lab Hours. Introduction to the principles, techniques and applications of remote sensing technology in geosciences including the analysis and interpretation of airborne and spaceborne remote sensing data for studying key earth system processes. **Prerequisite:** Junior or senior classification.

GEOG 370/MARS 370 Coastal Processes

Credits 3. 3 Lecture Hours. Introduction to the coastal system, waves and wave dominated coasts, shoreline morphodynamics, tidal and lake coasts, long term coastal development, sea level changes, subtidal and beach ecosystems, coastal dunes and wetlands, structures and organizations, coastal management and coastal hazards. **Cross Listing:** MARS 370/GEOG 370.

GEOG 380 Workshop in Environmental Studies

Credits 2 to 6. 2 to 6 Lab Hours. The study, understanding and solution of human environment problems based on principles learned in the classroom; library, laboratory and field work carried out by individuals and in groups; reports on work accomplished. May be repeated for credit as many as three times. **Prerequisite:** GEOG 330.

GEOG 390 Principles of Geographic Information Systems

Credits 4. 3 Lecture Hours. 2 Lab Hours. Basic concepts of design, planning and implementation of geographic information systems. **Prerequisite:** Junior or senior classification.

GEOG 391 Geodatabases

Credits 4. 3 Lecture Hours. 2 Lab Hours. GIS data modeling; introductory and advanced spatial SQL (structured query language); spatial database management system (DBMS) server setup, management and maintenance; spatial DBMS design, implementation, tuning, performance analysis and indexing; connecting spatial data services and warehouses to GIS software. **Prerequisite:** Junior or senior classification.

GEOG 392 GIS Programming

Credits 4. 3 Lecture Hours. 2 Lab Hours. Programming for geographic information science applications; principles of programming syntax and data structures; development of custom GIS programs; integration of programs into commercial GIS platforms. **Prerequisites:** GEOG 390 or equivalent, or approval of instructor; junior or senior classification.

GEOG 395 Cartography and Geovisualization

Credits 4. 3 Lecture Hours. 2 Lab Hours. Cartographic and data visualization applications of Geographic Information Systems (GIS); theory and practice of cartographic decisions and design; user interface, map design, and visualization of geospatial, spatiotemporal, 3D, and big data; designed map experiences for different environments and purposes. **Prerequisites:** GEOG 390.

GEOG 398 Interpretation of Aerial Photographs

Credits 3. 2 Lecture Hours. 3 Lab Hours. Identification and evaluation of natural and cultural features on aerial photographs; methods for extracting information concerning land use, vegetative cover, surface and structural features, urban/industrial patterns and archaeological sites. **Prerequisites:** Junior or senior classification or approval of instructor.

GEOG 400 Arid Lands Geomorphology

Credits 3. 3 Lecture Hours. Introduction to the geomorphology of deserts; processes, origin and evolution of arid lands; urban geomorphology in drylands; desertification.

GEOG 401 Political Geography

Credits 3. 3 Lecture Hours. The political process at a variety of geographic scales: international, intranational and urban; origins of territorial organization and conflicts over access to and use of space and its resources.

GEOG 405 Field Trips

Credits 1 to 4. 1 to 4 Other Hours. Supervised field trip to investigate the physical, economic and cultural processes that influence the spatial development and distribution on the landscape. May be repeated for credit. **Prerequisites:** GEOG 201, GEOG 202, GEOG 203 or GEOG 205, or concurrent enrollment; approval of instructor.

GEOG 406 Geographic Perspectives on Contemporary Urban Issues

Credits 3. 3 Lecture Hours. Contemporary readings on spatial patterns and processes in urban environments; sprawl; human-environment interaction; housing; development and growth; concept of place; scale; power and policy. **Prerequisite:** GEOG 304 or GEOG 306 or equivalent.

GEOG 409 Geographies of Decarbonization

Credits 3. 3 Lecture Hours. Geographical analysis of decarbonizing energy systems; territorialization and justice processes associated with decarbonization; implications of decarbonization for places and landscapes; influence of path dependencies and institutions on decarbonization. **Prerequisites:** GEOG 330 or GEOG 309 or approval of instructor.

GEOG 410/OCNG 412 Global Change

Credits 3. 3 Lecture Hours. The interaction of the earth, atmosphere, oceans, cryosphere and life, including the impact of human society on the environment and climate; global change modeling; politics, policy and decision making; and personal awareness. **Prerequisite:** Junior or senior classification. **Cross Listing:** OCNG 412/GEOG 410.

GEOG 420 Geography of Terrorism

Credits 3. 3 Lecture Hours. Exploration of global terrorism and counter terrorism; regional conflicts and mass violence; construction of places and regions associated with terror; American reactions to global terrorism. **Prerequisite:** Junior or senior classification.

GEOG 430 Environmental Justice

Credits 3. 3 Lecture Hours. Exploration into the spatial variability and human geography of exposure to environmental hazards in U.S. and international contexts; emphasizes environmental equity and environmental racism as it relates to occupational, leisure, and residential geography. **Prerequisites:** GEOG 201 or GEOG 202; junior or senior classification.

GEOG 434 Hydrology and Environment

Credits 4. 3 Lecture Hours. 2 Lab Hours. Examination of hydrologic processes in relation to climate, soils, vegetation, land use practices, and human impacts; natural scientific perspectives emphasized; field and laboratory included. **Prerequisite:** GEOG 203 or equivalent.

GEOG 435 Principles of Plant Geography

Credits 3. 2 Lecture Hours. 3 Lab Hours. Plant distributions, their associations and environmental relationships; survey of the principal explanatory systems; field and laboratory study of area patterns at various geographic scales. A weekend field trip is required. **Prerequisite:** BIOL 101 or BIOL 107 or BIOL 301 or approval of instructor.

GEOG 440 History and Nature of Geography

Credits 3. 3 Lecture Hours. Summary of classical knowledge of world; development of thought on nature of geography from 1800 to present. **Prerequisite:** Junior or senior classification.

GEOG 442/GEOL 442 Past Climates

Credits 3. 3 Lecture Hours. Terrestrial and marine proxy records of past climate variability, including tree rings, coral, and sediments; past climate change events such as the Little Ice Age and Medieval Warm Period; greenhouse gases and global temperature; insight into the nature of climate change and challenges humankind faces in the next few centuries. **Prerequisites:** GEOL 101, GEOL 104, GEOL 150, ATMO 201, GEOG 203, or OCNG 251; junior or senior classification. **Cross Listing:** GEOL 442/GEOG 442.

GEOG 443/GEOL 443 Global Biogeochemical Cycles

Credits 3. 3 Lecture Hours. Use of biogeochemical cycles to study the Earth system; description of movement and transformation of major elements such as C, N, P and trace elements; flux of material in and out of atmosphere, hydrosphere, pedosphere, and lithosphere; chemical and physical transformations that occur in Earth system. **Prerequisites:** CHEM 119 and CHEM 120; select two from ATMO 201, or OCNG 251, or GEOG 203 or GEOG 205, or GEOL 101 or GEOL 104 or GEOL 150. **Cross Listing:** GEOL 443/GEOG 443.

GEOG 450 Field Geography

Credits 3. 1 Lecture Hour. 6 Lab Hours. Introduction to field methods; documenting materials, reconnaissance, the field plan; mapping traverse, base maps and aerial photographs; recording techniques; interview procedures. Fields trips required, some on weekends and/or semester breaks, for which departmental fees may be assessed to cover costs. **Prerequisite:** 15 hours of geography or equivalent.

GEOG 461 Digital Image Processing in the Geosciences

Credits 4. 3 Lecture Hours. 2 Lab Hours. Key remote-sensing digital image processing methods; advanced topics in feature extraction, radiometric calibration, image enhancement, pattern recognition and geoscience applications. **Prerequisite:** GEOG 361 or equivalent and junior or senior classification.

GEOG 462/ECCB 406 Advanced GIS Analysis for Natural Resources Management

Credits 3. 2 Lecture Hours. 2 Lab Hours. Advanced topics in geographic information systems (GIS) to solve natural resource problems; manipulation of raster data types; three-dimensional modeling; emphasis on geoprocessing as it relates to applied projects particularly with habitat suitability models; field and lab use of global positioning systems (GPS); internet-based GIS modeling. **Prerequisites:** ECCB 351, RWFM 351, or AGSM 461, or equivalent, or approval of instructor; junior or senior classification. **Cross Listing:** ECCB 406/GEOG 462.

GEOG 467 Dynamic Modeling of Earth and Environmental Systems

Credits 4. 3 Lecture Hours. 2 Lab Hours. Dynamical systems modeling; key concepts and processes in earth and environmental systems; human impact on these systems; model building and testing; system behavior over time; model validation and sensitivity; examples from the applications in earth and environmental sciences. **Prerequisite:** GEOG 203 or approval of instructor.

GEOG 475 Advanced Topics in GIS (Geographic Information Systems)

Credits 4. 3 Lecture Hours. 2 Lab Hours. Advanced Topics in Geographic Information Systems. Topics related to GIS implementation, spatial database design, spatial data analysis, and various advanced GIS applications. **Prerequisite:** GEOG 390 or equivalent.

GEOG 476 GIS Practicum

Credits 3. 3 Other Hours. Introduction to current topics in Geographic Information Science including ethical and legal issues surrounding spatial technologies, proper GIS management practices and professional certification; development of professional research, technical and communication skills through participation in a coordinated internship or independent research project. Meets writing-intensive course requirements for environmental geosciences, environmental studies and geography majors. **Prerequisites:** Senior classification and enrollment in Geographic Information Science and Technology or approval of instructor.

GEOG 477 Terrain Analysis and Mapping

Credits 4. 3 Lecture Hours. 2 Lab Hours. Geomorphometry for land surface characterization; fundamentals of terrain analysis; theory of land surface dynamics; application of software for digital terrain modeling and analysis. **Prerequisites:** GEOG 361 and GEOG 390 or equivalents, or approval of instructor; junior or senior classification.

GEOG 478 WebGIS

Credits 4. 3 Lecture Hours. 2 Lab Hours. Investigation of web-based geographic information systems; introduction to server-oriented architectures for web-based applications and services; development of web applications; management of web servers, web services and databases. **Prerequisites:** GEOG 390 or equivalent, or approval of instructor; junior or senior classification.

GEOG 479 Principles of Geocomputation

Credits 4. 3 Lecture Hours. 2 Lab Hours. Geocomputation including geospatial technologies, computational techniques and algorithms utilizing high-performance computing; fundamental geocomputation principles, artificial and computational intelligence. **Prerequisites:** GEOG 361, GEOG 390, GEOG 475; CSCE 110 or CSCE 111.

GEOG 484 Internship

Credits 0 to 12. 0 to 12 Lecture Hours. Directed internship in a private firm, government agency or non-governmental organization to provide work experience related to the student's degree program and career objectives. **Prerequisites:** Junior or senior classification and approval of internship agency and departmental internship director.

GEOG 485 Directed Studies

Credits 1 to 23. 1 to 23 Other Hours. Individually supervised research or advanced study on restricted areas not covered in regular courses. **Prerequisite:** Approval of department head.

GEOG 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified area of geography. May be repeated for credit. **Prerequisite:** Approval of instructor.

GEOG 491 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in geography. May be repeated for credit. Registration in multiple sections of this course is possible within a given semester provided that the per semester credit hour limit is not exceeded. **Prerequisites:** Junior or senior classification and approval of instructor.

GEOL - Geology (GEOL)

GEOL 101 Principles of Geology

Credits 3. 3 Lecture Hours. (GEOL 1303, GEOL 1403*) Principles of Geology. Physical and chemical nature of the Earth and dynamic processes that shape it; plate tectonics, Earth's interior, materials it is made of, age and evolution, earthquakes, volcanism, erosion and deposition; introduces physical and chemical principles applied to the Earth; also taught at Galveston campus. Not open to students who have taken GEOL 103 or GEOL 104.

GEOL 102 Principles of Geology Laboratory

Credit 1. 2 Lab Hours. (GEOL 1103, GEOL 1403*) Principles of Geology Laboratory. Laboratory exercise-based introduction to the physical and chemical nature of the Earth and dynamic process that shape it; rock and mineral types; topographic and geologic maps; complements GEOL 101 but can be taken independently; also taught at Galveston campus.

GEOL 104 Physical Geology

Credits 4. 3 Lecture Hours. 3 Lab Hours. Earth materials, structures, external and internal characteristics; physical processes at work upon or within the planet. A working knowledge of high school chemistry and mathematics is required; also taught at Qatar campus.

GEOL 106 Historical Geology

Credits 4. 3 Lecture Hours. 3 Lab Hours. (GEOL 1104 and 1304, 1404) Historical Geology. Hypotheses of Earth's origin; age dating of geologic materials; development and history of life; plate tectonic reconstructions, geologic history, and paleogeography, with emphasis on the North American plate; also taught at Galveston campus.

GEOL 110/ATMO 110 Disasters and Society

Credits 3. 3 Lecture Hours. Exploration of the science behind disasters; how they occur, the choices society makes that create or affect disasters, how certain populations are privileged during disasters by the decisions society has made and how science informs preparation for and response to future disasters. **Cross Listing:** ATMO 110/GEOL 110.

GEOL 150 Introduction to the Solid Earth

Credits 4. 3 Lecture Hours. 2 Lab Hours. Introduction to the dynamic earth for careers in geosciences; origin and structure of the earth; earth materials and processes, particularly as they relate to plate tectonics; maps as a basic tool of geologists; not open to students who have taken GEOL 101 or GEOL 104.

GEOL 152 History of the Earth

Credits 4. 3 Lecture Hours. 2 Lab Hours. Evolution of life, plate tectonics processes, geography and climate through earth's history; the timing of major events in earth history; sedimentary environments and stratigraphy; fossils; biostratigraphic and radiometric dating of rocks; not open to students who have taken GEOL 106 or GEOL 208. **Prerequisites:** GEOL 101 and GEOL 102, or GEOL 104, or GEOL 150.

GEOL 180 Introduction to Geology and Geophysics

Credit 1. 1 Lecture Hour. Introduction to careers in geology and geophysics; campus resources for academic and personal success; tools for developing study skills and navigating the university; use of reflection to assess personal strengths, weaknesses and responsibilities and to devise strategies for improvement. **Prerequisite:** Approval of instructor.

GEOL 203 Mineralogy

Credits 4. 3 Lecture Hours. 3 Lab Hours. Crystallography, crystal chemistry, mineral chemistry, optical crystallography, physical properties, and geologic occurrence of rock-forming and economic minerals. **Prerequisites:** GEOL 101 and GEOL 102, or GEOL 104, or GEOL 150; MATH 151 or MATH 142; CHEM 119, or CHEM 107 and CHEM 117.

GEOL 207 Dinosaur World

Credits 3. 2 Lecture Hours. 2 Lab Hours. Survey of dinosaur paleobiology and paleoecology; terrestrial paleoclimate and paleoenvironments of the Mesozoic; dinosaur ancestors; appearance and radiation of dinosaurs; paleoecology and paleobiology of major dinosaur groups; extinction of large dinosaurs and the Cretaceous/Paleogene mass extinction; the appearance and ancestry of birds.

GEOL 208 Life on a Dynamic Planet

Credits 3. 2 Lecture Hours. 2 Lab Hours. Critical events in the Earth's 4.6 billion-year history that shaped life as we know it and the tools to investigate them; interactions between global environments, the evolution of life and the geologically recent development of human societies; not open to students who have taken GEOL 106 or GEOL 152.

GEOL 210 Geological Communication

Credits 3. 3 Lecture Hours. Introduction to communicating as a scientist particularly in geological settings; using precise language, illuminating graphs and correct mathematical and chemical symbols to describe geological observations and concepts in writing; using basic statistics to describe geological data and uncertainty; recognizing scientific ethical dilemmas and plagiarism and interpretation. **Prerequisites:** GEOL 101 and GEOL 102, or GEOL 104, or GEOL 150; ENGL 104; MATH 151 or MATH 142.

GEOL 250 Geological Field Methods

Credits 4. 3 Lecture Hours. 3 Lab Hours. Fundamental aspects of geologic mapping; field observation, data gathering and recording, use of a Brunton compass, pace-and-compass mapping, measurement of stratigraphic sections; topographic map use and interpretation, interpretation of geologic map patterns, construction of geologic cross sections; Integrating field and remote data to address geologic problems using GIS software; field trip fee charged at registration. **Prerequisites:** GEOL 101 and 102, or GEOL 104, or GEOL 150; GEOL 152.

GEOL 285 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Directed studies in specific problem areas of geology. **Prerequisite:** Approval of instructor.

GEOL 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified area of geology. May be repeated for credit. **Prerequisite:** Approval of instructor.

GEOL 291 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in geology. May be repeated 2 times for credit. Registration in multiple sections of this course is possible within a given semester provided that the per semester credit hour limit is not exceeded. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

GEOL 301 Mineral Resources

Credits 3. 2 Lecture Hours. 3 Lab Hours. Origin, geologic relations and geographic distribution of mineral and energy resources; mineral economics, mining and reclamation and global economics in the resource industry; identification and classification of economic minerals including energy resources, base and precious metals, chemical industrial minerals and gemstones. **Prerequisites:** GEOL 101 and 102, or GEOL 104, or GEOL 150; CHEM 107 and CHEM 117, or CHEM 119.

GEOL 304 Igneous and Metamorphic Petrology

Credits 4. 3 Lecture Hours. 3 Lab Hours. Origin and evolution of igneous and metamorphic rocks; identification, classification and petrographic analysis; relationships to tectonic settings; genetic processes inferred from laboratory studies and field occurrences. **Prerequisites:** GEOL 203; CHEM 120.

GEOL 306 Sedimentology and Stratigraphy

Credits 4. 3 Lecture Hours. 3 Lab Hours. Origin of sediments and sedimentary rocks; climate, weathering, and weathering products; transport, deposition, and depositional environments for sediments; field and laboratory studies in description and interpretation of genesis of sedimentary rocks; principles of stratigraphy and basin analysis; plate tectonics and the formation of sedimentary basins; stratigraphic nomenclature; geologic time and correlation; sequence stratigraphy and basin architecture. **Prerequisite:** CHEM 119 or equivalent; GEOL 152 or equivalent.

GEOL 310 Planetary Geology

Credits 3. 3 Lecture Hours. Introduction to planetary science; organization and composition of the solar system, including the planets, satellites and asteroids; surface features and internal structures of the terrestrial planets and moons; the dynamic processes of planetary resurfacing, including volcanism, tectonism, weathering and impacts; the history and future of solar system exploration. **Prerequisites:** GEOL 101 and GEOL 102, or GEOL 104, or GEOL 150.

GEOL 312 Structural Geology and Tectonics

Credits 4. 3 Lecture Hours. 3 Lab Hours. Fundamentals of the deformation of the lithosphere ranging from plate to atomic scales; stress, strain, experimental rock deformation, microscopic mechanisms and mechanical behaviors; analysis of faults, folds, flow and rock fabrics; subsurface interpretation; regional tectonics of selected areas; practical experience in geometric and kinematic analysis, constructing balanced cross sections. **Prerequisites:** GEOL 101 and GEOL 102, or GEOL 104, or GEOL 150; MATH 142 or MATH 152; PHYS 201 or PHYS 206.

GEOL 314 Paleontology and Geobiology

Credits 4. 3 Lecture Hours. 3 Lab Hours. Biosphere-geosphere interactions, including prokaryote controls on sedimentary geochemistry and organismal distributions, and fossil preservation; fossils in the context of evolutionary theory and global change; identification of important groups of marine fossils; use of fossils to determine the stratigraphic age of rocks and the history of life on Earth. **Prerequisites:** CHEM 107 and CHEM 117, or CHEM 119; GEOL 306.

GEOL 320 Geology for Civil Engineers

Credits 3. 2 Lecture Hours. 3 Lab Hours. Principles of physical and engineering geology; properties of minerals, rocks and soils; active surface and subsurface processes; applications to the siting, design, construction, operation and maintenance of engineered works and the protection of the environment. A three-day field trip is required (a field trip fee is charged at registration). **Prerequisite:** GEOL 101 and GEOL 102, or GEOL 104, or GEOL 150.

GEOL 330 Geologic Field Trips

Credits 1 to 3. 1 to 3 Other Hours. Field trips to observe, analyze and interpret the geology and geophysics of selected localities in Texas and adjacent regions; complements classroom experience. Trip frequencies, duration, dates and study localities vary with semester. May be repeated for credit. **Prerequisite:** GEOL 101 and GEOL 102, or GEOL 104 or GEOL 150, or approval of instructor.

GEOL 350 Summer Field Geology

Credits 3. 3 Other Hours. Intense immersive geologic mapping experience, integrating geological skills from throughout the curriculum; concepts of field relationships and field techniques are used to develop geologic maps, stratigraphic columns, cross-sections and geologic interpretations for a variety of geologic provinces; conduct off-campus in a field area or areas for three to four weeks; field trip fee charged at registration. **Prerequisites:** GEOL 304, GEOL 314, GEOL 306, GEOL 250 and GEOL 312.

GEOL 351 Geochemistry

Credits 3. 3 Lecture Hours. Chemical principles and processes responsible for the formation and cycling of Earth materials; chemical equilibrium and kinetics, acidity and alkalinity in the environment, oxidation-reduction reactions, organic geochemistry, isotope geochemistry; application to crustal processes, climate science, pollution, and petroleum and mineral exploration. **Prerequisite:** CHEM 120; GEOL 150, or GEOL 104, or GEOL 101 and GEOL 102; or approval of instructor.

GEOL 352/GEOG 352 GNSS in the Geosciences

Credits 3. 2 Lecture Hours. 3 Lab Hours. Fundamentals of Global Navigation Satellite Systems (GNSS); basic geodesy, figure of the earth; frames of reference, map projection, datums, ellipsoids; GPS accuracy and precision; applications in earth resource mapping and database creation; elementary GPS phase data processing. **Prerequisites:** Junior or senior classification or approval of instructor. **Cross Listing:** GEOG 352/GEOL 352.

GEOL 360 Analyzing Data in Geology

Credits 3. 3 Lecture Hours. Scientific programming and statistical methods commonly used in geology; univariate and multivariate statistical analyses to geological data; writing short programming scripts for R; evaluating statistical approaches and solving methodological obstacles. **Prerequisite:** GEOL 101 and GEOL 102, or GEOL 104, GEOL 150, or GEOL 208; MATH 142, MATH 147, MATH 151, or MATH 171.

GEOL 404 Geology of Petroleum

Credits 3. 2 Lecture Hours. 3 Lab Hours. Origin, migration and accumulation of petroleum; typical U.S. oil and gas fluids; laboratory work in subsurface geology. **Prerequisites:** GEOL 101 and GEOL 102, or GEOL 104 or GEOL 150; also taught at Qatar campus.

GEOL 410 Hydrogeology

Credits 3. 2 Lecture Hours. 2 Lab Hours. Geologic conditions determining the distribution and movement of ground water and their effect on the hydrologic properties of aquifers. **Prerequisite:** MATH 151 and MATH 152, or equivalent; junior or senior classification.

GEOL 412 Environmental Hydrogeology

Credits 3. 2 Lecture Hours. 2 Lab Hours. Hydrogeological, physical and geochemical processes related to geohazards and contaminant transport in the subsurface and its environmental impacts including land subsidence, flood control, slope stability control, waste disposal, groundwater resources pollution and protection, karst aquifer protection. **Prerequisite:** GEOL 410 or approval of instructor.

GEOL 416 Petroleum Systems Analysis and Basin Modeling

Credits 3. 3 Lecture Hours. Geological processes in sedimentary basins; petroleum system elements and modeling; hydrocarbon generation, expulsion, migration, accumulation; fluid analysis; multi-disciplinary data integration; basin modeling software and simulation. **Prerequisite:** GEOL 306, junior or senior classification or approval of instructor.

GEOL 420 Environmental Geology

Credits 3. 2 Lecture Hours. 2 Lab Hours. Geologic concepts of the nature of geologic environments and the dynamics of geologic processes needed to characterize and quantify human interactions with specific geologic systems including aquifers, watershed, coastlines and wetlands; specific techniques, including geophysical and geochemical techniques, field mapping, geographical information systems and remote sensing used to monitor human-geosphere interactions. **Prerequisites:** GEOL 101 or GEOL 203; junior or senior classification or approval of instructor.

GEOL 440 Engineering Geology

Credits 3. 2 Lecture Hours. 3 Lab Hours. Fundamentals of soil, rock and fluid mechanics and basic engineering practices as applied to the analysis of the geologic environment for engineering uses; intended for geoscience majors with no engineering courses. **Prerequisites:** GEOL 306 or approval of instructor; PHYS 218.

GEOL 442/GEOG 442 Past Climates

Credits 3. 3 Lecture Hours. Terrestrial and marine proxy records of past climate variability, including tree rings, coral, and sediments; past climate change events such as the Little Ice Age and Medieval Warm Period; greenhouse gases and global temperature; insight into the nature of climate change and challenges humankind faces in the next few centuries. **Prerequisites:** GEOL 101, GEOL 104, GEOL 150, ATMO 201, GEOG 203, or OCNG 251; junior or senior classification. **Cross Listing:** GEOG 442/GEOL 442.

GEOL 443/GEOG 443 Global Biogeochemical Cycles

Credits 3. 3 Lecture Hours. Use of biogeochemical cycles to study the Earth system; description of movement and transformation of major elements such as C, N, P and trace elements; flux of material in and out of atmosphere, hydrosphere, pedosphere, and lithosphere; chemical and physical transformations that occur in Earth system. **Prerequisites:** CHEM 119 and CHEM 120; select two from ATMO 201, or OCNG 251, or GEOG 203 or GEOG 205, or GEOL 101 or GEOL 104 or GEOL 150. **Cross Listing:** GEOG 443/GEOL 443.

GEOL 450 Geology Senior Project

Credits 3. 2 Lecture Hours. 3 Lab Hours. Conducting and communicating a team research project in geology and/or geophysics; formulating a research question and a plan to answer that question; synthesizing and interpreting the geological and geophysical literature; written and oral presentation of findings and critiquing those findings. **Prerequisites:** GEOL 210 and junior or senior classification, or approval of instructor.

GEOL 451 Introduction to Geochemistry

Credits 3. 2 Lecture Hours. 2 Lab Hours. Chemical principles and processes responsible for the formation and cycling of earth materials, with emphasis on low temperature equilibria and kinetics in rockwater systems. **Prerequisite:** GEOL 304 or approval of instructor.

GEOL 478 Earth Science Modeling

Credits 4. 3 Lecture Hours. 3 Lab Hours. Techniques for building, solving and analyzing numerical models applied to a wide variety of problems in geology, geochemistry, geobiology and geophysics; derivation and scaling of conservation laws; finite difference and finite element techniques; programming in MATLAB or a higher-level language. **Prerequisites:** MATH 151; MATH 152; junior or senior classification.

GEOL 481 Seminar

Credit 1. 1 Other Hour. Review of selected topics in the geological literature; preparation of oral and written reports. **Prerequisites:** Junior or senior classification or approval of instructor.

GEOL 484 Internship

Credits 0. 0 Other Hours. Directed internship in a private firm, government agency or non-governmental organization to provide work experience related to the student's degree program and career objectives. May be taken two times. **Prerequisites:** Junior or senior classification and approval of internship agency and approval of instructor.

GEOL 485 Directed Studies

Credits 1 to 12. 1 to 12 Other Hours. Advanced problems in geology; also taught at Galveston and Qatar campuses. **Prerequisites:** Junior or senior classification or approval of instructor.

GEOL 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified area of geology. May be repeated for credit. **Prerequisite:** Approval of instructor.

GEOL 491 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in geology. May be repeated 2 times for credit. Registration in multiple sections of this course is possible within a given semester provided that the per semester credit hour limit is not exceeded. **Prerequisites:** Junior or senior classification and approval of instructor.

GEOP - Geophysics (GEOP)

GEOP 170 Planet Quest

Credits 3. 3 Lecture Hours. Materials and processes that create solar systems and potentially habitable exoplanets; use of simple models to explore how exoplanets are found, and how the existence and surface condition of a planet are affected by stellar composition and luminosity, physics of orbits, gravity, magnetism, volcanism and tectonics.

GEOP 291 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in geophysics. May be repeated 2 times for credit. Registration in multiple sections of this course is possible within a given semester provided that the per semester credit hour limit is not exceeded. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

GEOP 313 Geophysical Field Methods

Credits 4. 3 Lecture Hours. 2 Lab Hours. Planning, safe execution and analysis of applied geophysical surveying including magnetics, gravity, resistivity, induced polarization, seismic reflection, seismic refraction, ground-penetrating radar, frequency-domain and time-domain electromagnetic induction; experimental design, precise navigation, quality assurance and control, data management, elementary processing, error analysis and estimation, visualization and interpretation procedures. **Prerequisites:** GEOP 341; PHYS 206 and PHYS 207, or equivalent; MATH 308; GEOL 250.

GEOP 341 Fundamentals of Geophysics

Credits 3. 2 Lecture Hours. 2 Lab Hours. The structure, composition and evolution of the earth; the concepts and application of various geophysical methods to infer earth structure, including seismology, gravity and geodesy, magnetics; generation of internal heat and heat loss; quantification of the driving forces of plate tectonics and isostatic topography. **Prerequisites:** PHYS 206 and PHYS 207, or equivalent; MATH 308; GEOL 150 or equivalent.

GEOP 361 Geophysical Signal Processing

Credits 3. 2 Lecture Hours. 2 Lab Hours. Fundamental concepts in digital signal processing for geophysicists; practical applications of sampling theory, Fourier analysis, filter design, spectral decomposition, instrument deconvolution, and methods of finding hidden signals within geophysical data; Matlab-based laboratory exercises involve analysis of various types of real geophysical/geological data. **Prerequisites:** GEOP 341, PHYS 206, PHYS 207, and MATH 311 or equivalent.

GEOP 413 Near-surface Geophysics

Credits 3. 3 Lecture Hours. Fundamentals of traditional and emergent surface and borehole geophysical methods, as they are applied to shallow (less than 100 meters) subsurface investigations; emphasis on electrical, magnetic and electromagnetic methods; seismic reflection and crosswell tomography. **Prerequisites:** GEOP 313, GEOP 361, PHYS 206, and PHYS 207, or approval of instructor.

GEOP 421 Seismology

Credits 4. 3 Lecture Hours. 2 Lab Hours. Mathematical theory of elasticity and seismic wave propagation; properties of body and surface waves and applications to inference of earth structure; introduction to source theory; use of seismic data to determine major earth structures; characteristics of seismic noise fields; influence seismic anisotropy. **Prerequisites:** GEOP 361, MATH 311 and PHYS 206, or approval of instructor.

GEOP 435 Methods of Geophysical Exploration

Credits 4. 3 Lecture Hours. 3 Lab Hours. Introduction to theory of gravity, magnetic, electrical and seismic exploration methods; physical properties of earth materials and their influence on geophysical measurements; limitations of geophysical data in the interpretation of subsurface structure. **Prerequisites:** GEOL 250 and MATH 251.

GEOP 470 Computational Geophysics

Credits 3. 3 Lecture Hours. Techniques used in the study of geophysical processes, including heat and chemical transport in the Earth, rock deformation and viscous fluid flow; development of conservation laws, relevant boundary conditions and analytical solutions; introduction to numerical solutions. **Prerequisites:** GEOL 101 and GEOL 102 or GEOL 104 or GEOL 150; MATH 308; or approval of instructor.

GEOP 475 Interpretation of Gravity and Magnetic Fields

Credits 3. 3 Lecture Hours. Applications of potential theory in the interpretation of gravity and magnetic fields; analysis of geophysical anomalies produced by geologic structures and by variation in the physical properties of rocks; use of regional gradients, residual anomalies, higher derivatives and surfaces, line integrals and two and three dimensional models. **Prerequisites:** GEOL 312; MATH 311 or approval of instructor.

GEOP 484 Internship

Credits 0. 0 Other Hours. Directed internship in a private firm, government agency or non-governmental organization to provide work experience related to the student's degree program and career objectives. May be taken two times. **Prerequisites:** Junior or senior classification and approval of internship agency and approval of instructor.

GEOP 485 Directed Studies

Credits 1 to 12. 1 to 12 Other Hours. Advanced problems in geophysics. **Prerequisites:** Junior or senior classification or approval of instructor.

GEOP 489 Special Topics In...

Credits 1 to 4. 1 to 4 Other Hours. Selected topics in geophysics. May be repeated for credit. **Prerequisite:** Junior or senior classification.

GEOP 491 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in geophysics. May be repeated 2 times for credit. Registration in multiple sections of this course is possible within a given semester provided that the per semester credit hour limit is not exceeded. **Prerequisites:** Junior or senior classification and approval of instructor.

GERM - German (GERM)

GERM 101 Beginning German I

Credits 4. 3 Lecture Hours. 2 Lab Hours. (GERM 1411) Beginning German I. Elementary language study with oral, written and reading practice. Preparation for conversation. Part of class preparation will be done in language laboratory.

GERM 102 Beginning German II

Credits 4. 3 Lecture Hours. 2 Lab Hours. (GERM 1412) Beginning German II. Continuation of GERM 101. Part of class preparation will be done in language laboratory. **Prerequisite:** GERM 101.

GERM 104 Intensive Beginning German

Credits 8. 8 Lecture Hours. 0 Lab Hours. Accelerated elementary language study, with oral, listening, reading, and writing practice. Equivalent to GERM 101 and GERM 102.

GERM 121 Beginning German Abroad I

Credits 4. 4 Lecture Hours. Elementary language study with focus on development of oral, written, and reading competencies; preparation for conversation and other forms of authentic interaction; conducted abroad and in German.

GERM 122 Beginning German Abroad II

Credits 4. 4 Lecture Hours. Continuation of GERM 121; elementary language study with focus on development of oral, written, and reading competencies; preparation for conversation and other forms of authentic interaction; conducted abroad and in German. **Prerequisites:** GERM 101 or GERM 121.

GERM 201 Intermediate German I

Credits 3. 3 Lecture Hours. (GERM 2311) Intermediate German I. Readings of average difficulty; review of grammar; practice in conversation composition. **Prerequisite:** GERM 102 or GERM 104.

GERM 202 Intermediate German II

Credits 3. 3 Lecture Hours. (GERM 2312) Intermediate German II. Continuation of GERM 201 with more advanced material. Some literary selections included in class readings. **Prerequisite:** GERM 201.

GERM 204 Intensive Intermediate German

Credits 6. 6 Lecture Hours. Accelerated intermediate-level language study, with oral, listening, reading, and writing practice. Equivalent to GERM 201 and GERM 202. **Prerequisite:** GERM 102 or GERM 104.

GERM 221 Field Studies I

Credits 3. 3 Other Hours. German language and culture taught in Germany; supervised travel of cultural interest; living with local families; participation in the activities and courses of a German university or institute; written and oral reports, exams. **Prerequisites:** GERM 102 or GERM 104; GERM 222 or concurrent enrollment.

GERM 222 Field Studies II

Credits 3. 3 Other Hours. German language and literature taught in Germany in cooperation with a German university or institute; exams, written reports. **Prerequisites:** GERM 102 or GERM 104; GERM 221 or concurrent enrollment.

GERM 285 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Individual supervision of readings or assigned projects in German, selected for each student individually. **Prerequisite:** Approval of instructor and department head.

GERM 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of German. May be repeated for credit. **Prerequisite:** Approval of instructor.

GERM 310 Composition

Credits 3. 3 Lecture Hours. Development of writing skills in German; emphasis on grammatical construction; taught in German. **Prerequisites:** GERM 202, GERM 204, or GERM 222; junior or senior classification or approval of instructor.

GERM 311 Conversation

Credits 3. 3 Lecture Hours. Development of effective communication skills in spoken German, with emphasis on language appropriate to various social context; taught in German. **Prerequisite:** GERM 202, GERM 204, or GERM 222; junior or senior classification or approval of instructor.

GERM 315 Literary Investigations: German Short Fiction

Credits 3. 3 Lecture Hours. Readings of selected works of short prose from the early 20th century to the present with emphasis on principles of literary analysis; conducted in German. **Prerequisites:** GERM 202, GERM 204, or GERM 222; junior or senior classification or approval of instructor.

GERM 316 Advanced Business German

Credits 3. 3 Lecture Hours. Continuation of GERM 203; reading and oral practice of German pertinent to business, trade and international commerce. **Prerequisite:** GERM 202, GERM 204, or GERM 222; junior or senior classification or approval of instructor.

GERM 321 German Culture and Civilization I

Credits 3. 3 Lecture Hours. German culture and civilization from classical antiquity to 1830; major stylistic periods in literature and the fine arts; conducted in German. **Prerequisite:** GERM 202, GERM 204, or GERM 222; junior or senior classification or approval of instructor.

GERM 322 German Culture and Civilization II

Credits 3. 3 Lecture Hours. German culture and civilization from 1830 to the present; conducted in German. **Prerequisite:** GERM 202, GERM 204, or GERM 222; junior or senior classification or approval of instructor.

GERM 331 German Literary Expression I

Credits 3. 3 Lecture Hours. Readings of selected drama, poetry, and prose works of German literature from the Middle Ages through Romanticism; problems involved in defining dramatic, lyric, and epic genres considered; structural and aesthetic elements of literary works; conducted in German. **Prerequisite:** GERM 310 or GERM 315, or concurrent enrollment.

GERM 332 German Literary Expression II

Credits 3. 3 Lecture Hours. Readings of selected drama, poetry, and prose works of German literature of the modern era; problems involved in defining dramatic, lyric, and epic genres considered; structural and aesthetic elements of literary works; conducted in German. **Prerequisite:** GERM 310 or GERM 315, or concurrent enrollment.

GERM 333 Contemporary Germany

Credits 3. 3 Lecture Hours. Social, political, and economic debates and issues in Germany from 1945 to the present through the arts (literature, film, video, music); focus on post-war reconstruction, divided Germany, and post-reunification periods; conducted in German. **Prerequisite:** GERM 310 or GERM 315, or concurrent enrollment.

GERM 334 German Drama

Credits 3. 3 Lecture Hours. Study, analysis and public presentation in German of a major German dramatic work; literary theory and intensive conversational practice combined with skills of language acquisition within a performance setting. **Prerequisite:** GERM 310 or GERM 315, or concurrent enrollment.

GERM 336 German Fairy Tales

Credits 3. 3 Lecture Hours. Introduction to and study of fairy tales and children's literature through German tradition in these forms; reception of fairy tales through adaptation and modernization; taught in German. **Prerequisite:** GERM 310 or GERM 315, or concurrent enrollment.

GERM 362 The Weimar Republic: Literature and Culture

Credits 3. 3 Lecture Hours. Film, theater and poetry in the turbulent era prior to the Nazi terror; conducted in German. **Prerequisite:** GERM 310 or GERM 315, or concurrent enrollment.

GERM 410 Seminar in German Literature and Culture

Credits 3. 3 Lecture Hours. Survey of major literary and intellectual landmarks of a period in German history (Enlightenment, Romanticism, High Modernism, post-1945); study of literary works in context of social and cultural history, with attention to Germany's particular place in Europe and the world; taught in German. May be taken two times. **Prerequisite:** GERM 310, GERM 315, or concurrent enrollment.

GERM 411 German Author and Genre Studies

Credits 3. 3 Lecture Hours. Examination of the work of a specific author, such as Goethe, Schiller, Kafka, Brecht, Frisch, or Grass, or the diachronic study of a specific genre, e.g., poetry, drama, prose; taught in German. May be taken two times. **Prerequisite:** GERM 310, GERM 315, or concurrent enrollment.

GERM 435/FILM 435 German Film

Credits 3. 3 Lecture Hours. Consideration and analysis of major works and directors of German Film; interpretation of culture through film; relationship of film to history, literature, and other arts; taught in English. May be repeated for credit. **Prerequisites:** Junior or senior classification, or approval of instructor. **Cross Listing:** FILM 435/GERM 435.

GERM 437 German Romanticism: Literature, Theory, Philosophy

Credits 3. 3 Lecture Hours. From Goethe's "Faust" to the romantic exaltation of poetry; influence of the romantic movement on European literary theory and philosophy; taught in English. **Prerequisite:** Junior or senior classification or approval of instructor.

GERM 440 Global Germany

Credits 3. 3 Lecture Hours. Impact of globalization on Germany and the globalization of German life and culture from postwar period to the present; analysis of theoretical, historical, fictional and/or cinematic works presenting relationship of modern Germany with world affairs. Course conducted in English. **Prerequisite:** Junior or senior classification or approval of instructor.

GERM 441 Representations of the Holocaust

Credits 3. 3 Lecture Hours. Analysis of artistic mediations of the Holocaust across diverse textual and visual media with particular focus on aesthetic, political, pedagogical, and ethical challenges. Course conducted in English. **Prerequisite:** Junior or senior classification or approval of instructor.

GERM 485 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Individual supervision of readings or assigned projects, selected for each student individually; written and oral reports. **Prerequisite:** Approval of instructor and department head.

GERM 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of German. May be repeated for credit. **Prerequisite:** Approval of instructor.

GERM 491 Research

Credits 1 to 3. 1 to 3 Other Hours. Research conducted under the direction of faculty member in German. May be taken three times for credit. **Prerequisites:** Junior or senior classification and approval of department head.

GLST - Global Studies (GLST)

GLST 201 Introduction to Global Studies

Credits 3. 3 Lecture Hours. Concepts, theories, and frameworks for a humanities-based approach to understanding global issues; focus on human cultures; emphasis on critical thinking and cultural literacy.

GLST 205 Research in Global Studies

Credits 3. 3 Lecture Hours. Introduction to academic research methods in Global Studies; emphasis on data analysis and library skills; qualitative and quantitative methods, theoretical approaches, and ethical considerations.

GLST 209 Languages in the United States

Credits 3. 3 Lecture Hours. Introduction to linguistic diversity in the United States, particularly the relationship between English and minority languages including Arabic, Chinese, German, Navajo, Spanish, etc.; investigation of topics such as bilingualism, history of immigration, language ideologies, language shift and maintenance, as well as case studies of individual minority language groups and their linguistic practices; taught in English.

GLST 210 Languages of the World

Credits 3. 3 Lecture Hours. Exploration of the fundamentals of language, including structures, lexicon, writing systems; examination of protolanguages, language families, and dialects; investigation of language contact, diversification, shift, attrition, and death, with a focus on revitalization of minority languages and linguistic rights.

GLST 211/ENGL 211 Foundations in Cultural Studies

Credits 3. 3 Lecture Hours. Introduction to history, influence and major ideas of Cultural Studies; use of culture as a means to critique social problems and understand social forces; analysis of culture in its relationship to power; participation in project investigating contemporary U.S. youth subcultures. **Cross Listing:** ENGL 211/GLST 211.

GLST 215/FILM 215 Global Cinema

Credits 3. 3 Lecture Hours. History and theory of global cinema; historical, socio-political, national and international contexts of film production and reception; transnational film; FILM-215 also taught at Galveston campus. **Cross Listing:** FILM 215/GLST 215.

GLST 220/WGST 220 Feminist Approaches to Science, Technology, and Medicine

Credits 3. 3 Lecture Hours. Introduction to selected topics about gender and the history of science; focus on feminist critique of science, technology, and medicine; exploration of the connections between the biomedical sciences and the politics of gender and sexuality in a global context. **Cross Listing:** WGST 220/GLST 220.

GLST 285 Directed Studies

Credits 0 to 3. 0 to 3 Other Hours. Individual supervision of readings or assigned projects in global studies. May be taken three times for credit. **Prerequisites:** Approval of instructor and department head.

GLST 289 Special Topics in...

Credits 1 to 4. 1 to 4 Other Hours. Introduction to the broad range of disciplines and issues explored in the global studies curriculum. May be repeated for credit. **Prerequisites:** Freshman or sophomore classification.

GLST 300 International Experience

Credits 0. For students completing an international experience; study abroad program, internship, volunteer service work, or a combination of these options with department approval; documentation and self-assessment of learning experience. **Prerequisites:** Grade of C or better in GLST 201 and GLST 205; GLST majors.

GLST 311/ENGL 309 Cultural Politics

Credits 3. 3 Lecture Hours. Exploration of the concept of cultural politics across several academic disciplines in the humanities and social sciences; broad interrogation of relationships that mediate culture and power in national and international contexts; focus on how culture shapes and is shaped by society, political perspectives and actions.

Prerequisites: Junior or senior classification; or approval of the instructor.

Cross Listing: ENGL 309/GLST 311.

GLST 400/AFST 400 Global Africa

Credits 3. 3 Lecture Hours. Exploration of African diaspora around the world; examination of the historic globality of Africa with a focus on Black artistic expression and its impact on global culture; investigation of Black cultures' interactions with music, literature, performing arts, visual arts, religions, and social movements. **Prerequisites:** Junior or senior classification or approval of instructor. **Cross Listing:** AFST 400/GLST 400.

GLST 401/INTA 401 The City and its Global Contexts

Credits 3. 3 Lecture Hours. Examination of rural and urban environments affected by global currents in culture, politics, and society; exploration of urbanism as represented by artists, writers, and filmmakers; study of such topics such as urban design. **Prerequisites:** INTA 211 or GLST 201; junior or senior classification or approval of instructor. **Cross Listing:** INTA 401/GLST 401.

GLST 402 Global Perspectives on Environmental Humanities

Credits 3. 3 Lecture Hours. Investigation of contemporary approaches to environmental issues in the humanities; analysis of present-day environmental challenges; implications for thought of climate change in the Anthropocene. **Prerequisites:** Junior or senior classification.

GLST 403 Global and Cultural Aspects of Everyday Consumption

Credits 3. 3 Lecture Hours. Investigation of the global implications of domestic consumer behavior in their many manifestations, specifically the exploration of the cultural connections between the globalized economy and the decisions made by consumers at the local level; analysis of intended and unintended consequences of consumerism around the world, whether they be environmental, demographic, or cultural. **Prerequisites:** Junior or senior classification or approval of instructor.

GLST 406 Humanities Studies in Science and Technology

Credits 3. 3 Lecture Hours. Exploration of global discourses on science and technology from a humanistic perspective. **Prerequisites:** Junior or senior classification.

GLST 407 Migration, Indigeneity, and Diaspora

Credits 3. 3 Lecture Hours. Examination of the cultural constructs that arise through the encounters with colonialism from the conquest of the Americas to the present; cultural studies and literary analysis to identify and interrogate the common principles of human interaction in the face of cultural diversity. **Prerequisites:** Junior or senior classification or approval of instructor.

GLST 408/VIST 408 Techne, Technology, and the Visual Arts

Credits 3. 3 Lecture Hours. Examination of the tension between techne, art, and technology through an exploration of influential theoretical texts; analysis of major challenging works of visual art, ancient and contemporary, analog and digital, human and non-human; investigation of visual art and technology in a global context. **Prerequisites:** Junior or senior classification or approval of instructor. **Cross Listing:** VIST 408/GLST 408.

GLST 410/INTA 410 Gender and Globalization

Credits 3. 3 Lecture Hours. Concepts of gender from a global perspective; global theories of gender and sexuality across media. **Prerequisites:** INTA 211 or GLST 201; junior or senior classification or approval of instructor. **Cross Listing:** INTA 410/GLST 410.

GLST 413 Race, Gender, and the Environment

Credits 3. 3 Lecture Hours. Investigation of social inequalities related to environmental issues; focus on environmental justice and ecofeminism; exploration of the connections among racism, patriarchy, and the environment. **Prerequisites:** Junior or senior classification. **Cross Listing:** HISP 413 and WGST 413.

GLST 444 Foreign Language Pedagogy

Credits 3. 3 Lecture Hours. Study of the principles of second language acquisition relating to language pedagogy in a K-12 classroom setting for modern and classical languages; examination of key concepts (e.g., input, output, interaction, corrective feedback), pedagogical frameworks (e.g., grammar translation, communicative language teaching, task-based language teaching), lesson planning, assessments, and classroom management. **Prerequisites:** Junior or senior classification, or approval of instructor.

GLST 467/ENGL 467 Cultural Texts as Data

Credits 3. 3 Lecture Hours. Exploration of concepts, tools, methods, and approaches to computationally manipulating cultural texts and large text corpora such as academic databases and newspaper, periodical, and social media archives; identification of connections between cultural phenomena through analysis of patterns of meaning, linguistic etymologies, and cultural biases. **Prerequisites:** Junior or senior classification, or approval of instructor. **Cross Listing:** ENGL 467/GLST 467.

GLST 475/FILM 475 Film, Propaganda, and Dissidence

Credits 3. 3 Lecture Hours. Examination of films promoting well-defined political aims in various countries and historical periods; focus on dissident works produced under repressive regimes. **Prerequisites:** Junior or senior classification or approval of instructor. **Cross Listing:** FILM 475/GLST 475.

GLST 481 Seminar

Credits 3. 3 Other Hours. Course designed to produce in-depth research projects; based on student's international experience and area of expertise acquired in major. **Prerequisites:** Global Studies major; grade of C or better in GLST 201 and GLST 205; GLST 300; senior classification.

GLST 484 Internship

Credits 0 to 3. 0 to 3 Other Hours. Directed internship in a private firm, government or non-profit agency; provide on-the-job experience appropriate to the student's program of work and career objectives. May be taken for credit up to three hours. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisites:** GLST 201; approval of internship coordinator.

GLST 485 Directed Studies

Credits 0 to 3. 0 to 3 Other Hours. Research problems and readings for students majoring in global studies; directed independent study of a global issue related to student's area of interest. May be taken three times for credit. **Prerequisites:** Junior or senior classification; approval of instructor and department head.

GLST 489 Special Topics in...

Credits 1 to 4. 1 to 4 Other Hours. Selected topics in an identified area of global studies. May be repeated for credit. **Prerequisites:** Junior or senior classification; or approval of instructor.

GLST 491 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in global studies. May be taken three times for credit. **Prerequisites:** GLST 201; GLST 205; junior or senior classification and approval of instructor.

GLST 497 Independent Honors Study

Credits 0 to 4. 0 to 4 Other Hours. Directed independent studies designed to produce a senior honors thesis; based on international experience and interdisciplinary expertise acquired in major. May be taken two times for credit. **Prerequisites:** GLST major; honors candidate; junior or senior classification and approval of instructor.

HBRW - Hebrew (HBRW)

HBRW 101 Elementary Modern Hebrew I

Credits 4. 3 Lecture Hours. 2 Lab Hours. Elementary language study with oral, written and reading practice; preparation for conversation; part of class preparation to be done in the language laboratory.

HBRW 102 Elementary Modern Hebrew II

Credits 4. 3 Lecture Hours. 2 Lab Hours. Continuation of HBRW 101; part of class preparation to be done in the language laboratory. **Prerequisite:** HBRW 101.

HBRW 285 Directed Studies

Credits 0 to 3. 0 to 3 Other Hours. Individual supervision of readings or assigned projects in Hebrew, selected for each student individually. **Prerequisites:** Approval of instructor and department head.

HBRW 289 Special Topics In...

Credits 3. 3 Lecture Hours. Selected topics in an identified area of Hebrew studies. May be repeated for credit. **Prerequisite:** Approval of instructor.

HEFB - Health Ed Field Based (HEFB)

HEFB 222/KNFB 222 Culturally Responsive Pedagogy

Credits 3. 2 Lecture Hours. 3 Lab Hours. Developing an understanding of students in multiple settings and levels; development, structure, history, finance, and management of schools in a democratic society; philosophical, ethical and moral dimensions of teaching; professional role of teacher. **Prerequisite:** Kinesiology and Health majors. **Cross Listing:** KNFB 222/HEFB 222.

HEFB 324/KNFB 324 Technology and Teaching Skills for the 21st Century Learner

Credits 3. 2 Lecture Hours. 2 Lab Hours. Preparation of future Health and Physical Education teachers with practical skills related to: technology in the classroom/gymnasium, strategies for addressing urban education and English language learners, liability, management and classroom discipline, development of professional communication skills and time management; includes field based experiences in diverse classroom settings. **Prerequisite:** Grade of C or better in HEFB 222/KNFB 222 or KNFB 222/HEFB 222; grade of C or better in BIOL 107 or BIOL 111; grade of C or better in PHYS 201 or CHEM 119; junior or senior classification. **Cross Listing:** KNFB 324/HEFB 324.

HEFB 325/KNFB 325 Introduction to Secondary School Teaching

Credits 3. 2 Lecture Hours. 2 Lab Hours. Introduce fundamental teaching skills and theories necessary for preparing reflective teachers; examine classroom management, learning strategies and assessment techniques; classroom lectures combined with field-based experiences to link theory into practice. **Prerequisite:** Grade of C or better in HEFB 324/KNFB 324 or KNFB 324/HEFB 324; junior or senior classification. **Cross Listing:** KNFB 325/HEFB 325.

HEFB 450/KNFB 450 Supervised Student Teaching

Credits 6. 0 Lecture Hours. 6 Other Hours. Observation and participation in an accredited public school classroom; techniques of teaching student's teaching fields, and appropriate instructional strategies for assigned student population. **Prerequisites:** Grade of C or better in HLTH 415/PHLT 420 or KNFB 416. **Cross Listing:** KNFB 450/HEFB 450.

HHUM - Health Humanities (HHUM)

HHUM 107 Introduction to the Health Humanities

Credits 3. 3 Lecture Hours. Introduction to the methods and approaches of the health humanities; exposure to key scholarship in this field as well as major methods and approaches; application of such skills to the analysis of cultural case studies such as illness narratives or contemporary debates in scientific bioethics. **Cross Listing:** COMM 107, ENGL 107, and PHIL 107.

HHUM 482/ENGL 482 Advanced Studies in Health Humanities

Credits 3. 3 Lecture Hours. Capstone course; application of skills and knowledge acquired during health humanities concentration coursework; exposure to specialized methods of inquiry; development and execution of an individualized final project. **Prerequisites:** ENGL 107, COMM 107, HHUM 107, ENGL 292, ENGL 342, COMM 342, WGST 342, or ENGL 395; junior or senior classification. **Cross Listing:** ENGL 482/HHUM 482.

HISP - Hispanic Studies (HISP)

HISP 201 Current Issues in Hispanic Studies

Credit 1. 1 Lecture Hour. Exploration of current issues and concerns in Hispanic Studies through attendance and participation in Hispanic Studies-related events and lectures by noted academics and professionals in Hispanic Studies; in-class discussions. May be taken three times for credit. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisite:** ENGL 104.

HISP 204 Spanish and Spanish American Literature in Translation

Credits 3. 3 Lecture Hours. Survey of literature from the Spanish-speaking world from the Middle Ages to the present; English translations of masterpieces of Spanish language literature; authors such as Cervantes, Lope de Vega, Dario, Garcia Marquez; also taught at Galveston campus. Taught in English.

HISP 205 Don Quixote and the Other Arts

Credits 3. 3 Lecture Hours. A study of Miguel de Cervantes' masterwork, Don Quixote, and its representations in other arts such as painting, film and music. Taught in English. **Prerequisite:** ENGL 104.

HISP 206 Food in the Hispanic World

Credits 3. 3 Lecture Hours. A study of food, food preparation and consumption in the Hispanic world from historical, geographical, artistic, social and psychological perspective. Taught in English. **Prerequisite:** ENGL 104.

HISP 250 Contemporary Spanish Culture

Credit 1. 1 Lecture Hour. Cultural and practical orientation for students participating in the summer study abroad programs in Spain; brief introduction to contemporary social and cultural institutions; discussions of Spanish university system; oral reports and final paper; readings and discussion in English and Spanish. **Prerequisite:** SPAN 101 or equivalent.

HISP 260 Contemporary Mexican Culture

Credit 1. 1 Lecture Hour. Introduction to contemporary Mexican social, cultural, and political institutions; discussion of Mexican university system; readings and discussion in Spanish and English. For preparation for study abroad program in Mexico. **Prerequisite:** SPAN 101 or equivalent.

HISP 262/ENGL 262 Introduction to Latinx Literary Studies

Credits 3. 3 Lecture Hours. Introduction to Latinx literature; emphasis on methods and approaches, historical breadth and context and the diverse literary traditions of people of Hispanic and Latinx descent in the United States. **Cross Listing:** ENGL 262/HISP 262.

HISP 285 Directed Studies

Credits 0 to 3. 0 to 3 Other Hours. Individual supervision of readings or assigned projects in Hispanic Studies, selected for each student individually. **Prerequisites:** Approval of instructor and department head.

HISP 289 Special Topics In...

Credits 3. 3 Lecture Hours. Selected topics in an identified area of Hispanic Studies. May be taken three times for credit. **Prerequisites:** ENGL 104; freshman or sophomore classification; approval of department head.

HISP 291 Research

Credits 0 to 3. 0 to 3 Other Hours. Research in Hispanic Studies conducted under the direction of faculty member. May be taken two times for credit. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

HISP 352/FILM 352 Hispanic Literature and Film

Credits 3. 3 Lecture Hours. Exploration of inter-media relationships between film and literature; investigation of the language of film, especially films as expressions of cultural realities through the adaptation of Hispanic literary works; taught in English. **Prerequisites:** Junior or senior classification, or approval of instructor. **Cross Listing:** FILM 352/HISP 352.

HISP 362/ENGL 362 Latino/a Literature

Credits 3. 3 Lecture Hours. Literature by U.S.-based Latino/a authors writing mostly in English; examination of historical and social contexts of cultural production; may include novels, poetry, short stories, plays, and films to gain understanding of aesthetic expression of diverse Latino/a authors, including but not limited to Mexican Americans, Puerto Ricans, Cuban Americans, and Dominican Americans. **Prerequisite:** Junior or senior classification. **Cross Listing:** ENGL 362/HISP 362.

HISP 363 Borderlands: U.S. and Mexico

Credits 3. 3 Lecture Hours. Multiple images of the U.S./Mexico border, their creation, their evolution, and their conflicting representations in filmic, literary and musical texts. **Prerequisites:** ENGL 104 and junior or senior classification.

HISP 409 Hispanic Photography in a Global Context

Credits 3. 3 Lecture Hours. Study of works produced by major photographers across the Hispanic world in a global context; exploration of photography the origins of the medium in the mid-19th century to the present; theoretical, historical, and critical readings; analysis of various genres, modes, and formats; taught in English. **Prerequisites:** Junior or senior classification, or approval of instructor.

HISP 413 Race, Gender, and the Environment

Credits 3. 3 Lecture Hours. Investigation of social inequalities related to environmental issues; focus on environmental justice and ecofeminism; exploration of the connections among racism, patriarchy, and the environment. **Prerequisites:** Junior or senior classification. **Cross Listing:** GLST 413 and WGST 413.

HISP 414 Environmental Perspectives on the U.S. and Mexico Border

Credits 3. 3 Lecture Hours. Exploration of selected topics about environmental history and social movements related to the U.S. and Mexico border; focus on issues of race, gender, sexuality, and nation; exploration of connections among citizenship, border militarization, and the environment. **Prerequisites:** Junior or senior classification, or approval of instructor.

HISP 471/RELS 471 Hispanic Religions

Credits 3. 3 Lecture Hours. Exploration of the history and practice of Hispanic religion, including spirit possession, evil eye, consumption of sacred substances, healing traditions, ex-votos, relics, prophecy, omens, monsters, astrology, witchcraft, the Inquisition, festivals, pilgrimage, mystics and religious contributions of diverse ethnic groups. **Prerequisite:** Junior or senior classification or approval of instructor. **Cross Listing:** RELS 471/HISP 471.

HISP 474/RELS 474 Diversity Lessons from Medieval Spain

Credits 3. 3 Lecture Hours. Crucible of cultures—Christian, Jewish, and Muslim—that was medieval Spain and modern implications of that experience in diversity. **Prerequisites:** ENGL 104 and junior or senior classification. **Cross Listing:** RELS 474/HISP 474.

HISP 485 Directed Studies

Credits 0 to 3. 0 to 3 Other Hours. Individual supervision of readings or assigned projects in Hispanic Studies, selected for each student individually. **Prerequisites:** Junior or senior classification; approval of instructor and department head.

HISP 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified area of Hispanic studies. May be taken three times for credit. **Prerequisites:** ENGL 104; junior or senior classification; approval of department head.

HISP 491 Research

Credits 0 to 3. 0 to 3 Other Hours. Research in Hispanic Studies conducted under the direction of faculty member. May be taken two times for credit. **Prerequisites:** Junior or senior classification and approval of instructor.

HIST - History (HIST)

HIST 101 Western Civilization to 1660

Credits 3. 3 Lecture Hours. (HIST 2311) Western Civilization to 1660. Ancient civilizations, Greek, Roman and Asian; Christianity; medieval civilization in west, eastern Europe; political, social and intellectual developments from earliest human cultures to 1660.

HIST 102 Western Civilization Since 1660

Credits 3. 3 Lecture Hours. (HIST 2312) Western Civilization Since 1660. Religious, dynastic and imperial developments; Industrial Revolution; western democracies; rise of nationalism and communism; central and eastern Europe; intellectual revolution; World Wars I and II and the contemporary world.

HIST 103 World History to 1500

Credits 3. 3 Lecture Hours. (HIST 2321) World History to 1500. Development of major world societies in the premodern era; emergence of agrarian-based modes of production, political states, religious economy and a global division of systems; Eurasian world system and the civilizations of Africa and the Americas.

HIST 104 World History Since 1500

Credits 3. 3 Lecture Hours. (HIST 2322) World History Since 1500. Interaction of major world societies in the modern era; emergence of the modern world-economy and a global division of labor; European imperialism and colonialism and reactions in Africa, Asia and Latin America.

HIST 105 History of the United States

Credits 3. 3 Lecture Hours. (HIST 1301) History of the United States. Colonial heritage; Revolution; adoption of Constitution; growth of nationalism and sectionalism; Civil War; Reconstruction; also taught at Galveston and Qatar campuses.

HIST 106 History of the United States

Credits 3. 3 Lecture Hours. (HIST 1302) History of the United States. Since reconstruction; new social and industrial problems; rise of progressivism; U.S. emergence as a world power; World War I; reaction and New Deal; World War II; contemporary America; also taught at Galveston and Qatar campuses.

HIST 201 Introduction to Public History

Credits 3. 3 Lecture Hours. Examination of the methods, practices, and approaches of Public History; exploration of how historians work with and influence the development of museums, libraries, and archives; historic markers, historic sites, and monuments; exhibits, artwork, and oral history; television, film, and podcasts/radio, digital maps, virtual reality, and programming.

HIST 202 The Human Experience

Credits 3. 3 Lecture Hours. Introduction to classic transformative texts in the history of the arts, sciences, and humanities; interdisciplinary methods and approaches within the humanities; key ethical and moral debates across the human experience. **Cross Listing:** ARSC 202 and PHIL 202.

HIST 209 Famous Trials in American History

Credits 3. 3 Lecture Hours. History of prominent legal trials in the United States; role of the media in legal discourse; overview of changing ideas about crime, punishment, and justice; examination of trials as a mirror onto social, political, and cultural trends.

HIST 210 Introduction to Russian History

Credits 3. 3 Lecture Hours. Russian history, culture and society from origins to the present; rise of the Russian Empire; autocracy; modernization without liberalization; reforms, reaction, revolution; development of Communist regime; continuity from Imperial to Soviet period in industrialization, bureaucracy and treatment of peasants, nationalities and intellectual opposition; Gorbachev and a new "revolution.

HIST 212/RELS 212 Holy War

Credits 3. 3 Lecture Hours. Concepts of holy war in Jewish, Christian and Muslim history; language and literature of holy war; motivations for waging holy war; the relationship between war, martyrdom, pilgrimage and sainthood; religious orders engaging in holy war; political aims of holy war; practices of holy war; perspectives of those attacked in holy wars. **Cross Listing:** RELS 212/HIST 212.

HIST 213 History of England

Credits 3. 3 Lecture Hours. British, Saxon and Norman origins; national development; struggles between church and state; crown and nobles; nobles and commons; development of parliament.

HIST 214 History of England

Credits 3. 3 Lecture Hours. Agrarian and Industrial Revolutions; relations with Ireland; evolution of democracy; struggles with France and Napoleon; social legislation in the 20th century; growth of Empire until World War II.

HIST 220 History of Christianity: Origins to the Reformation

Credits 3. 3 Lecture Hours. History of Christian doctrine, ecclesiastical organization, and religious practice, origins through Reformation, with emphasis on religion and society; life and teachings of Jesus; apostolic church; patristic period; Christianization of Roman Empire and northern Europe; monasticism; medieval church; Gregorian reform; heresy; papal monarchy; schism and conciliarism; reformations of the sixteenth century. **Cross Listing:** CLAS 220 and RELS 220.

HIST 221/RELS 221 History of Islam

Credits 3. 3 Lecture Hours. Key themes in Islam and Islamic history; Orientalism; pre-Islamic Arabia; the Qur'an; Sunni-Shi'i sectarian divisions; Islamic law; theology; sciences; mystical traditions; rituals of the Muslim faith; cross-cultural and religious encounters; holy war; ritual practices; fundamentalism; women in Islam; Islam in the West. **Cross Listing:** RELS 221/HIST 221.

HIST 222/RELS 222 History of Christianity, Reformation to Present

Credits 3. 3 Lecture Hours. History of Christian religion from the era of the Reformation (sixteenth century) to the present, with emphasis on social, cultural, political and economic history in relation to Christian structures and theological movements. **Cross Listing:** RELS 222/HIST 222.

HIST 225 Revolutionary America

Credits 3. 3 Lecture Hours. History of the American Revolution; cultural conflict and diversity; loyalists; the conflict as a civil war; ideological clashes; British perspectives; African slave experiences; American Indian experiences; home front; social diversity of American forces; global consequences; the ongoing struggle to fulfill the revolution's promises.

HIST 226 History of Texas

Credits 3. 3 Lecture Hours. (HIST 2301) History of Texas. History of Texas from Spanish period to present day. Stress placed upon period of Anglo-American settlement, revolution, republic and development of modern state; also taught at Galveston campus.

HIST 230 American Military History, 1609 to Present

Credits 3. 3 Lecture Hours. Main events, personalities and technologies related to American military history; also taught at Qatar campus.

HIST 231 The Second World War: Origins, Course, and Consequences

Credits 3. 3 Lecture Hours. Rise of fascism in Europe and East Asia; causes and consequences of World War Two; strategies, tactics, and battles in the European and Pacific theaters; civilian lives and the homefront for Allied and Axis powers.

HIST 232 History of American Sea Power

Credits 3. 3 Lecture Hours. Development of American sea power from the 18th century to the present; also taught at Galveston campus.

HIST 234 European Military History

Credits 3. 3 Lecture Hours. Includes societal involvement, democratization of war, technology, strategy, military thought and campaigns.

HIST 236/CLAS 236 War and Violence in the Ancient World

Credits 3. 3 Lecture Hours. Equipment, organization, tactics and strategy on land and sea in the wars of the Ancient World, including the Near East, Greece and Rome; use of force and violence in the furtherance of political objectives and social control; winners, losers and survivors. **Cross Listing:** CLAS 236/HIST 236.

HIST 240 Empires of Food

Credits 3. 3 Lecture Hours. History of the relationships between food, imperialism and colonization; topics include sugar and slavery, environmental impact of colonial agriculture, agricultural labor, cultural impact food security and consumerism; also taught at Galveston campus.

HIST 241 Sport in National and International History

Credits 3. 3 Lecture Hours. Sport in politics, culture, and region; race, place, gender, and identity in athletic history; sports as an expression of nationalism, globalism, commerce, and media.

HIST 242 United States Maritime History

Credits 3. 3 Lecture Hours. Development of American maritime history from colonial times to the present; Galveston campus.

HIST 258 American Indian History

Credits 3. 3 Lecture Hours. Survey of American Indian history; Pre-Columbian, First Contact, Colonial Conquest, Differentiation between cultural groups; Reservation period, twentieth-century self-determination, and Pan-Indianism; also taught at Qatar campus.

HIST 280 The Historian's Craft

Credits 3. 3 Lecture Hours. The world of the professional historian; meanings and uses of history; current debates; archival research; evidence and argumentation; principles and methods of the analytical narrative. **Prerequisite:** History majors.

HIST 285 Directed Studies

Credits 0 to 3. 0 to 3 Other Hours. Selected fields of history not covered in depth by other courses. Reports and extensive reading required.

Prerequisite: Approval of department head.

HIST 289 Special Topics in...

Credits 3. 3 Other Hours. Selected topics in an identified area of history. May be repeated for credit. **Prerequisite:** Approval of instructor.

HIST 291 Research

Credits 0 to 3. 0 to 3 Other Hours. Research conducted under the direction of faculty member in history. **Prerequisites:** 24 hours if history, with 12 or more at 200-level or above; freshman or sophomore classification and approval of instructor.

HIST 300/AFST 300 Blacks in the United States, 1607-1877

Credits 3. 3 Lecture Hours. Blacks in the United States from the colonial period to 1877; the slave trade, slavery, free blacks and the impact of the Civil War and Reconstruction on blacks. **Prerequisite:** Junior or senior classification. **Cross Listing:** AFST 300/HIST 300.

HIST 301/AFST 301 Blacks in the United States Since 1877

Credits 3. 3 Lecture Hours. Blacks in the United States from the end of Reconstruction to the present; ideologies of black leaders, disfranchisement, lynching and the quest for equality in the 1950s and 1960s. **Prerequisite:** Junior or senior classification; HIST-301 also taught at Qatar campus. **Cross Listing:** AFST 301/HIST 301.

HIST 302 Women and War in the African Diaspora

Credits 3. 3 Lecture Hours. Case studies of women and war in the African diaspora in a wide historical and comparative context; social, economic, and cultural influence of war on women's lives; women as victims, combatants, and refugees; historical construction of race, ethnic and gender identity during times of conflict. **Prerequisite:** Junior or senior classification.

HIST 303 History and Memory

Credits 3. 3 Lecture Hours. Relationships between past and present; role of change in political, social and cultural contexts across time; social and public functions of historical research; contested relationship between professional historians, politicians and states, cultural institutions, the media and the general public. **Prerequisites:** Junior or senior classification or approval from instructor.

HIST 304 Southwest Borderlands

Credits 3. 3 Lecture Hours. Origins and development of Indigenous, Spanish, and Mexican history of Greater Southwest; exploration and conquest; Spanish entradas into Southwest; rise of institutions and colonial society; economic history; examination of social and cultural relations including gender; Mexican independence; Mexico's far northern frontier, 1821-1848. **Prerequisite:** Junior or senior classification.

HIST 305 Chicana/o History since 1848

Credits 3. 3 Lecture Hours. Social, economic and political evolution of Chicanas/os from 1848 to present; includes current issues, legacies of violence, land tenure systems, racial discrimination, changing class relations, gender, civil rights, immigration, identity, and culture.

Prerequisite: Junior or senior classification.

HIST 307 Latinx History

Credits 3. 3 Lecture Hours. Latinx communities from the nineteenth century to the present in the U.S.; Mexican Americans, Puerto Ricans, Cubans, and Central and South Americans; differences in historical experiences; role of race, class, politics, immigration, gender and sexuality; cultural identity as expressed in art, literature, folklore and religion; contemporary social, political and economic issues. **Prerequisite:** Junior or senior classification or approval of instructor.

HIST 308 History of American Indians in the U.S. South

Credits 3. 3 Lecture Hours. Examination of the role of indigenous populations in the history and formation of the U.S. South; cultural values and social practices; impact of European exploration and African slavery; trade patterns, imperial wars, and removal policies. **Prerequisite:** Junior or senior classification.

HIST 316 Latino/a Labor in the United States

Credits 3. 3 Lecture Hours. The experience of Latino/a labor in the United States, from the 19th through the early 21st century; role of gender, race and ethnicity and policy on labor experiences and labor relations; intersections of labor and migration, globalization. **Prerequisite:** Junior or senior classification.

HIST 317 Born Country - American Agricultural History

Credits 3. 3 Lecture Hours. History of American agricultural settlement and development from the colonial period to the present; labor, technology, the environment, politics and government policy; regional variations; farmer rebellions; rural society and culture. **Prerequisites:** Junior or senior classification.

HIST 319 U.S. Immigration and Ethnicity

Credits 3. 3 Lecture Hours. The sources and persistence of ethnic identity in 19th and 20th century America; its interaction with religion, politics, languages, education and social mobility; various nativist and anti-immigrant movements; contrasts and continuities between contemporary immigration patterns and those of earlier eras.

HIST 320 History of the Atlantic World

Credits 3. 3 Lecture Hours. Introduction to the comparative study of the civilizations and cultures that bordered on the Atlantic Ocean; examination of culture and economic exchanges and adaptations, migrations, empire-building, and the emergence of new societies and cultures. **Prerequisite:** Junior or senior classification.

HIST 321 The Age of Revolution in the Atlantic World

Credits 3. 3 Lecture Hours. Origins and events of the revolutions that transformed the Atlantic empires of Great Britain, France, and Spain in the late eighteenth and nineteenth centuries; disruption of old political and economic orders; creation of independent states in the Americas.

Prerequisite: Junior or senior classification.

HIST 322 History of the Iberian World

Credits 3. 3 Lecture Hours. Introduction to the people and places of the Iberian World, ca. 1500-1900; social, political and economical relations between Spain, Portugal, Asia and the Americas; emergence of a shared culture and cross-cultural exchange. **Prerequisite:** Junior or senior classification or approval of instructor.

HIST 323 Asian American History

Credits 3. 3 Lecture Hours. Asian migration to the Americas; East Asian, Southeast Asian, South Asian and Pacific Islander American perspectives; role of race, class, gender, and sexuality; civil movements for immigration and citizenship rights; cultural expression and identity formation. **Prerequisite:** Junior or senior classification.

HIST 326 History of the Caribbean

Credits 3. 3 Lecture Hours. History of the Caribbean region from human settlement to the present; Indigenous peoples; European colonization; colonial societies; challenges to the imperial plantation model; emancipation; independence and decolonization. **Prerequisite:** Junior or senior classification.

HIST 330 Women in Ancient Greece and Rome

Credits 3. 3 Lecture Hours. Survey of women in classical Greece and Rome; emphases on female occupations and family relationships, legal and political status, traditional values, notorious women, how women were viewed and how they viewed themselves. **Prerequisite:** Junior or senior classification. **Cross Listing:** CLAS 330 and WGST 330.

HIST 331 Medieval Mediterranean, 300-1453

Credits 3. 3 Lecture Hours. History of the European, North African and Middle Eastern states of the Mediterranean region in the medieval period; emphasis on political, religious, cultural, social, economic, environmental, scientific, institutional and diplomatic issues of the area and its hinterlands. **Prerequisite:** Junior or senior classification or approval of instructor.

HIST 333 Europe in the Age of Absolutism, 1660-1815

Credits 3. 3 Lecture Hours. Europe from the "Age of Louis XIV" to the Congress of Vienna; Russia, Austria and Prussia. Mercantilism, capitalism and the rise of the middle class. Origins and consequences of the Enlightenment.

HIST 334 History of Europe in the Nineteenth Century

Credits 3. 3 Lecture Hours. Cultural, economic, and political processes that shaped European civilization (east and west); the Napoleon era; industrialization and urbanization; liberalism and socialism; empire and revolution; cultural developments. **Prerequisite:** Junior or senior classification.

HIST 335 Europe, 1890-1932

Credits 3. 3 Lecture Hours. A political, diplomatic, social and cultural history of Europe prior to, during and shortly after World War I.

HIST 336 Europe Since 1919

Credits 3. 3 Lecture Hours. A political, diplomatic, military, economic, social and cultural history of Europe since World War I. **Prerequisite:** Junior or senior classification or approval of instructor.

HIST 337 War and Society in Europe Since 1900

Credits 3. 3 Lecture Hours. War and social change in Europe during the twentieth century; relationships between front lines and home fronts; government and civil society; gender and war; ethnic and national identities in Eastern, Central, and Western Europe. **Prerequisite:** Junior or senior classification.

HIST 338 The Rise of the European Middle Class

Credits 3. 3 Lecture Hours. Survey of European society and social classes from the origins of capitalism in the Middle Ages to the triumph of the "middle class world" in the 19th century; rise of the middle class, development of bourgeois ideology and culture, and creation of the working class.

HIST 339 Eastern Europe

Credits 3. 3 Lecture Hours. Eastern Europe from the late middle ages to the present; Ottoman, Habsburg, Russian and Soviet Empires; origins of modern East European nation-states; world wars; rise of nationalism; experience of communism and the Cold War; collapse of communism; post-communist democratic and economic transitions. **Prerequisite:** Junior or senior classification.

HIST 340 Global Communism - Its Rise, Fall and Legacies

Credits 3. 3 Lecture Hours. History of communism and the movements and states it inspired across the globe; communism's intellectual origins and development throughout the world; everyday life; state violence and communism at war; race, gender, nationalism and environmental impacts; the decline, collapse and reinvention of communism; contested legacies and relevance of communism today. **Prerequisite:** Junior or senior classification.

HIST 341 Latin America to 1810

Credits 3. 3 Lecture Hours. Spanish and Portuguese colonization in the Americas; encounters between Indigenous, African and European peoples; everyday lives of individual women and men in the Iberian colonies; cultural, social, economic and political developments within colonial Latin America. **Prerequisite:** Junior or senior classification.

HIST 342 Latin America Since 1810

Credits 3. 3 Lecture Hours. Political history of independent South American nations since independence with emphasis upon ABC countries; economic, social and cultural development; foreign relations. **Prerequisite:** Junior or senior classification.

HIST 343 Inter-American Relations

Credits 3. 3 Lecture Hours. Cultural, diplomatic and economic relations in the Western Hemisphere in historical perspective. **Prerequisite:** Junior or senior classification or approval of instructor.

HIST 344/AFST 344 History of Africa to 1800

Credits 3. 3 Lecture Hours. Origins of humankind in Africa; development and spread of pastoralism, agriculture and iron-working; formation of states and empires; impact of Christianity and Islam; rise of international trade in gold, ivory and slaves; African diaspora. **Prerequisite:** Junior or senior classification. **Cross Listing:** AFST 344/HIST 344.

HIST 345/AFST 345 Modern Africa

Credits 3. 3 Lecture Hours. Survey of Africa since 1800; pre-colonial African states and societies; establishment and impact of European colonial rule; rise of nationalist movements; achievement of independence; problems of political stability and economic development in contemporary Africa; South Africa's apartheid regime and its opponents. **Prerequisite:** Junior or senior classification. **Cross Listing:** AFST 345/HIST 345.

HIST 346/AFST 346 History of South Africa

Credits 3. 3 Lecture Hours. Selected themes in the history of South Africa from the African Iron Age to the Apartheid regime; history of race relations in the 19th and 20th centuries and the rise of a modern industrial state. **Cross Listing:** AFST 346/HIST 346.

HIST 347/RELS 347 Rise of Islam, 600-1258

Credits 3. 3 Lecture Hours. Late-Antiquity; Pre-Islamic Arabia; the rise of Islam and a historical survey of the development of the Islamicate civilizations from c. 600 to the Mongol Conquests c. 1258 with an emphasis on politics, religion, society and culture. **Prerequisite:** Junior or senior classification or approval of instructor. **Cross Listing:** RELS 347/HIST 347.

HIST 348 Modern Middle East

Credits 3. 3 Lecture Hours. Survey of the Middle East since 1800; introduction to Islam and Islamic civilization; decline of the Ottoman Empire; European imperialism; rise of nationalist movements; Zionism and the emergence of Israel; Arab-Israeli conflict; impact of oil; revolution in Iran and Islamic resurgence. **Prerequisite:** Junior or senior classification.

HIST 349/ASIA 349 The Vietnam War/The American War

Credits 3. 3 Lecture Hours. Vietnam's relations with the West; French colonialism; origins and development of Vietnamese nationalism; Cold War and American involvement; wartime societies in North and South Vietnam; expansion of the war to Cambodia and Laos; anti-war movements in the United States; reasons for American defeat; consequences and lessons of the war. **Prerequisite:** Junior or senior classification. **Cross Listing:** ASIA 349/HIST 349.

HIST 350/ASIA 350 World War II in Asia and the Pacific

Credits 3. 3 Lecture Hours. Origins and development of Japanese imperialism; Japan's expansion into East and Southeast Asia and the Pacific; wartime societies; collaboration and resistance; effects of the war in the United States on Japanese-Americans; outcomes of the war; remembrance of the war. **Prerequisite:** Junior or senior classification. **Cross Listing:** ASIA 350/HIST 350.

HIST 352/ASIA 352 Modern East Asia

Credits 3. 3 Lecture Hours. Impact of the West on traditional China and Japan; the response through modernization; rise of nationalism and formation of modern nation states. **Prerequisite:** Junior or senior classification. **Cross Listing:** ASIA 352/HIST 352.

HIST 353 Modern South Asia

Credits 3. 3 Lecture Hours. Evolution of cultures, politics and societies in Indian sub-continent from c.1500 to present; rise and demise of empires (especially Mughal and British); anti-colonialism and emergence of nation states; social and cultural struggles and debates. **Prerequisite:** Junior or senior classification.

HIST 354/ASIA 354 Imperial China

Credits 3. 3 Lecture Hours. History of imperial China from the earliest dynasties through the mid-19th century, including major political events, the structure of Chinese government, economic development, philosophies and religion, wars and military and culture and daily life. **Prerequisite:** Junior or senior classification. **Cross Listing:** ASIA 354/HIST 354.

HIST 355/ASIA 355 Modern China

Credits 3. 3 Lecture Hours. History of China from the coming of the West to the present; social, economic and political changes which have taken place during that period. **Prerequisite:** Junior or senior classification. **Cross Listing:** ASIA 355/HIST 355.

HIST 356/ASIA 356 Twentieth Century Japan

Credits 3. 3 Lecture Hours. Industrialization and modernization of Japan; its rise from an isolated nation to a major world power and economic giant. **Cross Listing:** ASIA 356/HIST 356.

HIST 357/AFST 357 Out of Africa: The Black Diaspora and the Modern World

Credits 3. 3 Lecture Hours. History and cultures of the peoples of the African Diaspora from the fourteenth through the nineteenth centuries; social, political, and economic impact on Africa, the Americas, Europe, and the Arab World; emphasis on race, gender, identity, and migration. **Prerequisite:** Junior or senior classification. **Cross Listing:** AFST 357/HIST 357.

HIST 358/ASIA 358 Chinese Cultural History

Credits 3. 3 Lecture Hours. 0 Lab Hours. Examination of Chinese culture and its evolution over the last 4,000 years; customs, art, literature, festivals, folklore, religion, architecture, medicine, and everyday life. **Prerequisite:** Junior or senior classification. **Cross Listing:** ASIA 358/HIST 358.

HIST 359 American Environmental History

Credits 3. 3 Lecture Hours. History of American attitudes toward nature: use of land, water, timber, oil, coal, wildlife and other natural resources in the United States; conservation movement and significant conflicts over resources; changing perception of the physical environment.

HIST 360 History of Energy in America

Credits 3. 3 Lecture Hours. Impact of energy upon industrial America; emphasis on relationship between energy and industrial development, emergence of state and federal energy policies, role of energy in foreign policy, growth of energy-oriented industries and impact of energy development on the environment.

HIST 361 From Gutenberg to Google - International History of Technology and Innovation

Credits 3. 3 Lecture Hours. Invention, development, innovation, diffusion, transfer, adaptation and application of technologies; agricultural, industrial, transportation, communications revolutions; societal shaping of technology; technological shaping of societies.

HIST 362 History of Science

Credits 3. 3 Lecture Hours. The ideas of the great scientists and their impact on society; the Newtonian Revolution; Lavoisier and the new chemistry; Darwin and evolutionary thought; Enrico Fermi, Robert Oppenheimer and the development of nuclear energy.

HIST 363 History of Science in America

Credits 3. 3 Lecture Hours. The major developments in the physical and life sciences from colonial times to the present; the lives and scientific contributions of such famous American scientists as Benjamin Franklin, Joseph Henry, Thomas Edison and J. Robert Oppenheimer.

HIST 364 From Axes to iPads - History of Innovation and Technology in America

Credits 3. 3 Lecture Hours. Pre-colonial to contemporary eras; invention, development, innovation, transfer, diffusion, adaptation and application of technologies; societal shaping of technology; technological shaping of societies.

HIST 365/RELS 365 Religion in Early America

Credits 3. 3 Lecture Hours. Religion in North America from colonial beginnings to eve of Civil War; relations between European Christianity, Native Americans and African Americans; religious pluralism, reform movements, social and political change. **Prerequisite:** Junior or senior classification. **Cross Listing:** RELS 365/HIST 365.

HIST 366/RELS 366 Religion in Modern America

Credits 3. 3 Lecture Hours. Religion in America from the Civil War to contemporary period; relationship of religion and racial formation, capitalism, gender, sexuality, immigration; religious pluralism; evangelicalism; role of religious politics and social movements. **Prerequisite:** Junior or senior classification. **Cross Listing:** RELS 366/HIST 366.

HIST 367 American Colonies

Credits 3. 3 Lecture Hours. Colonization of North America and the Caribbean; interactions between diverse Indigenous, African and European peoples; development of colonial societies and the creation of an Atlantic world. **Prerequisite:** Junior or senior classification.

HIST 368 The Birth of the Republic, 1763-1820

Credits 3. 3 Lecture Hours. Impact of French and Indian War; British colonial policy 1763-1775; War for Independence; Confederation crisis; Constitution-making and ratification; development of political parties; problem of foreign entanglements; War of 1812; conflict of nationalist and sectionalist tendencies; historiography and interpretation.

HIST 369 The United States, 1820-1860

Credits 3. 3 Lecture Hours. Jacksonian democracy; impact of nationalism and sectionalism; manifest destiny and Mexican War; slavery controversy; expansion.

HIST 370 Civil War and Reconstruction

Credits 3. 3 Lecture Hours. Survey of background and causes of the war; military, political, economic, and diplomatic aspects of the war; life behind the lines; Reconstruction and post-war adjustments, 1861-1877.

HIST 371 America in the Gilded Age, 1877-1901

Credits 3. 3 Lecture Hours. The United States from 1877 to 1901; political, cultural and economic developments.

HIST 372 Reform, War and Normalcy: The United States, 1901-1929

Credits 3. 3 Lecture Hours. Emergence of Progressivism; reform in the cities and states; reforms and foreign policies of the Theodore Roosevelt, William Howard Taft and Woodrow Wilson administrations; World War I and aftermath; Harding-Coolidge normalcy; the Jazz Age; Hoover and the Great Crash.

HIST 373 The Great Depression and World War II

Credits 3. 3 Lecture Hours. The United States, 1929-1945; cultural, social, economic, and political developments in the nation; global diplomacy and military strategy; also taught at Galveston campus.

HIST 374 The United States After World War II

Credits 3. 3 Lecture Hours. The United States since World War II; political, economic, cultural and social changes and role as a world leader; also taught at Galveston campus.

HIST 376 Great Scientists in History

Credits 3. 3 Lecture Hours. History of fundamental scientific principles through biography; Galileo, Newton, Darwin, Mendel, Curie, Einstein, Pauling, and others. **Prerequisite:** Junior or senior classification.

HIST 377 Africana Women's History

Credits 3. 3 Lecture Hours. Black women's history from the precolonial era to the present; emphasis on the cultural, political, legal, economic, sexual, social, and religious factors that shaped their experiences across the African Diaspora and the world. **Prerequisites:** Junior or senior classification. **Cross Listing:** AFST 377 and WGST 377.

HIST 378 Afro-Latin America

Credits 3. 3 Lecture Hours. History and cultures of the Black Diaspora in Latin America from colonization through the twentieth century; social, political, cultural, and economic impact of Africans and their descendants on the region; emphasis on race, culture, citizenship, and identity.

Prerequisite: Junior or senior classification.

HIST 379 Modern Korea

Credits 3. 3 Lecture Hours. History of modern Korea; South Korea; North Korea; Korea through imperialism, decolonization, a civil war, dictatorship, and democratization; emphasis on cultural, social, economic, and political developments. **Prerequisites:** Junior or senior classification.

HIST 380 The Mongols in World History

Credits 3. 3 Lecture Hours. Examination of the origins, development, and legacies of the largest contiguous empire in history; exploration of the environmental context, notable rulers, Mongol warfare, imperial governance and administration, interactions between the Mongols and rival nomadic groups, trade, gender and the role of women, religious and ideological policies, and long-term impacts. **Prerequisites:** Junior or senior classification; or approval of instructor.

HIST 381 Energy and the Environment - Conflict or Compatibility

Credits 3. 3 Lecture Hours. Examination of history of renewable and non-renewable energy sources and their impact on the environment; focuses on the research of scientists and the scientific-technological, political, economic, and cultural issues that emerged in the 1800s-2000s; investigation of whether production and consumption of non-renewable fossil fuel energy sources are compatible or in conflict with the scientific community's environmental concerns. **Prerequisites:** Junior or senior classification or approval of instructor.

HIST 382/ANTH 382 Conflict Archaeology and Military History

Credits 3. 3 Lecture Hours. Military history; conflict archaeology; human conflict; diplomacy, ethics, and leadership in conflicts; warfare; modern global issues; public service. **Prerequisites:** Junior or senior classification or approval of instructor. **Cross Listing:** ANTH 382/HIST 382.

HIST 401 Slavery in World History

Credits 3. 3 Lecture Hours. Comparative history of human slavery; slavery in the Ancient World, Asia, Africa; varieties of modern slavery in the New World since 1500; abolition of slavery and continuing forms of human bondage in the contemporary world. **Prerequisite:** Junior or senior classification. **Cross Listing:** AFST 401 and ASIA 401.

HIST 402 History of Modern Germany

Credits 3. 3 Lecture Hours. Germany from the late eighteenth century to the present; cultural, social and political developments in national and transnational context.

HIST 404 Post 1945 Germanies

Credits 3. 3 Lecture Hours. Examines Germany from the end of World War II to the end of the 20th century; includes political, social, cultural, and economic life in divided and occupied Germany; covers Germany since reunification in 1990. **Prerequisite:** Junior or senior classification.

HIST 405 History of the Holocaust

Credits 3. 3 Lecture Hours. History of the Nazi Holocaust; Third Reich; Jewish Ghetto life and concentration camps; role of the military, U.S. and German business; lessons and legacies; also taught at Galveston campus.

HIST 406 The Era of the French Revolution and Napoleon, 1715-1815

Credits 3. 3 Lecture Hours. Origins and events of the French Revolution; Napoleon Bonaparte and the First Empire; social, economic, political and military developments in France and Europe.

HIST 407 History of France Since 1815

Credits 3. 3 Lecture Hours. Nineteenth century Bourbon, Orleanist, Bonapartist and Republican regimes; France in World Wars I and II; De Gaulle and the role of France in the 20th century.

HIST 409 Youth in Modern Asia: Rebellions and Conformities

Credits 3. 3 Lecture Hours. Twentieth century history of youth in Asia; social, cultural and political youth movements; roots of rebellions and conformities; colonialism and post-colonialism; war and anti-war movements; role of hippies, class and consumerism; femininity and masculinity; globalization and national identity; religion and morality; education; music. **Prerequisites:** Junior or senior classification or approval of instructor.

HIST 410 Russian History to 1801

Credits 3. 3 Lecture Hours. Origins and Christianization of Russia; establishment and decline of Kievan Rus' state; Mongol conquest and domination of Russia; rise of Moscow, establishment of tsardom, expansion of state in sixteenth and seventeenth centuries; Peter the Great's reforms; emergence of Russian Empire as a major power; era of Catherine the Great.

HIST 411 Imperial Russia 1801-1917

Credits 3. 3 Lecture Hours. The last century of the autocratic Romanov dynasty and the social, intellectual, economic and political forces that ended it; political culture, society in transition, international affairs and revolutionary groups in an era of reform, counter-reform, reaction and industrialization.

HIST 412 Russia's Long Twentieth Century - The Soviet Experiment and Beyond

Credits 3. 3 Lecture Hours. Historical examination of the late Russian Empire; 1917 revolutions; building the world's first socialist society; Stalinism and political terror; Great Patriotic War; Cold War; reforming the Soviet system; socialist stagnation; the Gorbachev "revolution" and Soviet collapse; post-Soviet developments and rise of Putin. **Prerequisite:** Junior or senior classification.

HIST 416 Texas as Border Region

Credits 3. 3 Lecture Hours. History of Texas since annexation; slavery and its aftermath; border cultures and identities; race and ethnicity; modernization and its discontents. **Prerequisite:** Junior or senior classification or approval of instructor.

HIST 418 Intellectual History from the Ancient Near East to the Early Middle Ages

Credits 3. 3 Lecture Hours. Political, social, cultural and religious histories of significant figures, groups, schools of thought and movements in western Afro-Eurasia from the Assyrian Empire to the later Roman Empire; developments in political theory, literature, sociology, arts, architecture, music, philosophy, law, sciences and education. **Prerequisite:** Junior or senior classification. **Cross Listing:** CLAS 418 and RELS 418.

HIST 419/RELS 419 Intellectual History, 500 to 1600

Credits 3. 3 Lecture Hours. Political, social, cultural and religious histories of significant figures, groups, schools of thought and movements in western Afro-Eurasia from the rise of Islam to the Renaissance; developments in political theory, literature, sociology, arts, architecture, music, philosophy, law, sciences and education. **Prerequisite:** Junior or senior classification. **Cross Listing:** RELS 419/HIST 419.

HIST 420 European Intellectual History from the Enlightenment to 1900

Credits 3. 3 Lecture Hours. Political and social history of selected major figures and important movements in political theory, literature, sociology, art, economics and philosophy in the 18th and 19th centuries.

HIST 421 European Intellectual History in the Twentieth Century

Credits 3. 3 Lecture Hours. Political and social history of selected major figures and important movements in political theory, literature, sociology, art, economics and philosophy from the turn of the century to the present.

HIST 425/RELS 425 The Sacred and Profane in History

Credits 3. 3 Lecture Hours. Case studies of the sacred in varied times and regions; holy persons; holy places; holy objects; language and literature of the sacred; competing concepts of the holy within society; gender and the holy; institutions promoting holy people and places; the impact of social, political, cultural and intellectual developments on the relationship between the sacred and the profane. **Prerequisites:** Junior or senior classification. **Cross Listing:** RELS 425/HIST 425.

HIST 426/CLAS 426 The Ancient Greeks

Credits 3. 3 Lecture Hours. Greek History and civilization from the Archaic Age to Alexander the Great (8th-late 4th century B.C.). **Prerequisite:** Junior or senior classification, or approval of instructor. **Cross Listing:** CLAS 426/HIST 426.

HIST 427/CLAS 427 The Roman Republic

Credits 3. 3 Lecture Hours. Major events and issues in Roman history from the beginnings of the Republic to its incipient disintegration. **Prerequisite:** Junior or senior classification, or approval of instructor. **Cross Listing:** CLAS 427/HIST 427.

HIST 428/CLAS 428 The Roman Empire: Principate

Credits 3. 3 Lecture Hours. Major events and issues in Roman history from the late Republic to the consolidation of the state of Late Antiquity. **Prerequisite:** Junior or senior classification, or approval of instructor. **Cross Listing:** CLAS 428/HIST 428.

HIST 429/CLAS 429 The Roman Empire: Transformations

Credits 3. 3 Lecture Hours. Major events and issues in Roman history from the rise of Christianity as an imperial religion to the end of Late Antiquity. **Prerequisite:** Junior or senior classification, or approval of instructor. **Cross Listing:** CLAS 429/HIST 429.

HIST 431 The Kingdom of Ireland, 1541-1800

Credits 3. 3 Lecture Hours. History of Ireland from the mid sixteenth century through the end of the eighteenth century; impact of religion, politics, warfare, land disputes, famine, and international developments; creation of the United Kingdom. **Prerequisite:** Junior or senior classification.

HIST 432 The Nation of Ireland, 1800 to the Present

Credits 3. 3 Lecture Hours. History of Ireland from the creation of the United Kingdom through the end of the twentieth century; British-Irish relations; agrarian unrest and violence; famine; political, cultural, and religious developments. **Prerequisite:** Junior or senior classification.

HIST 433 Digital Humanities Theory and Practice

Credits 3. 3 Lecture Hours. The use of digital tools for conducting humanities research; theoretical ideas that inform the field; application of theory to the critical assessment of online digital projects in the field. **Prerequisite:** Junior or senior classification. **Cross Listing:** DHUM 433 and ENGL 433.

HIST 434/FILM 434 History and Film

Credits 3. 3 Lecture Hours. Relationship between film, historical events, and public memory; cinematic representation of political, social, and economic change in various contexts; analysis of movies as historical texts; topics covered will vary according to an individual instructor's discretion. **Prerequisites:** Junior or senior classification. **Cross Listing:** FILM 434/HIST 434.

HIST 435 Sixteenth-Century Britain

Credits 3. 3 Lecture Hours. Changes in social, cultural, economic, political and religious institutions and organization; growth of the nation state; the "new monarchy"; Reformation and religious settlement; international relations; inflation and social dislocation; the role of Parliament.

HIST 436 Seventeenth-Century Britain

Credits 3. 3 Lecture Hours. Social, political, economic, cultural and religious developments, Puritanism and the Revolution of the 1640s, the Restoration, establishment of constitutional monarchy after 1688, Great Britain's rise as an imperial power.

HIST 437 Eighteenth Century Britain

Credits 3. 3 Lecture Hours. Political, social, economical, intellectual, cultural, and imperial history of Britain in the eighteenth century. **Prerequisite:** Junior or senior classification.

HIST 438 Nineteenth Century Britain

Credits 3. 3 Lecture Hours. Political, social, economic, cultural, intellectual and military history of Great Britain from 1815 to 1914. **Prerequisite:** Junior or senior classification or approval of instructor.

HIST 439 Twentieth Century Britain

Credits 3. 3 Lecture Hours. Constitutional, political, economic, military, social and cultural history of Great Britain since 1900. **Prerequisite:** Junior or senior classification or approval of instructor.

HIST 441 History of Mexico, 1821 to the Present

Credits 3. 3 Lecture Hours. Political, economic and social development of Mexico since independence and her relation to other world powers.

HIST 442 World War II

Credits 3. 3 Lecture Hours. Origins; military campaigns in Europe, North Africa, Asia, and the Pacific; European, Japanese, Asian, and American home fronts; collapse of Germany; atomic warfare; legacies. **Prerequisite:** Junior or senior classification.

HIST 443 American Military History to 1901

Credits 3. 3 Lecture Hours. American military experience from colonial days to 1901; causes, nature and effect of the wars in which the United States has participated.

HIST 444 American Military History Since 1901

Credits 3. 3 Lecture Hours. American military experience from 1901 to present; causes, nature and effect of wars in which the United States has participated; effect of war on American history.

HIST 445 History of Military Strategy

Credits 3. 3 Lecture Hours. Military thought and theory, 1700 to the present. **Prerequisite:** Junior or senior classification.

HIST 447 Law and Society in the United States through Reconstruction

Credits 3. 3 Lecture Hours. How political and social conditions in American history have produced fundamental constitutional principles, changes and practices; historical evolution of written and unwritten Constitution; state law, legal theory, legal profession and private law through the Civil War and Reconstruction. **Prerequisite:** Junior or senior classification or approval of instructor.

HIST 448 American Law Since 1865

Credits 3. 3 Lecture Hours. Analysis of themes in American legal and constitutional history since 1865; examination of social, cultural, and political context surrounding major Supreme Court decisions; social impact of laws and Supreme Court decisions; investigation of legal activities such as moot court and amicus curiae briefs. **Prerequisites:** Junior or senior classification.

HIST 449 History of Brazil, 1822 to the Present

Credits 3. 3 Lecture Hours. Political, cultural and economic development of Brazil since independence; slavery and race relations; relation to other world powers. **Prerequisite:** Junior classification.

HIST 450 Southern Identities and Cultures through Reconstruction

Credits 3. 3 Lecture Hours. Focus on parts of North America where slavery dominated the economy, politics and demographics; experiences of native, African and European-descended peoples in such regions from the colonial period to the end of slavery; debates about geographical and cultural roots of regional identities. **Prerequisite:** Junior or senior classification or approval of instructor.

HIST 451 Southern Identities and Cultures Since Reconstruction

Credits 3. 3 Lecture Hours. Focus on the aftermath of slavery and defeat in those parts of North America where slavery dominated the economy, politics and demographics; transformations in race, culture and politics in such regions and emergence of new identities since Reconstruction; debates over the geographic and cultural roots of the American South. **Prerequisite:** Junior or senior classification or approval of instructor.

HIST 452 The American Revolution

Credits 3. 3 Lecture Hours. The causes and consequences of revolutionary activity; battlefields and homefronts during the War for Independence; social, political and economic impact of the Revolution on diverse peoples and communities both in the new United States and abroad; historical memory of the American Revolution. **Prerequisite:** Junior or senior classification.

HIST 453 The American West

Credits 3. 3 Lecture Hours. Patterns of westward expansion and settlement; Native American history and culture; global immigration to the region; Western political, economic, social, and environmental developments; the American West in popular culture. **Prerequisite:** Junior or senior classification.

HIST 455 History of the American City

Credits 3. 3 Lecture Hours. History of American Cities; a social, economic and political study of industry, labor and immigration; development of a metropolitan society.

HIST 458 The History of Childhood and Family in America

Credits 3. 3 Lecture Hours. History of childhood and family in American history; examination of how region, race, ethnicity, class and gender shape children's and the family's experiences; consideration of how social, cultural, economic, and political structures shape ideas about and activities of children and families in America.

HIST 459 American Society and Culture to 1877

Credits 3. 3 Lecture Hours. Century of social and political thought, religion, science, scholarship and education in the United States.

HIST 460 American Society and Culture Since 1877

Credits 3. 3 Lecture Hours. Continuation of HIST 459 from 1877 to the present.

HIST 461/WGST 461 History of American Women

Credits 3. 3 Lecture Hours. Cultural, political, legal and religious factors that helped shape the role and character of women in American society from colonial times to the present; historical role of women in the development of the nation. **Cross Listing:** WGST 461/HIST 461.

HIST 462 American Foreign Relations to 1913

Credits 3. 3 Lecture Hours. History of U.S. foreign relations and policies to 1913. **Prerequisite:** Junior or senior classification or approval of instructor.

HIST 463 American Foreign Relations Since 1913

Credits 3. 3 Lecture Hours. History of U.S. foreign relations and policies since 1913. **Prerequisite:** Junior or senior classification or approval of instructor.

HIST 464 International Developments Since 1918

Credits 3. 3 Lecture Hours. General survey of world politics since close of World War I; problems and ideologies of great powers of Europe and factors and conditions which explain present political tendencies and policies.

HIST 468/LMAS 468 Latinx Civil Rights Movements

Credits 3. 3 Lecture Hours. Latinx civil rights movements in the twentieth century; Mexican American, Puerto Rican, Cuban, Central American; racism, economic inequality, labor exploitation, segregation, anti-immigrant sentiment, gender discrimination; role of liberalism, multiethnic coalitions, third world liberation movements, revolutionary nationalism, religion; movement philosophies and strategies; contemporary immigrant rights movements. **Prerequisites:** Junior or senior classification or approval of instructor. **Cross Listing:** LMAS 468/HIST 468.

HIST 469 History of Collective Protest and Violence

Credits 3. 3 Lecture Hours. Examination of collective protest and violence on a case study basis and in comparative and historical context; emphasis on causes, the nature of participation, assumptions and goals, and the character of repression. **Prerequisite:** Junior or senior classification.

HIST 470 American Business History

Credits 3. 3 Lecture Hours. Management strategy and structure of the modern corporation in 19th and 20th century America and the corporation's changing roles in American society.

HIST 471 Survey of World History for Elementary Education Certification

Credits 3. 3 Lecture Hours. World history for future social studies instructors; politics, economics, religion, and culture in global context; instructional methods and pedagogical philosophy for prospective elementary-level educators. **Prerequisite:** Junior or senior classification.

HIST 472 Programming for Historians

Credits 3. 3 Lecture Hours. Exploration of the use of computers for historical research; creating data out of historical source material; computer programming skills for digitizing, querying, and sharing historical texts. **Prerequisite:** Junior or senior classification.

HIST 473/WGST 473 Women's History in the Modern U.S.

Credits 3. 3 Lecture Hours. History of women in the U.S. from the late nineteenth century to the present; role of intersectionality in defining the experience of modern womanhood; women as activists, workers, consumers, mothers, and feminists; experiences, lives and influence of women of color; examination of contemporary social, political and economic histories. **Prerequisite:** Junior or senior classification or approval of instructor; HIST-473 also taught at Galveston campus. **Cross Listing:** WGST 473/HIST 473.

HIST 474 Topics in Historical Ethnical Conflict

Credits 3. 3 Lecture Hours. Analysis of a specific instance of historical ethnic conflict; examination of the social, political, religious, and economic factors contributing to that historical conflict; discussion of structural factors influencing ethnic, national and other group efforts to advance claims to separate identity and self-government; case study will vary by semester. **Prerequisite:** Junior or senior classification.

HIST 475 Empires in History

Credits 3. 3 Lecture Hours. Empires in their formative, medieval, early modern and modern periods within a comparative framework with a case-study approach; geographic range varies; politics, religion, culture, literature, arts, economics, environment, race, gender, identity formation, technology, class, medicine, sciences, philosophy, labor, violence, agriculture, immigration, slavery, diplomacy and industrialization. May be taken 3 times for credit. **Prerequisite:** Junior or senior classification.

HIST 476/WGST 476 Sex and Sexuality in History

Credits 3. 3 Lecture Hours. Changing ideas about sex and sexuality over time; includes their interaction with ideas about gender, race, class, religion, science, technology, medicine, politics and popular culture; historical and cultural processes creating modern concerns about sex and sexuality. **Prerequisite:** Junior or senior classification. **Cross Listing:** WGST 476/HIST 476.

HIST 477/WGST 477 Women and Gender in Modern European History

Credits 3. 3 Lecture Hours. Women in Europe from the 18th century to the present: women's contributions to their societies; realities of their daily lives and their responses; perceptions of women; role of institutions in defining women's roles; significance for women of industrialization, revolution, warfare, scientific discoveries; interaction of class, race and gender. **Cross Listing:** WGST 477/HIST 477.

HIST 478 Immigration in Post-1945 European History

Credits 3. 3 Lecture Hours. History of immigration in post-1945 Europe; experiences of migrants to Europe; migrant participation in workforce; backlash to immigration; migrants' cultural contributions to Europe; transformation of Europe and European identity. **Prerequisites:** Junior or senior classification.

HIST 481 Seminar in History

Credits 3. 3 Lecture Hours. Literature of an issue, event, period or people in history; use of primary source materials connected with the field of the seminar; problems of bibliography, historiography and historical method; and experience in writing. Open to senior history majors or with instructor's approval. May be repeated for credit. **Prerequisites:** Grade of C or better in HIST 280; 21 credits of history, 9 of which must be 300-level or above; senior classification or approval of instructor.

HIST 485 Directed Studies

Credits 0 to 3. 0 to 3 Other Hours. Selected fields of history not covered in depth by other courses. Reports and extensive reading required. **Prerequisite:** Approval of instructor and academic advisor; also taught at Galveston campus.

HIST 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of history. May be repeated for credit.

HIST 491 Research

Credits 0 to 3. 0 to 3 Other Hours. Research conducted under the direction of faculty member in history. **Prerequisites:** 24 hours of history, with 12 or more at 300-level or above; junior or senior classification; approval of instructor and academic advisor.

HIST 497 Independent Honors Studies

Credits 1 to 3. 1 to 3 Other Hours. Directed independent studies for upper division Honors students, regardless of academic major, in selected aspects of history. **Prerequisites:** Junior or senior classification either as Honors student or with overall GPR of 3.25 and letter of approval from head of student's major department, approval of History department head, and approval of both instructor of record and History academic advisor.

HLTH - Health (HLTH)

HLTH 210 Introduction to the Discipline

Credits 3. 3 Lecture Hours. Concepts essential to understanding the discipline: competencies and career opportunities for professional health educators in school and community settings. **Prerequisites:** Current health major.

HLTH 214/KINE 214 Health and Physical Activity for Children

Credits 3. 3 Lecture Hours. (PHED 1331) Health and Physical Activity for Children. Coordinated school health and physical activity programs appropriate for elementary aged children; focus on the content of the curriculum and the philosophical underpinnings of programming related to health and physical activity. **Cross Listing:** KINE 214/HLTH 214.

HLTH 216/KINE 216 First Aid

Credits 2. 2 Lecture Hours. (PHED 1306) First Aid. Basic first aid instruction leading to University Level, first aid course completion recognition. **Cross Listing:** KINE 216/HLTH 216.

HLTH 221 Safety

Credits 3. 3 Lecture Hours. The magnitude of the accident problem as it relates to individual and community well-being; promotion of safe behavior.

HLTH 222 Concepts in Peer Health Education

Credits 3. 3 Lecture Hours. Preparation as peer educators and campus community leaders; experiential learning; includes various health topics, program development, presentation and public speaking, communication and group facilitation. **Prerequisite:** Grade of C or better in HLTH 210 or concurrent enrollment.

HLTH 231 Healthy Lifestyles

Credits 3. 3 Lecture Hours. (PHED 1304) Healthy Lifestyles. Health issues relevant to students; included are mental health, use and abuse of drugs, human sexuality, communicable diseases, environmental and consumer health.

HLTH 236 Introduction to Health Disparities and Diversity

Credits 3. 3 Lecture Hours. Explore in-depth the racial, ethnic, and cultural dimensions that underlie health and health disparities; emphasis on culture, social economic status and governmental policies as they influence the adaptation of health practices.

HLTH 240 Computer Technology in Health and Kinesiology

Credits 3. 3 Lecture Hours. Application of current technology in the areas of health and kinesiology; fundamentals of computers and their use; application of commercial software to health and kinesiology settings; use of computer networks for communications and research.

Prerequisite: Freshman or sophomore classification in health, kinesiology or sport management.

HLTH 285 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Work on a specified topic with the intent of promoting independent reading, research and study; supplement existing course offerings or subjects not presently covered. **Prerequisites:** Freshman or sophomore classification; approval of instructor.

HLTH 291 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in health. May be repeated 4 times for credit.

Prerequisites: Freshman or sophomore classification and approval of instructor.

HLTH 331 Community Health

Credits 3. 3 Lecture Hours. Exploration of aspects of a healthy community through community organizing, building and asset mapping; identification of factors that influence the health of the community; utilization of research methods and analysis to assess community health; identification of and application of evidence-based practices and interventions to address common community health issues. **Prerequisite:** Grade of C or better in HLTH 231 or concurrent enrollment.

HLTH 332 School Health Program

Credits 3. 3 Lecture Hours. Background, development, administration and framework of the school health program; role of the school health team; nature and function of school health services and healthful school living.

Prerequisite: Grade of C or better in HLTH 210 or concurrent enrollment.

HLTH 333/PHLT 363 Spirituality and Health

Credits 3. 3 Lecture Hours. Exploration of the relationship between spirituality, religion, health, health education and spiritual health; identification of techniques to measure spiritual health/wellness and enlighten healthcare professionals to the role spiritual health plays in healing; identification of spirituality topics important to health care professionals. **Prerequisite:** Junior or senior classification; School of Public Health majors. **Cross Listing:** PHLT 363/HLTH 333.

HLTH 334 Women's Health

Credits 3. 3 Lecture Hours. A broad range of health issues that are either unique to women or of special importance to women; information for the health consumer; preparation as an advocate of healthy lifestyles; awareness of the role health plays in the life of all women. **Prerequisite:** Junior or senior classification. **Cross Listing:** PHLT 360 and WGST 334.

HLTH 335 Human Diseases

Credits 3. 3 Lecture Hours. Causes of disease, course of communicable disease, body's defense against disease and classification and description of diseases. **Prerequisite:** Grade of C or better in BIOL 320, HLTH 210, HLTH 231, and HLTH 240.

HLTH 342/PHLT 342 Human Sexuality

Credits 3. 3 Lecture Hours. Many aspects of human sexuality; physiology and function of human reproductive system, factors involved in learning sex roles, biological and emotional motivations associated with the sexual aspects of life and their relationship to marriage and family planning. **Prerequisites:** Junior or senior classification. **Cross Listing:** PHLT 342/HLTH 342.

HLTH 353/PHLT 353 Drugs and Society

Credits 3. 3 Lecture Hours. Use and abuse of drugs in today's society; physiological, sociological and psychological factors involved.

Prerequisite: Grade of C or better in BIOL 320, HLTH 210, HLTH 231, and HLTH 240. **Cross Listing:** PHLT 353/HLTH 353.

HLTH 354/PHLT 354 Medical Terminology for the Health Professions

Credits 3. 3 Lecture Hours. Designed for students interested in pursuing a career in a health, medical, scientific or other helping profession; develop medical word power skills combined with related health and disease knowledge. **Prerequisite:** Junior or senior classification. **Cross Listing:** PHLT 354/HLTH 354.

HLTH 403/PHLT 403 Consumer Health

Credits 3. 3 Lecture Hours. Selection, evaluation and understanding of health information, medical services, advertising of products and sociocultural factors in consumer health protection. **Prerequisite:** Grade of C or better in HLTH 210. **Cross Listing:** PHLT 403/HLTH 403.

HLTH 405/PHLT 405 Rural Health

Credits 3. 3 Lecture Hours. Issues facing rural health care; emphasis on understanding the geographical characteristics of rural communities and their affect on health care delivery. **Prerequisite:** Junior or senior classification; School of Public Health major. **Cross Listing:** PHLT 405/HLTH 405.

HLTH 407 Global Health

Credits 3. 3 Lecture Hours. A synthesized examination of global health from a multi-level, anthropological perspective; strong emphasis on ethical considerations implicit in global health research and program implementation; heavy use of true case studies and problem-solving exercises designed to increase cross-cultural awareness, cultural competence, empathy and critical thinking skills. **Prerequisite:** Grade of C or better in HLTH 210, HLTH 231, HLTH 240, BIOL 319, BIOL 320 and COMM 203; grade of C or better in ENGL 103 or ENGL 104.

HLTH 410 Worksite Health Promotion

Credits 3. 3 Lecture Hours. Careful examination of strategies to design, implement and evaluate exercise and health programs in worksites; including health risk assessment, marketing protocol, needs assessment, corporate culture issues, policy development and cost-benefit analysis. **Prerequisite:** Grade of C or better in BIOL 320, COMM 203, ENGL 104 or ENGL 103, HLTH 210, HLTH 231, and HLTH 240.

HLTH 415/PHLT 420 Health Education Methodology

Credits 3. 3 Lecture Hours. Theory and practice in the development and use of creative and traditional health education strategies in secondary schools and community settings; emphasis is given to cognitive, affective and behavioral teaching strategies. **Prerequisite:** Grade of C or better in HLTH 231, BIOL 320, and COMM 203; grade of C or better in HLTH 222, HLTH 240, HLTH 332, or HLTH 331; grade of C or better in ENGL 103 or ENGL 104. **Cross Listing:** PHLT 420/HLTH 415.

HLTH 421 Elementary School Health Instruction

Credits 3. 3 Lecture Hours. Modern issues, trends, content and material in elementary school health programs; research and instructional strategies essential for reading in content areas with an emphasis on developing the coordinated school health education for health and kinesiology teacher certification majors. **Prerequisite:** Grade of C or better in HEFB 222/KNFB 222 or KNFB 222/HEFB 222; grade of C or better in BIOL 107 or BIOL 111; grade of C or better in PHYS 201 or CHEM 119; junior or senior classification.

HLTH 425/PHLT 425 Health Program Evaluation

Credits 3. 3 Lecture Hours. Theory and practice in evaluation of health programs in school and community; analysis of test results; evaluation of standardized health tests. **Prerequisite:** Grade of C or better in HLTH 222, HLTH 231, HLTH 240, HLTH 331, BIOL 320, and COMM 203; grade of C or better in ENGL 103 or ENGL 104. **Cross Listing:** PHLT 425/HLTH 425.

HLTH 429 Environmental Health

Credits 3. 3 Lecture Hours. Emphasis on the interconnectedness between the environment, both natural and man-made, and human health; range of topics including sustainability, population growth, toxicology, waste management, air and water quality, built environment and environmental psychology; demonstration of how the environment can support or hinder each dimension of wellness while being effective consumers of information. **Prerequisite:** Junior or senior classification.

HLTH 440/PHLT 440 Contemporary Issues for Community Health Interns

Credits 3. 3 Lecture Hours. Preparatory course for advanced students in the community health internship program. **Prerequisite:** Grade of C or better in HLTH 222, HLTH 231, HLTH 240, HLTH 331, BIOL 320, and COMM 203; grade of C or better in ENGL 103 or ENGL 104; admission into internship program. **Cross Listing:** PHLT 440/HLTH 440.

HLTH 445 Professional Practice in Health Education

Credits 2. 2 Lecture Hours. Information, perspectives and skills to promote health and quality of life effectively in community, school, workplace and health-care settings; boundary-crossing partnerships across health disciplines; the role of collaborative efforts to better meet community health needs. **Prerequisites:** Admission to professional phase of program; junior or senior classification.

HLTH 481 Seminar in Allied Health

Credit 1. 1 Lecture Hour. Admission to allied health professional school and/or careers; research on selected allied health fields, discussion of transition from college environment to professional school/career environment including professional development. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisite:** Grade of C or better in HLTH 210, HLTH 231, HLTH 240, and COMM 203; grade of C or better in ENGL 103 or ENGL 104.

HLTH 482 Grant Writing in Health

Credit 1. 1 Lecture Hour. A writing intensive course focused on grant writing in the field of health education and health promotion; grant application written by student on a health-related topic using a recursive writing process. May be taken two times for credit. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisite:** Grade of C or better in HLTH 210, HLTH 231, HLTH 240, BIOL 320, and COMM 203; grade of C or better in ENGL 103 or ENGL 104.

HLTH 484 Community Health Internship

Credits 0 to 12. 0 to 12 Other Hours. Supervised internship at selected community, public or private health agencies. **Prerequisites:** Grade of C or better in HLTH 415/PHLT 420, HLTH 425/PHLT 425, and HLTH 440/PHLT 440; completion of all coursework.

HLTH 485 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Directed study of special problems within the discipline. **Prerequisites:** Junior or senior classification; approval of instructor.

HLTH 489 Special Topics in...

Credits 0 to 4. 0 to 4 Lecture Hours. Selected topics in an identified area of the discipline. May be repeated for credit.

HLTH 491 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in health. May be repeated 4 times for credit. **Prerequisites:** Junior or senior classification and approval of instructor.

HMGT - Hosp, Hotel Mgmt, Tour (HMGT)

HMGT 201 Foundations of Hospitality, Hotel Management and Tourism

Credits 3. 3 Lecture Hours. Theoretical foundations of the hospitality, hotel management, and tourism profession; professional philosophy, present status, prospects for the future and the role of hospitality, hotel management, and tourism in modern society.

HMGT 204 International Food - Service, Cuisine and Culture

Credits 3. 3 Lecture Hours. Exploration of the diverse culinary traditions and food practices around the world; examination of how culture, history, geography, and socio-economic factors influence what and how people eat; understanding of global food cultures and the role of cuisine in cultural identity, social practices, and international relations.

HMGT 207 Interpretation of Natural and Cultural Resources

Credits 3. 2 Lecture Hours. 2 Lab Hours. Principles and methods of effective communication with the public at parks, cultural institutions and tourism destinations; application of guided techniques to connect audiences with meanings inherent in a resource.

HMGT 210 Data-Driven Decision Making in Hospitality, Hotel Management and Tourism

Credits 3. 3 Lecture Hours. Critical-to-quality metrics applied to decisions in Hospitality, Hotel, and Tourism management (HMGT) and techniques needed to inform management decisions in those agencies; future HMGT managers will learn how to acquire, and interpret data to monitor quality, improve processes, and inform decisions. **Prerequisites:** HMGT 201.

HMGT 211 Planning and Implementation of Events and Programs

Credits 3. 3 Lecture Hours. Planning, operations, administration and evaluation of experiences; includes creation and implementation of experiences and special events with budgeting, operational and venue logistics, marketing, fund raising, hospitality training and participant satisfaction.

HMGT 212 Resort Event and Program Planning

Credits 3. 3 Lecture Hours. Planning, operations, administration, implementation and evaluation of resort programs and events; includes budgeting, operational and venue logistics, marketing, fund raising, hospitality training and participant satisfaction.

HMGT 223 Managing Hospitality and Tourism Organizations

Credits 3. 3 Lecture Hours. Management theory, best practices and functions associated within hospitality, hotel and tourism agencies; concepts and issues related to budgeting, financing, planning, organizing, leading, coordinating, controlling and staffing for profit, nonprofit and public organizations.

HMGT 281 Career Planning in Hospitality, Hotel Management, and Tourism

Credit 1. 1 Lecture Hour. Development of knowledge and skills necessary for employment in hospitality, hotel management and tourism; career preparation and job search strategies, professionalism, networking and opportunities for advanced education; preparation for internship and post-graduation positions. **Prerequisites:** HMGT majors only.

HMGT 291 Research

Credits 1 to 3. 1 to 3 Other Hours. Research conducted under the direction of faculty member in Hospitality, Hotel Management and Tourism. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

HMGT 300 Supervised Field Studies

Credits 3. 3 Other Hours. Survey and application of principles of tourism, hospitality and recreation; selected aspects of management in an operational setting. May be taken three times for credit. **Prerequisites:** Junior or senior classification or approval of instructor.

HMGT 301 Recreation in American Culture

Credits 3. 3 Lecture Hours. Identify and examine the fundamental concepts of leisure and outdoor recreation and how they influence us as individuals, groups and society; critical factors such as self, family, lifespan, ecology, health, work patterns, communications, diversity, popular culture, and consumption are studied in relationship to past, present and future leisure patterns. **Prerequisite:** Junior or senior classification.

HMGT 302 Application of Tourism Principles

Credits 3. 3 Lecture Hours. Tourism principles applied at local, regional and international levels; examination of the scale, scope and organization of the industry including marketing destinations and experiences; issues related to the economic, technological and political aspects of tourism. **Prerequisite:** Junior or senior classification.

HMGT 312 Managing Human Capital in Hospitality, Hotel Management, and Tourism

Credits 3. 3 Lecture Hours. Examination of best practices in managing human capital in hospitality, hotel management and tourism, agencies including sourcing, learning and development, employee relations and compensation and benefits. **Prerequisites:** HMGT 201; junior or senior classification.

HMGT 313 Managing for Service Quality in Events, Tourism and Recreation

Credits 3. 3 Lecture Hours. Tools and skills to successfully manage customer interactions in leisure contexts; creating value and satisfaction for guests and employees; managing capacity and demand; service strategy, guest experience design, conflict, recovery, and continuous improvement research. **Prerequisites:** HMGT 201; junior or senior classification.

HMGT 314 Service Quality in Hospitality, Hotel Management, and Tourism

Credits 3. 3 Lecture Hours. Key concepts in managing service organizations and their operations to create value and satisfaction for employees and end users; service strategy, user experience and user interface design, conflict, recovery, and research; managing capacity and demand; overview of tools and skills to successfully manage customer interactions. **Prerequisites:** Junior or senior classification.

HMGT 319 Event Management in Specialized Contexts

Credits 3. 3 Lecture Hours. Intermediate level applications of event management principles as they specifically relate to various event settings, purposes, and scales to include live music, festivals, cultural events, meetings, conventions, conferences, trade shows, incentive travel, non-profit fundraisers, wedding, life cycle events, sporting events, and other ancillary activities. **Prerequisites:** HMGT 211; junior or senior classification.

HMGT 320 Event Management and Operations

Credits 3. 3 Lecture Hours. Principles and applications for effective planning and management of events; planning, promotion, operational logistics, sponsorship and evaluation. **Prerequisites:** HMGT 211; junior or senior classification.

HMGT 331 Marketing in the Digital Age for Hospitality, Hotel Management and Tourism

Credits 3. 3 Lecture Hours. Application of basic and digital tourism marketing principles and concepts in government, business, and social-cause contexts; situation analysis and operational evaluation; decision making in terms of product, place, price, and channel of distribution mixes for tourism attractions and services. **Prerequisite:** Junior or senior classification.

HMGT 333 Meetings, Incentives, Conventions, and Exhibitions

Credits 3. 3 Lecture Hours. Application of hospitality management principles to convention, incentive tourism and corporate meeting planning; key planning elements applicable to the Meetings, Incentives, Conventions, Exhibitions (MICE) industry on local, national and global scales; development of MICE careers. **Prerequisites:** Junior or senior classification.

HMGT 336 Recreation Program Assessment and Evaluation

Credits 3. 3 Lecture Hours. Best practices for service and program assessment and evaluation practices in recreation and hospitality industries; quantitative and qualitative techniques; user needs assessments; introductory data analysis techniques; use of infographics, social math and other data reporting techniques. **Prerequisites:** HMGT 201, HMGT 211 and junior or senior classification.

HMGT 340 Global Communities & Diverse Populations in Hospitality, Hotel Management and Tourism

Credits 3. 3 Lecture Hours. Global Communities & Diverse Populations in Hospitality, Hotel Management and Tourism. Impact of ethnicity, gender, sexuality, age, socioeconomic factors, and disability on the preferences and experiences of people in the United States; implications of diversity on hospitality, hotel, and tourism, programs; topics include issues of inclusion, equity, marginalization and oppression, concepts of social justice, and strategies for serving global communities and diverse populations. **Prerequisite:** Junior or senior classification.

HMGT 352 Hotel and Resort Operations

Credits 3. 3 Lecture Hours. Examination of the crucial elements involved in the successful operation of a hotel or resort and how they interrelate; analysis and application of management principles in the major departments of hotels and resorts to include rooms division, food and beverage, recreation, sales and marketing. **Prerequisites:** Junior or senior classification.

HMGT 353 Food and Beverage Management

Credits 3. 3 Lecture Hours. Key principles and skills required in the effective management of food and beverage operations; topics include application of strategic, managerial and operational factors which characterize successful food and beverage operations within hotels and resorts; menu planning, food purchasing, receiving, preparation, serving and marketing; development of the industry; ethical obligations in the industry. **Prerequisites:** Junior or senior classification.

HMGT 354 Restaurant Management

Credits 3. 3 Lecture Hours. Overview of management of all areas of restaurant business including back-of-house, front-of-house, development of a new restaurant business; legal considerations; managing staff; budget control. **Prerequisites:** HMGT 353; junior or senior classification.

HMGT 380 Healthy Living and Recreation Environments

Credits 3. 3 Lecture Hours. Roles of parks and recreation within the healthy living paradigm; outcomes of recreation programs and places on overall quality of life, physical, mental, and social health of communities and community members; examination of key sociological concepts related to lifelong leisure skills, leisure across the lifespan, and quality of life as well as agency and community level concepts such as social and behavioral marketing, social ecological model, and participatory action research. **Prerequisites:** Junior or senior classification.

HMGT 382 Sustainability and Place Management

Credits 3. 3 Lecture Hours. Exploration of parks and recreation as sustainable places; land access issues facing urban and sprawling communities and how modern-day park systems address land-use, repurpose land, and design and program spaces for park and recreation use with an emphasis on natural and environmental benefits; crucial components of land acquisition, classifications, operations, planning, and design concepts. **Prerequisites:** HMGT 201 and junior or senior classification.

HMGT 384 Junior Internship

Credits 2. 2 Other Hours. Practical experience working in a professional hospitality, tourism, recreation, or event management setting.

Prerequisites: HMGT 201 and HMGT 281; junior or senior classification.

HMGT 401 Entrepreneurship in Hospitality, Tourism and Events

Credits 3. 3 Lecture Hours. Market and financial feasibility analysis; resource characteristics, location and market aspects of hospitality, tourism and event enterprises; sources of funding for facility development; approaches to marketing hospitality, tourism and event services; business plan development. **Prerequisites:** HMGT 223 or HMGT 411; junior or senior classification.

HMGT 402 Planning and Design of Hospitality, Tourism and Recreation Places

Credits 3. 2 Lecture Hours. 2 Lab Hours. Analysis of the classification of areas according to primary function, location and clientele served; examination of basic park planning principles involving scale, circulation, function and spatial relationships; methodology for establishing planning goals, objectives and planning strategies. **Prerequisites:** HMGT 201; junior or senior classification.

HMGT 411 Cruise Tourism

Credits 3. 3 Lecture Hours. Overview of cruise tourism; management of service sectors; understanding of cultural aspects of places traveled; cruise marketing/decision making; geography of cruising; youth programming; agri-tourism; identification of issues related to the economic, technological and political aspects of cruise tourism. **Prerequisite:** Junior or senior classification.

HMGT 412 International Event Management

Credits 3. 3 Other Hours. Event execution and experience in a country other than the US; evaluation of venues, vendors, and other logistical and practical elements specific to the culture or country of study. **Prerequisites:** HMGT 211 or approval of instructor; junior or senior classification.

HMGT 424 Event Management Capstone

Credits 3. 3 Lecture Hours. Practical application of event management principles through event execution; exploration and application of event design principles; demonstration of academic knowledge in management of events through certification and professional documentation of event coordination experiences. **Prerequisites:** HMGT 320; junior or senior classification.

HMGT 426 Sustainable Tourism

Credits 3. 3 Lecture Hours. Sustainability-oriented approach to the development, planning and management of tourism destinations, attractions and events; dynamic characteristics of the complex tourism system; local to global scope of tourism-related impacts; key stakeholders and power relations; application of key principles of sustainable tourism development for destination resilience, community well-being and long-term sustainability of tourism destinations. **Prerequisites:** HMGT 302; junior or senior classification.

HMGT 430 Leadership Seminar in Hospitality and Hotel Management

Credits 3. 3 Lecture Hours. Overview of leadership styles, skills, roles, and functions of leaders of organizations; history and origins of leadership, theoretical approaches to leadership, and ethical issues facing contemporary leaders; moral and ethical responsibilities of leaders; awareness of individual styles of leadership. **Prerequisites:** HMGT 223; senior classification.

HMGT 440 Global Engagement in Hospitality, Hotel Management and Tourism Studies

Credits 2 to 6. 2 to 6 Other Hours. Exploration of sustainable tourism destination management in a foreign country; conservation of natural and cultural resources balanced with hospitality infrastructure and visitor experience. May be repeated for credit. **Prerequisites:** Junior or senior classification or approval of instructor.

HMGT 442 International Perspectives in Hospitality, Tourism and Events

Credits 3. 3 Lecture Hours. Transnational tourism and hospitality; cross-cultural consumption of experiences; differences and similarities in cultural norms, exceptions, rules and preferences; global perspective from a hospitality and tourism lens to explore culture, language, customs, religion, politics, leisure, business, law, gastronomy and environment. **Prerequisites:** HMGT 201 and HMGT 340; junior or senior classification.

HMGT 446 Information and Communication Technology in Hospitality, Hotel Management and Tourism

Credits 3. 3 Lecture Hours. Information and communication technologies in the hospitality, tourism, recreation, and event management fields; analysis of technology adoption and how technology is used for knowledge management, support, collaboration, communication, accounting, reservations and scheduling, forecasting, and payments. **Prerequisites:** HMGT 211 and HMGT 223; junior or senior classification.

HMGT 449 Tourism Capstone

Credits 3. 3 Lecture Hours. Application of theoretical frameworks and tourism management concepts to a project with a participating company; strategic analysis of company structure and needs; research of areas and markets; analysis and presentation of findings in accordance with project objectives. **Prerequisites:** HMGT 302; HMGT 320 or HMGT 446; HMGT 401; senior classification.

HMGT 450 Financing Hospitality, Hotel, and Tourism Services

Credits 3. 3 Lecture Hours. Exploration of financial vehicles for funding hospitality, hotels and tourism organizations and services. **Prerequisites:** HMGT 223 or HMGT 411; junior or senior classification.

HMGT 451 Law, Negotiation, and Risk Management in Hospitality, Tourism and Recreation

Credits 3. 3 Lecture Hours. Evaluation of laws and lines of legal inquiry related to work in hospitality, events, tourism, youth, and recreation settings; skills related to contract negotiation and review; elements of contracts and completion of agreements. **Prerequisites:** HMGT 201; junior or senior classification.

HMGT 452 Strategic Management for Hospitality and Tourism

Credits 3. 3 Lecture Hours. Fundamentals of strategic management in hospitality and tourism contexts using theoretical frameworks and practical applications; three phases in the strategic management process – planning, implementation and evaluation will be examined; critical evaluations of the long-term strategic issues affecting hospitality and tourism enterprises. **Prerequisites:** HMGT 201; junior or senior classification.

HMGT 465 Revenue Management

Credits 3. 3 Lecture Hours. Demand-based pricing system employed in the hospitality and tourism industry coupled with information technology resulting in long term strategic impacts; role and function of revenue manager as the key executive responsible for managing the pricing and supply policies in hotels and airlines. **Prerequisites:** HMGT 352; junior or senior classification.

HMGT 467 Seminar for the Visitor Economy

Credits 3. 3 Other Hours. Overview of micro, meso, and macro-economic effects of tourism related enterprises on the visitor economy; challenges facing managers in relation to the visitor economy, whether local, state, regional, national or global; impacts and opportunities for various tourism sectors. **Prerequisites:** HMGT 201; HMGT 223 or HMGT 411; junior or senior classification.

HMGT 470 Contemporary Hotel and Resort Development

Credits 3. 3 Lecture Hours. International contemporary trends including Integrated Resort and Mega Hotels to include accommodations, entertainment, event venues, theme parks, luxury management and retail facilities; course will address branding and market segmentation, and how those specific niches influence future development of hotels and resorts. **Prerequisites:** HMGT 352; junior or senior classification.

HMGT 476 Leadership for Outdoor Recreation

Credits 3. 3 Lecture Hours. Leadership principles related to outdoor recreation; classroom instruction and experiential learning; skills training through field trips; risk management planning, environmental education, group facilitation, and trip planning. **Prerequisite:** Junior or senior classification.

HMGT 480 Hospitality Enterprises Practicum

Credits 3. 3 Other Hours. Practical experience working in a professional hospitality setting; offered on an individual basis. **Prerequisites:** HMGT 201, HMGT 281; junior or senior classification.

HMGT 481 Seminar

Credit 1. 1 Other Hour. Development of knowledge and skills necessary for employment in hospitality, hotel management and tourism; career preparation and job search strategies, professionalism, networking and opportunities for advanced education; preparation for internship and post-graduation positions. **Prerequisites:** HMGT majors; junior or senior classification.

HMGT 484 Internship

Credits 3. 3 Other Hours. Practical experience working in a professional hospitality, hotel management, tourism, event management or recreation setting; offered on an individual basis. May be repeated for credit.

Prerequisites: HMGT 340 and HMGT 384; junior or senior classification.

HMGT 485 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. For individual research by advanced undergraduates upon a broad range of subjects not included in established courses. **Prerequisite:** Junior classification or approval of department head.

HMGT 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 9 Lab Hours. Selected topics in an identified area of hospitality, hotel, tourism, recreation and event management. May be repeated for credit.

HMGT 491 Research

Credits 1 to 3. 1 to 3 Other Hours. Research conducted under the direction of faculty member in Hospitality, Hotel Management and Tourism. Registration in multiple sections of this course are possible within a given semester provided that the per semester credit hour limit is not exceeded. **Prerequisites:** Junior or senior classification and approval of instructor.

HORT - Horticultural Sciences (HORT)

HORT 201 Horticultural Science and Practices

Credits 3. 3 Lecture Hours. (AGRI 1315, AGRI 1415*, HORT 1301, HORT 1401*) Horticultural Science and Practices. Structure, growth and development of horticultural plants from a practical and scientific approach; environmental effects, basic principles of propagation, greenhouse and outdoor production, nutrition, pruning and chemical control of growth, pest control and branches of horticulture.

HORT 202 Horticultural Science and Practices Laboratory

Credit 1. 3 Lab Hours. (HORT 1101, AGRI 1115, HORT 1401*, AGRI 1415*) Horticultural Science and Practices Laboratory. Methods and practices related to production of horticultural crops; practical exercises in greenhouse and field. **Prerequisite:** HORT 201 or registration therein.

HORT 203 Floral Design

Credits 3. 2 Lecture Hours. 2 Lab Hours. Principles of design illustrated with the use of floral materials; floral design elements and techniques including color, form, line and texture; history and utilization of floral art in society.

HORT 281 Professions in Horticulture

Credit 1. 1 Lecture Hour. Comprehensive view of the opportunities in the science, technology and art of horticultural sciences and potential career paths; sub-disciplines by crop (fruit, vegetable, viticulture, nut, ornamental crops, floral crops, controlled environment and urban horticulture) and approach (research, technology, biotechnology, mechanization, genetics, genomics, and breeding, phenomics, landscaping, production, sustainability, floral design, indoor farming, and entrepreneurship); examination of the national and international scope and economic, environmental and health impacts of horticulture; major horticultural regions in Texas; interactions with representatives and leaders of various horticultural industries; featured horticulture innovations presented by inventors; development of an online professional profile, such as LinkedIn.

HORT 291 Research

Credits 1 to 3. 1 to 3 Other Hours. Research conducted under the direction of faculty member in horticulture. May be repeated 2 times for credit. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

HORT 301 Garden Science

Credits 3. 3 Lecture Hours. Identification, propagation, soil management, fertilization, growth control and protection of common garden plants: indoor ornamentals, landscape ornamentals, fruits and vegetables; special topics include home landscaping, container gardens, bonsai, herbs and medicinal plants and hobby greenhouse management; overview of the effects of organic and non-organic practices on the garden ecosystem. **Prerequisites:** Junior or senior classification, or approval of instructor.

HORT 306 Trees and Shrubs for Sustainable Built Environments

Credits 3. 2 Lecture Hours. 2 Lab Hours. Better known woody ornamental trees and shrubs; identification, morphology, classification, nomenclature and adaptability for use in landscape environments. **Prerequisite:** BIOL 101, BIOL 111, BIOL 113, HORT 201, HORT 301, LAND 101, or RENR 205, or approval of instructor.

HORT 308 Plants for Sustainable Landscapes

Credits 3. 2 Lecture Hours. 2 Lab Hours. Identification and use of indigenous and introduced landscape plants; plants for special uses in urban environments; emphasis on plants' ornamental attributes, cultural requirements, and adaptability in urban and suburban environments. **Prerequisite:** BIOL 101, BIOL 111, BIOL 113, HORT 201, HORT 301, LAND 101, or RENR 205, or approval of instructor.

HORT 313 Introduction to Plant Physiology

Credits 3. 3 Lecture Hours. Study of principal life processes of higher plants; influence of environmental factors on these processes; agricultural and ecological significance of life processes of plants. **Prerequisite:** BIOL 101, BIOL 111 or BIOL 113 and CHEM 222 or CHEM 227.

HORT 315 Issues in Horticulture

Credits 3. 3 Lecture Hours. Analysis of contemporary economic, technological, environmental, human resource, and regulatory issues that impact the way global horticultural firms compete; emphasis on problem recognition and analysis of managerial decisions by firms throughout the entire horticultural supply chain. **Prerequisites:** HORT 201, HORT 202, and junior or senior classification.

HORT 319 Fruit and Nut Production

Credits 3. 2 Lecture Hours. 3 Lab Hours. Rootstocks, cultivars, identification, site selection, pollination, pruning, fruit thinning, dormancy, orchard culture management, irrigation, pest control, harvesting and post harvest physiology of temperate fruit and nut species. **Prerequisite:** HORT 201.

HORT 325 Vegetable Crop Production

Credits 3. 2 Lecture Hours. 3 Lab Hours. Origin, nutritive value, economic importance, botany and cultural practices of the major vegetable crops. Lab activities include organic and non-organic production of major vegetable crops.

HORT 326 Plant Propagation

Credits 4. 3 Lecture Hours. 3 Lab Hours. Principles, practices and techniques followed in the sexual and asexual propagation of horticultural plants: seed technology and seed propagation, rooting and propagation of cuttings, graftage and budding systems, layering and propagation by specialized plant structures, biotechnology and tissue culture systems for micropropagation. **Prerequisites:** Grade of D or better in HORT 201 or approval of instructor.

HORT 332 Horticulture Landscape Graphics

Credits 3. 2 Lecture Hours. 2 Lab Hours. Graphic representation of landscape design; demonstrations of technique; examination of drawing examples and drawing production; basic hand graphics techniques for visual-thinking and presentation-quality landscape drawings. **Prerequisite:** Junior or senior classification.

HORT 335 Sociohorticulture

Credits 3. 3 Lecture Hours. Horticulture as it relates to humans through people-plant interactions; use of horticulture to improve quality of life; awareness and appreciation of the economic, environmental, social and health benefits of plants. **Prerequisite:** Junior classification.

HORT 360 Landscapes of Sustainable Built Environments

Credits 3. 3 Lecture Hours. Construction and maintenance considerations for landscapes in urban sustainable environments, including green roofs, bioretention cells, rain gardens, and living walls; how to maximize benefits of each system, current trends in regulatory and permitting processes of green infrastructure, and the development of industry-wide guidelines versus standards. **Prerequisites:** Grade of C or better in HORT 201 or concurrent enrollment, or junior or senior classification.

HORT 400 Field Studies in Horticulture

Credits 1 to 3. 1 to 9 Other Hours. History of garden design and the development of the field of Ornamental Horticulture; designs of famous designers Capability Brown and Gertrude Jekyll; pastoral and formal design themes; plant selection and placement from an artistic and functional design perspective; European manipulation of plant form.

Prerequisites: HORT 201 or HORT 301 and approval of instructor.

HORT 404 Plant Breeding

Credits 3. 2 Lecture Hours. 2 Lab Hours. Application of genetics and other sciences to breeding and improvement of horticultural crops; methods and special techniques employed. Offered in even numbered years. Only one of the following will satisfy the requirements for a degree: HORT 404 or SCSC 304. **Prerequisite:** HORT 201, SCSC 205, or GENE 302, or approval of instructor.

HORT 411 Hydroponic and Soilless Crop Production

Credits 3. 2 Lecture Hours. 2 Lab Hours. Principles, practices, and techniques exploring the science and management of controlled environment crop production using hydroponics and other soil-less cultivation methods; construction and maintenance of hydroponic systems and the growth of crops in a research and commercial production setting. **Prerequisites:** HORT 201 and junior or senior classification.

HORT 416 Understanding Wine - From Vines to Wines and Beyond

Credits 3. 3 Lecture Hours. Facets of wine in the United States and around the world; the history of wine, grape growing and winemaking, types of wine, wine etiquette, beer and spirits, sensory evaluation, wine marketing, and winery tasting room and event management. **Prerequisites:** Must be 21 years of age; junior or senior classification or approval of instructor.

HORT 418 Nut Culture

Credits 3. 3 Lecture Hours. Orchard management, native grove development, cultivars, fruit setting, soils, nutrition, propagation, pest control, harvesting, shelling, storage and marketing of temperate tree nut crops grown in the U.S. with major emphasis on pecans. Offered in odd numbered years. **Prerequisite:** HORT 319 or approval of instructor.

HORT 419 Viticulture and Small Fruit Culture

Credits 3. 3 Lecture Hours. Classic winegrape culture in Europe and U.S. are taught; influence of climate, soil, cultivar, rootstock, canopy and management is presented; nutrition, water, spacing, trellis, pruning, IPM and harvest are integrated for quality yields; culture of muscadines, berries, figs and persimmons are taught. Offered in even numbered years. **Prerequisite:** HORT 201 or approval of instructor.

HORT 420 Concepts of Wine Production

Credits 3. 3 Lecture Hours. Classic wine grapes of the world and where they are produced; evaluation of wine style and quality through formal laboratory tastings. **Prerequisites:** HORT 201 or FSTC 201; must be 21 years of age; junior or senior classification.

HORT 421 Enology

Credits 3. 2 Lecture Hours. 3 Lab Hours. Provides a basic understanding of each step of the wine making process; emphasis on home and small scale commercial wine production as related to Texas conditions.

Prerequisites: Must be 21 years of age; junior or senior classification.

HORT 423 Tropical Horticulture

Credits 3. 3 Lecture Hours. Production, processing and marketing of coffee, bananas, cacao, mango, cashew, pineapple, coconut and root and tuber crops; recent significant developments in plant breeding and cultural practices. Offered in odd numbered years. **Prerequisites:** HORT 201 or approval of instructor.

HORT 425 Horticulture Landscape Installation

Credits 3. 2 Lecture Hours. 3 Lab Hours. Principles and practices of grading, drainage and construction of residential and small commercial landscapes; cost and bid estimation; soil preparation; transplanting operations; control of landscape diseases and pests; estimating maintenance requirements of landscape installations. **Prerequisite:** HORT 201 or approval of instructor.

HORT 426 International Floriculture Marketing

Credits 3. 2 Lecture Hours. 2 Lab Hours. Importance, cost, and opportunities in marketing floral products, fresh cut flowers, flowering potted plants, foliage plants, and bedding/garden plants; topics include: world production areas, economic value, species grown, marketing channels, retail environments, current/future consumers, postharvest handling, promotion/advertising, perceived/added value, marketing trends and employment opportunities. **Prerequisites:** HORT 201; junior or senior classification.

HORT 428 Greenhouse Technology & Sustainable Crop Production Systems

Credits 3. 2 Lecture Hours. 2 Lab Hours. Greenhouse Technology & Sustainable Crop Production Systems. Technology used to operate and manage energy efficient greenhouses for sustainable production of crops; greenhouse structures, equipment and automation; heating, cooling and ventilating systems; environmental computerized controls; environmental inputs as they affect plant physiological processes and influence plant growth and development including temperature and light, root substrates, water quantity and quality, irrigation efficiency, fertilization sources and integrated pest management; sustainable crop production systems and practices for hydroponics, plug production, photoperiodic crops, vernalization and lighting technology to produce vegetative and reproductive plant products; scheduling, controlling growth, harvesting and marketing practices for commercially important, high quality, high value crops. **Prerequisite:** HORT 201 and junior or senior classification, or approval of instructor.

HORT 429 Floriculture Crop Production

Credits 3. 2 Lecture Hours. 2 Lab Hours. Production of floriculture crops in the greenhouse environment; scheduling and controlling crop growth for target market periods; specific flowering crops will be used as models to demonstrate potted flowering plant, cut flower, and garden plant production systems; hands-on crop production experience in lab. **Prerequisite:** HORT 201 or approval of instructor.

HORT 431 Nursery Production and Management

Credits 3. 2 Lecture Hours. 2 Lab Hours. Container, field and protected culture production of ornamental nursery plants (shrubs, trees, ground covers, bedding plants and herbaceous perennials); retail and wholesale nursery-site selection and development, financing, niche-marketing, personnel and labor management; wholesale nursery production cycles and systems, storage and shipping. **Prerequisites:** Grade of C or better in HORT 201 or approval of instructor.

HORT 432 Horticulture Landscape Design

Credits 3. 2 Lecture Hours. 2 Lab Hours. Application of the principles and elements of design to planning and developing both exterior residential landscape designs and interior commercial designs. **Prerequisites:** HORT 332 or concurrent enrollment; HORT 306 or concurrent enrollment, or HORT 308; or approval of instructor.

HORT 435 Urban Horticulture

Credits 3. 3 Lecture Hours. Introduction to urban horticulture and its role in community development and well-being; emphasis on career opportunities and the roles of the urban horticulture programmer. Offered in odd numbered years. **Prerequisite:** Junior or senior classification.

HORT 440 International Horticulture

Credits 3. 3 Lecture Hours. Examines the source of horticultural commodities; shows how geography, culture, politics, and history influence our markets, gardens and kitchens; educates students on interpreting different garden styles. **Prerequisites:** HORT 201 or HORT 301 or approval of instructor.

HORT 442 Horticulture Landscape Design II

Credits 3. 2 Lecture Hours. 2 Lab Hours. Computer-aided-drafting (CAD) to produce site layout, grading and planting plan, and construction details for small-scale landscape design; advanced design principles and practices in their historical context, includes design and drafting of hardscape details, manipulation of earth forms, ecological urban park design to traditional garden design. **Prerequisites:** HORT 432; HORT 306 or HORT 308, or concurrent enrollment, or approval of instructor.

HORT 446 Commercial Fruit and Vegetable Processing

Credits 3. 2 Lecture Hours. 3 Lab Hours. Pilot plant and laboratory operations pertaining to processed fruits, vegetables and beverages; new product development emphasized via individual laboratory projects. **Prerequisite:** FSTC 311.

HORT 450 Processing Coffee and High-Value Horticultural Crops

Credits 3. 3 Lecture Hours. Examination of the principles behind coffee processing and other high-value food crops including cultivation; different unit processing operations; methods for preservation; packaging and marketing strategies; and a processing plant visit. **Prerequisite:** Junior or senior classification or approval of instructor.

HORT 451 Retail Floristry

Credits 3. 2 Lecture Hours. 3 Lab Hours. Principles of floral design in a commercial shop enterprise; aspects of design in vase arrangements, personal flowers, sympathy flowers and flowers for special occasions; production costs and profit analysis, selling techniques and customer relations; term project required. **Prerequisite:** HORT 203 or approval of instructor.

HORT 452 Floral Design: Weddings and Personal Flowers

Credits 3. 2 Lecture Hours. 3 Lab Hours. Basic principles of floral design as applied to wedding work; design principles and mechanics as applied to corsages, headpieces, hand bouquets and ceremony and reception decorations; history of wedding traditions; selling and pricing weddings. **Prerequisite:** HORT 203 or HORT 451 or approval of instructor.

HORT 453 Floral Art

Credits 2. 1 Lecture Hour. 2 Lab Hours. Advanced study of floral design as an art form in contrast to a commercial florist operation; interpretive expression of design principles and color stressed along with international design styles. **Prerequisites:** HORT 203.

HORT 454 Special Event Design and Production

Credits 2. 1 Lecture Hour. 2 Lab Hours. Role of event planners, production managers, designers, and decorators within traditional event management practices; analyze how artistic components are used in visual styling to achieve a specific purpose; impact of collaborative planning, effective research, and strong communication skills, social psychological and economic influences as they relate to event planning. **Prerequisite:** Junior or senior classification.

HORT 460 Landscape Estimating, Bidding, and Operations

Credits 3. 2 Lecture Hours. 2 Lab Hours. Landscape estimating, bidding and sales processes; business structures, insurance and bonding requirements and business management; overhead costing structures and management; case study involves bidding from a set of landscape plans and specifications. **Prerequisites:** Junior or Senior classification.

HORT 481 Seminar

Credits 2. 2 Lecture Hours. Advanced preparation for the transition from college to the work environment including career investigation, presentation techniques and practice, resume and e-portfolio preparation, and professional development and career advancement; required of all senior students in horticulture. **Prerequisite:** Junior or senior classification.

HORT 484 Internship

Credits 1 to 9. 1 to 9 Other Hours. On-the-job experience program in the student's area of horticultural specialization. May be taken three times for credit. **Prerequisites:** Sophomore, junior or senior classification; approval of instructor; 2.0 GPR in major and overall.

HORT 485 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Special problems and projects in any area of horticulture. **Prerequisite:** Junior or senior classification or approval of department head.

HORT 489 Special Topics in...

Credits 1 to 4. 0 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified area of horticultural science. May be repeated for credit. **Prerequisite:** Approval of instructor.

HORT 491 Research

Credits 1 to 3. 1 to 3 Other Hours. Research conducted under the direction of faculty member in horticulture. May be repeated 2 times for credit. Registration in multiple sections of this course are possible within a given semester provided that the per semester credit hour limit is not exceeded. **Prerequisites:** Junior or senior classification and approval of instructor.

HUMA - Humanities (HUMA)

HUMA 304/RELS 304 Asian Religions

Credits 3. 3 Lecture Hours. Beliefs and practices of Hinduism, Jainism, Sikhism, Buddhism, Confucianism, Taoism and Shinto with particular attention to their philosophical presuppositions. **Cross Listing:** RELS 304/HUMA 304.

HUMA 321 Political Islam and Jihad

Credits 3. 3 Lecture Hours. Interaction between Islamic movements and politics in various Middle Eastern countries; the meaning and evolution of jihad; the role of Islam as a tool for political and social mobilization. **Prerequisite:** Junior or senior classification, or approval of instructor. **Cross Listing:** INTA 321 and RELS 321.

HUMA 485 Directed Studies

Credits 1 to 6. 1 to 6 Other Hours. Directed Studies in humanities. May be repeated for credit. **Prerequisite:** Approval of department head.

HUMA 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of humanities. May be repeated for credit. **Prerequisite:** Approval of instructor.

IBUS - International Business (IBUS)

IBUS 285 Directed Studies

Credits 1 to 3. 1 to 3 Other Hours. Directed study of selected problems in international business not covered in other courses. May be taken two times for credit. **Prerequisites:** Freshman or sophomore classification in business.

IBUS 289 Special Topics in...

Credits 1 to 3. 1 to 3 Lecture Hours. 0 to 3 Lab Hours. Selected topics in an identified area of international business. May be taken two times for credit. **Prerequisites:** Freshman or sophomore classification in business.

IBUS 291 Research

Credits 1 to 4. 1 to 4 Other Hours. Research conducted under the direction of faculty members in international business. May be repeated one time for credit. **Prerequisites:** Business majors; freshman or sophomore classification; approval of instructor.

IBUS 301 Business Study Abroad

Credits 1 to 18. 1 to 18 Lecture Hours. For students in approved programs abroad. May be repeated for credit. **Prerequisites:** Admission to upper division in Mays Business School and selected for program; approval of study abroad coordinator and academic dean.

IBUS 310 Global Context of Business

Credits 3. 3 Lecture Hours. Examination of how culture, government, history, politics, economy, and current events of one or more countries affect business; development of understanding of the foreign country or countries; real world comprehension on how to successfully engage in business due to understanding the economic, cultural, and political issues facing the country; global field-study based course with a duration of 1-2 weeks abroad. **Prerequisite:** Admitted to Mays Business School and approval of instructor.

IBUS 320 Global Sustainable Business

Credits 3. 3 Lecture Hours. Examination of sustainable business development, financial literacy, and small business consulting; real world comprehension on how to successfully engage in sustainable business development in context of host community and country's economic, cultural, and political issues; global field-study based course with hands on experience engaging indigenous, rural community for 1-2 weeks abroad. May be repeated two times for credit. **Prerequisite:** Admitted to Mays Business School and approval of instructor.

IBUS 401/MKTG 401 Global Marketing

Credits 3. 3 Lecture Hours. Survey of the aspects involved in marketing goods and services in a global marketplace; social, political, legal and economic issues associated with conducting business globally. **Prerequisite:** MKTG 321. **Cross Listing:** MKTG 401/IBUS 401.

IBUS 402/MKTG 402 International Marketing: Study Abroad

Credits 3. 3 Lecture Hours. Introduction to the facets of doing business in an international setting; provides exposure to a variety of foreign cultures; facilitates understanding of the international marketplace in which these students will function. **Prerequisites:** MKTG 321 or MKTG 409; junior classification; 2.5 GPR overall. **Cross Listing:** MKTG 402/IBUS 402.

IBUS 403/MKTG 403 International Market Entry Strategies

Credits 3. 3 Lecture Hours. A research-based course in which students prepare an analysis of a country, or region outside the U.S., and use it in the preparation of a marketing plan for a good or service to be introduced and marketed in that country. **Prerequisites:** MKTG 321 or MKTG 409; concurrent registration in IBUS 402/MKTG 402 or MKTG 402/IBUS 402; junior or senior classification. **Cross Listing:** MKTG 403/IBUS 403.

IBUS 430/ACCT 430 Global Immersion in Accounting

Credits 3. 3 Lecture Hours. Combination of classroom work in the spring and a field trip to the selected country in summer; introduction to international opportunities within the public accounting firms; meet with former students to gain a local and corporate view of business in the selected country. May be taken two times for credit. **Prerequisites:** ACCT 327 and approval of instructor. **Cross Listing:** ACCT 430/IBUS 430.

IBUS 440/ISTM 440 International Technology Management

Credits 3. 3 Lecture Hours. Examines global information and communications technology (ICT) business environment; challenges and opportunities for technology companies in the region; history, culture, politics, economic issues, and infrastructure influencing ICT support and innovation in the region; combination of classroom work in the spring and a field trip to the selected country in the summer; repeatable for credit if taken in a different country. **Prerequisites:** Junior or senior classification; approval of instructor. **Cross Listing:** ISTM 440/IBUS 440.

IBUS 445/ACCT 445 International Accounting

Credits 3. 3 Lecture Hours. Introduction and examination of accounting issues unique to multinational enterprises and international business activity; only ACCT 445/IBUS 445 sections count for the accounting coursework requirements for the CPA exam. **Prerequisites:** ACCT 315 or ACCT 327; FINC 341. **Cross Listing:** ACCT 445/IBUS 445.

IBUS 446/FINC 445 International Finance

Credits 3. 3 Lecture Hours. International business transactions, balance of payments and exchange rate systems, exchange rate risk and hedging techniques, sources of funding, relation to international financial institutions and capital instruments; foreign direct investment; international asset and liability management. **Prerequisites:** FINC 351 and FINC 361; ACCT 328 or concurrent enrollment. **Cross Listing:** FINC 445/IBUS 446.

IBUS 450/MGMT 450 International Environment of Business

Credits 3. 3 Lecture Hours. Broad survey of international business issues; analyzes the environment in which international businesses operate; examines international economic issues including trade theory, investment theory, foreign exchange and capital markets, and balance of payments; introduces multinational enterprises, global competition, international organizations, treaties and international law, national trade policies and the determinants of competitiveness of firms in international markets. **Prerequisites:** Admission to upper division in Mays Business School. **Cross Listing:** MGMT 450/IBUS 450.

IBUS 452/MGMT 452 International Management

Credits 3. 3 Lecture Hours. An overview of international management to include international dimensions of organizational behavior, theory, strategy and human resource management; application of theoretical ideas to real-world situations through case analyses, presentations, projects and interactive class discussion. **Prerequisite:** MGMT 450/IBUS 450 or IBUS 450/MGMT 450, or concurrent enrollment. **Cross Listing:** MGMT 452/IBUS 452.

IBUS 455 Asian Business Environment

Credits 3. 3 Lecture Hours. The scope of business environments of Asia; geographical, demographic and cultural makeup; economic integration; human and cultural elements; financial and communication infrastructures; risk and market analysis; trade and investment patterns; Asian MNC's. May be repeated for credit if taken in a different country. **Prerequisite:** Admission to upper division in Mays Business School.

IBUS 456 European Integration and Business

Credits 3. 3 Lecture Hours. History and institutional structure of the European Union; its regional cultures, values, economies and rifts; challenges faced by corporations and people in the region, including issues involving doing business with the European Union. May be repeated one time for credit. **Prerequisite:** Admission to upper division in Mays Business School.

IBUS 457/MGMT 457 Global Entrepreneurship

Credits 3. 3 Lecture Hours. Practical issues associated with taking small- and medium-size business global; includes importing and exporting, developing global strategies, evaluating market opportunities, regional impact on economies and people. **Prerequisite:** Admission to upper division in Mays Business School. **Cross Listing:** MGMT 457/IBUS 457.

IBUS 459 Latin American Markets

Credits 3. 3 Lecture Hours. Comparing and contrasting the Latin American, Canadian and U.S. markets across different variables, including culture, economics, social and legal aspects. May be repeated for credit if taken in a different country.

IBUS 460 Academy for Future International Leaders

Credits 3. 3 Lecture Hours. A practical orientation to international business and cultural issues to prepare selected Texas A&M students for the international marketplace; joint effort among all colleges at Texas A&M; designed to complement any academic major by helping students gain a global perspective of their chosen field of study. **Prerequisites:** Junior or senior classification and selection for the Academy for Future International Leaders.

IBUS 484 International Business Internship

Credits 1 to 4. 1 to 4 Other Hours. International business internship with practicing professionals under the direction of a faculty member. **Prerequisites:** Admission to upper division in Mays Business School; approval of department head.

IBUS 485 Directed Studies

Credits 1 to 6. 1 to 6 Other Hours. Directed study on selected problems in the area of international business. **Prerequisites:** Admission to upper division in Mays Business School and approval of instructor.

IBUS 489 Special Topics in...

Credits 0 to 4. 0 to 4 Other Hours. Selected topics in an identified area of international business. May be repeated for credit. **Prerequisites:** Admission to upper division in Mays Business School and approval of instructor.

IBUS 491 Research

Credits 1 to 4. 1 to 4 Other Hours. Research conducted under the direction of faculty members in international business. May be repeated one time for credit. **Prerequisites:** Business majors; junior or senior classification; approval of instructor.

IDIS - Industrial Distribution (IDIS)

IDIS 240 Introduction to Industrial Distribution

Credits 3. 3 Lecture Hours. Definition, history, types of industrial distribution; range of products; line of distribution; function of and services provided by distributors; distributor operational and financial analyses; measures of organizational effectiveness; employment and advancement opportunities in the field of industrial distribution.

IDIS 330 Sales Engineering

Credits 4. 3 Lecture Hours. 2 Lab Hours. Sales and sales management techniques for analyzing distribution challenges and providing solutions through effective communication; establishing credibility, effective questioning techniques, developing solutions, presenting solutions, anticipating objections and gaining a commitment, plus techniques for building, developing and compensating an effective sales organization. **Prerequisites:** Grade of C or better in IDIS 240 or concurrent enrollment; industrial distribution major or technical sales minor.

IDIS 340 Manufacturer Distributor Relations

Credits 3. 3 Lecture Hours. Approaches and procedures for developing and maintaining effective manufacturer distributor relations: marketing channel design, channel roles, managing uncertainty, legal and ethical imperatives, conflict resolution, decision support and strategic marketing. **Prerequisites:** Grade of C or better in IDIS 240 or concurrent enrollment; industrial distribution major or technical sales minor.

IDIS 343 Distribution Logistics

Credits 3. 3 Lecture Hours. Study of concepts, issues and techniques used to plan, analyze and control the logistics network; examination of three key logistical decision-making areas: inventories, facilities and transportation; techniques and technologies for managing and optimizing the logistical (supply) chain. **Prerequisite:** Grade of C or better in IDIS 240; grade of C or better in STAT 201, STAT 211, or STAT 303; industrial distribution major.

IDIS 344 Distributor Information and Control Systems

Credits 4. 3 Lecture Hours. 3 Lab Hours. Industrial distribution systems including hardware and software operations; inventory management, vendor evaluation; physical distribution systems; use of bar codes, radio frequency and other automated data entry techniques; purchasing operations. **Prerequisites:** Grade of C or better in IDIS 240; industrial distribution major, junior or senior classification.

IDIS 364 Distributor Financial Management

Credits 3. 3 Lecture Hours. Maximization of shareholder value; assessment and improvement of firm performance utilizing financial statement analysis and industry studies; methods for planning, implementing and monitoring profitability from distributor operations; procedures for controlling cash flow; credit and receivables, payables, inventory, capital assets, personnel and productivity; related financial operations. **Prerequisites:** Grade of C or better in IDIS 240; grade of C or better in ACCT 209 or ACCT 229.

IDIS 371 Industrial Distribution Technical Sales Seminar

Credit 1. 1 Other Hour. Practical applications for materials presented in academia; practical insights delivered by industry guest speakers from their perspectives of what they encounter and expect in the real-world of industrial distribution sales. **Prerequisites:** Junior or senior classification.

IDIS 424 Purchasing Applications in Distribution

Credits 3. 3 Lecture Hours. Applications of purchasing systems, specifically for the distribution industry; emphasis on supplier relations, strategic purchase planning, supplier evaluation, global purchasing techniques, cost analysis, life cycle costing, value analysis; case studies and procurement modeling for distributors. **Prerequisites:** Grade of C or better in IDIS 340; grade of C or better in IDIS 343 or concurrent enrollment; junior or senior classification in industrial distribution major.

IDIS 433 Industrial Sales Force Development

Credits 3. 3 Lecture Hours. Techniques and processes for developing, maintaining and leading high performing industrial sales organizations; organization planning and forecasting processes, processes and procedures for identifying and developing talented sales professionals who can operate within a sales process and provide solutions to customers while growing profitable accounts. **Prerequisite:** Grade of C or better in IDIS 330; senior classification in industrial distribution or technical sales minor.

IDIS 434 The Quality Process in Distribution

Credits 3. 3 Lecture Hours. Application of the Deming principles specifically for distributors, including customer needs analysis, research and data collection methodology, employee involvement techniques, team building, statistical methods and data analysis; solutions to quality problems for distributors, lean and six-sigma principles. **Prerequisites:** Grade of C or better in IDIS 343; senior classification in industrial distribution.

IDIS 443 Distribution Project and Process Management

Credits 3. 3 Lecture Hours. Design and development of a solution to a distribution problem using systematic research methods and tools in a team-based environment; application of systems thinking to develop best practices related to the chosen field, logistics, operations, sales, etc., to determine the impact of their proposed solution on other components, or fields, of the business. **Prerequisites:** Grade of C or better in IDIS 343; grade of C or better in ESET 300, IDIS 344, and MMET 301 or concurrent enrollment; must be taken the long semester immediately prior to IDIS 444; senior classification in Industrial Distribution.

IDIS 444 Distribution Project and Process Management II

Credits 3. 3 Lecture Hours. Continuation of IDIS 443; second-semester in capstone design sequence; design and development of a solution(s) to a distribution problem using systematic research methods and tools in a team-based environment; application of a systems-thinking approach for the development of best practices related to the chosen field such as logistics, operations, sales, etc. to determine the impact of their proposed solution on other component areas of the business. **Prerequisites:** Grade of C or better in IDIS 464 or IDIS 443; grade of C or better in IDIS 424, IDIS 433, IDIS 434, and IDIS 450, or concurrent enrollment; satisfactory grade in ENTC 399 or concurrent enrollment; must be taken in the last semester of coursework; senior classification in industrial distribution.

IDIS 450 Analytics for Distribution Operation

Credits 4. 3 Lecture Hours. 2 Lab Hours. Fundamental concepts in data analytics; transformation of business transaction data and visualization with state-of-the-art software; various statistical and analytical models used in the distribution world; building and interpreting the predictive analytics model for strategic and tactical decisions making problems. **Prerequisite:** Grade of C or better in IDIS 343 and IDIS 344; senior classification in industrial distribution.

IDIS 464 Distributor Operations and Financial Management

Credits 3. 3 Lecture Hours. First course in a two-semester capstone project course sequence; assessment of firm performance utilizing financial statement analysis and industry studies; methods for planning, implementing and monitoring profitability from distributor operations; procedures for controlling cash flow; credit, receivables, inventory, personnel and productivity; and related financial operations. **Prerequisites:** Grade of C or better in IDIS 343 and ACCT 209 or ACCT 229; grade of C or better in ESET 300, IDIS 344, and MMET 301 or concurrent enrollment; must be taken the long semester immediately prior to IDIS 444; senior classification in industrial distribution major.

IDIS 471 Industrial Business to Business Marketing

Credits 3. 3 Lecture Hours. Study of Business to Business (B2B) industrial and construction distributors' marketing strategies, planning, and tactics; focus on the alignment of sales and marketing, customer buying journey, B2B branding, the role of suppliers in marketing, digital marketing strategies, marketing tactics, lead generation, and social selling; marketing tech, tools, and analytics. **Prerequisites:** Junior or senior classification and enrollment in Technical Sales minor.

IDIS 481 Seminar - Internship Preparation

Credit 1. 1 Lecture Hour. Develop an understanding of the distribution industry and its opportunities; prepare students for summer internships; provide students with opportunities to network with industry and companies that will be hiring summer interns. **Prerequisite:** Minimum of 60 credit hours.

IDIS 484 Professional Internship

Credits 2. 2 Other Hours. Independent study and on-the-job supervised experience related to a professional area of interest in industrial distribution. **Prerequisites:** IDIS 481; junior or senior classification.

IDIS 485 Directed Studies

Credits 1 to 6. 1 to 6 Other Hours. Permits work in a special problem area on an individual basis with the intent of promoting independent reading, research and study; to supplement existing course offerings or subjects not presently covered. **Prerequisites:** Senior classification and approval of instructor.

IDIS 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of industrial distribution. **Prerequisite:** Approval of instructor.

IDIS 491 Research

Credits 0 to 4. 0 Lecture Hours. 0 Lab Hours. 0 to 4 Other Hours. Research conducted under the direction of faculty member in the college of engineering. May be repeated three times for credit. **Prerequisites:** Junior or senior classification and approval of instructor.

INST - Interdisciplinary Studies (INST)

INST 181 Seminar

Credits 0 to 4. 0 to 4 Other Hours. Assist with the transition to college; may include career exploration, employment skills, self-advocacy, campus resources, financial literacy, independent living, social skills, and relationship development. May be taken nine times for credit.

INST 210 Understanding Special Populations

Credits 3. 3 Lecture Hours. (EDUC 2301) Understanding Special Populations. Referral, assessment and categorization of special populations including physical, cognitive and affective characteristics; cultural, ethnic, economic and linguistic differences; giftedness; special education and compensatory programs; awareness of legislative history that results in rights for special populations. **Prerequisite:** Sophomore classification or above.

INST 222 Foundations of Education in a Multicultural Society

Credits 3. 3 Lecture Hours. Historical, philosophical and cultural foundations of education emphasizing education for a multicultural society; also taught at Qatar campus.

INST 291 Research

Credits 0 to 3. 0 to 3 Other Hours. Research conducted under the direction of faculty member in teaching, learning and culture. May be taken three times for credit. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

INST 301 Educational Psychology

Credits 3. 3 Lecture Hours. Application of psychology to problems of teaching. Nature and operation of principles of learning, transfer of training; nature, measurement and significance of individual differences; conditions influencing efficiency of learning. **Prerequisite:** Junior or senior classification.

INST 362 English as a Second Language Methods I

Credits 3. 3 Lecture Hours. Basic principles of language acquisition, multiple approaches to second language acquisition; individual differences and second language acquisition; stages of second language development; multiple approaches to assessment. **Prerequisite:** INST or EDIS majors.

INST 363 English as a Second Language Methods II

Credits 3. 3 Lecture Hours. Strategies and techniques for teaching English language learners; curriculum design and material development, instruction of English language learners, content area instruction, and language assessment instruments; a historical perspective of the education of English language learners in United States' schools. **Prerequisite:** Grade of C or better in INST 362 or approval of instructor.

INST 491 Research

Credits 1 to 4. 1 to 4 Other Hours. Research conducted under the direction of faculty member in teaching learning and culture. May be repeated 2 times for credit. **Prerequisites:** Junior or senior classification and approval of instructor.

INTA - International Affairs (INTA)

INTA 205 Current Issues in International Studies

Credit 1. 1 Lecture Hour. Exploration of current issues and problems in International Studies through attendance of events, lectures by noted international academics and professionals, and in-class discussions. May be taken three times for credit. **Prerequisite:** International studies major.

INTA 211 Introduction to International Social Issues

Credits 3. 3 Lecture Hours. Introduction to the basic concepts and frameworks for analyzing global events and understanding the current international situation; for freshman and transfer international studies majors. **Prerequisites:** International Affairs major.

INTA 216 World Cinema and International Politics

Credits 3. 3 Lecture Hours. Investigation of film as political discourse; overview of how films and filmmakers from Africa, Asia, Latin America, Europe, and/or the Middle East frame and represent international politics and explore how the influence of film becomes a powerful form of political speech.

INTA 221 Principles of International Affairs

Credits 3. 3 Lecture Hours. An overview of the study of international relations; exploration of theories of international politics, war, nuclear weapons, terrorism, trade, finance, globalization, international law and human rights, and the environment. **Prerequisites:** International Affairs major.

INTA 231 Principles of the Global Economy

Credits 3. 3 Lecture Hours. Instruction in three fundamental aspects of the global economic environment including economics of trade and international trade policies, international finance issues, introduction of international economic issues in developing countries; exposure to analytical tools and concepts in international economics and development economics. **Prerequisites:** International Affairs major.

INTA 251 Contemporary Issues in the Middle East

Credits 3. 3 Lecture Hours. Exploration of current political and cultural issues in the Middle East.

INTA 261/AFST 261 Contemporary Issues in the Global South

Credits 3. 3 Lecture Hours. Exploration of current political and cultural issues in the Global South. May be repeated once for credit. **Cross Listing:** AFST 261/INTA 261.

INTA 285 Directed Studies

Credits 0 to 3. 0 to 3 Other Hours. Individual supervision of readings or assigned projects in international studies. May be taken two times for credit. **Prerequisites:** Approval of instructor and department head.

INTA 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Introduction to the broad range of disciplines and issues explored in the international studies curriculum. May be repeated for credit. **Prerequisite:** Freshman or sophomore classification.

INTA 300 International Experience

Credits 0. 0 Other Hours. Language immersion program abroad; minimum of ten weeks; completed after the fourth semester of the target foreign language; study abroad program, internship, volunteer service work, or a combination of these options with department approval. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisites:** Grade of C or better in INTA 211; grade of C or better in ARAB 202, CHIN 202, FREN 202, GERM 202, ITAL 202, JAPN 202, RUSS 202, SPAN 202, or SPAN 203; major in international studies; junior or senior classification.

INTA 301 Theories of Globalization

Credits 3. 3 Lecture Hours. Diverse global and international cultural processes in their economic and political contexts; analyses of theoretical lenses on transnationalism including diaspora, hybridity, liminality, marginality, cyborgism, nomadism, scapes and flows and others; case studies of global cultures. **Prerequisite:** Junior or senior classification or approval of instructor.

INTA 321 Political Islam and Jihad

Credits 3. 3 Lecture Hours. Interaction between Islamic movements and politics in various Middle Eastern countries; the meaning and evolution of jihad; the role of Islam as a tool for political and social mobilization. **Prerequisite:** Junior or senior classification, or approval of instructor. **Cross Listing:** HUMA 321 and RELS 321.

INTA 323 International Law

Credits 3. 3 Lecture Hours. The course provides an overview of International Law; sources, organization, and adjudicating bodies of international law; examination of topics such as use of force, humanitarian law, economic law and environmental law from an international perspective. **Prerequisites:** International Affairs major; junior or senior classification.

INTA 330 Governing Capitalism

Credits 3. 3 Lecture Hours. Exploration of the interaction between economics and politics; examination of some of the foundational theorists of political economy over the last three centuries. **Prerequisites:** INTS and INTA majors; junior or senior classification; prior background in introductory economics recommended.

INTA 352 Cyberpolicy

Credits 3. 3 Lecture Hours. Examination of the national security implications of cyberspace and cyber-enabled technologies, including cyber-enabled influence operations, in support of national security interests; understanding and analysis of relevant issues related to cyberspace and cyber-enabled operations; introduction to and examination of the cyberspace aspects of several disruptive technologies in a national security context, including artificial intelligence (AI), autonomous weapons systems, biotechnology, and others. **Prerequisites:** INTS and INTA majors; junior or senior classification.

INTA 401/GLST 401 The City and its Global Contexts

Credits 3. 3 Lecture Hours. Examination of rural and urban environments affected by global currents in culture, politics, and society; exploration of urbanism as represented by artists, writers, and filmmakers; study of such topics such as urban design. **Prerequisites:** INTA 211 or GLST 201; junior or senior classification or approval of instructor. **Cross Listing:** GLST 401/INTA 401.

INTA 403 Nations and Nationalisms

Credits 3. 3 Lecture Hours. Interdisciplinary approach where nation is understood as modern political entity distinct from country; examination of historical and philosophical origins of idea of nationalism; theories on nationhood, national identity and rise of nationalism; global variety of concrete test cases to highlight actual functions (wars, decolonization, symbolic representations in film, etc.). **Prerequisites:** International studies major; INTA 211.

INTA 405 War and Memory

Credits 3. 3 Lecture Hours. Examination of world wars, colonial wars, genocides, and historical crimes from the late nineteenth century until the present; analysis of the changing memory of those traumatic events as evident in historical accounts, commemorations, film, and literature. **Prerequisites:** International studies major; INTA 211.

INTA 406 Technology and Global Change

Credits 3. 3 Lecture Hours. Interdisciplinary examination of the transformative impact of new technologies on global social, economic, political and cultural reality; focus on changes in the exercise of power and state sovereignty, labor and economic transactions, war and social activism, subjectivity and social interactions, surveillance and anonymity, internet of things and artificial intelligence. **Prerequisite:** INTA 211; international studies major; junior or senior classification.

INTA 409 Culture, Neoliberalism and Globalism

Credits 3. 3 Lecture Hours. Examination of largely North Atlantic cultural forms and meanings that arise in the context of neoliberalism from the late 1970's to the present; cultural studies and broad-based social analysis to identify and interrogate the many relational contexts where power circulates through cultural objects and meanings. **Prerequisites:** INTA 211; international studies major; junior or senior classification.

INTA 410/GLST 410 Gender and Globalization

Credits 3. 3 Lecture Hours. Concepts of gender from a global perspective; global theories of gender and sexuality across media. **Prerequisites:** INTA 211 or GLST 201; junior or senior classification or approval of instructor. **Cross Listing:** GLST 410/INTA 410.

INTA 412 International Economic Development

Credits 3. 3 Lecture Hours. Examines theories of economic growth and development; explains concepts and methods commonly used when evaluating the effectiveness of international development programs. **Prerequisites:** International Affairs Major and junior or senior classification.

INTA 415 American Foreign Policy

Credits 3. 3 Lecture Hours. Examination of political, economic, cultural, and military dimensions of the United States' interactions with the world since the 19th century; focus on how interests of soldiers, business people, missionaries, civilians within the United States and in combat zones impact policy. **Prerequisites:** International Affairs major; junior or senior classification.

INTA 418 Economic Statecraft

Credits 3. 3 Lecture Hours. Introduction to emerging field of economic statecraft; use of economic tools of national power; overview of important seminal works on economic statecraft; instruction in theoretical and empirical aspects of economic statecraft. **Prerequisites:** International Affairs major; junior or senior classification, and ECON 202, ECON 203, INTA 301, and INTA 231 or approval of instructor.

INTA 443 International Organizations

Credits 3. 3 Lecture Hours. Theoretical and empirical aspects of the role, potentials, and limitations of major International Organizations (IO) in world politics; study of norms and rules that govern international relations and institutions where those rules are formulated and implemented; survey of IOs in areas of peace operations, human rights, environment and international trade. **Prerequisites:** International Affairs major; junior or senior classification.

INTA 445 Women and International Affairs

Credits 3. 3 Lecture Hours. Overview of important dimensions of women and international affairs; stratification of human society by sex, women and international political economy, women and national/international security, women and international human rights; examination of international efforts to improve women's situation worldwide and other international policy initiatives. **Prerequisites:** International Affairs major; junior or senior classification.

INTA 452 Intelligence and National Security

Credits 3. 3 Lecture Hours. Examination of historical and contemporary Intelligence capabilities as a part of the National Security environment, study of teamwork used by multiple organizations to inform world leaders; understanding of the major intelligence disciplines; instruction in how the intelligence cycle collects, analyses, and informs decisions related to National Security matters. **Prerequisites:** International Affairs major; junior or senior classification.

INTA 455 European Politics

Credits 3. 3 Lecture Hours. Historical examination of the evolution of the European Union and its contemporary politics; overview of formation of the European Union and its integration processes, contemporary European Politics in Western and Eastern Europe and security developments in the European Union. **Prerequisites:** International Affairs major; junior or senior classification.

INTA 473 Chinese Politics

Credits 3. 3 Lecture Hours. Study of Chinese domestic political history; instruction in the origins and development of the contemporary political system of China; overview of the history and foundational experiences of the Chinese Communist Party and its leaders. **Prerequisites:** International Affairs major; junior and senior classification.

INTA 476 International Politics of the Middle East

Credits 3. 3 Lecture Hours. Examination of interactions among states of the region, the region's non-state actors and outside powers in the post-World War II period; topics include power distributions within the region and globally, effects of transnational ideological and identity movements, domestic political institutions in the region's states, regional economic systems, outside power policies in the region, war and peace decisions, alliance and alignment patterns, and regional modes of statecraft. **Prerequisites:** International Affairs major; junior or senior classification.

INTA 481 Senior Seminar in International Studies

Credits 3. 3 Lecture Hours. Capstone course designed to produce in-depth research projects; based on student's international experience and specific area of expertise acquired in major. **Prerequisite:** International Studies major; INTA 211; 6 hours of INTA 401/GLST 401, 403, 405, 407, 409, 410 or INTA 489; senior classification; INTA 300.

INTA 484 Directed Internship

Credits 0 to 3. 0 to 3 Other Hours. Directed internship in a private firm, government or non-profit agency outside the United States; provide on-the-job experience appropriate to the student's program of work and career objectives. To be taken on a satisfactory/unsatisfactory basis. Maximum of 3 credit hours may count towards degree. **Prerequisites:** INTA 211; approval of internship coordinator.

INTA 485 Directed Studies

Credits 0 to 3. 0 to 3 Other Hours. Research problems and readings for students majoring in international studies; directed independent study of an international issue related to student's area of interest. **Prerequisite:** Junior or senior classification or approval of instructor.

INTA 486 Russia and the Former Soviet Union

Credits 3. 3 Lecture Hours. Investigation of how history, institutions, and political culture in Russia influences choices that elites and ordinary people make about politics; overview of Tsarist Russian imperialism, Soviet experiment in modernization and multinational governance, collapse of Soviet Union and creation of 15 independent states; examination of processes of political change and governance in post-communist Russia, and factors that influence processes. **Prerequisites:** International Affairs major; junior or senior classification.

INTA 489 Special Topics in...

Credits 1 to 4. 1 to 4 Other Hours. Selected topics in an identified area of international affairs. May be repeated for credit. **Prerequisite:** Junior or senior classification or approval of instructor; INTS and INTA majors.

INTA 491 Research

Credits 0 to 3. 0 to 3 Other Hours. Research conducted under the direction of faculty member in international studies. **Prerequisites:** INTA 211; junior or senior classification and approval of instructor.

INTA 494 Inter-American Affairs - U.S. Interventions in Latin America and Beyond

Credits 3. 3 Lecture Hours. Study of the dynamics of contemporary Inter-American political relations; introduction of policy and security issues relevant to the Americas (US, Canada, Caribbean, and Latin America). **Prerequisites:** International Affairs major; junior or senior classification.

INTA 497 Independent Honors Study

Credits 3. 3 Other Hours. Directed independent studies designed to produce a senior honors thesis; based on international experience and interdisciplinary expertise acquired in major. **Prerequisites:** INTA major; honors candidate; completed international experience.

ISEN - Indust & Systems Engr (ISEN)

ISEN 210 Deterministic Optimization Modeling and Design

Credits 2. 2 Lecture Hours. Development and application of fundamental deterministic optimization models; emphasis on formulating real-world problems as linear, integer, and network flow models; computer optimization software will be used to solve the linear and integer models. **Prerequisites:** Grade of C or better in MATH 152 and ENGR 102.

ISEN 230 Informatics for Industrial Engineers

Credits 3. 3 Lecture Hours. Structured programming concepts for implementing mathematical and statistical models in industrial engineering problems; emphasis on introductory production and service system problems and computer-based approaches to solve the problems; engineering applications of probability and statistics concepts. **Prerequisites:** CSCE 206, CSCE 111, CSCE 120, CSCE 121, or CSCE 110 or equivalent; concurrent enrollment in STAT 211.

ISEN 281 Essentials of Modern Manufacturing Methods for Engineering Design

Credits 3. 2 Lecture Hours. 3 Lab Hours. . Fundamental basis from materials and manufacturing methods selection in engineering design; basic elements and theory of a range of materials manufacturing methods, with specific emphasis on recent developments in the field including rapid prototyping 3D, computer control of machines - tools, automation robotics micro-fabrication and metrology. **Prerequisite:** Grade of C or better in ENGR 217/PHYS 217 or PHYS 217/ENGR 217, or concurrent enrollment.

ISEN 285 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Problems of limited scope in industrial engineering approved on an individual basis intended to promote independent study. **Prerequisite:** Approval of department head.

ISEN 289 Special Topics in...

Credits 1 to 5. 1 to 5 Other Hours. Selected topics in an identified area of Industrial Engineering. May be repeated for credit. **Prerequisites:** Approval of instructor.

ISEN 291 Research

Credits 1 to 4. 1 to 4 Other Hours. Research conducted under the direction of faculty member in industrial and systems engineering. May be taken four times for credit. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

ISEN 302 Economic Analysis of Engineering Projects

Credits 2. 2 Lecture Hours. Principles of economic equivalence; time value of money; analysis of single and multiple investments; comparison of alternatives; capital recovery and after-tax analysis of economic projects. **Prerequisites:** Grade of C or better in MATH 152 or MATH 172; also taught at Qatar campus.

ISEN 310 Uncertainty Modeling for Industrial Engineering

Credits 3. 3 Lecture Hours. Models and methods based on probability and statistics for industrial engineering applications; random variables, expectation, distribution fitting, reliability of systems, central limit theorem and interval estimates in the context of production and service systems. **Prerequisites:** Grade of C or better in ISEN 230 or concurrent enrollment; grade of C or better in STAT 211.

ISEN 311 Introduction to Data Analytics and Engineering

Credits 3. 3 Lecture Hours. Basic concepts in data engineering, including data acquisition, data management and models for learning with associated algorithms; iterative algorithms; tree-based and regression-based classification; graphs and graph-based methods; clustering; neural networks basics and their training; data structures for storing and processing data; introduction to databases. **Prerequisites:** Grade of C or better in CSCE 110, CSCE 111, CSCE 120, CSCE 121, or CSCE 206; grade of C or better in STAT 211; junior or senior classification.

ISEN 320 Operations Research I

Credits 3. 3 Lecture Hours. Development and application of fundamental deterministic optimization models and solution methods; focus on quantitative modeling and formulation of linear, integer, and network flow problems; use of computer optimization software to model and solve real-life problems. **Prerequisites:** Grade of C or better in MATH 304 or MATH 323.

ISEN 330 Human Systems Interaction

Credits 3. 3 Lecture Hours. Principles of human factors and ergonomics; emphasis on design to support human capabilities, limitations, and interaction tendencies in sociotechnical work systems; topics include human information processing, physiological and biomechanical functioning, and implications for design of the workplace and jobs; case studies in manufacturing, medicine, aerospace, ground transportation, and computer interaction. **Prerequisite:** Grade of C or better in MEEN 221; junior or senior classification.

ISEN 340 Operations Research II

Credits 3. 3 Lecture Hours. Probabilistic methods for industrial and service systems; stochastic processes used in industrial engineering, including Poisson processes and discrete and continuous-time Markov chains; applications to production operations, inventory control, revenue management, quality control, reliability, digital simulation and finance. **Prerequisites:** Grade of C or better in MATH 304 or MATH 323; grade of C or better in ISEN 310, STAT 212, or ECEN 303; junior or senior classification.

ISEN 350 Quality Engineering

Credits 3. 2 Lecture Hours. 3 Lab Hours. Strategic approach to implementing quality, process and business improvement methods using data analysis tools; total quality management and six sigma approaches to define, measure, analyze, improve and control processes; principles of lean engineering; control charts; process capability analysis; basic metrology, applied statistics, lean principles and process capability. **Prerequisites:** Grade of C or better in ISEN 310 and ISEN 230.

ISEN 355 System Simulation

Credits 3. 2 Lecture Hours. 3 Lab Hours. Systems simulation structure, logic and methodologies; development of simulation models; data handling methods; analysis of simulation data; verification and validation; system simulation languages, models and analysis; applications to industrial situations. **Prerequisites:** Grade of C or better in ISEN 230 and ISEN 310.

ISEN 360 Lean Thinking and Lean Engineering

Credits 3. 3 Lecture Hours. Philosophical, managerial, and operational principles of lean thinking within the context, tools, and practices of lean engineering; focuses on principles and practices of lean engineering that are applicable across industry types; includes design of lean systems, lean cell design, modeling of lean manufacturing systems and operation of manufacturing cells; queuing network theory for the analysis of lean systems. **Prerequisite:** Grade of C or better in STAT 211; junior or senior classification.

ISEN 370 Production Systems Engineering

Credits 3. 3 Lecture Hours. Principles, models, and techniques for planning and analysis of production and distribution systems; application of linear, integer, and nonlinear optimization models and solution methods for aggregate planning, supply chain planning, push (MRP) and pull (JIT) material flow management, inventory control under deterministic and stochastic demands, operations scheduling, and production scheduling. **Prerequisites:** Grade of C or better in ISEN 230 and ISEN 320.

ISEN 399 Professional Development

Credits 0. 0 Other Hours. Participation in an approved high-impact learning practice; reflection on professional outcomes from engineering body of knowledge; documentation and self-assessment of learning experience at mid-curriculum point. **Prerequisites:** Grade of C or better in ISEN 210 and ISEN 230; senior classification.

ISEN 405 Facilities Design and Material Handling

Credits 3. 3 Lecture Hours. Principles of facilities location, layout, and material handling systems and to practice designing facilities; modeling, design, and analysis techniques; methodologies in facilities location, layout, and material handling; integration of ergonomics analysis techniques and their implications on design, layout, safety and quality. **Prerequisites:** Grade of C or better in ISEN 210 and ISEN 320; junior or senior classification.

ISEN 410 Advanced Engineering Economy

Credits 3. 3 Lecture Hours. Principles of economic equivalence; borrowing, lending, and investing; establishing minimum attractive rate of return; replacement analysis; capital budgeting; uncertainty analysis; decision trees. **Prerequisites:** Grade of C or better in ISEN 210 or ISEN 302; junior or senior classification.

ISEN 411 Engineering Management Techniques

Credits 3. 3 Lecture Hours. Techniques relating to managing engineering activities; engineer's transition into management; engineering managerial functions; motivation of individual and group behavior; productivity assessment/improvement; managing the quality function and communications. **Prerequisite:** Grade of C or better in ISEN 350; senior classification.

ISEN 413 Advanced Data Analytics for Industry

Credits 3. 3 Lecture Hours. Data mining; linear discriminant analysis (LDA), principal component analysis (PCA) and other methods; classification, clustering, and mining, information extraction; dealing with uncertainty, Bayesian inference; neural models, regression and feature selection. **Prerequisites:** Grade of C or better in ISEN 310 and ISEN 350; junior or senior classification.

ISEN 414 Total Quality Engineering

Credits 3. 2 Lecture Hours. 3 Lab Hours. Principles of total quality engineering; total quality management philosophy, engineering approaches for designing quality into products and processes; off-line experimentation methods for the robust design; emphasis on teamwork and continuous quality improvement. **Prerequisite:** Grade of C or better in STAT 211; junior or senior classification.

ISEN 425 Design and Analysis of Industrial Systems with Simulation

Credits 3. 2 Lecture Hours. 3 Lab Hours. In-depth study into the design-modeling and subsequent analysis of contemporary production/service systems; factory/service systems are modeled using the ARENA/SIMAN V simulation-animation language; emphasis is placed on the critical analysis of alternative flow designs of modeled systems using flow and economic parameters to assess system improvement. **Prerequisites:** Grade of C or better in ISEN 210 and ISEN 355.

ISEN 427/DAEN 427 Decision and Risk Analysis

Credits 3. 3 Lecture Hours. Overview of the state of the art in descriptive and prescriptive theories of decision making under uncertainty with emphasis on the ways in which human decisions depart from normative models of rationality; analytical foundations stemming from several disciplines, economics, psychology, management science; application in engineering systems will be considered. **Prerequisite:** Grade of C or better in ISEN 310, DAEN 321, or STAT 212. **Cross Listing:** DAEN 427/ISEN 427.

ISEN 432/AERO 436 Human Factors Engineering for Aerospace Designs

Credits 3. 3 Lecture Hours. Physiological and psychophysiological issues encountered in aviation and space environments and their effect on human cognitive and physical performance; survey methods for human workload and performance evaluations; apply human-systems design principles to an aerospace design project. **Prerequisites:** Junior or senior classification. **Cross Listing:** AERO 436/ISEN 432.

ISEN 433 Biomechanics of Work

Credits 3. 3 Lecture Hours. Mechanical behavior of the human musculoskeletal system and component tissues during physical activity; fundamental biomechanical concepts, principles, tools and methods for the measurement of human physical attributes, evaluation of human mechanical capabilities and modeling of human musculoskeletal system; application of concepts to improve performance or prevent injuries during daily activities. **Prerequisite:** Grade of C or better in ISEN 330; junior or senior classification.

ISEN 434 Human Error and Resilient System Design

Credits 3. 3 Lecture Hours. Human error from a sociotechnical systems perspective; role of error in complex system failures; human behavioral modes and system design factors; analytical methods for defining the roles and impact of errors in large-scale system accidents; real-world case studies. **Prerequisites:** Grade of C or better in ISEN 330; junior or senior classification.

ISEN 440 Systems Thinking

Credits 3. 3 Lecture Hours. Systems thinking process, systems of systems and the fundamental considerations associated with the engineering of large-scale systems, or systems engineering including systems modeling, design and the system development process.

Prerequisites: Grade of C or better in MATH 304; junior or senior classification.

ISEN 441 System Reliability Engineering

Credits 3. 3 Lecture Hours. Methods of system modeling and analysis to predict and enhance the reliability, maintainability, and availability of complex engineered systems including component and systems reliability models, system life prediction, and data collection and analysis of failure and repair distributions. **Prerequisites:** Grade of C or better in STAT 211 or equivalent; junior or senior classification.

ISEN 442 Organizational Systems

Credits 3. 3 Lecture Hours. Role of people and organizations in the design and development of complex engineered systems; providing engineers with the skills needed to effectively manage large-scale system development programs. **Prerequisites:** Grade of C or better in ISEN 330; junior or senior classification.

ISEN 453 Manufacturing Operations

Credits 3. 3 Lecture Hours. Analytical principles of manufacturing systems design, analysis and control; emphasis placed on stochastic analysis; role of variability and impact on cycle time; push versus pull production strategies including Kanban and constant WIP control; probability, queuing theory, Little's Law, heavy traffic approximations, and queuing networks. **Prerequisites:** Grade of C or better in ISEN 340 and MATH 304; junior or senior classification.

ISEN 460 Capstone Senior Design

Credits 3. 1 Lecture Hour. 6 Lab Hours. Engineering design including identification of a problem; development, analysis and evaluation of alternative solutions; and recommendations for and, where possible, development of systems improvement tools; application of experience and training to provide a product or solution that helps company clients; balancing client needs with academic requirements. **Prerequisite:** Grade of C or better in ISEN 210, ISEN 330, ISEN 340, ISEN 350, ISEN 355 and ISEN 370; junior or senior classification.

ISEN 485 Directed Studies

Credits 1 to 6. 1 to 6 Other Hours. Permits work on special project in industrial engineering; project must be approved by department head. May be taken for credit up to 6 hours. **Prerequisites:** Senior classification in industrial engineering.

ISEN 489 Special Topics in...

Credits 1 to 5. 1 to 5 Lecture Hours. 0 to 5 Lab Hours. In-depth study of areas of current student interest and recent advances; normally used for first time offering of new courses. **Prerequisite:** Approval of instructor.

ISEN 491 Research

Credits 1 to 4. 1 to 4 Other Hours. Research conducted under the direction of faculty member in industrial and systems engineering. May be taken for credit up to 6 hours. **Prerequisites:** Junior or senior classification and approval of instructor.

ISTM - Mgmt Info Systems (ISTM)

ISTM 209 Business Information Systems Concepts

Credits 3. 3 Lecture Hours. Introduction to the use of computers in data and document management and as a problem-solving tool for business; fundamental concepts of information technology and theory; opportunities to use existing application software to solve various business information systems oriented problems. May not be used to satisfy degree requirements for majors in business. **Prerequisite:** For students other than business and agribusiness majors.

ISTM 210 Fundamentals of Information Systems

Credits 3. 3 Lecture Hours. (BCIS 1305 and 1405) Fundamentals of Information Systems. Introduction to information systems concepts; study of information systems in the functional areas of business; overview of hardware, software and popular operating systems; study of problem solving tools; human factors. **Prerequisite:** Business and Maritime Business Administration majors; also taught at Galveston campus.

ISTM 250 Business Programming Logic and Design

Credits 3. 3 Lecture Hours. Development of structured and object-oriented program logic and design in solving business programming problems; writing, documenting, debugging and testing computer code; emphasis on good coding techniques and logical thinking. **Prerequisite:** ISTM 210 or concurrent enrollment.

ISTM 281 Professional Development Information Systems Seminar

Credit 1. 1 Other Hour. Exposure to professional issues, contemporary information systems topics, potential MIS careers and employers. May be taken three times for credit. **Prerequisite:** Admission to Mays Business School; intend to major in management information systems.

ISTM 310 Network Communications and Infrastructure

Credits 3. 3 Lecture Hours. Concepts, technologies and applications of on-line and network-based systems; analysis and design of data communications; requirements in an information system environment; impact on business organizations; installation, configuration and management of virtual servers. **Prerequisite:** ISTM 250; ACCT 230 and BUSN 203, or concurrent enrollment; admission to upper division in Mays Business School, or approval of instructor if major is outside of Mays Business School.

ISTM 313 Foundations of Data Analytics for Non-MIS Majors

Credits 3. 3 Lecture Hours. Use and application of data modeling, Structured Query Language (SQL), Database Management Systems (DBMS) and data visualization in the solution of business problems. Only one of the following will satisfy the requirements for a degree: ISTM 313 or ISTM 315. **Prerequisites:** Admission to upper division in Mays Business School.

ISTM 315 Database Programming

Credits 3. 3 Lecture Hours. Use and application of Structured Query Language (SQL); Database Management Systems (DBMS) in the solution of business problems; database programming. Only one of the following will satisfy the requirements for a degree: ISTM 313 or ISTM 315.

Prerequisites: ISTM 310; ISTM 320; or approval of instructor.

ISTM 320 Business Systems Analysis and Design

Credits 3. 3 Lecture Hours. Techniques and methods currently used in system analysis and design including object oriented methods; use of automated tools to support systems development. **Prerequisite:** ISTM 250; ACCT 230 and BUSN 203, or concurrent enrollment; admission to upper division in Mays Business School or approval of instructor if major is outside of Mays Business School.

ISTM 325 Business Object Oriented Programming with Java

Credits 3. 3 Lecture Hours. Introduction of abstract data types, inheritance, object identity, polymorphism as they relate to building business objects and business classes; use of Java programming language depicting the object orientation concepts; use of class libraries and Java packages for business object construction. **Prerequisites:** Admission to upper division in Mays Business School; ISTM 250.

ISTM 360 Applied Predictive Analytics

Credits 3. 3 Lecture Hours. Development and application of predictive analytics to business problems using state-of-the-art software tools; implementation, validation and testing of models that employ machine learning methods and artificial intelligence; hands-on, practical approach to project-based predictive analytics using real-world data sets.

Prerequisite: ISTM 313 or ISTM 315; BUSN 203 or equivalent; admission to upper division in Mays Business School.

ISTM 365 Fundamentals of Cloud Computing

Credits 3. 3 Lecture Hours. Overview of cloud computing concepts; examination of information systems in the cloud impacting functional areas of business; topics include Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS); focus on how changes in computing towards commodity services drive impact across business systems, Line of Business (LoB) applications, cost efficiency, and top-line revenue growth. **Prerequisites:** Admission to upper division in Mays Business School.

ISTM 380 Human-Computer Interaction

Credits 3. 3 Lecture Hours. Techniques, principles and theory involved in designing, implementing and evaluating interactive technologies based on humans' physical, cognitive and emotional resources; focus on the role of task and context as key to understanding interaction phenomena at the individual, group, organizational and societal levels; accessibility, cultural and ethical implications of human-computer interaction. **Prerequisite:** ISTM 320; admission to upper division in Mays Business School.

ISTM 381 Ethics of Information Systems

Credits 3. 3 Lecture Hours. Exposure to the main ethical issues surrounding information, data and the systems and artifacts that are used; examination of information in multiple business areas, including marketing, accounting, finance, HR, sales, operations, and information systems. **Prerequisite:** Admission to upper-division in Mays Business School.

ISTM 410 Management of Information Systems

Credits 3. 3 Lecture Hours. Strategic management of information systems; change and risk management processes during information systems implementation; role of information systems to support business goals; writing business cases for request for proposals and responses; project management techniques. **Prerequisite:** ISTM 310; ISTM 320; or approval of instructor.

ISTM 415 Information Systems Capstone Project

Credits 3. 3 Lecture Hours. Design and development of information system software based on technical specifications; multi-platform environment; database server and web server software deployment. **Prerequisites:** ISTM 315; ISTM 410; or approval of instructor.

ISTM 420 Web-Enabled Applications

Credits 3. 3 Lecture Hours. Distributed business applications using the World Wide Web; advanced discussions of the concepts of internet, intranet, extranet; different methods to design web-enabled applications; active web applications; cutting edge website design; legacy to web integration; use of web-oriented languages. **Prerequisites:** Admission to upper division in Mays Business School.

ISTM 440/IBUS 440 International Technology Management

Credits 3. 3 Lecture Hours. Examines global information and communications technology (ICT) business environment; challenges and opportunities for technology companies in the region; history, culture, politics, economic issues, and infrastructure influencing ICT support and innovation in the region; combination of classroom work in the spring and a field trip to the selected country in the summer; repeatable for credit if taken in a different country. **Prerequisites:** Junior or senior classification; approval of instructor. **Cross Listing:** IBUS 440/ISTM 440.

ISTM 444 Computer Trading for Non-Finance Majors

Credits 3. 3 Lecture Hours. Overview of quantitative investing using algorithmic trading for investment management; exploration of collecting and preparing financial trading data, time series analysis, trend systems, momentum and mean reversal, arbitrage, backtesting, order execution, and reporting of risk and performance measures; tools, methods, and trading techniques using R programming language and R Studio. **Prerequisites:** ISTM 313 or ISTM 315; BUSN 203; admission to upper division in Mays Business School.

ISTM 450 Business Intelligence and Data Mining

Credits 3. 3 Lecture Hours. Rationale for Business Intelligence and data mining through business case studies; lab training using data mining software; and process of data mining by using commercial data mining software on large data sets. **Prerequisites:** Grade of "C" or better in BUSN 203 or equivalent; junior or senior classification.

ISTM 455/SCMT 455 Cybersecurity Management

Credits 3. 3 Lecture Hours. Explores business, managerial and technological aspects of information and cybersecurity; analysis, design, implementation and management issues surrounding effective information security; includes risk management, business continuity planning, and security policy development. **Prerequisite:** ISTM 310 or SCMT 375. **Cross Listing:** SCMT 455/ISTM 455.

ISTM 481 Information Systems Seminar

Credit 1. 1 Other Hour. Exposure to professional issues, contemporary information systems topics, potential MIS careers and employers. May be taken three times for credit. **Prerequisite:** Admission to upper division in Mays Business School; or approval of instructor.

ISTM 482 Data Analytics Platforms

Credits 3. 3 Lecture Hours. Coding platforms used for data analytics; data wrangling, exploration and visualization; model testing and validation; machine learning techniques. **Prerequisite:** BUSN 203 or equivalent.

ISTM 484 Management Information Systems Internship

Credits 1 to 4. 1 to 4 Other Hours. A directed internship in an organization to provide students with a learning experience supervised by professionals in organizational settings appropriate to the student's professional objectives. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisites:** Management Information Systems major and approval of academic advisor and instructor.

ISTM 485 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Directed study of selected problems in an area of management information systems not covered in other courses. **Prerequisites:** Admission to upper division in Mays Business School and approval of academic advisor and instructor.

ISTM 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topic in an identified field of management information systems. **Prerequisites:** Admission to upper division in Mays Business School and approval of academic advisor and instructor.

ISTM 601 Fundamentals of Business Programming

Credits 3. 3 Lecture Hours. Business Application Development using both procedural and object-oriented programming techniques; use of component based software design and development for distributed business software systems. **Prerequisite:** Graduate business classification or approval of instructor.

ISTM 610 Network and Cloud Infrastructure

Credits 3. 3 Lecture Hours. Concepts and technology of network and cloud systems in business; analysis of networking and cloud requirements, design, selection and application of technologies including wide and local area networks, distributed processing, network and cloud architecture, and systems management and control; software simulation projects emphasized. **Prerequisites:** Graduate classification.

ISTM 612 Management Information Systems

Credits 1 to 3. 1 to 3 Lecture Hours. Concepts, theories, and the strategic role of information systems as applied to business organizations; highly integrative/cross functional in nature. Classification 6 students may not enroll in this course. **Prerequisite:** Enrollment is limited to MBA students.

ISTM 615 Business Database Systems

Credits 3. 3 Lecture Hours. Information processing and management involving applications and user orientation in a business environment using commercially available database management systems. **Prerequisite:** Graduate classification or approval of instructor.

ISTM 620 Systems Analysis and Design

Credits 3. 3 Lecture Hours. Methodologies, techniques, and tools for information systems analysis and design; the analysis and logical design of business processes and management information systems focusing on the systems development life cycle; techniques for logical system design.

ISTM 622 Advanced Data Management

Credits 3. 3 Lecture Hours. Data and database management and advanced SQL techniques; issues of data security, backup and recovery, large scale databases, master data management, concurrent user data access, scalability, and policies. **Prerequisites:** ISTM 615 or equivalent; graduate classification in business.

ISTM 624 Advanced Systems Analysis and Design

Credits 3. 3 Lecture Hours. Advanced topics in business systems analysis and design; alternative methodologies such as agile development, extreme programming, Rational Unified Process; Unified Modeling Language; bench marking and best practices for systems development; cost/benefit analysis, estimation and budgeting for business information systems; testing; patterns, domain-driven design; process modeling; service-oriented architecture and cloud computing. **Prerequisite:** ISTM 620 or equivalent; graduate classification in business.

ISTM 630 MIS Project Management and Implementation

Credits 3. 3 Lecture Hours. Advanced coverage of systems development topics with emphasis on the management and implementation of business computing systems; group project orientation to include feasibility analysis, alternative evaluation and selection, and management approval; use of software engineering tools where appropriate. Classification 6 students may not enroll in this class. **Prerequisite:** ISTM 620.

ISTM 631 Information Systems Design and Development Project

Credits 3. 3 Lecture Hours. Design and delivery of functional, multi-platform application system using current technologies; user interface design emphasized; issues of mobile device forms, software delivery, and development. **Prerequisites:** Graduation classification; ISTM 622; ISTM 630.

ISTM 635 Business Information Security

Credits 3. 3 Lecture Hours. Explores the business, managerial, and technological aspects of information security; analysis, design, and implementation issues surrounding effective information security; authentication, authorization, availability, business continuity planning, confidentiality, disaster recovery, encryption, firewalls, fraud protection, security policy development, integrity, risk management, virus protection, VPNs and wireless security. Classification 6 students may not enroll in this course. **Prerequisite:** ISTM 610.

ISTM 637 Data Warehousing

Credits 3. 3 Lecture Hours. Provides an understanding of the process by which a data warehouse system is designed and developed along with the underlying concepts and software systems; includes OLAP models and their differences with standard OLTP models. **Prerequisite:** ISTM 615 or approval of instructor.

ISTM 643 Corporate Information Planning

Credits 3. 3 Lecture Hours. Concepts regarding the design and use of computer-based management information and decision support systems; combinations of computing hardware and software and design concepts evaluated to meet managers' information needs. Classification 6 students may not enroll in this course. **Prerequisites:** ISTM 615 or equivalent or approval of instructor.

ISTM 644 Computer Trading for Non-Finance Majors

Credits 3. 3 Lecture Hours. Overview of quantitative investing using algorithmic trading for investment management; exploration of collecting and preparing financial trading data, time series analysis, trend systems, momentum and mean reversal, arbitrage, backtesting, order execution, and reporting of risk and performance measures; tools, methods, and trading techniques using R programming language and R Studio.

Prerequisites: ISTM 601 and ISTM 615, or approval of instructor.

ISTM 645 IT Security Controls

Credits 3. 3 Lecture Hours. Familiarization with planning, design, and implementation of controls to minimize risks to business information; focus on the importance of managing business information security; introduction to the tools, concepts and theories to safeguard an organization's information systems and IT assets; understanding of cryptography and application, operations, and physical security. **Prerequisite:** ISTM 635.

ISTM 650 Business Data Mining

Credits 3. 3 Lecture Hours. Rationale for business Data Mining through case studies of business applications; process of data mining by using commercial Data Mining software on very large data sets; classification, clustering, association rule mining, visualization, and prediction through a hands-on approach. **Prerequisite:** STAT 652 or approval of instructor.

ISTM 652 Customer Relationship Management and Technologies

Credits 3. 3 Lecture Hours. Theory and application of information technology in customer relationship management, construction of CRM infrastructures in organizations. **Prerequisite:** ISTM 615.

ISTM 655 Security Management and Compliance

Credits 3. 3 Lecture Hours. Familiarization with managerial and legal aspects of business information security; focus on importance of managing business information security and theories to help safeguard an organization's information systems and IT assets; understanding of Security Architecture and Design, Business Continuity and Disaster Recovery Planning, Laws Investigation and Ethics. **Prerequisite:** ISTM 635.

ISTM 657 Blockchain and Artificial Intelligence Business Transformation

Credits 3. 3 Lecture Hours. Transforming processes and business models through the application of advanced technologies; Blockchain and Artificial Intelligence (AI); focus on underlying technologies, business process design, and business case development; final project presentation of a new process or model and a supporting business case. **Prerequisites:** Graduate classification.

ISTM 660 Applied Predictive Analytics for Business

Credits 3. 3 Lecture Hours. Develop an understanding of the role of predictive analytics in shaping business outcomes; provide hands-on, practical approach to implementing predictive analytics tools for gaining competitive advantage in business. **Prerequisite:** Graduate classification.

ISTM 662 Management of the Technology Organization

Credits 3. 3 Lecture Hours. Corporate management of technology; exploration of Management Information Systems, Operations, Strategic Management, Human Resources, Management, Organizational Behavior, Entrepreneurship, Marketing, Finance, and Accounting from both a strategic and tactical perspective. **Prerequisites:** Graduate classification.

ISTM 665 Cloud Computing Technologies

Credits 3. 3 Lecture Hours. Overview of cloud computing concepts; examination of information systems in the cloud impacting functional areas of business; topics include Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS); focus on how changes in computing towards commodity services drive impact across business systems, Line of Business (LoB) applications, cost efficiency, and top-line revenue growth. **Prerequisites:** Graduate classification.

ISTM 670 Capstone Information Systems Service Project

Credits 3. 3 Lecture Hours. Philanthropic collaboration with a not-for-profit or non-profit entity in a consultative capacity; hands-on experience with consulting practices, client relationships, systems analysis and design, project-management, IT development and implementation, digital collaboration tools, knowledge management, organizational change, and/or IT security. **Prerequisite:** ISTM 615 or equivalent; ISTM 620 or equivalent; ISTM 630 or equivalent.

ISTM 680 Human-Computer Interaction in Management Information Systems

Credits 3. 3 Lecture Hours. Techniques, principles and theory involved in designing and implementing interactive technologies based on humans' physical, cognitive and emotional resources; focus on application of qualitative and quantitative evaluation techniques for interaction phenomena; understanding interaction phenomena at the individual, group, organizational and societal levels; accessibility, cultural and ethical implications of human-computer interaction. **Prerequisite:** Graduate classification.

ISTM 681 Ethics of Information Systems

Credits 3. 3 Lecture Hours. Exposure to the main ethical issues surrounding information, data and the systems and artifacts that are used; examination of information in multiple business areas, including marketing, accounting, finance, HR, sales, operations and information systems.

ISTM 682 Data Analytics Platforms

Credits 3. 3 Lecture Hours. Coding platforms used for data analytics; data wrangling, exploration and visualization; model testing and validation; machine learning techniques. **Prerequisite:** STAT 601 or equivalent.

ISTM 683 Web and Social Media Analytics

Credits 3. 3 Lecture Hours. Study of business challenges faced by modern firms in the new economy; focus on web analytics, unstructured data analytics and social network analytics to derive insights from business data. **Prerequisites:** Graduate classification.

ISTM 684 Professional Internship

Credits 1 to 6. 1 to 6 Other Hours. A directed internship in an organization to provide students with on-the-job training with professionals in organizational settings appropriate to the student's professional objectives. May be repeated for credit. Classification 6 students may not enroll in this course. **Prerequisite:** Approval of committee chair and department head.

ISTM 685 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Directed study on selected problems using recent developments in business research methods. Classification 6 students may not enroll in this course. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisites:** Approval of instructor and graduate advisor.

ISTM 689 Special Topics in...

Credits 1 to 4. 1 to 4 Other Hours. Selected topics in identified area of information systems, operations management or management science. Classification 6 students may not enroll in this course. May be repeated for credit.

ISTM 705 Information Management for Decision Making

Credits 1 to 4. 1 to 4 Lecture Hours. Policies, practices and procedures for management corporation information; relational database theory and relationship database management systems; data modeling; structured and unstructured data management; structured query language; secure data practices; information management for managerial decision making. **Prerequisite:** For Master of Science in Business students only.

ITAL - Italian (ITAL)

ITAL 101 Beginning Italian I

Credits 4. 3 Lecture Hours. 2 Lab Hours. (ITAL 1411) Beginning Italian I. Elementary language study with oral, written and reading practice; preparation for conversation; part of class preparation will be done in language laboratory.

ITAL 102 Beginning Italian II

Credits 4. 3 Lecture Hours. 2 Lab Hours. (ITAL 1412) Beginning Italian II. Continuation of ITAL 101; part of class preparation will be done in the language laboratory. **Prerequisite:** ITAL 101.

ITAL 201 Intermediate Italian I

Credits 3. 3 Lecture Hours. (ITAL 2311) Intermediate Italian I. Readings of average difficulty; review of grammar; practice in conversation and composition. **Prerequisite:** Grade of C or better in ITAL 102 or equivalent, or approval of instructor.

ITAL 202 Intermediate Italian II

Credits 3. 3 Lecture Hours. (ITAL 2312) Intermediate Italian II. Continuation of ITAL 201 with more advanced material. **Prerequisite:** Grade of C or better in ITAL 201 or equivalent, or approval of instructor.

ITAL 221 Field Studies I

Credits 3. 3 Lecture Hours. 3 Other Hours. Italian language and culture taught in Italy; supervised travel of cultural interest; participation in living with local families; participation in the activities of an Italian university or institute. **Prerequisite:** Grade of C or better in ITAL 102 or equivalent or approval of instructor; concurrent enrollment with ITAL 222.

ITAL 222 Field Studies II

Credits 3. 3 Lecture Hours. 3 Other Hours. Italian language and culture taught in Italy; supervised travel of cultural interest; participation in living with local families; participation in the activities of an Italian university or institute. **Prerequisite:** Grade of C or better in ITAL 102 or equivalent, or approval of instructor; concurrent enrollment in ITAL 221.

ITAL 251 Global Italy

Credits 3. 3 Lecture Hours. Examination of how Italian uniqueness shaped the world in the literary, visual, plastic, performance and applied arts, and in the natural and social sciences; course materials drawn from a variety of media to highlight the continued presence of Italian culture on the global stage; taught in English.

ITAL 285 Directed Studies

Credits 1 to 4. 1 to 4 Lecture Hours. Individual supervision of readings or assigned projects in Italian, selected for each student individually. **Prerequisites:** Approval of instructor and department head.

ITAL 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of Italian studies. May be repeated for credit. **Prerequisite:** Approval of instructor.

ITAL 303 Composition and Conversation

Credits 3. 3 Lecture Hours. Readings of contemporary Italian prose; intensive review of grammar and syntax; development of written and oral skills; expansion of vocabulary; translations, compositions and short presentation. **Prerequisite:** ITAL 202 or equivalent.

ITAL 321 Italian Culture and Arts I

Credits 3. 3 Lecture Hours. Italian culture and arts from classical antiquity to 1860; major stylistic periods in literature and the fine arts; conducted in Italian. **Prerequisite:** Grade of C or better in ITAL 202 or equivalent and junior or senior classification; or approval of instructor.

ITAL 322 Italian Culture and Arts II

Credits 3. 3 Lecture Hours. Italian culture, arts, and society from 1860 to the present; conducted in Italian. **Prerequisite:** Grade of C or better in ITAL 202 or equivalent and junior or senior classification; or approval of instructor.

ITAL 452 Topics in Italian Women and Gender Studies

Credits 3. 3 Lecture Hours. The historical and cultural dynamics forging the notion of woman and gender in Italian society and cultural production; discussion of cultural works, media, and theoretical texts concerning subjectivity and language, body and culture; Italian feminist theories from different disciplinary perspectives; conducted in English. May be repeated two times for credit. **Prerequisite:** Junior or senior classification or approval of instructor.

ITAL 453 Literatures of Italy

Credits 3. 3 Lecture Hours. Exploration of literary works that sparked Western realism in fiction and lyrical language in poetry, from Dante to modern and contemporary Italian authors; the relationship between literature and the natural and physical sciences, and between literature and the social sciences; taught in English. May be repeated two times for credit. **Prerequisites:** Junior or senior classification, or approval of instructor.

ITAL 455/FILM 455 Italian Cinema

Credits 3. 3 Lecture Hours. Consideration and analyses of major works and directors of Italian cinema, from its origin through Neorealism to the present; analysis of how its visual language relates to Italian history, culture and to other arts; taught in English. May be repeated two times for credit. **Prerequisite:** Junior or senior classification, or approval of instructor. **Cross Listing:** FILM 455/ITAL 455.

ITAL 456 Contemporary Italian Cultures

Credits 3. 3 Lecture Hours. Examination of issues currently debated in multicultural Italian society since World War II, such as national identity, immigration, emigration, homoparental families, the "Made in Italy" brand, ecology and sustainability; discussion of creed, country, color, gender, class and organized crime, in literature and film, sociology, political theory and critical studies; conducted in English. May be repeated two times for credit. **Prerequisites:** Junior or senior classification, or permission of instructor.

ITAL 485 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Individual supervision of readings or assigned projects, selected for each student individually; written and oral reports. **Prerequisite:** Approval of instructor and department head.

ITAL 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of Italian. May be repeated for credit. **Prerequisite:** Approval of instructor.

ITAL 491 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of a faculty member in Italian. May be repeated two times for credit. **Prerequisites:** Junior or senior classification and approval of instructor.

ITDE - Interdisciplinary Engr (ITDE)

ITDE 201 Foundations of Interdisciplinary Engineering

Credit 1. 1 Lecture Hour. Success strategies for the interdisciplinary approach to engineering problems; ethical issues in engineering and formation of ethical codes in the interdisciplinary context; effective communications for engineering practice; formation of professional cohorts and networks. **Prerequisites:** Admission to major degree sequence in interdisciplinary engineering.

ITDE 285 Directed Studies

Credits 0 to 6. 0 to 6 Other Hours. Directed studies within interdisciplinary engineering. **Prerequisites:** Sophomore classification and approval of interdisciplinary engineering director or delegate.

ITDE 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of interdisciplinary engineering.

ITDE 291 Research

Credits 1 to 6. 1 to 6 Other Hours. Research conducted under the direction of faculty member in interdisciplinary engineering. **Prerequisites:** Sophomore classification and approval of interdisciplinary engineering director or delegate.

ITDE 301 Interdisciplinary Engineering Experimentation

Credit 1. 0 Lecture Hours. 3 Lab Hours. Role of experimentation across engineering problems; data collection, analysis and interpretation; use of engineering judgment to draw conclusions; instrumentation and procedures used in a variety of engineering contexts; presentation of experimental findings in written and oral formats. **Prerequisite:** Grade of C or better in ITDE 201 or approval of instructor.

ITDE 399 High Impact Experience for Interdisciplinary Engineers

Credits 0. 0 Other Hours. Participation in an approved high-impact learning practice; reflection on professional outcomes from engineering body of knowledge; documentation and self-assessment of learning experience at mid-curriculum point. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisites:** ITDE major; junior or senior classification.

ITDE 401 Interdisciplinary Engineering Capstone Design I

Credits 3. 2 Lecture Hours. 3 Lab Hours. Instruction and practice in the design process applied to an interdisciplinary design project including establish the customer need; determination of requirements in terms of function, what, and performance, how well; development of alternative design concepts; performance of trade-off studies among performance, cost and schedule; embodiment and detail design; iteration of the above steps; major interdisciplinary design project. **Prerequisite:** Grade of C or better in ITDE 301; senior classification; approval of instructor.

ITDE 402 Interdisciplinary Engineering Capstone Design II

Credits 2. 1 Lecture Hour. 3 Lab Hours. Extended interdisciplinary design development process; project management; product-market fit and customer search considerations; manufacturing detailed design specifications; failure modes; applications of codes and standards; selection of design margins; product, component, development guidelines; intellectual property, product liability and ethical responsibility. **Prerequisite:** Grade of C or better in ITDE 401.

ITDE 485 Directed Studies

Credits 0 to 6. 0 to 6 Other Hours. Directed studies within interdisciplinary engineering. **Prerequisites:** Junior or senior classification and approval of interdisciplinary engineering director or delegate.

ITDE 489 Special Topics In...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of interdisciplinary engineering. May be repeated for credit.

ITDE 491 Research

Credits 1 to 6. 1 to 6 Other Hours. Research conducted under the direction of faculty member in interdisciplinary engineering. **Prerequisites:** Junior or senior classification and approval of interdisciplinary engineering director or delegate.

ITDE 499 Degree Plan Approval for ITDE

Credits 0. 0 Other Hours. Successful completion of approved Bachelor of Science in Interdisciplinary Engineering degree plan; must be taken in graduating semester. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisites:** Grade of C or better in ITDE 402 or concurrent enrollment; ITDE major; junior or senior classification.

ITSV - Info Tech Service Mgmt (ITSV) Information Technology Service Management (ITSV)

ITSV 101 Introduction to Information Technology Service Management

Credit 1. 1 Lecture Hour. Framework of processes and best practices used to manage a modern Information Technology (IT) service organization using specific IT service management principles promulgated via the ITIL framework; framework of best practices for delivering IT services; offers optional ITIL Foundations certification examination; passing of this industry standard credential assesses the student's understanding of IT service management practices and is foundational to understanding higher-level service management problems.

ITSV 272 Foundations of Information Technology Management

Credits 3. 3 Lecture Hours. Overview of the theory and practices in the field of Information Technology Service Management; analysis of the foundations of alignment of IT services with organizational value goals, as well as basic understanding of computational thinking; fundamentals of IT management and its roles in today's organizations. **Prerequisites:** Grade of C or better in ITSV 101; sophomore classification.

ITSV 274 Foundations of Networking

Credits 3. 3 Lecture Hours. 1 Lab Hour. Introduction to the fundamental building blocks that form a modern digital network, such as OSI model, protocols, topologies, hardware, and network operating systems; topics include in-depth coverage of the most important concepts in contemporary networking, such as TCP/IP, Ethernet, wireless transmission, and security; preparation of the skills required to build a network from scratch and maintain, upgrade, and troubleshoot an existing network. **Prerequisites:** Grade of C or better in ITSV 272 or concurrent enrollment; approval of instructor; sophomore classification.

ITSV 303 Unix System Administration Practices

Credits 4. 3 Lecture Hours. 3 Lab Hours. Development and system administration of the Unix operating system; technical alternatives for proactive and reactive maintenance of system health. **Prerequisites:** ITSV 272 and ITSV 274 with a grade of C or better; junior or senior classification or approval of instructor.

ITSV 308 Cybersecurity and Digital Ethics

Credits 3. 3 Lecture Hours. Introduction to cybersecurity; analysis of threats and risks from the environment; development of appropriate strategies to mitigate impact; ethics of extraordinary administrative access; ethics of digital forensics and implications to society. **Prerequisites:** ITSV 272 and ITSV 274 with a grade of C or better; junior or senior classification or approval of instructor.

ITSV 316 Database Systems Administration and Application

Credits 4. 3 Lecture Hours. 3 Lab Hours. Database administration and application use techniques; database structures, modeling, configuration, development, security, topologies and access; focus on system administration of Unix-based database systems. **Prerequisite:** ITSV 303 with a grade of C or better.

ITSV 385 Information Technology Management and Service Delivery

Credits 3. 3 Lecture Hours. Study of the disciplines necessary to create an organization that consistently delivers business value through Information Technology (IT) services; examination of all types of interaction between an IT service provider and their customers, users, suppliers, and partners, including governance and risk management, organizational change, communication models, and business relationship management; examination of customer and user experience concepts through customer journey mapping and acquire practical and strategic approaches to aligning IT services to organizational values; examination of the practical skills necessary to create a "learning and improving" IT organization, with an emphasis on Agile and Lean methodologies, and the strategies needed to embed continual improvement at every layer of the organization. **Prerequisites:** Grade of C or better in ITSV 101 and ITSV 274; junior or senior classification; Information Technology Service Management major.

ITSV 396 Foundations of Data Analytics in Information Technology Service Management

Credits 3. 3 Lecture Hours. Development of knowledge and skills towards gathering, describing, and analyzing data, and using advanced statistical tools to make decisions on information technology service management, organization operations, and risk management, etc; instruction in processes used to identify, locate, analyze, and report on data sources both qualitatively and quantitatively; exposure to hands-on practical experience of some advanced data analytic skills, including statistical inference, time series analysis, Monte Carlo simulation, and optimization models, etc. **Prerequisites:** Grade of C or better in STAT 201; junior classification; or approval of instructor.

ITSV 412 Contemporary Issues in Technology Management

Credits 3. 3 Lecture Hours. Specific innovation or practices nascent to the professional information technology industry; discovery of practical applications and analytics of new innovation. **Prerequisites:** ITSV 272 and ITSV 274 with a grade of C or better; junior or senior classification.

ITSV 465 DevOps and High Velocity Service Delivery

Credits 4. 3 Lecture Hours. 2 Lab Hours. A survey of concepts used to manage a modern Information Technology (IT) team in order to deliver IT services with scale and velocity; the ideas behind Lean and Agile organizations; systems automation and infrastructure as code; delivering modern IT services at scale using public cloud resources; how the IT unit relates to other groups within the organization (business relationship management and IT governance); practical application by creating an API-driven IT service; using continuous delivery tools to automate the build and delivery pipeline. **Prerequisite:** Grade of C or better in ITSV 274 and ITSV 303; junior or senior classification; Information Technology Service Management major.

ITSV 475 Information Technology Service Management Capstone I

Credits 4. 3 Lecture Hours. 2 Lab Hours. Exploration of planning, management, and execution of IT projects; reviewing project management methodologies; examination of project artifacts, deliverables, scoping, scheduling, critical path, changes, retrospectives, conducting meetings; exploration of team development and constraint theory. **Prerequisites:** Grade of C or better in ITSV 303, ITSV 308, ITSV 316, and ITSV 385; grade of C or better in ITSV 396 and ITSV 412, or concurrent enrollment; ENGL 210; junior senior classification or approval of instructor; Information Technology Service Management majors.

ITSV 476 Information Technology Service Management Capstone II

Credits 3. 3 Lecture Hours. Continuation of ITSV 475; execution of plan for capstone project; team experience in execution of project; sponsor interaction; peer review and feedback. **Prerequisites:** Grade of C or better in ITSV 475; grade of C or better in ITSV 465 or concurrent enrollment; or approval of the instructor.

JAPN - Japanese (JAPN)

JAPN 101 Beginning Japanese I

Credits 4. 3 Lecture Hours. 2 Lab Hours. (JAPN 1411) Beginning Japanese I. Elementary language study with oral, written and reading practice; preparation for conversation; part of class preparation to be done in the language laboratory.

JAPN 102 Beginning Japanese II

Credits 4. 3 Lecture Hours. 2 Lab Hours. (JAPN 1412) Beginning Japanese II. Continuation of JAPN 101; part of class preparation to be done in the language laboratory. **Prerequisite:** JAPN 101.

JAPN 201 Intermediate Japanese I

Credits 4. 4 Lecture Hours. Readings of average difficulty; review of grammar; practice in conversation and composition. **Prerequisite:** JAPN 102.

JAPN 202 Intermediate Japanese II

Credits 4. 4 Lecture Hours. Continuation of JAPN 201 with more advanced material. **Prerequisite:** JAPN 201.

JAPN 285 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Individual supervision of readings or assigned projects in Japanese, selected for each student individually; written or oral reports. **Prerequisite:** Approval of instructor and Director of AALO.

JAPN 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of Japanese studies. May be repeated for credit. **Prerequisite:** Approval of instructor.

JAPN 291 Research

Credits 0 to 3. 0 to 3 Other Hours. Research in Japanese studies conducted under the direction of faculty member approved by the Director of AALO. May be taken 2 times for credit. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

JAPN 301 Upper Level Japanese I

Credits 3. 3 Lecture Hours. Reading and listening practice using authentic and near-authentic materials; conversation practice in different levels of formality; composition and grammar; conducted in Japanese. **Prerequisite:** JAPN 202.

JAPN 302 Upper Level Japanese II

Credits 3. 3 Lecture Hours. Continuation of JAPN 301 with more advanced material. **Prerequisite:** JAPN 301.

JAPN 325 Japanese Language and Culture through Manga

Credits 3. 3 Lecture Hours. Examination of Japanese and Asian visual, linguistic, and cultural traditions, with emphasis on genre of Manga. **Prerequisite:** JAPN 202.

JAPN 401 Advanced Japanese I

Credits 3. 3 Lecture Hours. Readings with selected grammar and kanji lessons; focus on Japanese traditional and popular culture, religion, and history; taught in Japanese. **Prerequisite:** JAPN 302 or equivalent.

JAPN 402 Advanced Japanese II

Credits 3. 3 Lecture Hours. Readings with selected grammar and kanji lessons; focus on Japanese private and business life, education, politics, and contemporary culture; taught in Japanese. **Prerequisite:** JAPN 302 or equivalent.

JAPN 485 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Individual supervision of readings or assigned projects selected for each student individually; written or oral reports. **Prerequisite:** Approval of instructor and Director of AALO.

JAPN 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of Japanese studies. May be repeated for credit. **Prerequisite:** Approval of instructor.

JAPN 491 Research

Credits 1 to 4. 1 to 4 Other Hours. Research in Japanese studies conducted under the direction of faculty member approved by the Director of AALO. May be taken 2 times for credit. **Prerequisites:** Junior or senior classification and approval of instructor.

JOUR - Journalism (JOUR)

JOUR 102 American Mass Media

Credits 3. 3 Lecture Hours. (COMM 1307) American Mass Media. Introductory survey of mass communication media, their history and social role, to provide an understanding of the development and importance of mass communication media in modern society.

JOUR 200 Mass Media Information

Credits 3. 3 Lecture Hours. Strategies and procedures in identifying, gathering, analyzing and organizing information for the mass media; sources and methods; evaluation and validation of evidence; legal and ethical considerations. **Prerequisites:** Grade of C or better in JOUR 102; freshman or sophomore classification; enrollment in JOUR major, USLA-BA-JNS concentration, or JOUR minor; or approval of program director.

JOUR 203 Media Writing I

Credits 3. 2 Lecture Hours. 3 Lab Hours. (COMM 2311) Media Writing I. Basic journalistic techniques common to all media; integration of news gathering, writing and editing; ethics. Limited to minors in journalism, or with approval of program director. **Prerequisites:** Grade of C or better in JOUR 102 and JOUR 200; enrollment in JOUR major, the USLA-BA-JNS concentration or JOUR minor; or approval of program director.

JOUR 208 Television Sports Production

Credits 3. 3 Lecture Hours. Detailed study of all aspects of television sport production to develop an overall understanding and appreciation of the art of sports broadcasting; history of the sports broadcast industry; examination of historic and current philosophies.

JOUR 215/COMM 215 Interviewing: Principles and Practice

Credits 3. 3 Lecture Hours. Theory and practice of methods in selected interview settings; emphasis on communication between two persons, questioning techniques, and the logical and psychological bases of interpersonal persuasion. **Cross Listing:** COMM 215/JOUR 215.

JOUR 230/COMM 230 Communication Technology Skills

Credits 3. 3 Lecture Hours. Introduction to interactive media and media literacy skills in the digital domain; survey of technology histories, standards, and markets for industries such as multichannel TV, digital radio, video games, streaming media, epublishing, teleconferencing, and social networking. **Prerequisites:** Enrollment in communication or telecommunication media studies majors, USLA-BA-JNS concentration, or JOUR minor. **Cross Listing:** COMM 230/JOUR 230.

JOUR 248/COMM 248 Podcasting and Audio Storytelling

Credits 3. 3 Lecture Hours. Basic audio storytelling techniques required for podcast production within the journalism and public media context; principles of podcast development, scripting, audio recording and editing, and promotion. **Cross Listing:** COMM 248/JOUR 248.

JOUR 250/COMM 250 New Media and the Independent Voice

Credits 3. 3 Lecture Hours. Examination of new media as independent voices for cultural and political movements; principles governing the design, presentation, and evaluation of blogs as a persuasive medium in society. **Cross Listing:** COMM 250/JOUR 250.

JOUR 255/COMM 255 Media Literacy in the Digital Age

Credits 3. 3 Lecture Hours. Criticism and analysis of the function, role, and responsibility of the mass media in contemporary society. **Cross Listing:** COMM 255/JOUR 255.

JOUR 275/COMM 275 Introduction to Social Media

Credits 3. 3 Lecture Hours. Theoretical and practical approaches to social media; overview of social media, social media concepts and theories; social media applications and contexts. **Cross Listing:** COMM 275/JOUR 275.

JOUR 285 Directed Studies

Credits 0 to 3. 0 to 3 Other Hours. Research problems related to communication field; individual work, fitted to special needs of specific student as determined by their interests and aptitude. **Prerequisites:** Enrollment in JOUR major, USLA-BA-JNS concentration or JOUR minor; approval of the program director.

JOUR 289 Special Topics in...

Credits 3. 3 Other Hours. Selected topics in an identified area of journalism and mass communication. May be repeated for credit. **Prerequisites:** Enrollment in USLA-BA-JNS concentration or JOUR minor.

JOUR 291 Research

Credits 0 to 3. 0 to 3 Other Hours. Research conducted under the direction of a chosen faculty member in Journalism Studies. May be taken for a maximum of 3 hours credit. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

JOUR 301/COMM 307 Communication Law and Policy

Credits 3. 3 Lecture Hours. Law and policy that create the context and consequences for communication via mass media, social media, organizational, group and interpersonal communication, free speech, free press, libel, privacy, copyright, cybersecurity, constitutional principles, international law and human rights, fairness, equity and diversity in communication. **Prerequisites:** Junior or senior classification, or approval of instructor; COMM-307 also taught at Galveston campus. **Cross Listing:** COMM 307/JOUR 301.

JOUR 302 The Mass Media and Politics

Credits 3. 3 Lecture Hours. Examination of mass media impact on politics and political behavior, and governmental impact on the mass media. **Prerequisite:** POLS 206 or approval of department head; junior or senior classification. **Cross Listing:** COMM 302 and POLS 302.

JOUR 303 Media Writing II

Credits 3. 2 Lecture Hours. 3 Lab Hours. Interpretative news gathering and writing for various media; basic communication law and ethics; assigned practice on campus or other publications. **Prerequisites:** JOUR 203, enrollment in JOUR major, USLA-BA-JNS concentration or JOUR minor; or approval of program director.

JOUR 304 Editing for the Mass Media

Credits 3. 3 Lecture Hours. Principles and practice of editing including: improving and tightening text; writing headlines, titles and subheads; self-editing and editing others; tailoring texts for specific audiences; understanding style guides. **Prerequisite:** Grade of C or better in JOUR 203; enrollment in JOUR major, USLA-BA-JNS concentration or JOUR minor; or approval of program director; junior or senior classification.

JOUR 305/COMM 303 Communication Data Applications

Credits 3. 3 Lecture Hours. Overview of communication using big data; data management, extraction and visualization; message construction, message critique; uses and applications in the field of communication and media for evidence-based arguments, persuasion, education and digital storytelling. **Prerequisite:** Junior or senior classification. **Cross Listing:** COMM 303/JOUR 305.

JOUR 306/COMM 304 Digital Communication Analytics and Metrics

Credits 3. 3 Lecture Hours. Digital communication analytics; extraction of information and knowledge from digital communication data; application of data-analytics to social media marketing, demographic analyses of web users, optimization and connection of results across digital tactics; applications of special interest to fields of strategic communication, public relations, advertising, integrated marketing communication, social media strategy and journalism. **Prerequisite:** Grade of B or better in COMM 275/JOUR 275, COMM 323, or JOUR 200; junior or senior classification. **Cross Listing:** COMM 304/JOUR 306.

JOUR 313 Photojournalism I

Credits 3. 3 Lecture Hours. Photographic techniques, tools and content issues for visual journalism; photo assignments on the variety of situations working photojournalists encounter. **Prerequisites:** Junior or senior classification, or approval of instructor.

JOUR 317/COMM 317 Social Media Law

Credits 3. 3 Lecture Hours. Laws and regulations applied to social media, including communication law applied to enduring issues in the social media context; legal problems unique to social media; free speech, commercial speech and employment law as they affect individual users of social media as well as groups and organizations promoting points of view or products via social media, and employers. **Prerequisite:** Junior or senior classification or approval of instructor. **Cross Listing:** COMM 317/JOUR 317.

JOUR 318 Visual Journalism

Credits 3. 3 Lecture Hours. Critical evaluation of visual communication approaches as applied to journalism across mediums; assessment of strengths, and limitations of visual journalism through process of advancing technology and aesthetics in journalism and documentary projects. **Prerequisites:** Junior or senior classification; or approval of instructor.

JOUR 319/SPAN 319 Bilingual Reporting

Credits 3. 3 Lecture Hours. Journalistic techniques and skills used to report in Spanish and/or for Spanish-language media; examination of the unique set of challenges facing LatinX communities in the United States, Latin American, and Hispanic countries abroad; integration of newsgathering, writing, editing, research skills, multimedia podcasting. **Prerequisites:** Junior or senior classification; SPAN 302 or approval of instructor. **Cross Listing:** SPAN 319/JOUR 319.

JOUR 341 Mobile Journalism

Credits 3. 3 Lecture Hours. Multimedia journalism; photography, audio and video as used in journalism; reporting stories; adaptation of storytelling across media platforms; real-time mobile publishing. **Prerequisites:** Junior or senior classification or approval of instructor.

JOUR 345 Media Industries

Credits 3. 3 Lecture Hours. Survey of the business organization, economic structures and processes, and regulations of the media industry. **Prerequisite:** Junior or senior classification or approval of instructor. **Cross Listing:** COMM 345 and FILM 345.

JOUR 346/COMM 346 Media, Culture and Identity

Credits 3. 3 Lecture Hours. Media representations relating to power, privilege and difference; communication theories and concepts centered on how media and technology-use shape, and are shaped by, identity; critical analysis of media as sites for negotiation and construction of identities such as gender, race, ethnicity, sexuality, social class, physical/mental ability, nationality and religion; reflection on and analysis of bias, prejudice, discrimination, power, equity and privilege. **Prerequisites:** Junior or senior classification or approval of instructor. **Cross Listing:** COMM 346/JOUR 346.

JOUR 359 Reporting Sports

Credits 3. 3 Lecture Hours. Gathering, organizing, researching, evaluating and writing sports information; employing accepted professional sports writing style across various news media platforms. **Prerequisites:** Junior or senior classification.

JOUR 365/COMM 365 International Communication

Credits 3. 3 Lecture Hours. Mass media, international, and cross-cultural audiences; theoretical, pragmatic, political and ethical issues; including cultural differences, comparative media systems, development communication, patterns of world news flow, political propaganda, impact of international advertising and other issues. **Prerequisite:** Junior or senior classification; COMM-365 also taught at Qatar campus. **Cross Listing:** COMM 365/JOUR 365.

JOUR 450 Political Reporting

Credits 3. 3 Lecture Hours. Interviewing; reporting; and writing various types of political stories and commentary; exploration of ethical principles and issues in political reporting including role of free press in a democracy. **Prerequisite:** Junior or senior classification or approval of instructor.

JOUR 451 Arts & Entertainment Journalism

Credits 3. 3 Lecture Hours. Arts & Entertainment Journalism. Journalistic coverage of arts and entertainment issues and events; examination of reviews and feature stories; feature writing and criticism; extensive workshop experience; emphasis on the value of research, self-editing and revision. **Prerequisite:** Junior or senior classification or approval of instructor.

JOUR 452 Business Reporting

Credits 3. 3 Lecture Hours. Specialized concepts and skills required to cover business; everyday impact on the lives of consumers; exploration of and writing about interaction of companies, communities, consumers, governments and global events. **Prerequisites:** Junior or senior classification or approval of instructor.

JOUR 455 Literary Nonfiction

Credits 3. 3 Lecture Hours. Explores the art of writing literary nonfiction, a major trend in 21st century journalism; examines several forms of literary nonfiction, including personal essay, memoir, historical biography and modern narrative: to be written in each form; provides extensive workshop experience; emphasizes the value of critiques, self-editing and revision. **Prerequisite:** Junior or senior classification or approval of instructor.

JOUR 458/COMM 458 Global Media

Credits 3. 3 Lecture Hours. Study of globalization through media ownership; content, flow, cultural values, political power and technological impact; implications of globalization for local economies and audiences. **Prerequisite:** Junior or senior classification or approval of instructor. **Cross Listing:** COMM 458/JOUR 458.

JOUR 459 Sports Entertainment Reporting

Credits 3. 3 Lecture Hours. Nontraditional sports storytelling for 21st-century audiences; instruction in narrative components of sports blogs, fan sites, commentary and analysis; examination of key debates about sports media and sports journalism ethics in the 24/7 digital and social media-driven news cycle. **Prerequisites:** Junior or senior classification, or approval of instructor.

JOUR 468 Magazine Feature Writing

Credits 3. 3 Lecture Hours. Focus on the ability to communicate through a variety of styles including traditional long-form magazine writing and profiles; critical analysis and adaptation of writing skills for the latest trends in magazine, including audio and multimedia storytelling and the advent of purely digital magazines. **Prerequisites:** JOUR 203; junior or senior classification, or approval of instructor; major in JOUR or university studies-journalism or minor in journalism.

JOUR 484 Internship

Credits 0 to 3. 0 to 3 Other Hours. Directed internship in a private firm or public agency to provide on-the-job experience appropriate to the student's degree program and career objectives. To be taken on a satisfactory/unsatisfactory basis. Maximum of 3 credits may apply toward degree. **Prerequisites:** Junior or senior classification; enrollment in USLA-BA-JNS concentration or JOUR minor; approval of instructor; grade of C or better in JOUR 203.

JOUR 485 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Research problems related to communication field. Individual work, fitted to special needs of specific student as determined by his or her interests and aptitude. **Prerequisites:** Junior or senior classification; enrollment in USLA-BA-JNS concentration or JOUR minor; approval of instructor.

JOUR 489 Special Topics in...

Credits 1 to 4. 1 to 4 Other Hours. Selected topics in an identified area of journalism and mass communication. May be repeated for credit. **Prerequisites:** Junior or senior classification; enrollment in USLA-BA-JNS concentration or JOUR minor; or approval of instructor.

JOUR 490 Journalism as a Profession

Credits 3. 3 Lecture Hours. Exit-level course for interdisciplinary minor in Journalism; requires students to produce publication-quality projects; includes seminars in contemporary news media issues and practices. **Prerequisite:** JOUR 203; junior or senior classification; enrollment in USLA-BA-JNS concentration or JOUR minor; and approval of instructor.

JOUR 491 Research

Credits 0 to 3. 0 to 3 Other Hours. Research conducted under the direction of a chosen faculty member in Journalism Studies. May be taken for a maximum of 3 hours credit. **Prerequisites:** Grade of C or better in JOUR 203; junior or senior classification and approval of instructor.

JWST - Jewish Studies (JWST)

JWST 201/RELS 201 Introduction to Jewish Studies

Credits 3. 3 Lecture Hours. Exploration of Jewish history, culture, identity, and art throughout the millennia and in the modern world; focus on material in multiple media and approaches from a variety of disciplines. **Cross Listing:** RELS 201/JWST 201.

JWST 285 Directed Studies

Credits 0 to 3. 0 to 3 Other Hours. Readings and/or assigned projects for specific needs of students minoring in Jewish studies; directed independent or individual study in an identified area of Jewish studies. **Prerequisites:** Approval of instructor.

JWST 289 Special Topics in...

Credits 1 to 4. 1 to 4 Other Hours. Selected topics in an identified area of Jewish studies. May be repeated for credit.

JWST 291 Research

Credits 0 to 3. 0 to 3 Other Hours. Research conducted under the direction of a faculty member in Jewish Studies. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

JWST 301 Contemporary Jewish Cultures

Credits 3. 3 Lecture Hours. Exploration of contemporary Jewish cultures in the United States and around the world; examination of intersections and challenges of Jewish identity with local and global influences. **Prerequisites:** Junior or senior classification.

JWST 315/FILM 315 Cinema in Israel

Credits 3. 3 Lecture Hours. Consideration and analysis of major works of film in Israel; interpretation of diverse cultures in Israel through film; relationship of film to Israeli history; taught in English. **Prerequisites:** Junior or senior classification or approval of instructor. **Cross Listing:** FILM 315/JWST 315.

JWST 485 Directed Studies

Credits 0 to 6. 0 to 6 Other Hours. Readings and/or assigned projects for specific needs of students minoring in Jewish studies; directed independent or individual study in an identified area of Jewish studies. May be repeated for credit. **Prerequisites:** Junior or senior classification; approval of instructor.

JWST 489 Special Topics in...

Credits 1 to 4. 1 to 4 Other Hours. Selected topics in an identified area of Jewish studies. May be repeated for credit. **Prerequisites:** Junior or senior classification, or approval of instructor.

JWST 491 Research

Credits 0 to 3. 0 to 3 Other Hours. Research conducted under the direction of a faculty member in Jewish Studies. May be taken three times for credit. **Prerequisites:** Junior or senior classification and approval of instructor.

KINE - Kinesiology (KINE)

KINE 120 The Science of Basic Health and Fitness

Credit 1. 1 Lecture Hour. 1 Lab Hour. Overview of the human body; scientific fundamentals of stress, fitness, nutrition, disease and drug use; interdisciplinary focus on wellness and longevity; integrated physical activity experiences centering on principles and applications of the scientific basis of conditioning; not open to students who have taken KINE 223; also taught at Galveston campus.

KINE 121 Physical and Motor Fitness Assessment

Credits 2. 1 Lecture Hour. 2 Lab Hours. Assessment of individual physical fitness and motor ability profiles for students majoring in kinesiology. **Prerequisite:** Kinesiology major.

KINE 175 Gender Neutral Partnering

Credit 1. 2 Lab Hours. Explores the fundamental principles of partnering; explores the properties of momentum, weight sharing, contact improvisation, breath, timing and trust; develops movement phrases on the principles of impromptu and partnering.

KINE 199 Required Physical Activity

Credit 1. 2 Lab Hours. (Any 1-hour PHED activity course) Required Physical Activity. Selection from a wide variety of activities designed to increase fitness and/or encourage the pursuit of lifetime activity; also taught at Galveston campus.

KINE 210 The Art of Movement

Credits 3. 3 Lecture Hours. Introductory course that examines and appreciates movement as expressed by every culture; movement is a function driven by context, whether practical or artistic; this course examines how dance is used to advance personal, social expression via design, patterning, connoted meaning, and inter-connectivity of form; in-class discussions, applications, and presentations, students attend and critique off-campus dance productions to enhance perspective, experience and appreciation of dance movement; Galveston campus; also taught at College Station campus.

KINE 213 Foundations of Kinesiology

Credits 3. 3 Lecture Hours. (PHED 1301) Foundations of Kinesiology. History, principles, objectives, current concepts of kinesiology.

KINE 214/HLTH 214 Health and Physical Activity for Children

Credits 3. 3 Lecture Hours. (PHED 1331) Health and Physical Activity for Children. Coordinated school health and physical activity programs appropriate for elementary aged children; focus on the content of the curriculum and the philosophical underpinnings of programming related to health and physical activity. **Cross Listing:** HLTH 214/KINE 214.

KINE 215 Fundamentals of Coaching

Credits 3. 3 Lecture Hours. (PHED 1321) Fundamentals of Coaching. Preparation of prospective coaches by gaining competence in coaching in today's environment; emphasis on developing the athlete, creating an effective practice environment, utilizing game management strategies, and skill analysis; research of successful coaches to develop coaching philosophy. **Prerequisite:** Kinesiology majors and coaching minors only.

KINE 216/HLTH 216 First Aid

Credits 2. 2 Lecture Hours. (PHED 1306) First Aid. Basic first aid instruction leading to University Level, first aid course completion recognition. **Cross Listing:** HLTH 216/KINE 216.

KINE 223 Introduction to the Science of Health and Fitness

Credits 3. 2 Lecture Hours. 2 Lab Hours. Overview of the human body systems; interdisciplinary focus on wellness, fitness, nutrition, disease, drug use; integrated physical activity centering on principles and applications of conditioning; collect data, evaluate information, formulate plans based on findings; experience with pedometers, heart rate monitors, bioelectrical impedance devices, software and other technology; also taught at Galveston campus.

KINE 282 Culture of Wellness

Credits 3. 2 Lecture Hours. 2 Lab Hours. Explore the dimensions of wellness across worldwide cultures; analyze, compare and contrast wellness choices and their impact on the individual and society; investigate a global region and its wellness practices; integrate physical activity experiences that are centered on the history and culture of a focus activity that originated outside the United States; also taught at Galveston campus.

KINE 285 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Work on a specified topic with the intent of promoting independent reading, research and study; supplement existing course offerings or subjects not presently covered. **Prerequisites:** Freshman or sophomore classification; approval of instructor.

KINE 289 Special Topics in...

Credits 0 to 4. 0 to 4 Lecture Hours. Selected topics in an identified area of kinesiology. May be repeated for credit.

KINE 291 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in kinesiology. May be repeated 4 times for credit. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

KINE 305 Sport Nutrition

Credits 3. 3 Lecture Hours. 0 Lab Hours. Optimal nutritional intake in support of peak performance in sport and dance; food as fuel and which fuels are most important to specific sport/dance activities; the role nutritional supplements can play; fluid balance; weight management for athletes and dancers. **Prerequisites:** Junior or senior classification.

KINE 307 Lifespan Motor Development

Credits 3. 3 Lecture Hours. Comprehensive study of biological, neurological, and physiological changes that influence motor behavior across the human lifespan; focus on heredity, neural development, physical growth, motor skill changes, and the impact of sociocultural settings; application of ecological and information processing models, and use of assessment tools to evaluate motor development in typical and atypical populations from prenatal stages through older adulthood. **Prerequisites:** Junior or senior classification or approval of instructor.

KINE 308 Integrated Adventure Education

Credits 3. 2 Lecture Hours. 3 Lab Hours. Philosophy of outdoor education in a physical education program; designing and implementing outdoor adventure activities in an experiential and interdisciplinary manner for reinforcing the Texas Essential Knowledge and Skills. **Prerequisites:** Junior or senior classification or instructor approval.

KINE 311 Fundamental Rhythms and Dance

Credits 3. 2 Lecture Hours. 3 Lab Hours. Appreciation of rhythms and dance movements in a cultural context; analysis of dance performance; basic understanding of the various dance components. **Prerequisite:** Approval of instructor.

KINE 312 Coaching of Baseball

Credits 2. 1 Lecture Hour. 2 Lab Hours. Theory and practice of coaching fundamentals in baseball. **Prerequisite:** Grade of C or better in KINE 215.

KINE 314 Coaching of Soccer

Credits 2. 1 Lecture Hour. 2 Lab Hours. Study of modern theories and applications related to coaching soccer. **Prerequisites:** Grade of C or better in KINE 215.

KINE 317 Coaching of Football

Credits 2. 1 Lecture Hour. 2 Lab Hours. Theory and practice of coaching fundamentals in football. **Prerequisite:** Grade of C or better in KINE 215.

KINE 318 Care of the Athlete

Credits 3. 3 Lecture Hours. Overview of the profession of athletic training; comprehensive analysis of the theories and practices in preventing, recognizing and treating common athletic injuries. **Prerequisite:** Junior or senior classification.

KINE 321 Coaching of Volleyball

Credits 2. 1 Lecture Hour. 2 Lab Hours. Coaching fundamentals in volleyball. **Prerequisites:** Grade of C or better in KINE 215.

KINE 324 Career Development in Coaching and Youth Development

Credits 3. 3 Lecture Hours. Topic relevant to and career options in the coaching profession; preparation of future coaches and youth development professionals for successful careers; exploration and development of skills and knowledge to lead and manage individuals and teams. **Prerequisites:** Junior or senior classification; approval of instructor.

KINE 325 Administrative and Athletic Operations for Coaches

Credits 3. 3 Lecture Hours. Development of knowledge and skills related to event and tournament organization, sport governing bodies, school officials; comprehension of risk management, financial management; includes classroom experiences, observations and field-based experiences to link theory into practice. **Prerequisites:** Junior or senior classification.

KINE 334 Coaching in Personal Training

Credits 2. 1 Lecture Hour. 2 Lab Hours. An overview of the knowledge, skills, and expectations associated with being a competent personal trainer or fitness professional; fundamentals in addressing an individual's health, medical and fitness status, along with comprehending fitness concepts including nutrition, bioenergetics, biomechanics and applied anatomy. **Prerequisite:** Grade of C or better in KINE 215.

KINE 335 Coaching in Group Fitness

Credits 2. 1 Lecture Hour. 2 Lab Hours. An overview of the knowledge, skills and expectations associated with being a competent group fitness instructor; creation, application and adaptation of a variety of group fitness classes based on population size, skill level, equipment available and facility space; basic business practices and professional certification procedures that are required of a fitness professional. **Prerequisite:** Grade of C or better in KINE 215.

KINE 340 Essentials of Strength and Conditioning

Credits 3. 3 Lecture Hours. Current principles and procedures essential to strength training and conditioning practices; emphasis on development and practical applications of scientific based anaerobic conditioning, flexibility, mobility, muscular strength, power and aerobic endurance program designs. **Prerequisites:** Junior or senior classification; recommend KINE 199 Majors Aerobic Movement or Majors Resist Flex.

KINE 345 Coaching of Weight Training

Credits 2. 1 Lecture Hour. 2 Lab Hours. Overview of the knowledge, skills, and expectations associated with being a competent resistance training coach; fundamentals in addressing training facility etiquette and safety, along with gaining proper knowledge for exercise technique and improvement of athletic performance; specific, real-world information about the knowledge, skills, and expectations associated with a competent coach and specific skills gained during weight training sessions. **Prerequisites:** Grade of C or better in KINE 215.

KINE 351 Coaching of Basketball

Credits 2. 1 Lecture Hour. 2 Lab Hours. Theory of fundamental skills needed to coach basketball with emphasis on knowledge of rules, strategies and skill analysis. **Prerequisites:** Grade of C or better in KINE 215.

KINE 353 Coaching of Softball

Credits 2. 1 Lecture Hour. 2 Lab Hours. Theory of fundamental skills needed to coach softball with emphasis on knowledge of rules, strategies and skill analysis. **Prerequisites:** Grade of C or better in KINE 215.

KINE 355 Coaching of Track

Credits 2. 1 Lecture Hour. 2 Lab Hours. Theory and practice of coaching fundamentals in track and field events. **Prerequisite:** Grade of C or better in KINE 215.

KINE 370 Basic Biology of Performance for Coaches

Credits 3. 3 Lecture Hours. Fundamental knowledge in motor neuroscience, biomechanics, cardiovascular and skeletomuscular physiology, strength and conditioning and sport nutrition from an applied perspective for coaches. **Prerequisites:** Junior or senior classification.

KINE 386 Sport Physiology

Credits 3. 3 Lecture Hours. Scientific physiological principles as they relate to sport and exercise in the preparation of current and future coaches; emphasis on cognitive, physiological knowledge and practical applications necessary to earn a creditable national certification; safely and effectively train athletic, fitness and general populations. **Prerequisites:** KINE 121 and KINE 213; grade of C or better in KINE 302.

KINE 404 Coaching Psychology

Credits 3. 3 Lecture Hours. Mental aspects of coaching for performance improvement in athletic and exercise settings; focus on coaching applications of theoretical concepts including individual differences, motivation, team and group dynamics, leadership, performance enhancement, positive and negative health behaviors and youth development.. **Prerequisite:** Junior or senior classification, or approval of instructor.

KINE 406 Motor Learning and Skill Performance

Credits 3. 3 Lecture Hours. Learning and control in the psychomotor domain focusing on the study of neurophysiological processes involved in physical or motor activity, sensorimotor interactions, and diseases/disabilities limiting motor activity; instruction of central and peripheral neural anatomy, muscular anatomy, and function, as related to the performer and instructional techniques (body training, practice, exercise) that influence motor skill learning at the level of cognitive, neural, and muscular processes. **Prerequisites:** Grade of C or better in BIOL 319 and PHYS 201; concurrent enrollment BIOL 320; junior or senior classification.

KINE 407 Motor Control and Learning Lab

Credit 1. 2 Lab Hours. Study of control and learning of physical or motor activity; collection of behavioral and neurophysiological measures of human performance, muscle activity, sensorimotor interactions, cognitive processes; assessment of the influence of instructions, body training and practice on skill performance; development of graphing and scientific writing skills. **Prerequisites:** Junior or senior classification; grade of C or better or concurrent enrollment in KINE 406.

KINE 425 Tests and Measurements

Credits 3. 3 Lecture Hours. Comprehensive examination of the conceptual and theoretical aspects of measurement and evaluation in the field of kinesiology; emphasis on the application of statistical techniques germane to measurement and evaluation. **Prerequisites:** Junior or senior classification; or approval of instructor for non-majors.

KINE 426 Exercise Biomechanics

Credits 3. 3 Lecture Hours. An integrated, mechanistic study of biomechanics of human motion during physical activity and exercise; biology and mechanical properties of the human movement system including bones, tendons, ligaments, cartilage, skeletal muscles, joints and whole body systems investigated. **Prerequisites:** Grade of C or better in KINE 121, KINE 213, PHYS 201, BIOL 319, and BIOL 320; junior or senior classification.

KINE 427 Therapeutic Principles

Credits 3. 3 Lecture Hours. Focused on anatomy and physiology of human tissue injury, degeneration, and regeneration including biochemistry and molecular biology of corresponding cell signaling events; comparative physiology to describe composite tissue regeneration with particular emphasis placed upon the role of the immune system and tripartite crosstalk of muscles, blood vessels, and nerves; overview of therapeutic modality physics and physiology pertaining to human tissue regeneration. **Prerequisites:** Grade of C or better in KINE 121, KINE 213, BIOL 319, BIOL 320, and PHYS 201; junior or senior classification.

KINE 428 Exercise Biomechanics Laboratory

Credit 1. 2 Lab Hours. Applied development of the mechanistic concepts of biomechanics of human motion during physical activity, performance and exercise; investigation of the biological and mechanical properties of the human movement system including bones, tendons, ligaments, cartilage, skeletal muscles, joints and whole body system. **Prerequisites:** Grade of C or better in KINE 426 or concurrent enrollment; grade of C or better in PHYS 201; junior or senior classification.

KINE 429 Adapted Physical Activity

Credits 3. 2 Lecture Hours. 2 Lab Hours. Kinesiology for individuals with handicapping conditions; emphasis on cognitive recognition of such handicaps as postural deviations, emotional disturbances, convulsive disorders, vision and auditory problems, and other learning disability conditions. **Prerequisite:** Grade of C or better in HEFB 222/KNFB 222 or KNFB 222/HEFB 222; grade of C or better in BIOL 107 or BIOL 111; grade of C or better in PHYS 201 or CHEM 119; junior or senior classification.

KINE 433 Physiology of Exercise

Credits 3. 3 Lecture Hours. Physiological bases of exercise and physical conditioning; measurement of metabolic efficiency during exercise, neuromuscular efficiency and body composition. **Prerequisites:** Grade of C or better in KINE 121, KINE 213, PHYS 201, BIOL 319, and BIOL 320; junior or senior classification.

KINE 435 Physiology of Exercise Lab

Credit 1. 2 Lab Hours. Assessment of systemic physiological responses to exercise; contemporary laboratory equipment used to assess physiological responses to aerobic and anaerobic exercise; emphasis on physiology relating to bioenergetics/ fuel utilization, skeletal muscle function, and cardio-respiratory responses to exercise. **Prerequisites:** Grade of C or better in KINE 433 or concurrent enrollment; junior or senior classification.

KINE 439 Exercise Evaluation and Prescription

Credits 4. 3 Lecture Hours. 3 Lab Hours. Theory and techniques for evaluation of human performance and cardiovascular disease risk factors in healthy and diseased populations; exercise prescription for disease prevention and rehabilitation. **Prerequisite:** Grade of C or better in KINE 433 or concurrent enrollment; junior or senior classification.

KINE 483 Practicum in Kinesiology

Credits 0 to 3. 0 to 2 Lecture Hours. 0 to 2 Lab Hours. Participation and study in the areas of fitness assessment, exercise and/or sport programming, and fitness/sport administration; acquisition and practice of professional and/or clinical skills in kinesiology and/or coaching. **Prerequisite:** Senior classification; approval of instructor.

KINE 484 Internship in Kinesiology

Credits 0 to 12. 0 to 12 Other Hours. Supervised internship with corporate fitness centers, rehabilitation centers, hospitals, recreation centers and similar agencies and organizations. **Prerequisites:** Grade of C or better in KINE 483; completion of all coursework.

KINE 485 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Special problems in kinesiology assigned to individual students or to groups. **Prerequisites:** Junior or senior classification; approval of instructor.

KINE 489 Special Topics in...

Credits 0 to 4. 0 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified area of kinesiology; also taught at Galveston campus. May be repeated for credit.

KINE 491 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in kinesiology. May be repeated 4 times for credit. **Prerequisites:** Junior or senior classification and approval of instructor.

KNFB - Kinesiology Field Based (KNFB)

KNFB 222/HEFB 222 Culturally Responsive Pedagogy

Credits 3. 2 Lecture Hours. 3 Lab Hours. Developing an understanding of students in multiple settings and levels; development, structure, history, finance, and management of schools in a democratic society; philosophical, ethical and moral dimensions of teaching; professional role of teacher. **Prerequisite:** Kinesiology and Health majors. **Cross Listing:** HEFB 222/KNFB 222.

KNFB 315 Elementary School Physical Activities

Credits 3. 2 Lecture Hours. 2 Lab Hours. Physical activities, materials and curriculum in elementary schools. **Prerequisite:** Grade of C or better in HEFB 222/KNFB 222 or KNFB 222/HEFB 222; grade of C or better in BIOL 107 or BIOL 111; grade of C or better in PHYS 201; junior or senior classification.

KNFB 324/HEFB 324 Technology and Teaching Skills for the 21st Century Learner

Credits 3. 2 Lecture Hours. 2 Lab Hours. Preparation of future Health and Physical Education teachers with practical skills related to: technology in the classroom/gymnasium, strategies for addressing urban education and English language learners, liability, management and classroom discipline, development of professional communication skills and time management; includes field based experiences in diverse classroom settings. **Prerequisite:** Grade of C or better in HEFB 222/KNFB 222 or KNFB 222/HEFB 222; grade of C or better in BIOL 107 or BIOL 111; grade of C or better in PHYS 201 or CHEM 119; junior or senior classification.

Cross Listing: HEFB 324/KNFB 324.

KNFB 325/HEFB 325 Introduction to Secondary School Teaching

Credits 3. 2 Lecture Hours. 2 Lab Hours. Introduce fundamental teaching skills and theories necessary for preparing reflective teachers; examine classroom management, learning strategies and assessment techniques; classroom lectures combined with field-based experiences to link theory into practice. **Prerequisite:** Grade of C or better in HEFB 324/KNFB 324 or KNFB 324/HEFB 324; junior or senior classification. **Cross Listing:** HEFB 325/KNFB 325.

KNFB 416 Middle and Secondary School Physical Activities

Credits 3. 2 Lecture Hours. 2 Lab Hours. Physical activities, teaching strategies, media techniques and curriculum in middle and secondary schools. **Prerequisite:** Grade of C or better in HEFB 222/KNFB 222 or KNFB 222/HEFB 222, grade of C or better in BIOL 107 or BIOL 111; grade of C or better in PHYS 201; junior or senior classification.

KNFB 450/HEFB 450 Supervised Student Teaching

Credits 6. 6 Other Hours. Observation and participation in an accredited public school classroom; techniques of teaching student's teaching fields, and appropriate instructional strategies for assigned student population. **Prerequisites:** Grade of C or better in HLTH 415/PHLT 420 or KNFB 416. **Cross Listing:** HEFB 450/KNFB 450.

LAND - Landscape Architecture (LAND)

LAND 101 Introduction to Landscape Architectural Practice

Credit 1. 1 Lecture Hour. Explores and evaluates the diversity of landscape architectural practice; defines the traditional practice forms and examines evolving and boundary expanding opportunities for future practice; introduces the departmental curriculum and faculty.

LAND 111 Landscape Architecture Communications I

Credits 3. 2 Lecture Hours. 4 Lab Hours. Introduction to basic drafting and drawing required for landscape architecture projects, introduction to basic concepts, principles of graphic composition and pencil sketching techniques.

LAND 112 Landscape Architectural Communications II

Credits 3. 2 Lecture Hours. 4 Lab Hours. Advanced study in traditional and computer-based communication techniques in landscape architecture including studio explorations in concept and analysis graphics, color sketching, perspective drawing and rendering, desktop publishing, image capturing and manipulation, and compilation of graphic presentations; lecture, demonstrations and studio assignments. **Prerequisite:** LAND 111 or approval of instructor.

LAND 210 Microclimatic Urban Design: Cool Solutions for Hot Cities

Credits 3. 3 Lecture Hours. Introduction to methods of designing thermally-comfortable urban microclimates to reduce negative impacts of hot cities on human health and well-being; includes methods of analyzing and illustrating climate data; human thermal comfort modeling; application to urban design and landscape architecture; no previous drawing or design skills necessary.

LAND 211 Landscape Design I

Credits 4. 2 Lecture Hours. 7 Lab Hours. Beginning studio course in land design; forces that produce useable three-dimensional site-space relationships; problems presented to give a basic knowledge, scope and application of landscape architecture design principles. Overnight field trip required. **Prerequisites:** LAND 112; junior or senior classification or approval of instructor.

LAND 212 Landscape Design II

Credits 4. 2 Lecture Hours. 7 Lab Hours. Continuation of LAND 211; basic design principles that combine natural systems (such as landform, water, vegetation, wildlife habitat, soils, climate) and human-built systems (such as roads, building utilities). **Prerequisites:** LAND 211 and LAND 231.

LAND 231 Landscape Construction I

Credits 4. 2 Lecture Hours. 4 Lab Hours. First construction studio course; aspects of site engineering and consideration of earth bound elements in land development; contours, landform, grading design, drainage principles, cut and fill computations, basic hydraulics and hydrology, stormwater management. **Prerequisite:** Junior or senior classification or approval of instructor.

LAND 232 Landscape Construction II

Credits 3. 2 Lecture Hours. 4 Lab Hours. Second construction studio course; essential construction materials and systems applied in landscape development; topics include statics and mechanics of simple structures; properties and procedures of wood, masonry and concrete construction; construction sequencing and material costs; development of a construction document package required. Construction observation field trips required. **Prerequisites:** LAND 211 and LAND 231; junior or senior classification.

LAND 240 History of Landscape Architecture

Credits 3. 3 Lecture Hours. Introduction to history of land use, urban design and planning, and site design from prehistory to the present in Europe, Asia, Africa and Australia; contemporary issues in landscape architecture such as sustainability, ecological design, and professional roles, both historically and at present, with comparisons to American examples. **Prerequisite:** Sophomore classification or higher.

LAND 241 History and Development of Landscape Architecture in North America

Credits 3. 3 Lecture Hours. Interaction between people and the land in North America from first settlement to the present; settlement patterns, sustainable land use, urban design and plan, and site design in context of cultural, social, and technological factors; current issues in landscape architecture, landscape urbanism, and land-use planning.

LAND 291 Research

Credits 1 to 4. 1 to 4 Other Hours. Research conducted under the direction of faculty member in landscape architecture. May be repeated 2 times for credit. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

LAND 301 Landscape Architecture Theory

Credits 3. 3 Lecture Hours. Landscape Architecture. Relevant theoretical discourse in landscape architecture, urban planning and urban design; urban theory, social and cultural theory; critical and creative thinking; ecological planning and design; design process and sustainable development; environmental philosophy and environmental aesthetics. **Prerequisite:** Junior classification or approval of instructor.

LAND 311 Landscape Design III

Credits 5. 2 Lecture Hours. 9 Lab Hours. Design process, sustainable landscape design, synthesis and design refinement; problems to stimulate highly creative self-motivated results, design thinking to integrate behavioral settings into natural and/or built landscape systems. **Prerequisites:** LAND 212 and LAND 232; junior or senior classification.

LAND 312 Landscape Design IV

Credits 5. 2 Lecture Hours. 9 Lab Hours. Continuation of LAND 311; land design projects of increased complexity and emphasis on sustainability, with site scale problems used to demonstrate complete design thought. One or more field trips may be required. **Prerequisite:** LAND 311.

LAND 331 Landscape Construction III

Credits 4. 2 Lecture Hours. 4 Lab Hours. Third construction studio course; sustainable water management techniques in landscape development; theory, principles and techniques of low impact development; construction document preparation, working drawings, project layout and design; theory and principles of irrigation and lighting design. Field trips required. **Prerequisites:** LAND 320 and LAND 330; junior or senior classification.

LAND 412 Landscape Design VI

Credits 5. 2 Lecture Hours. 9 Lab Hours. Capstone studio; advanced study and research designed to go beyond the core design experience; introduction of issues, methodologies, tools and techniques developing in professional practice. **Prerequisite:** LAND 312.

LAND 431 Professional Practice

Credits 3. 3 Lecture Hours. Procedures, management and ethical frameworks in which professional landscape architectural practice occurs; topics include forms of practice, employment, proposal preparation, fee and contract structures, project management, roles of the landscape architect, presentations and public participation, legal and ethical responsibilities. **Prerequisites:** Senior classification; approval of instructor.

LAND 484 Summer Internship

Credits 0. 0 Lecture Hours. Practical experience in an office of design allied professionals; 10 week internship with a minimum of 400 hours; continuous employment; departmental pre-approval through the department internship coordinator required. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisites:** Upper level classification and approval of internship coordinator; LAND 321.

LAND 485 Directed Studies

Credits 1 to 6. 1 to 6 Other Hours. Special problems in various phases of landscape architecture assigned to individual students or to groups. Consultation and assigned collateral reading. **Prerequisite:** Approval of department head.

LAND 489 Special Topics in...

Credits 1 to 4. 1 to 4 Other Hours. Selected topics in an identified field of landscape architecture. May be repeated for credit.

LAND 491 Research

Credits 1 to 4. 1 to 4 Other Hours. Research conducted under the direction of faculty member in landscape architecture. May be repeated 2 times for credit. **Prerequisites:** Junior or senior classification and approval of instructor.

LAND 494 Internship

Credits 6. 6 Lecture Hours. An internship (15 week, 600 hours) with a landscape architecture or landscape architecture-related company that exposes the student to landscape architectural professional practice; monthly reports, final internship portfolio and internship supervisor assessment letter required; distance education course with non-resident status. **Prerequisites:** LAND 321 and approval of coordinator.

LING - Linguistics (LING)

LING 209/ENGL 209 Introduction to Linguistics

Credits 3. 3 Lecture Hours. Nature of human language and of linguistics; includes an introduction to phonology, syntax, semantics and morphology and the role of spoken and written discourse in sustaining societal arrangements. **Cross Listing:** ENGL 209/LING 209.

LING 291 Research

Credits 1 to 3. 1 to 3 Other Hours. Research conducted under the direction of faculty member in linguistics. **Prerequisites:** LING 209/ENGL 209; freshman or sophomore classification and approval of instructor.

LING 307 Language and Culture

Credits 3. 3 Lecture Hours. Language and its correlations with other aspects of culture; nature and definition of language; non-technical overview of linguistic science and language as it is related to other behavior. **Prerequisite:** Junior or senior classification.

LING 310/ENGL 310 History of the English Language

Credits 3. 3 Lecture Hours. Phonological, grammatical and lexical history of the English language; brief discussion of some other Indo-European languages; principles of linguistic change, as reflected in English.

Prerequisite: Junior or senior classification. **Cross Listing:** ENGL 310/LING 310.

LING 403 Language and Gender

Credits 3. 3 Lecture Hours. Language and gender from a sociolinguistic perspective; gender in the words and structures of language; gender representation and gendered language use in the media, and a variety of sociocultural contexts; language use in intimate relationships; computer-mediated discourse; language, sexuality, and sexual orientation.

Prerequisite: Junior or senior classification. **Cross Listing:** ENGL 403 and WGST 403.

LING 481 Senior Seminar

Credits 3. 3 Lecture Hours. Seminar on significant figures, movements and issues in linguistics or rhetoric, with special attention to the methods and materials of scholarship. **Prerequisites:** Junior or senior classification; 6 credits in linguistics.

LING 485 Directed Studies

Credits 1 to 3. 1 to 3 Other Hours. Directed individual study of topics in linguistics. May be repeated for credit.

LING 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of linguistics. May be repeated for credit.

LING 491 Research

Credits 1 to 3. 1 to 3 Other Hours. Research conducted under the direction of faculty member in linguistics. May be repeated 2 times for credit. **Prerequisites:** 6 credits of linguistics; junior or senior classification and approval of instructor.

LMAS - Latino/Mex Amer Studies (LMAS)

LMAS 201 Introduction to Latino/Mexican American Studies

Credits 3. 3 Lecture Hours. Introductory survey of the historical presence of U.S. Latinos and Mexican Americans from an interdisciplinary perspective that incorporates the group's global origins; application of critical thinking skills to the study of Latinos and Mexican Americans.

LMAS 285 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Special problems not covered by other courses; course depends upon needs and interest of the student and upon the number of credit hours. May be repeated for credit.

Prerequisites: Freshman or sophomore classification; approval of instructor.

LMAS 289 Special Topics in...

Credits 1 to 4. 1 to 4 Other Hours. Selected topics in an identified area of Latino/a, Mexican-American studies. May be repeated for credit.

Prerequisite: Approval of instructor.

LMAS 291 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in Interdisciplinary Critical Studies faculty or affiliated faculty. May be repeated for credit. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisite:** Freshman or sophomore classification.

LMAS 422 Race, Ethnicity, Crime and Justice

Credits 3. 3 Lecture Hours. Racial/ethnic disparities in criminal offending and victimization, as well as different experiences with law enforcement, judicial, and correctional agencies. **Prerequisites:** SOCI 220 or equivalent.

Cross Listing: AFST 422 and SOCI 422.

LMAS 423/COMM 423 Communicating Latinidad

Credits 3. 3 Lecture Hours. Examination of communication by and about Latinos; analysis of critical and historical orientation; topics include social movements, organizational and institutional discourse, and media.

Prerequisite: Junior or senior classification or approval of instructor.

Cross Listing: COMM 423/LMAS 423.

LMAS 468/HIST 468 Latinx Civil Rights Movements

Credits 3. 3 Lecture Hours. Latinx civil rights movements in the twentieth century; Mexican American, Puerto Rican, Cuban, Central American; racism, economic inequality, labor exploitation, segregation, anti-immigrant sentiment, gender discrimination; role of liberalism, multiethnic coalitions, third world liberation movements, revolutionary nationalism, religion; movement philosophies and strategies; contemporary immigrant rights movements. **Prerequisites:** Junior or senior classification or approval of instructor. **Cross Listing:** HIST 468/LMAS 468.

LMAS 484 Internship

Credits 0 to 4. 0 to 4 Other Hours. Directed internship in a public or private organization to provide students with applied experience; opportunity to observe first hand issues and problems covered in Latino/a and Mexican-American Studies courses; designed to enhance and clarify the student's career objectives. May be taken for credit up to six hours. **Prerequisites:** Approval of instructor.

LMAS 485 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Directed individual study of identified topics in Latino/a, Mexican-American studies. May be repeated for credit. **Prerequisites:** Junior or senior classification; approval of Instructor.

LMAS 489 Special Topics in...

Credits 1 to 4. 1 to 4 Other Hours. Selected topics in an identified area of Latino/a, Mexican-American studies. May be repeated for credit. **Prerequisites:** Junior or senior classification; approval of Instructor.

LMAS 491 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in interdisciplinary critical studies or affiliated faculty. May be repeated for credit. **Prerequisites:** Junior or senior classification; approval of Instructor.

LTPS - Learn Tech & Perf Sys (LTPS)

LTPS 130 Introduction to Learning Technology and Performance Systems

Credits 3. 3 Lecture Hours. . Fundamental understanding of the intersection of technology, organizational performance, and human development; topics include the evolution of learning technologies, data analysis for decision-making, organizational governance and integrated management, instructional design principles, and risk management and IT security; engagement in hands-on projects, case studies, and discussions, laying a strong foundation to navigate the complex landscape of learning technologies and performance systems.

LTPS 210 Introduction to Learning Management Systems

Credits 3. 3 Lecture Hours. . Exploration of open source and commercial systems that facilitate knowledge transfer; evaluation of platform usefulness, understanding options within systems, and managing user accounts.

LTPS 240 Introduction to Instructional Design Systems

Credits 3. 3 Lecture Hours. Development of instructional materials, including multimedia assets, assessments, and interactive activities; utilization of authoring tools and learning management systems (LMS) to create and organize content; seamless integration of various technologies such as LMS, mobile learning platforms, virtual classrooms, and performance support systems; teams approach to practice prototyping while testing to gather feedback and make necessary adjustment. **Prerequisites:** LTPS 210.

LTPS 311 Database Learning Management for Learning Technology and Performance Systems

Credits 3. 3 Lecture Hours. Familiarity with software and database systems used to store, retrieve, and run queries on data in organizations; includes best practices on designing and organizing data using commonly available tools and systems, managing personal data and the associated regulatory frameworks (ex. FERPA, HIPPA), and incorporating emerging technologies to draw both quantitative and qualitative insights from large data sets. **Prerequisites:** Junior or senior classification.

LTPS 312 Use of Information Systems and Networking in Learning Technology and Performance Systems

Credits 3. 3 Lecture Hours. 1 Lab Hour. . Evaluation of hardware for end-user needs by identifying network design fundamentals to help guide technology design and acquisitions to support learning management requirements in various settings; introduction to concepts such as differentiating between public and private cell networks, bandwidth management, IP and MAC addresses, URL, VPN, URLs and Domains, TCP/IP, authentication protocols, wireless and wired connection technologies, and encryption. **Prerequisites:** Junior or senior classification.

LTPS 350 Program Management for Learning Technology and Performance Systems

Credits 3. 3 Lecture Hours. Exploration of leadership strategies that bridge organizational silos, optimize resource allocation, and enhance operational efficiency; understanding the art of stakeholder management such as building strong relationships with clients, partners, and internal teams; exploration of methodologies for aligning business goals with service delivery, measuring, and enhancing customer satisfaction while ensuring sustainable growth and value creation. **Prerequisites:** Junior or senior classification.

LTPS 360 Organizational Governance and Learning Development

Credits 3. 3 Lecture Hours. Analysis and engagement of key internal and external stakeholders for policies and standards; includes governance models, policy development, compliance management, ethical considerations, and organization development practices that align with strategic goals and regulatory standards; examination of case studies that highlight successful and challenged governance initiatives, offering insights into practical applications of theory in enhancing organizational effectiveness and resilience. **Prerequisites:** Junior or senior classification.

LTPS 440 Advanced HRIS and LMS Technology and Instructional Design Integration

Credits 3. 3 Lecture Hours. Instructional design focusing on ways to design and implement effective training programs and performance support systems that integrate seamlessly with Human Resources Information Systems (HRIS) and Learning Management Systems (LMS) Systems. **Prerequisites:** LTPS 130 and LTPS 210.

LTPS 484 Internship

Credits 6. 6 Other Hours. Directed internship in an organization to provide students with a learning experience supervised by professionals in organizational settings appropriate to the student's professional objectives; must be in good standing with the University. Must be taken on a satisfactory/unsatisfactory basis. May be taken up to 12 hours for credit. **Prerequisites:** Grade of C or better in EHRD 481; approval of instructor.

MARA - Maritime Administration (MARA)

MARA 201 Foundations of Maritime Cyber Security

Credits 3. 3 Lecture Hours. Basic terminology, concepts, technology and trends of maritime cybersecurity; foundations of maritime cybersecurity to include cryptography, public key infrastructure, standards and protocols, physical security, network fundamentals; workings of systems, networks, infrastructure; legal and ethical issues in maritime cybersecurity.

MARA 205 Introduction to Ships and Shipping

Credits 3. 3 Lecture Hours. 0 Lab Hours. Introduction to the maritime industry and ships used in transportation of goods and services. Shipboard nomenclature, types and missions of merchant ships, shipbuilding nomenclature and dimensions, shipbuilding materials and methods, modes of cargo handling and their impact on ship design.

MARA 212 Business Law

Credits 3. 3 Lecture Hours. Legal principles of business, legal reasoning, dispute resolution and procedure, contract law, bankruptcy law, property law, Uniform Commercial Code sections concerning contracts, security interests, negotiable instruments and sales.

MARA 285 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Directed study on selected problems in the area of maritime administration not covered in other courses. **Prerequisite:** Approval of MARA department head.

MARA 289 Special Topics

Credits 1 to 4. 1 to 4 Lecture Hours. Study of selected topics in an identified area of maritime administration. **Prerequisite:** Approval of MARA department head.

MARA 301 Ocean Transportation

Credits 3. 3 Lecture Hours. Examination of theory and practice in the management of transportation logistics, labor, rate-making, role of government, international conventions and treaties; exposure to current trends and developments in shipping. **Prerequisites:** Junior or senior classification or approval of department head.

MARA 304 Marine Insurance

Credits 3. 3 Lecture Hours. Marine insurance problems and cases and how they relate directly to a ship's officer; hull, cargo, and personal injury cases are examined from the officers' and insurers' points of view; introduction to Admiralty Law and the court process for seamen's rights and ship owners' privileges; actual hearings and trials are observed to complete the background. **Prerequisite:** Junior or senior classification or approval of department head.

MARA 342 Managerial Maritime Finance

Credits 3. 3 Lecture Hours. Continuation of topics introduced in Business Finance (FINC 341) including risk and return, investment valuation, the selection of risky investment projects, capital structure, dividend policy, and methods of raising long-term capital; applications to the maritime industry are made where appropriate. **Prerequisite:** Junior or senior classification or approval of department head.

MARA 345 Maritime and Marine Entrepreneurship Ventures

Credits 3. 3 Lecture Hours. The attributes that enable entrepreneurs to pursue opportunities in maritime business development; formation of teams to experience each step of entrepreneurial process; exposure to real entrepreneurial operations and businesses. **Prerequisite:** Junior or senior classification or approval of department head.

MARA 346 Maritime and Marine Business Plans

Credits 3. 3 Lecture Hours. Planning described as a mechanism to guide entrepreneurial intentions and behavior; development of formal written plans that allow investors to anticipate future outcomes; discussion of firms from the perspective of nascent entrepreneurs and potential investors. **Prerequisite:** Junior or senior classification or approval of department head.

MARA 347 Launch a Startup

Credits 3. 3 Lecture Hours. Overview of the steps for entrepreneurs to start creating and developing a business plan to launch. **Prerequisite:** Junior or senior classification or approval of department head.

MARA 348 Maritime Service Operations

Credits 3. 3 Lecture Hours. Classical service operations management and contemporary case-by-case based problem-solving in the maritime service sector. **Prerequisites:** Junior or senior classification or approval of department head.

MARA 350 Maritime Business Computer Programming and Security

Credits 3. 3 Lecture Hours. Concepts of computer programming and security utilizing Visual Basic for Applications with emphasis to business and maritime area specifically; includes basic programming logic, programming in VBA, computer security principles and techniques for enhancing computer security. **Prerequisites:** Junior or senior classification or approval of department head.

MARA 360 Maritime Cybersecurity Issues

Credits 3. 3 Lecture Hours. Discussion of risks and cyber incidents; exploration of computer systems architecture and the framework of computer security on vessels. **Prerequisite:** MARA 201; junior or senior classification or approval of department head.

MARA 363 The Management Process

Credits 3. 3 Lecture Hours. Management as an academic discipline; goal setting; planning, controlling and decision-making; models for thinking about organizations; organization design; organization change; models for understanding individual behavior; job performance and job satisfaction; interpersonal behavior, motivation and leadership, behavior in work groups; careers in management, ethics and international management. **Prerequisites:** Junior or senior classification or approval of department head.

MARA 373 Personnel Management

Credits 3. 3 Lecture Hours. Strategic issues in managing human resources; shared responsibilities of line managers and human resource staff for developing and implementing human resource policies and procedures; human resource planning; job design, analysis and evaluation; staffing; compensation; performance appraisal; training and development career management; labor relations; legal, ethical and international issues. **Prerequisite:** Junior or senior classification or approval of department head.

MARA 401 Brokerage and Chartering

Credits 3. 3 Lecture Hours. Operational and legal environment of ship brokerage and chartering; responsibilities of owner and charterer under various charter forms; American, British and Canadian acts governing charters and bills of lading; rules and regulations concerning loading and discharging. **Prerequisites:** Junior or senior classification or approval of department head.

MARA 402 Inland Waterways

Credits 3. 3 Lecture Hours. Development of inland waterways of the U.S. and federal policies relating to them; port and terminal development, competition with other transportation forms, manpower, rates, environmental concerns and the impact of waterway systems on regional economies. **Prerequisites:** Junior or senior classification or approval of department head.

MARA 403 Law and Policy in Cybersecurity

Credits 3. 3 Lecture Hours. Examination of law and policy issues related to cybersecurity for the spectrum of cybersecurity jobs; includes procurement, operations and maintenance, governance and oversight, protection and defense, analysis, intelligence collection and operation and investigation cybersecurity jobs. **Prerequisite:** Junior or senior classification; MARA-403 taught at Galveston campus. **Cross Listing:** CSCE 402 and CYBR 402.

MARA 416 Port Operations, Administration and Economics

Credits 3. 3 Lecture Hours. Concepts of the port and methods of intermodal transfer; port functions divided and analyzed along business lines - economics, management, finance, accounting and marketing; cost studies. **Prerequisites:** Junior or senior classification or approval of department head.

MARA 421 Admiralty Law

Credits 3. 3 Lecture Hours. Essential principles of admiralty, general maritime, and international law as applicable to the marine industry and ocean shipping; evolution and state of the law concerning maritime liens, ship mortgages, rights of seamen and harbor workers, limitation of liability, bills of lading and cargo carriage, collision liability, general average, marine salvage, charter parties, and international rights and responsibilities of ships and shipping. **Prerequisites:** Junior or senior classification or approval of department head.

MARA 424 Intermodal Transportation

Credits 3. 3 Lecture Hours. Historical development, structure, function, and regulation of highway, rail, water, pipeline, and air transportation systems. Application of economic concepts and principles to transportation development and operations. **Prerequisites:** Junior or senior classification or approval of department head.

MARA 435 Labor Law and Policy

Credits 3. 3 Lecture Hours. Federal and state public policy and laws regulating human resource management including National Labor Relations Act, Railway Labor Act, Fair Labor Standards Act, employment discrimination statutes, statutes regarding public sector unionization, and other relevant legal authorities; various forms of dispute settlement including litigation, mediation, fact finding and arbitration; legal ramification of strategic human resource management decision making. **Prerequisites:** Junior or senior classification or approval of department head.

MARA 440 Global Economy and Enterprise Management

Credits 3. 3 Lecture Hours. Economic, political, social and ethical environments of international business including the determinants of trade and investment patterns and the logic of government interventions in both trade and capital markets; structure, strategy and operations of the international firm. **Prerequisites:** Junior or senior classification or approval of department head.

MARA 445 Lean Start Up

Credits 3. 3 Lecture Hours. Project-based hands-on experience; validation of business ideas with an emphasis on the operations aspects of entrepreneurship; focus on advances in globalization and outsourcing. **Prerequisites:** Junior or senior classification or approval of department head.

MARA 446 Entrepreneurship Greenhouse

Credits 3. 3 Lecture Hours. Continuation of project in Lean Start Up course (MARA 445); focus on transitioning business models from mind to market. **Prerequisite:** Grade of C or better in MARA 345, MARA 346, and MARA 445; junior or senior classification or approval of department head.

MARA 450 Maritime Supply Chain Management

Credits 3. 3 Lecture Hours. Introduction to the concepts involved in supply chain management (SCM); SCM encompasses the functional areas of procurement, operations management, inbound/outbound transportation, customer service, and information technologies; emphasizes how these functional areas are integrated to achieve the firm's overall objectives. **Prerequisites:** BUSN 203 and SCMT 364; junior or senior classification or approval of department head.

MARA 461 Disciplined Entrepreneurship

Credits 3. 3 Lecture Hours. Maritime business startup process and fine-tuning of ideas through project-based hands-on entrepreneurship experiences and a project management approach. **Prerequisites:** Junior or senior classification or approval of department head.

MARA 466 Strategic Management

Credits 3. 3 Lecture Hours. Strategic issues facing organizations, including top management decision making and social responsibility; environmental and industry analysis; establishing organizational mission and objectives; corporate, business and functional level strategy formulation; global and multidomestic strategies; strategic implementation and control; integrating operations, finance, marketing and human resource strategies; case analysis. **Prerequisites:** MARA 363, MKTG 321, SCMT 364, and FINC 341; senior classification or approval of department head.

MARA 470 Environmental Law

Credits 3. 3 Lecture Hours. Broad background of basic statutes, regulations and cases dealing with the major issues in international and federal environmental law; focus on pragmatic training in statutory, regulatory and treaty reading and interpretation; analysis of administrative and legislative intent for law. **Prerequisites:** Junior or senior classification or approval of department head.

MARA 475 Business Leadership

Credits 3. 3 Lecture Hours. Focus on theory and practice of leadership; familiarize with components, theory and models of leadership; compare/contrast styles; review leadership/followership relationship as a collaborative activity resulting in achieved goals; analyze cultural and global components and ethical issues associated with leadership. **Prerequisite:** Junior or senior classification or approval of department head.

MARA 484 Management Internship

Credits 0 to 4. 0 to 4 Other Hours. Internship in management; staffing, planning, organizing, leading and controlling. Enrollment is limited to those who have managerial responsibilities for the resources used by a business, non-profit, or other organization. **Prerequisites:** Junior or senior classification; approval of department head.

MARA 485 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Directed study on selected problems in the area of maritime administration not covered in other courses. **Prerequisites:** Junior or senior classification; approval of department head.

MARA 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Study of selected topics in an identified area of maritime administration. **Prerequisite:** Junior or senior classification; approval of department head.

MARA 490 Maritime Interdisciplinary Studies - Business, Law and Policy

Credits 2. 2 Lecture Hours. Emphasis on cultural, economic, political, social and historical aspects of the maritime industry; coverage of different management styles, business practices and regulatory focus. **Prerequisites:** Junior or senior classification or approval of department head.

MARA 491 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in Maritime Administration. May be repeated 2 times for credit. Please see academic advisor in department. Registration in multiple sections of this course is possible within a given semester provided that the per semester credit hour limit is not exceeded. **Prerequisites:** Junior or senior classification; approval of department head.

MARA 493 International Maritime Management Experience

Credits 3. 3 Lecture Hours. Combination of classroom and two week international travel emphasizing cultural and historic aspects of maritime industry; direct contact with managers and regulators in the international maritime industry; examination of different management styles, business practices and regulatory approaches. **Prerequisite:** Junior or senior classification; approval of department head.

MARB - Marine Biology (MARB)

MARB 101 Succeeding in Science

Credits 3. 2 Lecture Hours. 2 Lab Hours. An orientation of the biological sciences including the nature of science, functions of scientists, and a better understanding of the fundamentals of science; hands-on experiences that provide opportunities to work with faculty, graduate and other undergraduate students.

MARB 214 Evolutionary Biology

Credits 3. 3 Lecture Hours. Conceptual examination of evolutionary theory; not a survey of specific organismal evolutions; evidence for the abiotic origin; discussion of micro-evolutionary (including drift and natural selection) and macro-evolutionary (including evolutionary trends) mechanisms; application of these concepts to human evolution. **Prerequisites:** BIOL 111.

MARB 215 Marine Zoology

Credits 4. 3 Lecture Hours. 3 Lab Hours. The study of multicellular animal life and the traits, adaptations, and ecology of major metazoan groups, emphasizing patterns of evolutionary change. Includes laboratory dissections and exploration of preserved displays to reinforce lecture material and provide supplemental information to the topics discussed in lecture. **Prerequisite:** BIOL 111.

MARB 285 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Special topics and problems in field and/or laboratory work suited to analysis by individuals or small groups concerning aspects of marine biology. Usually requires a report describing techniques and results. Only 3 credit hours may be used in the degree plan curriculum. **Prerequisites:** 2.25 GPR, Approval of instructor.

MARB 289 Special Topics in Marine Biology

Credits 1 to 4. 1 to 4 Lecture Hours. Study of selected topics in an identified area of marine biology. **Prerequisite:** Approval of instructor.

MARB 300 Scientific Methods in Marine Biology

Credits 2. 1 Lecture Hour. 3 Lab Hours. An introduction to field, laboratory and analytical methods, equipment and instruments; field portion includes making proper observations, sampling techniques, and data recording; laboratory portion includes sample analysis methods, use of instruments, introduction to data analysis including elementary statistics, introduction to scientific literature and report writing style. **Prerequisites:** BIOL 112; junior or senior classification or approval of instructor.

MARB 301 Genetics

Credits 4. 3 Lecture Hours. 3 Lab Hours. Fundamental principles of genetics; physical basis of Mendelian inheritance; expression and interaction of genes, linkage, sex linkage, biochemical nature of genetic material, and mutation. **Prerequisite:** BIOL 111.

MARB 302 The Sea World Experience

Credits 3. 2 Lecture Hours. 3 Lab Hours. Exploration of marine organisms, survey topics in vertebrate marine biology and the role that aquatic oriented parks play in education, research and conservation; hands-on experiences by participating in aspects of maintaining aquatic organisms in captivity including animal care and nutrition, physiology, behavior, animal training and water quality; exposure to marine organismal taxonomy, natural history, anatomy and ecology. **Prerequisites:** BIOL 111 with a grade of C or better; GPA greater than 2.00.

MARB 303 Biostatistics

Credits 4. 3 Lecture Hours. 3 Lab Hours. Descriptive statistics, data visualization, probability and probability distribution, parameter estimation, and testing of hypotheses, analysis of variance, correlation and regression, parametric and non-parametric techniques with emphasis on methods applied to biological investigations. **Prerequisite:** MATH 142, MATH 147 or MATH 151.

MARB 310 Introduction to Cell Biology

Credits 4. 3 Lecture Hours. 3 Lab Hours. Cell physiology, the regulation of gene expression, protein structure and function, the aggregation of cells to form tissues, neurons and current paradigms in cell biology. **Prerequisites:** MARB 215 or BIOL 112; CHEM 227.

MARB 311 Ichthyology

Credits 4. 3 Lecture Hours. 3 Lab Hours. Freshwater and marine fishes. Subject will be mainly systematic, but evolution, ecology, life history, and economics of more important species will be treated. **Prerequisite:** BIOL 112 or MARB 215.

MARB 315 Natural History of Vertebrates

Credits 4. 3 Lecture Hours. 3 Lab Hours. Natural history of fishes, amphibians, reptiles, birds, and mammals, with emphasis on coastal Texas vertebrates. **Prerequisite:** BIOL 112 or MARB 215.

MARB 320 Fisheries Techniques

Credits 4. 3 Lecture Hours. 3 Lab Hours. Theory and techniques in fisheries biology and ecology; experience with fisheries equipment and techniques provided in both field and laboratory; practical sampling design, collection and interpretation of data from estuarine, coastal and offshore environments. **Prerequisite:** MARB 311.

MARB 335 Fish Physiology

Credits 3. 3 Lecture Hours. Study of the basic physiology of fishes; examination of fish cardiovascular, renal, digestive, locomotor, reproductive, and central and peripheral nervous systems; discussion of physiological adaptations enhancing survival in a water medium. **Prerequisite:** MARB 215 or BIOL 112; junior or senior classification, or approval of instructor.

MARB 360 Marine Conservation Biology

Credits 4. 3 Lecture Hours. 3 Lab Hours. Lectures and laboratories cover the major principles of conservation biology; a new synthetic field that applies concepts of ecology, systematics and evolution, biogeology, genetics, behavioral sciences, and social sciences to the conservation of marine fisheries resources. Lab exercises include morphometric and genetic variation, GIS, molecular systematics and phylogenetic inference. **Prerequisite:** Junior or senior classification or approval of instructor.

MARB 400 Biology of Marine Mammals

Credits 4. 3 Lecture Hours. 3 Lab Hours. A broad-spectrum course on the taxonomy, evolution, morphology, behavior, and ecology of marine mammals, including sirenians, carnivores, baleen and toothed whales and dolphins. **Prerequisite:** MARB 315.

MARB 401 Physiological Ecology of Marine Mammals

Credits 3. 3 Lecture Hours. 0 Lab Hours. Anatomy, taxonomy, phylogeny and physiological adaptations of marine mammals. **Prerequisite:** MARB 315 or approval of instructor.

MARB 403 Cetacean Behavior and Behavioral Ecology

Credits 3. 3 Lecture Hours. Up to date descriptions of Cetacean behavior and ecology. **Prerequisite:** MARB 315 or approval of instructor.

MARB 405 Marine Parasitology

Credits 3. 3 Lecture Hours. Fundamentals of parasitology, with emphasis on marine applications; survey of major parasites of marine animals and the diseases they cause, especially in ecologically and commercially-important host species. **Prerequisite:** MARB 215 or BIOL 112; junior or senior classification, or approval of instructor.

MARB 406 Life in Extreme Environments

Credits 3. 3 Lecture Hours. Key metabolic and physiological innovations of extremophile organisms; topics include the molecular biology, biochemistry and physiology of organisms living in extreme environments. **Prerequisites:** MARB 315; CHEM 228; junior or senior classification or approval of instructor.

MARB 407 Research and Conservation in Greece-Dolphins, Fisheries and Cultural Heritage

Credits 4. 3 Lecture Hours. 3 Lab Hours. Lectures, readings and labs on the ecology and behavior of the vertebrate fauna of Greece; laboratory hands-on experience of the marine environment from boats, readings, videos, interpretation and select major peer-review scientific papers and books. **Prerequisites:** Junior or senior classification; MARB 315 or approval of instructor.

MARB 408 Marine Botany

Credits 4. 3 Lecture Hours. 3 Lab Hours. Morphology, systematics, ecology, and biochemistry of representative algae, fungi and submarine grasses. **Prerequisites:** BIOL 112 or MARB 215; junior or senior classification, or approval of instructor.

MARB 410 Animal Behavior

Credits 3. 3 Lecture Hours. Examination of ethological concepts; discussion of the development, genetics, physiology and evolution of animal behavior patterns involved in reproduction, territoriality, aggression, communication, population dispersion, sociality and sociobiology of invertebrates and vertebrates. **Prerequisite:** MARB 215 or BIOL 112.

MARB 411 Elasmobranch Ecology

Credits 3. 3 Lecture Hours. Investigation of the ecological processes that shape the life histories and behaviors of sharks, skates and rays, including an introduction to methods used to study elasmobranchs and their applications to conservation and management. **Prerequisite:** MARB 311 or MARB 315; or approval of instructor.

MARB 414 Toxicology

Credits 4. 3 Lecture Hours. 3 Lab Hours. History and scope of toxicology as it applies to mammals; where possible, marine species will be used for examples and assigned papers. **Prerequisites:** MARB 215 or BIOL 112; CHEM 227 and CHEM 228.

MARB 420 Comparative Animal Physiology

Credits 4. 3 Lecture Hours. 3 Lab Hours. Principles of animal physiology are examined using invertebrate and vertebrate model systems; includes osmoregulation in marine versus freshwater versus terrestrial organisms, excretion, fluid circulation, nervous system structure and function, muscle activity, sensory neurobiology and endocrine mediation. **Prerequisites:** BIOL 112 or MARB 215; CHEM 227 and MARB 310.

MARB 421 Community Ecology in the Tropics

Credits 3. 2 Lecture Hours. 3 Lab Hours. Field-based exploration of the connections between producers and consumers in tropical marine ecosystems, including coral reefs, seagrass meadows, and mangrove forests; immersive understanding of symbiotic relationships that shape ecological communities, including mutualism, predation, and competition, with an emphasis on nearshore ecosystems in the tropics. **Prerequisites:** MARB 215; swim test completion; concurrent enrollment in MARB 422.

MARB 422 Tropical Marine Botany

Credits 3. 2 Lecture Hours. 3 Lab Hours. A field-based course exploring the connections between primary producers and organisms that utilize the marine environment; observation, identification, and counting of organisms in tropical marine environments including phytoplankton in coastal waters, coral reefs, seagrass meadows, and mangrove forests. **Prerequisites:** MARB 215; concurrent enrollment in MARB 421; completion of swim test.

MARB 423 Mariculture

Credits 4. 3 Lecture Hours. 3 Lab Hours. Study of factors determining the success of efforts to cultivate estuarine and marine species of economic importance. Mariculture practices used worldwide in the production of algae, mollusks, crustaceans, and fishes will be discussed. **Prerequisite:** Junior or senior classification or approval of instructor.

MARB 425 Marine Ecology

Credits 4. 3 Lecture Hours. 3 Lab Hours. Relationship between various marine environments and their inhabitants; intra- and interspecific relationships between organisms; structure and function among marine communities. Laboratory emphasis is placed on study of living material and natural habitats in the Gulf of Mexico. **Prerequisites:** MARB 315; senior classification or approval of instructor.

MARB 426 Aquatic Animal Nutrition

Credits 3. 3 Lecture Hours. Chemistry, digestion, absorption and intermediary metabolism of nutrient classes with special emphasis on their relationship to warmwater fish nutrition. Determination of nutrient requirements, feed evaluation, feed processing, ration formulation and feeding practices. **Prerequisites:** CHEM 227; junior or senior classification or approval of instructor.

MARB 430 Coastal Plant Ecology

Credits 4. 3 Lecture Hours. 3 Lab Hours. Study of the identification, distribution, production, and ecological importance of estuarine, coastal marsh, and dune vascular plants; the interaction of plants with their abiotic and biotic environments; and techniques of vegetation management and evaluation. **Prerequisite:** BIOL 111; junior or senior classification or approval of instructor.

MARB 433 Applied Bioinformatics

Credits 4. 3 Lecture Hours. 3 Lab Hours. Fundamental concepts and methods in bioinformatics using sequence analysis and practical applications; includes biological databases, sequence and structure alignments, structural bioinformatics, gene prediction and genome analysis; emphasis on understanding and application of these concepts. **Prerequisite:** MARB 301.

MARB 435 Marine Invertebrate Zoology

Credits 4. 3 Lecture Hours. 3 Lab Hours. General biology of marine invertebrate animals; morphology, evolution, and systematics; studies of local fauna in laboratory. **Prerequisite:** BIOL 112 or MARB 215.

MARB 437 Pathology of Marine Animals

Credits 3. 3 Lecture Hours. Examination of changes or loss of physiological function as related to common diseases, viral, bacterial, parasitic, or injury; mechanisms of disease in cells, tissues and organ systems of marine vertebrates; emphasis on marine mammals; fishes and marine reptiles and birds; clinical manifestations, diagnostics and treatments. **Prerequisite:** MARB 315.

MARB 438 Coastal Ornithology

Credits 3. 2 Lecture Hours. 3 Lab Hours. Coastal Ornithology. Field and laboratory studies on the identification, classification, distribution and ecology of birds with special emphasis on birds of the Texas Gulf Coast. Classroom lectures to include anatomy, physiology, behavior and migration. Field trips required. **Prerequisites:** MARB 315. Junior or senior classification or approval of instructor.

MARB 445 Marine Fisheries Management

Credits 3. 3 Lecture Hours. Basic knowledge from marine ichthyology, biology of fishes and biological oceanography related to applied aspects of marine fisheries sciences; emphasis placed on management techniques applicable to tidal-influenced inland water, estuaries, and oceans. **Prerequisite:** Junior or senior classification, or approval of instructor.

MARB 460 Fisheries Population Dynamics

Credits 4. 3 Lecture Hours. 3 Lab Hours. Principles and concepts of population dynamics related to fish; methods of estimating abundance, mortality, recruitment and sustainable harvest levels; introduction to models for population analysis with emphasis on stock assessments and quantitative fisheries; basic computer programming to explore population behavior and interactions. **Prerequisites:** MATH 142, MATH 147, or MATH 151; MARB 311 or approval of instructor.

MARB 484 Undergraduate Internship

Credits 0 to 9. 0 to 9 Other Hours. Supervised study in a research or teaching laboratory remote from TAMUG. Student involvement is to consist of real-life learning or marine biological research, teaching, management, or a combination of these. **Prerequisite:** Junior or senior classification or approval of instructor.

MARB 485 Directed Studies

Credits 1 to 6. 1 to 3 Other Hours. Per Semester. Special topics and problems in field and/or laboratory work suited to analysis by individuals or small groups concerning aspects of marine biology. Usually requires a report describing techniques and results. Only 3 credit hours may be used in the degree plan curriculum. **Prerequisites:** 2.25 GPR. Curriculum sophomore, junior or senior classification or approval of instructor.

MARB 489 Special Topics in Marine Biology

Credits 1 to 4. 1 to 4 Lecture Hours. Study of selected topics in an identified area of marine biology. **Prerequisite:** Junior or senior classification or approval of instructor.

MARB 491 Research in Marine Biology

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in Marine Biology. Please see academic advisor in department. Registration in multiple sections of this course is possible within a given semester provided that the per semester credit hour limit is not exceeded. May be repeated for credit. **Prerequisites:** Junior or senior classification and approval of instructor.

MARE - Marine Engr Technology (MARE)

MARE 100 Marine Engineering Fundamentals

Credits 3. 2 Lecture Hours. 3 Lab Hours. A study of basic marine engineering systems, with emphasis on propulsion plants. Introduction to propulsion plant machinery and shipboard safety practices and equipment; offshore oil production; subsea technologies; petroleum product transport and refinery.

MARE 102 Engine Room Resource Management

Credit 1. 2 Lab Hours. Marine engineering watch standing and operations; safety and security; effective resource management and control of engine room equipment; leadership and managerial skills.

MARE 111 Methods in Engineering Technology

Credits 2. 1 Lecture Hour. 3 Lab Hours. Analytical methods in engineering technology; problem solving, critical thinking, inductive and deductive reasoning, units and conversions, use of computational software, project management; basic calculations in statics, thermodynamics, electric circuits, engineering economics.

MARE 112 Graphics for Engineering Technology

Credits 2. 1 Lecture Hour. 3 Lab Hours. Graphical communication in engineering and engineering technology; lettering, sketching techniques, geometric construction, multi-view drawings, dimensioning and notation, piping and electrical diagrams, use of 2-D and 3-D CAD software, use of parametric software.

MARE 200 Basic Operations

Credits 4. 4 Lecture Hours. Practical application of student's classroom studies while at sea on training ship during sea-training period. Student required to complete several projects relating to engineering plant of ship. **Prerequisite:** Grade of C or better in MART 103.

MARE 202 Marine Thermodynamics

Credits 3. 3 Lecture Hours. Energy Concepts; First and second law of thermodynamics; Carnot and Rankine principles and reversible heat cycles; Properties of processes of vapors; vapor-power cycles and vapor refrigeration cycles. **Prerequisites:** MARE 100 or MARR 101; MATH 152 or MATH 161; or concurrent enrollment.

MARE 205 Engineering Mechanics I

Credits 3. 3 Lecture Hours. Statics, basic vector operations, mechanics of particles and rigid bodies. Center of gravity, analysis of structures, friction, moments of inertia. **Prerequisites:** Grade of C or better in MATH 151; grade of C or better in PHYS 218 or PHYS 206.

MARE 206 Engineering Mechanics II

Credits 3. 3 Lecture Hours. Dynamics; scalar and vector solutions of relative linear velocities and acceleration; kinetics; dynamics of translation and rotation; work; energy; impact; momentum. **Prerequisite:** Grade of C or better in MARE 205.

MARE 207 Electrical Power I

Credits 3. 2 Lecture Hours. 3 Lab Hours. Application of circuit analysis principles to DC and AC circuits having sources and passive inductors, resistors and capacitors; electrical instrumentation; power and voltage/current phase relationships in AC circuits; balanced three-phase AC power circuits; cable sizing. **Prerequisites:** Grade of C or better in MATH 151; grade of C or better in PHYS 208 or PHYS 207.

MARE 209 Mechanics of Materials

Credits 3. 2 Lecture Hours. 3 Lab Hours. Introduction to the study of stresses, strains, and deformation of a solid body which results when static forces are applied. Transformation of stresses and strains, torsion, beam deflection, and combined loadings are discussed. **Prerequisite:** Grade of C or better in MARE 205.

MARE 211 Steam Propulsion Plants

Credits 3. 2 Lecture Hours. 3 Lab Hours. Fossil fuel steam generators, shipboard propulsion turbines and condensers, reduction gears, line shafting, internal fittings and fluid flow paths, automatic controls, regulatory requirements for safety device settings, system tests and inspections, boiler water and feed water test and treatment, turbine and reduction gear lubrication, computer aided heat balances, parametric analysis of plant performance.

MARE 242 Manufacturing Methods I

Credits 2. 1 Lecture Hour. 3 Lab Hours. Introduction to manufacturing methods used in marine industries emphasizing fabrication techniques including oxy-acetylene cutting and welding, brazing, arc welding, pipe welding and sheet metal fabrication. Laboratory exercises will develop the knowledge and skills needed to perform fabrication operations, routine maintenance and emergency repairs of marine engineering structures and systems.

MARE 243 Manufacturing Methods II

Credit 1. 0 Lecture Hours. 3 Lab Hours. Continued introduction to manufacturing methods used in marine industries including machine, foundry and forge work and other manufacturing technologies. Laboratory emphasizes machine shop practices including safety, use and care of machine and hand tools; measuring instruments, layout, gauging, cutting speeds and feeds, drilling, tapping, threading, turning and milling. **Prerequisite:** Approval of Instructor.

MARE 261 Engineering Analysis

Credits 3. 3 Lecture Hours. Review of mathematical concepts previously studied (e.g., complex quantities, vectors and calculus), coupled with study of advanced concepts (e.g., differential equations, Laplace Transforms, statistics and numerical methods) with a view to emphasize applications in nuclear engineering, electrical engineering, thermodynamics, heat transfer and turbine theory. **Prerequisite:** MATH 152 or MATH 161.

MARE 285 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Special problems in marine engineering technology not covered by any other course in the curriculum; work may be in either theory or laboratory. **Prerequisite:** Approval of department head.

MARE 289 Special Topics

Credits 1 to 5. 0 to 5 Lecture Hours. 3 to 5 Lab Hours. Selected topics in an identified area of marine engineering technology. May be repeated for credit. **Prerequisite:** Approval of instructor.

MARE 291 Research

Credits 0 to 3. 0 to 3 Other Hours. Research conducted under the direction of faculty member in marine engineering technology. May be taken two times for credit. Please see an academic advisor in the department. **Prerequisites:** Freshman or sophomore classification; approval of instructor and department head.

MARE 300 Intermediate Operations

Credits 4. 4 Lecture Hours. Training program for second sea-training period. Sea project required of each student under supervision of officer-instructors. Lifeboat and safety training. **Prerequisites:** Grade of C or better in MARE 100, MARE 200, and MART 103; junior or senior classification or approval of MARE and MART department heads.

MARE 301 Digital Fundamentals for Marine Engineers

Credits 3. 2 Lecture Hours. 3 Lab Hours. Marine digital systems and applications including logic and devices that enable these applications throughout many industries; fundamentals and basic concepts of number systems, Boolean algebra, logic gates, combinatorial and sequential logic design, and digital electronics; examination of modern digital devices used for computing, automation, system monitoring, and control. **Prerequisites:** Grade of C or better in MARE 207, ECEN 215, or ESET 210, or concurrent enrollment; junior or senior classification or approval of instructor.

MARE 305 Fluid Mechanics Theory

Credits 4. 3 Lecture Hours. 2 Lab Hours. Theory of incompressible and compressible fluid flow, introduction to fluid power systems and controls, and dynamics of turbomachinery. Mathematical analysis of piping systems to determine pump head, system resistance, and pipe sizing optimization. Topics include physical properties of fluids, continuity equation, Bernoulli's Equation, Darcy's Equation, series and parallel flow, relative roughness, friction factors, dimensional analysis, and laws of similitude. **Prerequisite:** Junior or senior classification or approval of instructor.

MARE 306 Electrical Power II

Credits 3. 2 Lecture Hours. 3 Lab Hours. Electrical power generation and distribution; AC and DC rotating machinery; transformers; controllers and safety devices; operation, maintenance and repair procedures and practices; static converters AC/DC and DC/AC that are used in modern electric propulsion systems. **Prerequisite:** Grade of C or better in MARE 207.

MARE 307 Marine Electronics

Credits 3. 2 Lecture Hours. 3 Lab Hours. Introduction to the theory of electronic circuits. Fundamentals and basic concepts of semiconductors; solid-state components; power supplies; amplifiers; inverters; rectifiers; oscillators; digital and analog integrated circuits. Application in automation, motor controllers, battery-charging systems, communications; and propulsion plant monitoring systems. **Prerequisite:** Grade of C or better in MARE 207.

MARE 309 Marine Construction Materials

Credits 3. 2 Lecture Hours. 3 Lab Hours. Introduction to materials science and engineering, structural, property relationships; advanced manufacturing techniques from the point of view of marine applications such as subsea pipelines, ship hulls, etc.; corrosion and biofouling. Laboratory includes experimental testing of materials properties, materials syntheses and heat treatment techniques. **Prerequisite:** CHEM 107 and CHEM 117.

MARE 312 Diesel Propulsion Plants

Credits 3. 2 Lecture Hours. 3 Lab Hours. Comprehensive study of diesel engines, thermodynamics of air standard cycles, actual compression ignition engine cycles, emissions and emission controls, fuel injection systems and turbo charging systems, engine material properties, operational parameters including forces and temperatures resulting from combustion and inertial dynamics. Laboratory includes computer-aided parametric analysis of engine performance and use of low-speed diesel propulsion plant simulator. Junior or senior classification or approval of instructor. **Prerequisites:** CHEM 107; grade of C or better in MARE 202.

MARE 313 Heat Transfer

Credits 3. 3 Lecture Hours. Fundamentals of heat transfer modes and different solution techniques; 1-D and 2-D heat conduction in transient and steady state conditions; convection heat transfer under different flow conditions; forced convection in internal and external flows; analysis and selection of heat exchangers; and, thermal radiation heat transfer. **Prerequisite:** MARE 261; MARE 305 or concurrent enrollment; grade of C or better in MARE 202.

MARE 315 Thermodynamics for Technologists

Credits 4. 3 Lecture Hours. 2 Lab Hours. Thermal and mechanical energy transformations; relationships applied to flow and non-flow processes in power and refrigeration cycles; devices include compressors, turbines, heat exchangers, nozzles, diffusers, pumps and piston-cylinder models; computer modeling. **Prerequisites:** Grade of C or better in PHYS 206 or PHYS 218.

MARE 316 Marine Auxiliary Systems

Credits 3. 2 Lecture Hours. 2 Lab Hours. Study of the principal shipboard auxiliary systems, including auxiliary fired-boilers, sea water service, ballast, freshwater service, lubricating oil, fuel oil storage and transfer, distilling, refrigeration and steering systems; major components, operation and maintenance, and interrelationship with other auxiliary systems. **Prerequisites:** MARE 100, or MARR 101 with a grade of C or better.

MARE 325 Shipboard Networking Systems

Credits 3. 2 Lecture Hours. 3 Lab Hours. Design, operation, application and management of shipboard LANs and WANs; topologies, protocols, bridges, routers, hubs, switches, security; media and transport systems; Internet and TCP/IP topics including the protocol stack, router and bridge operation and addressing issues pertinent to shipboard systems. **Prerequisite:** Grade of C or better in MARE 301.

MARE 327 Data Science for Marine Cybersecurity

Credits 3. 2 Lecture Hours. 3 Lab Hours. Examination of cybersecurity fundamentals and the concept of network security; analysis of the cybersecurity conditions in the maritime domain and the countermeasures deployed against these cyberattacks by using data science tools; survey of data science programming and approaches adopted in the cybersecurity domain to eliminate malware and perform network traffic analysis; development and utilization of data analytic tools for assessing the cybersecurity risks of the maritime sector. **Prerequisites:** Sophomore classification.

MARE 335 Power Electronics for Shipboard Applications

Credits 3. 2 Lecture Hours. 3 Lab Hours. Power electronics design principles and applications in the marine environment; DC/DC converter theory and electrical inverter/converter concept of operation, design, and applications in dynamic shipboard operations and system control; rectification of utility input concepts. **Prerequisite:** MARE 207 or ESET 210 or ECEN 215 with a grade of C or better.

MARE 345 High Voltage Technology for Marine Engineers

Credits 3. 2 Lecture Hours. 3 Lab Hours. Study of High Voltage (HV) electrical systems which includes construction and operating parameters; HV generation, start-up procedures, maintenance and testing; electrical safety of HV equipment; protective relaying in HV systems; electrostatic field and breakdown strength in dielectrics and design consideration of HV equipment; response and control of overvoltage and surges in HV systems to include operator safety and system protective devices. **Prerequisite:** Grade of C or better in MARE 207 or ECEN 215 or ESET 210.

MARE 350 Commercial Cruise Internship

Credits 4. 4 Other Hours. Training program for second sea-training period; sea project required of each student under supervision of officer-instructors; lifeboat and safety training. **Prerequisites:** MARE 100, MARE 200, MART 103. Junior or senior classification or permission of MARR and MART department heads.

MARE 377 Engineering Risk Management in Maritime Construction and Shipbuilding

Credits 3. 3 Lecture Hours. Identification, classification, assessment and prioritization of risks in a maritime maintenance, repair or new build project; evaluation and determination of project risk using modern modeling techniques; knowledge and skill required to construct and justify the project management risk register; examination of project resources; diverse project team synthesis, development, management and leadership as a means of risk avoidance. **Prerequisites:** MARE 100 or MARR 101; MARE 209 and MATH 150; or approval of instructor.

MARE 396 Nuclear Engineering for Marine Engineers

Credits 3. 3 Lecture Hours. Analysis and design of nuclear power plants and their marine applications, nuclear physics, plant operations including startup/shutdown and criticality, subsystems, applications, costs, efficiency and cycles, and radiation health; modular design advancements, reactor safety, and case studies applicable to marine propulsion. **Prerequisites:** Grade of C or better in MARE 211, CHEM 107, and PHYS 207; junior or senior classification, or approval of advisor.

MARE 399 High Impact Experience in Marine Engineering Technology

Credits 0. 0 Lecture Hours. 0 Lab Hours. 0 Other Hours. Participation in an approved high-impact learning practice; reflection on professional outcomes from engineering body of knowledge; documentation and self-assessment of learning experience at mid-curriculum point. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisite:** Junior or senior classification.

MARE 400 Advanced Operations

Credits 4. 4 Lecture Hours. Training program for third sea-training period. At the end of this period each student will have achieved the knowledge and will have demonstrated the ability to take complete charge of a modern marine power plant while underway at sea. **Prerequisites:** Grade of C or better in MARE 100, MARE 200, MART 103, and MARE 300 or MARE 350, or equivalents; junior or senior classification or approval of MARR and MART department heads.

MARE 402 Shipboard Automation and Control

Credits 3. 2 Lecture Hours. 3 Lab Hours. Study of automation in marine power plants; including electronic and pneumatic proportional, integral and derivative control elements; applications in boiler combustion and water level control; engine speed control; remote sensing and performance monitoring systems. **Prerequisites:** MARE 307.

MARE 405 Fundamentals of Naval Architecture

Credits 3. 2 Lecture Hours. 3 Lab Hours. Ship geometry and arrangement; ship-form calculations; intact and damaged stability; ships' structure; fundamentals of resistance and propulsion; ship motion, maneuverability, and control; introduction to ship design, construction, and overhaul. **Prerequisites:** Junior or senior classification or approval of instructor.

MARE 410 Marine Engine, Energy, and Electrical Resource Management

Credits 3. 2 Lecture Hours. 3 Lab Hours. Advanced level Engine room Watchkeeping; includes the integration of Engine room and personnel Management (ERM), Management of Electronic and Electrical Systems (MEECES), Leadership and Managerial Skills (LMS), and Shipboard Energy Efficiency Planning (SEEMP); knowledge and understanding of the complexities of watchstanding directly impact the ability of a seafarer to operate a safe and efficient marine propulsion plant; training required under the International Convention on the Standards for Training and Certification of Watchkeepers, using simulator-based teaching techniques. **Prerequisites:** Grade of C or better in MARE 200, MARE 211, and MARE 312.

MARE 424 Gas Turbine Power Generation

Credits 3. 2 Lecture Hours. 3 Lab Hours. Application of the Brayton cycle to gas turbine power cycles, including ideal gas cycle analysis, compressor design and construction, gas turbine construction, operation and maintenance for marine and industrial installations. **Prerequisite:** Grade of C or better in MARE 202 and MARE 205; MARE 309 or concurrent enrollment and approval of instructor.

MARE 434 Offshore Energy, Oil, and Gas Production

Credits 3. 3 Lecture Hours. Orientation to the offshore and gas industry; petroleum exploration, production, and marketing; platform and floating production facilities; operations; classification of production systems; economics and risk management. **Prerequisite:** Junior or senior classification or approval of instructor.

MARE 441 Engineering Economics and Project Management

Credits 3. 3 Lecture Hours. Analysis of engineering economics and management, using costs and benefits of various engineering options. Topics include time value of money, cash flows, analysis techniques, interests rates, inflation, depreciation, optimization, statistics, network analysis and critical path programming. **Prerequisite:** Junior or senior classification or advisor approval.

MARE 442 Advanced Manufacturing Processes

Credits 3. 3 Lecture Hours. . Non-traditional manufacturing processes including ultrasonic machining, abrasive jet machining, water jet cutting, electro-mechanical machining, electric discharge machining, plasma arc machining and chemical milling that are used to optimize production in the manufacturing and shipbuilding industries. **Prerequisite:** MARE 242 and MARE 243.

MARE 443 Lean Sigma-Six Methodology

Credits 3. 3 Lecture Hours. History of lean and six sigma philosophies, their principles and implementation methodologies for creating a world class enterprise; topics in lean include five s, value stream mapping, cellular manufacturing, pull system, performance metrics, lean supplier network, lean product development, lean implementation models and impact of these technologies on the society. **Prerequisite:** MARE 242 and MARE 243.

MARE 445 Marine Navigation Systems

Credits 3. 2 Lecture Hours. 3 Lab Hours. Overview of Shipboard Navigation system components, electronics and electrical diagrams; examination of the fundamentals and basic concepts of communication systems such as Global Maritime Distress Safety System (GMDSS), Single Sideband Radio (SSB), and Emergency Position-Indicating Radio Beacon (EPIRBs), positioning systems such as Global Positioning Systems (GPS), hyperbolic long range radio navigation (Loran-C) and chart plotters; topics include radar, auto-pilot systems, and the design, maintenance and troubleshooting of the Shipboard Navigation Station and its power supplies both alternating current (AC) and direct current (DC). **Prerequisites:** Grade of C or better in MARE 235 and MARE 325.

MARE 451 Senior Design Project I

Credits 2. 1 Lecture Hour. 3 Lab Hours. Design, modeling, testing and validation processes; design of equipment, components or systems for marine and related power generation applications; complete design process including definition of the problem, research for existing designs and related technologies, conceptualization and evaluation of alternatives, development of preliminary design, refining and generation of final design and documents. **Prerequisites:** MARE 206, MARE 209, MARE 305, MARE 306, MARE 307, MARE 309 and MARE 313, or concurrent enrollment; senior classification.

MARE 452 Senior Design Project II

Credits 2. 1 Lecture Hour. 3 Lab Hours. This course is a continuation of MARE 451. Development of theoretical, computational or experimental models using the design developed in MARE 451. Formulation, construction and/or fabrication work. Refining, experimenting and testing of models considering alternatives. Analyzing results and preparing and submitting design documents including a project report. **Prerequisite:** MARE 451 or MARR 451.

MARE 467 Applied Marine Liquefied Gas Systems for Marine Engineers

Credits 3. 2 Lecture Hours. 2 Lab Hours. Theory, regulations and operation of modern engineering shipboard plants and shoreside facilities which are using dual and tri-fuel engines to generate power. Fuels include Liquefied Gas (LG), Liquid Fuels, Marine Gas Oil and Heavy Fuel Oil. The course will present varying engine operational characteristics. LG safety and risk assessments. The development of Floating Storage Regasification Units (FSRUs). The economic and environmental impact of tri-fuel vessels. **Prerequisites:** Grade of C or better in MARE 100 or MARR 101; grade of C or better in MARE 202 or concurrent enrollment.

MARE 481 Seminar

Credit 1. 1 Other Hour. Preparation of Engineering licensure; ethics and professional practice; safety, health, and the environment; review of engineering mathematics, probability and statistics; review of statics, dynamics, strength of materials, fluid mechanics and materials science; review of heat and mass transport processes; review of electricity, power, magnetism, instrumentation and data. **Prerequisite:** Senior classification.

MARE 482 License Preparation Seminar

Credit 1. 1 Other Hour. Preparation for United States Coast Guard (USCG) 3rd Assistant Engineer examination; review of marine engineering safety; review of motor plants; overview of steam plants; review of electricity and electrical control systems; review of refrigeration systems and general subjects. **Prerequisites:** Senior classification; enrollment in marine engineering technology license option program.

MARE 484 Undergraduate Internship

Credits 0 to 6. 0 to 6 Other Hours. Supervised study with an approved power generator, either electrical, mechanical, or thermal power. Alternatively, studies can be with a research, manufacturing or repair facility whose primary mission is to support power generation. May be taken for credit up to 6 hours. **Prerequisites:** 2.5 GPR and completion of 300 level courses.

MARE 485 Directed Studies

Credits 1 to 8. 1 to 8 Other Hours. Special problems in marine engineering technology not covered by any other course in the curriculum. Work may be in either theory or laboratory. **Prerequisites:** Approval of department head. Junior or senior classification or approval of instructor.

MARE 489 Special Topics

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of marine engineering technology. May be repeated for credit. **Prerequisites:** Junior or senior classification or approval of instructor.

MARE 491 Research in Marine Engineering Technology

Credits 1 to 4. 1 to 4 Other Hours. Research in Engineering Technology. Research conducted under the direction of faculty member in Marine Engineering Technology. May be repeated 2 times for credit. Please see academic advisor in department. Registration in multiple sections of this course is possible within a given semester provided that the per semester credit hour limit is not exceeded. **Prerequisites:** Junior or senior classification and approval of instructor.

MARR - Marine Engr Technology (MARR)

MARR 102 Engine Room Resource Management and Dynamics

Credit 1. 0 Lecture Hours. 2 Lab Hours. Marine engineering watch standing and operations, safety and security, effective resource management and control of engine room equipment, leadership and managerial skills.

MARS - Marine Science (MARS)

MARS 102 Earth and Ocean Science

Credits 4. 3 Lecture Hours. 3 Lab Hours. Introduction to earth systems analysis, plate tectonic framework; earth and ocean structure and chemistry, ocean and atmospheric circulation; global carbon and hydrologic cycles; focus on earth systems interactions in the coastal zone; primary productivity and oceanic life; human modification and dependence on earth system components; climate change analysis.

MARS 210 Marine Geography

Credits 3. 3 Lecture Hours. Introduction to the physical and cultural patterns of the coastal zones of the world. Interrelationships between the physical forms and processes and the cultural patterns are used to analyze human use and abuse of the sea.

MARS 252 Introductory Marine Science Laboratory

Credit 1. 3 Lab Hours. Overview of the global ocean environment and the interrelated sub-disciplines; the important of the ocean for the earth's ecosystems and human impact on the ocean; field work and boat trip, water and benthic sediment collection and analysis; navigation chart work. **Prerequisite:** OCNG 251 or concurrent enrollment.

MARS 280 Coastal and Ocean Resources

Credits 3. 3 Lecture Hours. Coastal and Ocean Resources. Resources from the ocean including food, minerals, transportation and recreation. Methods of recovery and utilization of resources from the ocean, efficiency and cost effectiveness. Provides a foundation for understanding the wealth of resources available from the ocean and its margins, to include the impact of human activity on these resources.

MARS 281 Sophomore Seminar in Marine Sciences

Credit 1. 1 Lecture Hour. Compilation and discussions of literature pertaining to topics in marine sciences. Emphasis placed upon preparation and presentation of a written report. **Prerequisite:** Sophomore standing or approval of instructor.

MARS 285 Directed Studies

Credits 1 to 6. 1 to 6 Other Hours. Special topics and problems suited to analysis by individuals or small groups concerning special aspects of marine sciences. **Prerequisite:** Approval of department head.

MARS 289 Special Topics in Marine Sciences

Credits 1 to 4. 1 to 4 Lecture Hours. Study of selected topics in an identified area of marine sciences. **Prerequisite:** Approval of instructor.

MARS 303 Computing and Data Display

Credits 3. 2 Lecture Hours. 3 Lab Hours. Programming with big ocean data in Python environment; basic to advanced Python programming; extensive practice on data analysis and visualization. **Prerequisites:** Junior or senior classification or approval of instructor.

MARS 305 Environmental Micropaleontology

Credits 4. 3 Lecture Hours. 3 Lab Hours. Major animal, plant and protist microfossils groups, ecology, biostratigraphy, paleoenvironmental and paleoclimatic utility, primary preparation techniques, basic microscopy, research design and dissemination; coastal foraminifera, thecamoebians and ostracods emphasized; field trips required. **Prerequisites:** MARS 102.

MARS 306 Coastal Sedimentary Geology

Credits 4. 3 Lecture Hours. 3 Lab Hours. A survey of modern coastal sedimentary systems, including principles of sedimentology and sediment analysis; laboratory includes a large group field projects; local field trips required. **Prerequisites:** GEOL 101 and GEOL 102.

MARS 310 Field Methods in Marine Sciences

Credits 3. 1 Lecture Hour. 6 Lab Hours. Techniques of documenting collected materials, the methods of reconnaissance and the mapping of traverses in the major coastal environments; sampling and recording techniques, interview procedures and the use of maps and remotely sensed imagery. **Prerequisites:** CHEM 120; PHYS 202, PHYS 208, or PHYS 207, and PHYS 217/ENGR 217; GEOL 101; GEOL 102.

MARS 325 Introduction to GIS for Marine Sciences

Credits 3. 2 Lecture Hours. 2 Lab Hours. Geographic Information Systems (GIS) are introduced for marine sciences and management. Basic use of software including creation of GIS models is covered. Creating, editing and querying GIS shape files is treated utilizing one of the standard GIS software packages such as ArcGis. **Prerequisite:** Junior or senior classification or approval of instructor.

MARS 330 Petroleum Geology

Credits 3. 3 Lecture Hours. Origin, migration and accumulation of petroleum; reservoir rock, traps, accumulation and conditions, and subsurface methods. **Prerequisites:** GEOL 101 and GEOL 102.

MARS 336 Integrated Marine Geohazards Assessment

Credits 3. 3 Lecture Hours. Implications of past failures and ongoing significance to operational safety and the environment of offshore operations; integration of geology, geophysics, and geotechnical and soil properties; exploration of integrated marine site investigation and its support to the delivery of the energy transition. **Prerequisite:** GEOL 101 and GEOL 102, or MARS 102.

MARS 342 Ancient Sea Monsters

Credits 3. 3 Lecture Hours. Examination of prehistoric marine reptile groups including ichthyosaurs, plesiosaurs, plesiosaurs, and mosasaurs; fundamental principles of vertebrate paleontology, evolution, and extinction; evaluation of the geological history of these sea reptile groups with the origins and history of the Western Interior Sea. **Prerequisites:** MARS 102 or approval of instructor.

MARS 350 Advanced Computer Applications

Credits 2. 1 Lecture Hour. 2 Lab Hours. Data manipulation, merging, selection, filtering and querying in Microsoft Office primarily using large real data sets. Introduction to GIS, MatLab and other software relevant to science and/or business applications. Discussion of algorithm development in structured and object oriented programming languages.

MARS 358 Coastal Disasters

Credits 3. 3 Lecture Hours. A survey of natural disasters resulting from seismic activity, severe weather, or other natural processes with special focus on disasters affecting coastal regions; discussion of how these phenomena occur as well as coastal mitigation strategies for each. **Prerequisites:** GEOL 101, MARS 102, or equivalent.

MARS 365 Integrated Marine Sciences Laboratory

Credits 3. 1 Lecture Hour. 6 Lab Hours. Integrated lectures, field and laboratory exercises for data collection and analysis of physical, chemical, biological and geological measurements in ocean, coastal and estuarine environments. **Prerequisites:** MATH 142 or 152, PHYS 202 or PHYS 208, OCNG 251, MARS 252, CHEM 102 and CHEM 112, BIOL 112 and GEOL 101 and GEOL 102, junior or senior classification or approval of instructor.

MARS 370/GEOG 370 Coastal Processes

Credits 3. 3 Lecture Hours. Introduction to the coastal system, waves and wave dominated coasts, shoreline morphodynamics, tidal and lake coasts, long term coastal development, sea level changes, subtidal and beach ecosystems, coastal dunes and wetlands, structures and organizations, coastal management and coastal hazards. **Cross Listing:** GEOG 370/MARS 370.

MARS 408 Estuarine and Coastal Hydrodynamics

Credits 3. 3 Lecture Hours. Physical processes in estuarine and coastal environments in various time scales: turbulent, tidal and residual (subtidal); study of salts, suspended solids, nutrients and heat affected by water movement; physical, biogeochemical processes and mass transport. **Prerequisites:** MATH 251, PHYS 218, junior or senior classification or approval of instructor.

MARS 410 Physical Oceanography

Credits 3. 2 Lecture Hours. 3 Lab Hours. Elements of the physics of the ocean; descriptive aspects and theoretical explanations of circulation, characteristic structure and waves. **Prerequisites:** MATH 152, MATH 150, or MATH 148; PHYS 207 and PHYS 217/ENGR 217, or PHYS 202 or ENGR 217/PHYS 217; junior or senior classification or approval of instructor.

MARS 412 Remote Field Investigations in Marine Sciences

Credits 1 to 6. 1 to 6 Lecture Hours. An overview of marine sciences in remote locations varying by instructor and selected topics; lectures on recent scientific papers, methods and concepts related to field area; individual projects; data collection; data analysis and presentation. **Prerequisite:** Junior or senior classification or approval of instructor.

MARS 415 Remote Sensing Technology

Credits 3. 3 Lecture Hours. An introduction to the uses of remote sensing technology in the marine sciences, including electromagnetic, acoustic, and seismic methods. Generation, transmission, and reception methods. Active and passive systems, multispectral techniques, and signal analysis systems. **Prerequisites:** PHYS 202 or 208, BIOL 112. Junior or senior classification or approval of instructor.

MARS 420 Biological Oceanography

Credits 3. 2 Lecture Hours. 3 Lab Hours. Study of biological and biogeochemical processes in the marine environment; discussion of the role of phytoplankton, zooplankton, bacteria, vertebrates and their benthic counterparts in the oceanic food web and how they relate to the earth system and climate change. **Prerequisite:** BIOL 112, OCNG 251, or MARS 102.

MARS 425 Coastal Wetlands Management

Credits 3. 3 Lecture Hours. Wetlands management laws, regulations, wetland delineation and applications of Geographic Information System (GIS) to wetlands management; biological species in wetlands delineation; basic biogeochemical cycles and interactions in wetlands. **Prerequisites:** BIOL 112, GEOL 101, and GEOL 102; concurrent enrollment in MARS 426 or approval of instructor.

MARS 426 Coastal Wetlands Delineation Laboratory

Credit 1. 3 Lab Hours. Coastal wetlands delineation, including mapping techniques, Geographic Information System (GIS) and theodolite; biological species and biogeochemical factors in wetlands delineation. **Prerequisites:** BIOL 112, GEOL 101, and GEOL 102; concurrent enrollment in MARS 425 or approval of instructor.

MARS 430 Marine Geology

Credits 4. 3 Lecture Hours. 3 Lab Hours. Geological and physical processes that controls the formation and evolution of ocean basins and passive and active continental margins. **Prerequisite:** GEOL 101 and GEOL 102, or MARS 102.

MARS 431 Geological Oceanography-Earth's Climate

Credits 3. 3 Lecture Hours. Understanding the complex interactions of the earth system and the critical role that geological oceanography plays in these interactions, specifically the paleoceanographic/climate change aspects of geological oceanography. **Prerequisites:** GEOL 101, OCNG 251, junior or senior classification or approval of instructor.

MARS 432 Peak Oil, Global Warming and Resource Scarcity

Credits 3. 3 Lecture Hours. The concept of peak oil, resource depletion, and human-induced climate change and the broad consequences for food and water supplies, mortality rates, conflict, migration, and political stability; scientific/social/political debates surrounding these issues, and the individual/local/national/global options for living in a globally-warmed world with declining natural resources. **Prerequisites:** Any two from GEOL 101, GEOL 102, OCNG 251, MARS 280, or approval of instructor.

MARS 440 Chemical Oceanography

Credits 3. 2 Lecture Hours. 3 Lab Hours. Chemical and biogeochemical processes in the marine environment and how they relate to the earth system; topics include the role of chemical oceanography in earth system science and global change, interactions of the ocean with the atmosphere, continents and the seafloor; the physical and chemical composition of sea water; chemical speciation; biogeochemical cycles of major, minor, nutrient, trace elements and gases in the oceans; marine organic and isotope geochemistry; sedimentary chemistry and diagenesis. **Prerequisite:** CHEM 120.

MARS 454 Coastal Hydrology

Credits 3. 3 Lecture Hours. Coastal hydrological cycle; surface water and groundwater flow, direction, and movement in coastal environments; types of coastal morphology and its implication to water flow; land to ocean contaminant transport via river and groundwater; introduction to field techniques for measuring surface water and groundwater fluxes; numerical methods for solving hydrological processes and problems; the impact of anthropogenic activities and hydroclimate extremes on coastal hydrology and water resources. **Prerequisites:** MATH 147 and MARS 102; junior or senior classification or approval of instructor.

MARS 456 Coastal Water Policy

Credits 3. 3 Lecture Hours. History, past and present legislation, the government entities and agencies molding the policies affecting coastal water policy in Texas. **Prerequisite:** Junior or senior classification or approval of instructor.

MARS 460 Capstone Undergraduate Research Experience I

Credit 1. 1 Lecture Hour. Methodology for research outlines, organization and strategies; research ethics, writing and presentation of results. **Prerequisites:** MARS 491 or concurrent enrollment, senior classification or approval of instructor.

MARS 461 Capstone Undergraduate Research Experience II

Credit 1. 1 Lecture Hour. Research and scientific communications; development of a scientific abstract, poster presentation, oral presentation or written scientific paper. **Prerequisites:** MARS 491 or concurrent enrollment, senior classification or approval of instructor.

MARS 470 Eco-Environmental Modeling

Credits 3. 3 Lecture Hours. Biological components are in chemical and physical environments which are influenced by the bio-system and flows of energy, water and chemical species. Coupling to the complex atmospheric, aquatic and terrestrial systems is important. Modeling entails mathematical tools and the underlying science, focusing on scientific models, from the simplest to the elaborate. **Prerequisites:** CHEM 102, BIOL 112 and MATH 151 or approval of instructor.

MARS 481 Seminar

Credit 1. 1 Lecture Hour. Problem-oriented discussion session. Topics and reports selected for current relevance. May be repeated once only for credit. **Prerequisite:** Junior or senior classification or approval of instructor.

MARS 484 Undergraduate Internship

Credits 0 to 6. 0 to 6 Other Hours. Supervised study in a research or teaching laboratory within or outside of the Texas A&M University System. Student involvement is to consist of real-life learning or marine sciences research, teaching, management or a combination of these.

Prerequisites: Junior or senior classification or approval of instructor. Approval of the department head.

MARS 485 Directed Studies

Credits 1 to 6. 1 to 6 Other Hours. Special topics and problems suited to analysis by individuals or small groups concerning special aspects of marine sciences. **Prerequisites:** Junior or senior classification or approval of instructor. Approval of department head.

MARS 489 Special Topics in Marine Sciences

Credits 1 to 4. 1 to 4 Lecture Hours. Study of selected topics in an identified area of marine sciences. **Prerequisite:** Junior or senior classification or approval of instructor.

MARS 491 Research in Marine Sciences

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in Marine Sciences. May be repeated 2 times for credit. Please see academic advisor in department. Registration in multiple sections of this course is possible within a given semester provided that the per semester credit hour limit is not exceeded.

Prerequisites: Junior or senior classification and approval of instructor.

MART - Marine Transportation (MART)

MART 103 Basic Safety and Lifeboatman Training

Credits 3. 2 Lecture Hours. 3 Lab Hours. Introduction to lifesaving equipment and apparatus, personal survival techniques, personal social and environmental responsibility and introductory medical first aid and CPR; practical lifeboat and survival training for the U.S. Coast Guard certification as life boatman. **Prerequisite:** Admission to license option program.

MART 104 Maritime Shipboard Leadership

Credits 3. 3 Lecture Hours. Principles of leadership and management aboard merchant vessels; outline global and organizational duties and responsibilities of various departments found aboard merchant vessels; development of an understanding of social responsibilities of merchant marine ship's officer in regard to laws, regulations, and management; engagement in critical thinking of decision making during daily operations aboard merchant vessels. **Prerequisites:** Admission to deck license option program.

MART 115 Seamanship I

Credits 3. 2 Lecture Hours. 3 Lab Hours. (STCW). Theory and application of traditional seamanship, such as handling of natural fiber, synthetic and wire ropes, block and tackle and marlinespike; introduction to competencies of the deck department, including safe systems of work, inspections and maintenance, anchoring, mooring operations, ladder use, crane operations and duties of the lookout and quartermaster.

Prerequisite: Admission to deck license option program.

MART 130 Introduction to Maritime Law

Credit 1. 1 Lecture Hour. Introduction to the various statutes which govern the operation of watercraft subject to U.S. jurisdiction; emphasis on the International Navigational Rules Act of 1977 which implemented the 72COLREGS, the regulations resulting from the 1972 Convention on International Regulations for Preventing Collisions at Sea. **Prerequisites:** Admission to Deck License Option program; freshman classification.

MART 200 Deck Sea Training I: Basic Communications, Navigation and Seamanship

Credits 4. 4 Other Hours. Practical application of shoreside studies aboard training ship during first training cruise; basic projects in communications, navigation, seamanship and rules of the road.

Prerequisites: Grade of C or better in MART 103, MART 115 or MART 203, MART 201, and MART 204, or concurrent enrollment, or approval of MART department head; admission into Deck License Option Program.

MART 201 Vessel Structure and Ship Knowledge

Credits 3. 2 Lecture Hours. 2 Lab Hours. Introduction to ship nomenclature and design, types and methods of ship construction, admeasurement and typical outfitting of various types of commercial vessels; classification societies, shipbuilding materials and methods, structural components and appurtenances of vessels. **Prerequisite:** Admission to deck license option program.

MART 202 Ship Stability and Trim

Credits 3. 2 Lecture Hours. 2 Lab Hours. Principles of flotation and buoyancy; inclining experiments; free surface; transverse and longitudinal stability; trim; motion of ship in waves and seaways; application of stability, trim and stress tables; effect of center of gravity on seaworthiness and stability; actions in event of partial loss of intact buoyancy; fundamentals of watertight integrity. **Prerequisites:** Grade of C or better in MART 103, MART 115, MART 200, MART 201, and MART 204; and grade of D or better in PHYS 201, or approval of MART department head.

MART 204 Terrestrial Navigation I

Credits 3. 2 Lecture Hours. 2 Lab Hours. (STCW). Technical and practical concepts of terrestrial navigation; includes fundamentals of terrestrial coordinates, piloting, chart construction and development, aids to navigation, useful publications, compass corrections, and the use of sailings to determine rhumb line course and distances. **Prerequisites:** Admission to deck license option program; MATH 140 or concurrent enrollment.

MART 205 Marine Surveying

Credits 3. 3 Lecture Hours. Fundamentals of marine surveying using the various types of maritime surveys; writing survey reports by meeting regulatory and industry standards for submission to maritime clients. **Prerequisites:** Grade of C or better in MART 115, MART 201, MART 202, MART 212, MART 215 (MART Majors); or MARE 205 (MARE Majors); or MARE 100 (MARE Majors); or approval of department head.

MART 208 Maritime Meteorology

Credits 3. 3 Lecture Hours. Weather and forecasting techniques used by merchant mariners to determine cloud formation, precipitation, visibility, atmospheric pressure, fronts, ocean currents, weather and voyage routing and ship maneuvering based upon ship's technology and reporting equipment; ocean passage planning. **Prerequisites:** Grade of C or better in MART 225 and MART 300 or MART 350, or approval of department head.

MART 210 Integrated Navigation I: RADAR/ARPA/ECDIS

Credits 4. 3 Lecture Hours. 3 Lab Hours. Theory, operation and interpretation of marine radar and automatic radar plotting aids (ARPA) and Electronic Chart Display Systems (ECDIS); introductory level watchkeeping, including applied use of radar, ARPA and ECDIS; U.S. Coast Guard Certification as "RADAR Observer" and Standards of Training, Certification and Watchkeeping (STCW) Radar and ARPA endorsements. **Prerequisites:** Grade of C or better in MART 200 and MART 225 or approval of department head.

MART 212 Marine Dry Cargo Operations

Credits 3. 3 Lecture Hours. Modern dry cargo principles associated with handling of general cargo, refrigerated cargo, dangerous cargo, containers, roll-on roll-off; cargo ventilation, securing of cargo, stability and trim, cargo gear stresses and heavy lift operations; documentation required for cargo operations, along with practical stowage problems. **Prerequisites:** Grade of C or better in MART 200; concurrent enrollment in MART 202; or approval of department head.

MART 213 Liquefied Gas Tankers

Credits 3. 2 Lecture Hours. 2 Lab Hours. Preparation as cargo officer for loading, discharging and transit of liquefied gas cargoes; emphasis on physical and chemical properties, operations, safety, firefighting and pollution prevention; completion required for registration in a MART 350 LNG commercial assignment. **Prerequisites:** MART majors - Grade of C or better in MART 200; or approval of department head; MARE majors - Grade of C or better in MARE 200 or MART 200, or approval of MART department head. Completion of this course is required for assignment to a MART 350 oil or chemical tanker commercial internship.

MART 215 Seamanship II

Credits 3. 2 Lecture Hours. 3 Lab Hours. Topics include mechanical appliances aboard ship, accident prevention, vessel sanitation, vessel operations, United States marine inspection laws and regulations, communication, ship's business, and International Conventions and Codes. **Prerequisites:** Grade of C or better in MART 200 or approval of department head.

MART 225 Terrestrial Navigation II

Credits 3. 3 Lecture Hours. (STCW). Builds upon MART 204; includes in-depth analysis of the earth's magnetic field, the ship's magnetic field, magnetic compass adjustment, and the sailings; introduction to propeller slip, ocean voyage planning, tide and tidal current theory, current sailing and major ocean circulation; discussion concerning the knowledge of the principles of magnetic compasses; required for Deck License Option. May be taken two times for credit. **Prerequisites:** Grade of C or better in MART 200 and MART 204; MATH 142, or approval of department head.

MART 265 Introduction to Dynamic Positioning OSVDPA Phase I

Credits 3. 2 Lecture Hours. 3 Lab Hours. Basic understanding and operation of Dynamic Positioning technology; theory and nomenclature of Dynamic Positioning principles and equipment; practical training utilizing Class C simulators; operating, maneuvering and familiarization with simulated DP vessels; satisfactory completion of this course provides the student entry in to the Off Shore Service Vessel Dynamic Positioning Authority (OSVDPA) scheme. **Prerequisites:** Grade of C or better in MART 201, MART 204, and MART 200; sophomore or junior classification.

MART 285 Directed Studies

Credits 1 to 4. 1 to 4 Lecture Hours. Directed study in problems in marine transportation not covered by other courses in the department. **Prerequisite:** Approval of department head.

MART 289 Special Topics in Marine Transportation

Credits 1 to 4. 1 to 4 Lecture Hours. Study of selected topics in an identified area of marine transportation or nautical science. **Prerequisite:** Approval of department head.

MART 300 Deck Sea Training II: Intermediate Communications, Navigation and Seamanship

Credits 4. 4 Other Hours. Practical application of shoreside studies aboard training ship during second training cruise; intermediate projects in communications, navigation, seamanship and rules of the road. **Prerequisites:** Grade of C or better in MART 200 or NAUT 200; grade of C or better in MART 202, MART 210 or MART 306, MART 212 or MART 312, MART 215 or MART 301, MART 303 and MART 321, or concurrent enrollment; junior or senior classification or approval of MART department head.

MART 303 Celestial Navigation

Credits 3. 2 Lecture Hours. 3 Lab Hours. Full range of celestial navigation; survey of nautical astronomy, sight reduction, sextants, compass error determination, and solutions of the navigational triangle by various methods. **Prerequisites:** Grade of C or better in MART 200, MART 204, and MART 225, or approval of MART department head, and junior or senior classification.

MART 307 Global Maritime Distress Safety System

Credits 3. 2 Lecture Hours. 3 Lab Hours. Requirements, regulations, equipment, principles and hands-on operating procedures of each Global Maritime Distress Safety System subsystem, including: SARTS, EPIRBs, NAVTEX, INMARSAT, SAFETYNET, VHF Survival Craft Transceivers, DSC, and HF Radio telephone; USCG and FCC certification as GMDSS Operator; minimum passing grade 75%. **Prerequisites:** Grade of C or better in MART 300 or MART 350.

MART 308 Fast Rescue Craft

Credits 3. 2 Lecture Hours. 3 Lab Hours. Search and rescue techniques through fast rescue craft maneuvers and team management; description of various rescue craft and U.S. Coast Guard "Fast Rescue Craft" Standard of Watchkeeping endorsement. **Prerequisites:** MART majors - Grade of C or better in MART 200 or NAUT 200; grade of C or better in MART 103, MART 115 or MART 203, MART 201 and MART 204, or concurrent enrollment or approval of department head; MARE majors - Grade of C or better in MARE 200 or MARR 200; grade of C or better in MART 103.

MART 310 Integrated Navigation II: Electronic Navigation

Credits 3. 2 Lecture Hours. 3 Lab Hours. Theory, operation and application of marine electronic navigation systems and aids; includes marine gyrocompass, vessel steering systems, hydrosonic systems, satellite navigation systems, AIS and VDR; intermediate level watchkeeping, including applied use of radar, ARPA and ECDIS. **Prerequisites:** Grade of C or better in MART 300 or MART 350; concurrent enrollment and grade of C or better in MART 321; or approval of department head.

MART 311 Tug and Towing Operations

Credits 3. 2 Lecture Hours. 3 Lab Hours. Knowledge associated with the safe, efficient operation of towing vessels through classroom discussion and through underway, hands-on vessel training aboard the T/V Ranger and barges. **Prerequisites:** Grade of C or better in MART 200 or concurrent enrollment; junior or senior classification.

MART 313 Marine Liquid Cargo Operations

Credits 3. 2 Lecture Hours. 2 Lab Hours. Principles and practice of bulk liquid, gas handling and carriage by water craft; theoretical and practical problems involved in loading, stowing and discharging of petroleum, chemical, elevated temperature and cryogenic cargoes; marine pollution abatement, personnel safety and firefighting techniques and systems; completion of course required for assignment to a MART 350 oil or chemical tanker commercial internship. **Prerequisites:** MART majors - Grade of C or better in MART 200; or approval of department head; MARE majors - Grade of C or better in MARE 200 or MART 200, or approval of MART department head.

MART 315 Integrated Navigation III - Shiphandling for the Mariner

Credits 2. 1 Lecture Hour. 3 Lab Hours. Principles and methods of propulsion and steering of ships including hull, propeller and rudder design; ship handling at sea, in narrow channels, docking, undocking, mooring; study of the principles of hydrodynamics that govern ship movement. **Prerequisites:** Grade of C or better in MART 300 or MART 350, and in MART 321, or approval of MART department head.

MART 321 Navigation Rules - International and Inland

Credits 2. 2 Lecture Hours. Purpose, application and knowledge of the International Regulations for Preventing Collision at Sea (COLREGS) and the Inland Navigation Rules and Regulations (Inland Rules). **Prerequisites:** Grade of C or better in MART 300 or MART 350; and grade of C or better in MART 130; or approval of department head.

MART 350 Deck Sea Training II – Commercial Internship

Credits 4. 4 Other Hours. Practical application of shoreside studies aboard an assigned merchant vessel during second training cruise; intermediate projects in communications, navigation, seamanship, rules for the road and other subjects pertaining to the maritime industry. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisites:** Grade of C or better in MART 200 or NAUT 200, MART 202, MART 210 or MART 306, MART 212 or MART 312, MART 215 or MART 301, MART 303, and MART 321, or concurrent enrollment; junior or senior classification or approval of MART department head.

MART 400 Deck Sea Training III: Advanced Communications, Navigation and Seamanship

Credits 4. 4 Other Hours. Practical application of shoreside studies aboard training ship during third training cruise; advanced projects in communications, navigation, seamanship and rules of the road. **Prerequisites:** Grade of C or better in MART 300, MART 350, or NAUT 300; grade of C or better in MART 307, MART 310 or MART 304, and MART 313 or MART 406, or concurrent enrollment; junior or senior classification or approval of MART department head.

MART 401 Maritime Security

Credits 3. 3 Lecture Hours. Presentation and analysis of historical and current maritime security issues, leading to the understanding of, and proficiency in, security-related duties and responsibilities of licensed Deck Officers aboard ship and of maritime industry personnel ashore. **Prerequisites:** Grade of C or better in MART 300 or 350, senior classification, or approval of MART department head.

MART 403 Advanced Topics in Shipboard Operations

Credits 3. 3 Lecture Hours. Advanced shipboard operations focuses on the expectations of the Third Mate, AGT, Oceans as a bridge watchstander or cargo officer on various types of vessels; emphasis on refreshing knowledge covering navigation, cargo handling and stowage, emergency response and onboard ship operations to prepare for immediate employment on board and for USCG examination; links to publications to help with additional knowledge and gain a deeper understanding of each topic; recommended to be taken concurrently with MART 404 during the semester prior to scheduling USCG Examinations. **Prerequisites:** MART 400, or concurrent enrollment or approval of department head.

MART 404 The Navigator

Credits 2. 1 Lecture Hour. 3 Lab Hours. Final advanced navigation course, reviewing and testing in terrestrial, celestial, and electronic navigation in preparation for the Third Mate's License; registration requirement and only permitted in the term immediately prior to taking the USCG License exams. **Prerequisites:** Grade of C or better in MART 400; Senior classification, or approval of MART department head.

MART 410 Bridge Resource Management

Credits 2. 1 Lecture Hour. 3 Lab Hours. Advanced level Bridge Watchkeeping; integration of navigation, communications and seamanship in Bridge Resource Management (BRM) training required under the International Convention on the Standards for Training and Certification of Watchkeepers, using simulator-based teaching techniques. **Prerequisites:** Grade of C or better in MART 300, MART 350, or NAUT 300; grade of C or better in MART 321, MART 210 or MART 306, and MART 310 or MART 304, or concurrent enrollment or approval of MART department head.

MART 420 Advanced Towing

Credits 3. 2 Lecture Hours. 3 Lab Hours. Building upon the technical and practical concepts of basic towing covered in MART 311 by completing the required practical USCG Assessments to qualify for the Near Coastal/Oceans Towing Officer Assessment Record (TOAR); successful completion of the TOAR enables graduation with a Mate of Towing endorsement on the USCG Merchant Mariners Credential (MMC) - Third Mate Unlimited license. **Prerequisites:** Grade of C or better in MART 311; junior or senior classification.

MART 430 Combined Basic & Advanced Training for Personnel on Vessels Subject to the IGF Code

Credits 3. 3 Lecture Hours. Combined Basic & Advanced Training for Personnel on Vessels Subject to the IGF Code. Safety duties associated with the care, use or in emergency response to the fuel on board ships subject to the IGF Code; care and use of fuels and fuel systems on ships subject to the IGF Code, the knowledge, understanding and proficiency (KUPs) required to demonstrate competence in safety for ships using gases or other low flashpoint fuels. **Prerequisites:** Grade of C or better in MART 200; grade of C or better in MART 213 or MART 313, or concurrent enrollment; or approval of department head.

MART 484 Internship

Credits 0 to 6. 0 to 6 Other Hours. Special topics and problems in field and/or laboratory work suited to analysis by individuals or small groups concerning internships of marine transportation; may require a report describing techniques and results. May be repeated for credit. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisites:** Junior or senior classification or approval of department head.

MART 485 Directed Studies

Credits 1 to 4. 1 to 4 Lecture Hours. Directed study in problems in marine transportation not covered by other courses in the department. **Prerequisite:** Senior classification or approval of department head.

MART 489 Special Topics in Marine Transportation

Credits 1 to 3. 1 to 3 Lecture Hours. 0 to 3 Lab Hours. Study of selected topics in an identified area of marine transportation or nautical science. **Prerequisites:** Approval of MART department head. Junior or senior classification or approval of instructor.

MART 491 Research in Marine Transportation

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in Marine Transportation. May be repeated 2 times for credit. See academic advisor in department. Registration in multiple sections of this course is possible within a given semester provided that the per semester credit hour limit is not exceeded. **Prerequisites:** Junior or senior classification and approval of instructor.

MART 498 Maritime Medical Care Provider

Credits 2. 1 Lecture Hour. 3 Lab Hours. Basic and advanced training for medical care of the sick and injured in the maritime environment; fundamentals of identification and assessment of and appropriate interventions for life-threats and other medical or trauma related conditions commonly encountered at sea; must complete course within one year of graduation. **Prerequisites:** MART majors - Grade of C or better in MART 300, MART 350, or NAUT 300, or concurrent enrollment or approval of MART department head; MARE majors - Grade of C or better in MARR 300, MARE 300, or MARE 350, or concurrent enrollment or approval of MART department head.

MASC - Integrated Math & Sci (MASC)

MASC 320 Inquiries in Physical Science

Credits 3. 3 Lecture Hours. Integration and connections among topics in physical sciences—matter, energy, force, motion, scientific cycles; focuses on inquiry emphasizing experimental design, data analysis and collection, and use of models in the physical sciences. **Prerequisites:** Junior or senior classification.

MASC 351 Problem Solving in Mathematics

Credits 3. 3 Lecture Hours. Problem solving strategies in math and science; evaluate conjectures and arguments; writing and collaborating on problem solutions; posing problems and conjectures; constructing knowledge from data; developing relationships from empirical evidence; connecting mathematics concepts; readings, discussions, and analyses will model and illustrate mathematics problems solving and proofs. **Prerequisite:** Junior or senior classification.

MASC 420 Inquiries in Life and Earth Sciences

Credits 3. 3 Lecture Hours. Integration and connections among topics in the life and earth sciences—diversity, natural selection, ecosystem development, earth's features, and weather systems; inquiry emphasizing experimental design, data analysis and collection; use of models in the life and earth sciences. **Prerequisites:** Junior or senior classification.

MASC 450 Integrated Mathematics

Credits 3. 3 Lecture Hours. Integration and connections among topics and ideas in mathematics and other disciplines; connections between algebra and geometry and statistics and probability; focus for integration with authentic problems requiring various branches of mathematics. **Prerequisite:** Admission to teacher education; junior or senior classification.

MASC 489 Special Topics in...

Credits 0 to 4. 0 to 4 Other Hours. Study of selected topics in an identified area of integrated math and science. May be repeated for credit.

Prerequisites: Junior or senior classification; approval of department head.

MASE - Maritime Systems Engr (MASE)

MASE 400 Introduction to Coastal Engineering

Credits 3. 3 Lecture Hours. Mechanics of shallow water wave motion; wave diffraction, refraction and reflection; wave forecasting; water level fluctuations; coastal processes and geomorphology; erosion control and shoreline stabilization; coastal structures; beach nourishment; dredging; introduction to physical and computer models and modeling techniques; design in coastal engineering. **Prerequisites:** OCEN 300; senior classification or approval of instructor. Enrollment in OCSE major degree sequence.

MASE 401 Underwater Acoustics

Credits 3. 3 Lecture Hours. Fundamentals of underwater acoustics, SONAR equations, propagation of underwater sound, acoustic transducers and arrays, noise in the ocean environment, design and prediction of SONAR systems, ocean engineering applications of underwater sound. **Prerequisites:** CVEN 311/EVEN 311, CVEN 336. Junior or senior classification or approval of instructor. Enrollment in OCSE major degree sequence.

MASE 407 Capstone Design II

Credits 3. 6 Lab Hours. Design of a major engineered system based on a proposal developed in MASE 406 completed as a group project; realistic application of engineering skills and tools, experience managing a significant engineering-design effort. This is a writing-intensive course including a major report and weekly one-page written reports. **Prerequisites:** MASE 406. Enrollment in OCSE major degree sequence.

MASE 410 Measurements in the Ocean Laboratory

Credit 1. 3 Lab Hours. Fundamental techniques and instrumentation for field and laboratory measurements pertaining to coastal and ocean engineering (e.g., currents, wave height, wave/sediment interaction, mass transport, surveying, etc.); experiment planning; data analysis and presentation; written reports on methodology, analysis, and results of experiments. **Prerequisites:** OCEN 300, MASE 400. Junior or senior classification or approval of instructor. Enrollment in OCSE major degree sequence.

MASE 485 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Directed study on selected current problems in the ocean and/or maritime industry. Offered to enable individuals or groups to undertake and complete with credit some specialized investigation not covered by other courses. **Prerequisites:** Approval of department head. Junior or senior classification or approval of instructor. Enrollment in OCSE major degree sequence.

MASE 489 Special Topics

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in a identified area of maritime systems engineering. May be repeated for credit. **Prerequisite:** Junior or senior classification or approval of instructor. Enrollment in OCSE major degree sequence.

MASE 491 Research in Maritime Systems Engineering

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in Maritime Systems Engineering. May be repeated 2 times for credit. Please see academic advisor in department. Registration in multiple sections of this course is possible within a given semester provided that the per semester credit hour limit is not exceeded. **Prerequisites:** Junior or senior classification and approval of instructor. Enrollment in OCSE major degree sequence.

MAST - Maritime Studies (MAST)

MAST 101 Connections

Credit 1. 1 Lecture Hour. A first year experience seminar to explore the connections between academics disciplines to develop creative and critical thinking strategies which will increase abilities to implement solutions, refine information literacy skills, and identify the resources available for a successful transition from high school to the university environment.

MAST 220 Introduction to Museums and Conservation

Credits 3. 3 Lecture Hours. Introduction to museums, cultural heritage and collections care; best practice for non-profit institutions, public engagement, and the collection, preservation and exhibition of material culture; emphasis on archaeological, ethnographic and historical collections, or other collections of cultural significance.

MAST 226 Museums, Law and Ethics

Credits 3. 3 Lecture Hours. Exploration of museum law and ethics; interdisciplinary topics.

MAST 230 Maritime Folklore

Credits 3. 3 Lecture Hours. Maritime folklore tales and myths; monsters and mysteries of the sea.

MAST 240 Introduction to Maritime Studies

Credits 3. 3 Lecture Hours. First year experience; exploration of Maritime Studies; interdisciplinary topics.

MAST 252 Crafts of the Maritime World

Credits 3. 3 Lecture Hours. An exploration of various crafts, skills and aesthetic/design used in and supporting the maritime world; hands-on activities and practical experience of various skills and processes, using traditional tools required to put a ship to sea; from carpentry to rope-making, sewing canvas sails to making blocks.

MAST 265 Elissa Sail Training

Credits 3. 3 Lecture Hours. Fundamentals of seamanship on a late 19th century square-rigged sailing vessel; train in sailing and maintenance of the 1877 barque ELISSA (owned and operated by the Texas Seaport Museum); lectures and activities in maritime life and seafaring history.

MAST 270 Historic Seafaring and Maritime Heritage

Credits 3. 3 Lecture Hours. Fundamentals of traditional seamanship and an exploration of the cultures and technologies of seafaring people throughout history and in various geographical locations.

MAST 289 Special Topics In...

Credits 1 to 3. 1 to 3 Lecture Hours. Selected topics in a identified area of maritime studies. May be repeated for credit.

MAST 333 Viking Archaeology and Norse Mythology

Credits 3. 3 Lecture Hours. Overview of Viking Age (ca. 800 to 1100 C.E.) in Northern Europe; topics include Norse seafaring, world-view, society, archaeology, religion and cosmology as know from the archaeological and literary record. **Prerequisite:** Junior or senior classification or approval of instructor.

MAST 336 Maritime Foreign Policy

Credits 3. 3 Lecture Hours. Strategies used by governments to guide international actions; objectives of state leaders in decision making; sources, processes, objectives and outcomes of maritime policy choices. **Prerequisite:** Junior or senior classification or approval of instructor.

MAST 345 Texas Maritime Culture and History

Credits 3. 3 Lecture Hours. The coastal peoples, maritime history and culture of the Texas Gulf Coast ranging from pre-historic times to the present day; geography's influence on exploration, resources utilization, development and inland access; Texas ports historic and modern; shipwreck sites and historical texts; La Salle's La Belle, Texas Navy, Mexican War logistics; Civil War Naval actions, Texas Fisheries, tourism and recreation. **Prerequisite:** Junior or senior classification.

MAST 350 A History of Wooden Ship Construction

Credits 3. 3 Lecture Hours. This course is designed to give undergraduate students an overview of ship construction and possible cultural factors that may influence how a shipwright builds a vessel. **Prerequisites:** Junior or senior classification or approval of instructor.

MAST 354 Ancient Egyptian Seafaring

Credits 3. 3 Lecture Hours. Archaeology, iconography and written records of ancient Egypt as they relate to local and international trade by land, river and sea, beginning in Neolithic times (c. 5000 B.C.) to the end of the New Kingdom (c. 1069 B.C.). **Prerequisites:** ANTH 316; junior or senior classification or approval of instructor.

MAST 365 Material Culture

Credits 3. 3 Lecture Hours. Examination of material evidence of human life, from cradles to graves, churches to forts, teapots to landscapes; material culture artifacts, the processes and technologies used to create them and their use in every day life; application to archaeology, museum studies and basic engineering. **Prerequisites:** Junior or senior classification or approval of instructor.

MAST 369 Collections Care and Management

Credits 3. 3 Lecture Hours. Managing collections in libraries, archives and museums; media and collections storage; digitization and metadata processes; use of writing styles and citations. **Prerequisites:** MAST 220; junior or senior classification or approval of instructor.

MAST 371 Archaeology of the Pacific

Credits 3. 3 Lecture Hours. Overview of the archaeology, history and cultures of the Pacific Rim; emphasizing the cultures of Polynesia, Melanesia, and Micronesia. **Prerequisite:** Junior or senior classification or approval of instructor.

MAST 411 International Maritime Culture

Credits 3. 3 Lecture Hours. Strategies used in the exploitation of marine, coastal, and island habitats throughout human evolutionary history and the variety and complexity of adaptations in such environments; lectures and group discussions with occasional slide or movie presentations. **Prerequisites:** Junior or senior classification.

MAST 425 Thesis and Technical Writing

Credits 3. 3 Lecture Hours. Rhetorical techniques for professional expository prose; intertextual argumentation and analysis. **Prerequisite:** Junior or senior classification; ENGL 104 and ENGL 203 or ENGL 210.

MAST 441 Maritime Piracy

Credits 3. 3 Lecture Hours. Research of social, economic, political and cultural aspects of piracy from ancient to modern times; presentation of findings; understanding modern perception of pirates through modern art, literature and movies. **Prerequisites:** Junior or senior classification and approval of instructor.

MAST 470 Advanced Museum Studies

Credits 3. 3 Lecture Hours. Exploration of advanced topics in museum programs; preservation, research, education, outreach; development and implementation; emphasis on historical contexts, disciplinary intersections, ethical obligations and professional responsibilities; service to community, state and national interest and advancement of sciences. **Prerequisite:** MAST 220; junior or senior classification.

MAST 480 Honors Seminar in Service Learning

Credit 1. 1 Lecture Hour. Opportunities for community service through active community participation; includes structured time for reflection; use of skills and knowledge in real-life situations; extend learning beyond the classroom; foster a sense of caring for others. **Prerequisites:** Junior or senior classification or permission from the instructor and must be a member of the Honors Program.

MAST 481 Seminar in Maritime Studies

Credit 1. 1 Lecture Hour. This course is intended to provide students with the opportunity to conduct in-depth research on a particular issue, event, period, or people in maritime studies. **Prerequisite:** This one-credit hour course is open to senior maritime studies majors or approval of instructor.

MAST 484 Undergraduate Internship

Credits 0 to 6. 0 to 6 Other Hours. Supervised study in a research or teaching laboratory remote from TAMUG. Student involvement is to consist of real-life learning or research, teaching, management, or a combination of these. May be repeated two times for credit. **Prerequisite:** Junior or senior classification or approval of instructor.

MAST 485 Directed Studies

Credits 1 to 4. 1 to 4 Lecture Hours. Individually supervised research or advanced study on restricted area not covered in regular courses. **Prerequisite:** Junior or senior classification or approval of instructor.

MAST 489 Special Topics

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in a identified area of maritime studies. May be repeated for credit. **Prerequisite:** Junior or senior classification or approval of instructor.

MAST 491 Research in Maritime Studies

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in Maritime Studies. May be repeated 2 times for credit. Please see academic advisor in department. Registration in multiple sections of this course is possible within a given semester provided that the per semester credit hour limit is not exceeded. **Prerequisites:** Junior or senior classification and approval of instructor.

MATH - Mathematics (MATH)

MATH 102 Algebra

Credits 3. 3 Lecture Hours. (MATH 1314, 1414) Algebra. Sets, structure of number system; absolute values, solution sets of linear and nonlinear equations, of systems of equations, and of inequalities; relations and functions, graphical representations, graphical representations, progressions, mathematical induction, determinants; also taught at Galveston campus.

MATH 135 Mathematics for Teachers I

Credits 3. 3 Lecture Hours. (MATH 1350) Mathematics for Teachers I. Concepts of sets, logic, numeration systems, elementary number theory, and properties of the various number systems with an emphasis on problem solving and critical thinking. **Prerequisites:** High school algebra I and II and geometry.

MATH 136 Mathematics for Teachers II

Credits 3. 3 Lecture Hours. (MATH 1351) Mathematics for Teachers II. Concepts of Euclidean geometry, measurement, probability, and statistics with an emphasis on problem solving and critical thinking. **Prerequisites:** High school algebra I and II and geometry.

MATH 140 Mathematics for Business and Social Sciences

Credits 3. 3 Lecture Hours. (MATH 1324) Mathematics for Business and Social Sciences. Application of common algebraic functions, including polynomial, exponential, logarithmic and rational, to problems in business, economics and the social sciences; includes mathematics of finance, including simple and compound interest and annuities; systems of linear equations; matrices; linear programming; and probability, including expected value. Only one of the following will satisfy the requirements for a degree: MATH 140 or MATH 168. **Prerequisites:** High school algebra I and II and geometry; not open to senior classification; also taught at Galveston campus.

MATH 142 Business Calculus

Credits 3. 3 Lecture Hours. (MATH 1325) Business Calculus. Limits and continuity; techniques and applications of derivatives including curve sketching and optimization; techniques and applications of integrals; emphasis on applications in business, economics, and social sciences. Only one of the following will satisfy the requirements for a degree: MATH 142, MATH 147, MATH 151 or MATH 171. **Prerequisites:** Grade of C or better in MATH 140 or MATH 150, or equivalent or acceptable score on Texas A&M University math placement exam; not open to senior classification; also taught at Galveston campus.

MATH 147 Calculus I for Biological Sciences

Credits 4. 3 Lecture Hours. 2 Lab Hours. Introduction to differential calculus in a context that emphasizes applications in the biological sciences. Only one of the following will satisfy the requirements for a degree: MATH 142, MATH 147, MATH 151 or MATH 171. **Prerequisite:** Grade of C or better in MATH 150 or equivalent or acceptable score on TAMU Math Placement Exam; also taught at Galveston campus.

MATH 148 Calculus II for Biological Sciences

Credits 4. 3 Lecture Hours. 2 Lab Hours. Introduction to integral calculus in a context that emphasizes applications in the biological sciences; ordinary differential equations and analytical geometry. Only one of the following will satisfy the requirements for a degree: MATH 148, MATH 152 or MATH 172. **Prerequisite:** MATH 147, MATH 151 or approval of instructor; also taught at Galveston campus.

MATH 150 Functions, Trigonometry and Linear Systems

Credits 4. 3 Lecture Hours. 2 Lab Hours. (MATH 2412) Functions, Trigonometry and Linear Systems. Graphs, functions, college algebra and trigonometry, linear systems and vectors; also taught at Galveston and Qatar campuses.

MATH 151 Engineering Mathematics I

Credits 4. 3 Lecture Hours. 2 Lab Hours. (MATH 2413) Engineering Mathematics I. Rectangular coordinates, vectors, analytic geometry, functions, limits, derivatives of functions, applications, integration, computer algebra. MATH 171 designed to be a more demanding version of this course. Only one of the following will satisfy the requirements for a degree: MATH 131, MATH 142, MATH 147, MATH 151 or MATH 171. **Prerequisite:** Grade of C or better in MATH 150 or equivalent or acceptable score on TAMU Math Placement Exam; also taught at Galveston and Qatar campuses.

MATH 152 Engineering Mathematics II

Credits 4. 3 Lecture Hours. 2 Lab Hours. (MATH 2414) Engineering Mathematics II. Differentiation and integration techniques and their applications (area, volumes, work), improper integrals, approximate integration, analytic geometry, vectors, infinite series, power series, Taylor series, computer algebra. MATH 172 designed to be a more demanding version of this course. Only one of the following will satisfy the requirements for a degree: MATH 148, MATH 152 or MATH 172. **Prerequisite:** Grade of C or better in MATH 151 or equivalent; also taught at Galveston and Qatar campuses.

MATH 167 Explorations in Mathematics

Credits 3. 3 Lecture Hours. Application of mathematics to topics of contemporary societal importance using quantitative methods; may include elements of management science (optimal routes, planning or scheduling), logic, sets, counting techniques (combinations and permutations), probability, statistics, cryptography, fairness (apportionment or voting), or patterns. **Prerequisites:** High school algebra I and II.

MATH 168 Finite Mathematics

Credits 3. 3 Lecture Hours. Linear equations and applications; systems of linear equations, matrix algebra and applications, linear programming, probability and applications, statistics. Only one of the following will satisfy the requirements for a degree: MATH 140 or MATH 168.

Prerequisites: High school algebra I and II and geometry; also taught at Galveston campus.

MATH 170 Freshman Mathematics Laboratory

Credit 1. 2 Lab Hours. Computing and problem solving laboratory; introduction to the various mathematical disciplines; development of skills in mathematical problem solving and skills in teamwork. May be taken two times for credit. **Prerequisites:** Concurrent enrollment in MATH 150, MATH 171, or MATH 172; admission to College of Science.

MATH 171 Calculus I

Credits 4. 4 Lecture Hours. Vectors, functions, limits, derivatives, Mean Value Theorem, applications of derivatives, integrals, Fundamental Theorem of Calculus. Designed to be more demanding than MATH 151. Only one of the following will satisfy the requirements for a degree: MATH 131, MATH 142, MATH 147, MATH 151, or MATH 171. **Prerequisite:** Grade of C or better in MATH 150 or equivalent or acceptable score on TAMU Math Placement Exam.

MATH 172 Calculus II

Credits 4. 4 Lecture Hours. Techniques of integration, applications of integrals, improper integrals, sequences, infinite series, vector algebra and solid analytic geometry. Designed to be more demanding than MATH 152. Only one of the following will satisfy the requirements for a degree: MATH 148, MATH 152, or MATH 172. **Prerequisite:** Grade of C or better in MATH 147, MATH 151 or MATH 171 or equivalent.

MATH 200 Horizons of Mathematics

Credit 1. 1 Lecture Hour. Overview of different areas and topics of mathematics including logic, infinite sets, elements of topology, elements of history of mathematics; introduction to future courses in math degree plans and to some areas of research done by mathematics department faculty; topics may vary at the discretion of the instructor. **Prerequisites:** MATH and APMS majors; freshmen or sophomore classification; approval of instructor.

MATH 221 Several Variable Calculus

Credits 4. 4 Lecture Hours. Vector algebra and solid analytic geometry; calculus of functions of several variables; Lagrange multipliers; multiple integration, theory, methods and application; line and surface integrals, Green's and Stokes' theorems; Jacobians. Designed to be more demanding than MATH 251 and MATH 253. Only one of the following will satisfy the requirements for a degree: MATH 221, MATH 251, or MATH 253. **Prerequisite:** Grade of C or better in MATH 148, MATH 152, or MATH 172, or equivalent.

MATH 225 Advanced Spreadsheet Techniques

Credit 1. 1 Lecture Hour. Advanced commands, formatting and functionality of spreadsheets, with Excel being the particular example.

Prerequisite: MATH or APMS major.

MATH 251 Engineering Mathematics III

Credits 3. 3 Lecture Hours. (MATH 2315) Engineering Mathematics III. Vector algebra, calculus of functions of several variables, partial derivatives, directional derivatives, gradient, multiple integration, line and surface integrals, Green's and Stokes' theorems. MATH 221 designed to be a more demanding version of this course. Only one of the following will satisfy the requirements for a degree: MATH 221, MATH 251, or MATH 253. **Prerequisite:** MATH 148, MATH 152, or MATH 172; also taught at Galveston and Qatar campuses.

MATH 253 Engineering Mathematics III

Credits 4. 3 Lecture Hours. 2 Lab Hours. (MATH 2415) Engineering Mathematics III. Vector algebra; calculus of functions of several variables, partial derivatives, directional derivatives, gradient, multiple integration, line and surface integrals, Green's and Stokes' theorems, computer algebra. MATH 221 designed to be a more demanding version of this course. Only one of the following will satisfy the requirements for a degree: MATH 221, MATH 251, or MATH 253. **Prerequisite:** MATH 148, MATH 152, or MATH 172.

MATH 281 Seminar in Mathematics

Credit 1. 1 Lecture Hour. Designed to familiarize students with mathematics pertaining to real world applications in such areas as biology, signal processing, quantum computation and robotics. May be taken four times for credit.

MATH 285 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Special problems not covered by any other lower-division course in the curriculum; intended for freshman and sophomore students. **Prerequisite:** Approval of department head.

MATH 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of mathematics. May be repeated for credit. **Prerequisite:** Approval of instructor.

MATH 291 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in mathematics. May be repeated 2 times for credit. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

MATH 300 Foundations of Mathematics

Credits 3. 3 Lecture Hours. Foundations of mathematics including logic, set theory, combinatorics, and number theory. **Prerequisite:** Grade of C or better in MATH 148, MATH 152 or MATH 172, or equivalent.

MATH 302 Discrete Mathematics

Credits 3. 3 Lecture Hours. Formal structures for describing data, algorithms and computing devices; theory and applications of sets, graphs and algebraic structures. **Prerequisite:** MATH 148, MATH 152, or MATH 172.

MATH 304 Linear Algebra

Credits 3. 3 Lecture Hours. Introductory course in linear algebra covering abstract ideas of vector space and linear transformation as well as models and applications of these concepts, such as systems of linear equations, matrices and determinants; MATH 323 designed to be a more demanding version of this course. Only one of the following will satisfy the requirements for a degree: MATH 304, MATH 307, MATH 309, MATH 311, or MATH 323. **Prerequisite:** MATH 148, MATH 152, or MATH 172; junior or senior classification; also taught at Galveston campus.

MATH 307 Mathematical Methods for Material Scientists and Engineers

Credits 3. 3 Lecture Hours. Elementary ordinary differential equations and their solutions; series solutions of ordinary differential equations; linear algebra concepts covering systems of linear equations, matrices, determinants and eigenvalue problems; applications of the above topics in materials sciences and engineering. Only one of the following will satisfy the requirements for a degree: MATH 307 or MATH 308; MATH 304, MATH 307, MATH 309, MATH 311, or MATH 323. **Prerequisite:** MATH 221, MATH 251, or MATH 253, or concurrent enrollment.

MATH 308 Differential Equations

Credits 3. 3 Lecture Hours. Ordinary differential equations, solutions in series, solutions using Laplace transforms, systems of differential equations. Only one of the following will satisfy the requirements for a degree: MATH 307 or MATH 308. **Prerequisite:** MATH 221, MATH 251, or MATH 253, or concurrent enrollment; knowledge of computer algebra system; also taught at Galveston and Qatar campuses.

MATH 309 Linear Algebra for Differential Equations

Credits 3. 3 Lecture Hours. Systems of linear equations, matrices, determinants, vector spaces, linear transformations, eigenvalues and eigenvectors, diagonalization, inner product spaces, orthogonal functions, separation of variables, Fourier series, Bessel functions. Only one of the following will satisfy the requirements for a degree: MATH 304, MATH 307, MATH 309, MATH 311, or MATH 323. **Prerequisites:** MATH 221, MATH 251, or MATH 253; MATH 308 or concurrent enrollment; junior or senior classification or approval of instructor.

MATH 311 Topics in Applied Mathematics I

Credits 3. 3 Lecture Hours. Systems of linear equations, matrices, determinants, vector spaces, linear transformations, eigenvalues and eigenvectors, diagonalization, inner product spaces, orthogonal functions; vector analysis, including gradient, divergence, curl, line and surface integrals, Gauss', Green's and Stokes' theorems. Only one of the following will satisfy the requirements for a degree: MATH 304, MATH 307, MATH 309, MATH 311, or MATH 323. **Prerequisites:** MATH 221, MATH 251, or MATH 253; MATH 308 or concurrent enrollment; junior or senior classification or approval of instructor; also taught at Galveston and Qatar campuses.

MATH 323 Linear Algebra

Credits 3. 3 Lecture Hours. Linear equations and matrices; real vector spaces, linear transformations, change of bases, determinants, eigenvalues and eigenvectors, diagonalization, inner products; designed to include more theory and be more demanding than MATH 304. Only one of the following will satisfy the requirements for a degree: MATH 304, MATH 307, MATH 309, MATH 311, or MATH 323. **Prerequisites:** MATH 148, MATH 152 or MATH 172; MATH 300; junior or senior classification or approval of instructor.

MATH 325 The Mathematics of Interest

Credits 3. 3 Lecture Hours. The mathematical theory associated with interest; annuities; varying annuities; sinking funds and amortization; coupon bonds; valuation of noncallable bonds; yield to maturity; yield curve; spot rates and forward rates; internal rate of return; duration and convexity; portfolio immunization. **Prerequisite:** MATH 152 or MATH 172.

MATH 365 Structure of Mathematics I

Credits 3. 3 Lecture Hours. Logic, sets, relations, functions, whole numbers, numeration systems, integers, number theory, rational numbers, real numbers, and algebraic topics with an emphasis on problem solving, critical thinking, and mathematical communication; intended primarily for EC-8 teacher certification. **Prerequisites:** Grade of C or better in MATH 135 and MATH 136, or equivalents, or approval of instructor.

MATH 366 Structure of Mathematics II

Credits 3. 3 Lecture Hours. Euclidean geometry, measurement, coordinate geometry, and trigonometry with an emphasis on problem solving, critical thinking, and mathematical communication; intended primarily for EC-8 teacher certification. **Prerequisites:** Grade of C or better in MATH 365 or approval of instructor.

MATH 367 Structure of Mathematics III

Credits 3. 3 Lecture Hours. Euclidean geometry, coordinate geometry, and elementary calculus concepts with an emphasis on problem solving, critical thinking, proofs, and mathematical communication; intended primarily for 4-8 teacher certification. **Prerequisites:** Grade of C or better in MATH 366 or approval of instructor.

MATH 375 Intermediate Real Analysis

Credits 3. 3 Lecture Hours. Development of the real numbers, limits, foundations and major theorems of calculus. Designed primarily for mathematics teacher certification. Others must have consent of instructor. **Prerequisite:** MATH 300 or equivalent.

MATH 376 Intermediate Abstract Algebra

Credits 3. 3 Lecture Hours. Relations, functions, binary operators, rings, homomorphisms, integral domains and fields. Designed primarily for mathematics teacher certification. Others must have consent of instructor. **Prerequisites:** MATH 300 or MATH 302; MATH 304 or equivalent.

MATH 396 Communications in Mathematics

Credit 1. 1 Lecture Hour. Electronic, written, and oral communications in mathematics. **Prerequisites:** MATH 300, junior or senior classification, and mathematics major.

MATH 401 Advanced Engineering Mathematics

Credits 3. 3 Lecture Hours. Engineering mathematics including Perturbation Theory, Fourier series and partial differential equations. Designed primarily for engineering majors. Others must have consent of instructor. **Prerequisite:** MATH 308; also taught at Galveston campus.

MATH 403 Mathematics and Technology

Credits 3. 3 Lecture Hours. Mathematical problem-solving and communication through the use of various technologies (both hardware and software). Intended primarily, but not limited to, students working toward teacher certification. **Prerequisite:** Grade of C or better in MATH 467.

MATH 407 Complex Variables

Credits 3. 3 Lecture Hours. Fundamental theory of analytic functions, including residues and their applications. **Prerequisite:** MATH 221, MATH 251, or MATH 253.

MATH 409 Analysis on the Real Line

Credits 3. 3 Lecture Hours. Cardinality; properties of the real numbers; the completeness axiom; sequences and series; continuity and uniform continuity; differentiation; the Riemann integral. **Prerequisites:** MATH 300; MATH 221, MATH 251 or MATH 253.

MATH 410 Multivariate Real Analysis

Credits 3. 3 Lecture Hours. Differential and integral calculus of functions defined on \mathbb{R}^m including inverse and implicit function theorems and change of variable formulas for integration; uniform convergence.

Prerequisites: MATH 304 or MATH 323; grade of C or better in MATH 409.

MATH 411 Mathematical Probability

Credits 3. 3 Lecture Hours. Probability spaces, discrete and continuous random variables, special distributions, joint distributions, expectations, law of large numbers, the central limit theorem. **Prerequisite:** MATH 221, MATH 251, or MATH 253.

MATH 412 Theory of Partial Differential Equations

Credits 3. 3 Lecture Hours. Formulation and solution of partial differential equations of mathematical physics; Fourier series and transform methods, complex variable methods, methods of characteristics and first order equations. **Prerequisite:** MATH 308 or approval of instructor.

MATH 414 Fourier Series and Wavelets

Credits 3. 3 Lecture Hours. Fourier series and wavelets with applications to data compression and signal processing. **Prerequisite:** MATH 304, MATH 309, MATH 311, or MATH 323; also taught at Qatar campus.

MATH 415 Modern Algebra I

Credits 3. 3 Lecture Hours. A study of groups, rings, fields with emphasis on the theoretical aspects and proofs. **Prerequisite:** MATH 300; MATH 304, MATH 309, MATH 311, or MATH 323.

MATH 416 Modern Algebra II

Credits 3. 3 Lecture Hours. Continuation of topics introduced in MATH 415 including Galois Theory and the Sylow Theorems with emphasis on the theoretical aspects. **Prerequisite:** MATH 415; junior or senior classification.

MATH 417 Numerical Methods

Credits 4. 3 Lecture Hours. 3 Lab Hours. Numerical methods for applications; qualitative discussion of convergence and stability properties; computer implementation; interpolation and quadrature, initial value problems, matrix decompositions, interactive solution of linear and non-linear systems, least squares approximation, boundary value problems for ordinary differential equations. Only one of the following will satisfy the requirements for a degree: MATH 417 or MATH 437.

Prerequisites: MATH 304, MATH 309, MATH 311, or MATH 323; MATH 308; ability to program; junior or senior classification.

MATH 419 Applications of Actuarial Science

Credits 3. 3 Lecture Hours. Applications of actuarial science using mathematical and statistical methods to assess risk in the insurance and finance industries; emphasis on probability, statistics, finance and economics; focus on using probabilistic models in the estimation of insurance premiums. **Prerequisite:** MATH 411 or STAT 414 or approval of math advisor.

MATH 420 Application of Actuarial Science II

Credits 2. 2 Lecture Hours. Use of mathematical and statistical methods to price various financial instruments, such as bonds; understanding how the term structure of interest rates affect the price of these instruments.

Prerequisite: MATH 325 or concurrent enrollment, or approval of instructor.

MATH 423 Linear Algebra II

Credits 3. 3 Lecture Hours. Eigenvalues, similarity and canonical forms, advanced topics to be chosen by the instructor. **Prerequisites:** MATH 300 or CSCE 222/ECEN 222; MATH 304 or MATH 323, or approval of instructor.

MATH 424/STAT 424 Probability and Computing

Credits 3. 3 Lecture Hours. Applications of modern probability in data science, with an emphasis on randomization and the role of probabilistic techniques in computing; discrete random variables and expectation; deviation inequalities and applications to randomized algorithms; probabilistic methods and satisfiability; Monte Carlo method; sample complexity; combinatorial dimension. **Prerequisites:** MATH 304, MATH 309, MATH 311, or MATH 323; MATH 411 or STAT 414. **Cross Listing:** STAT 424/MATH 424.

MATH 425 The Mathematics of Contingent Claims

Credits 3. 3 Lecture Hours. The mathematical theory associated with asset price dynamics; binomial pricing models; Black-Scholes analysis; hedging; volatility smile; implied volatility trees; implied binomial trees. **Prerequisites:** MATH 308; MATH 411, STAT 211 or STAT 414.

MATH 427 Introduction to Number Theory

Credits 3. 3 Lecture Hours. Prime and composite integers; Euclidean algorithm; modular arithmetic; Chinese remainder theorem; unique factorization; quadratic reciprocity; Riemann zeta function; representation of numbers as a sum of squares. **Prerequisites:** MATH 300; MATH 304 or MATH 323.

MATH 431 Structures and Methods of Combinatorics

Credits 3. 3 Lecture Hours. Enumerative techniques generating functions, partially ordered sets, elementary graph theory, elementary Ramsey theory. **Prerequisite:** MATH 300 or MATH 302 or approval of instructor; also taught at Galveston.

MATH 433 Applied Algebra

Credits 3. 3 Lecture Hours. An introduction to groups, rings, fields with emphasis on modular arithmetic; applications to number theory, coding theory, and other areas. **Prerequisites:** MATH 300 or MATH 302; MATH 304 or MATH 323.

MATH 436 Introduction to Topology

Credits 3. 3 Lecture Hours. Metric spaces; continuity of metric spaces; topological spaces; basic notions; separation axioms; compactness; local compactness; connectedness; basic notions in homotopy theory; quotient spaces, paracompactness and topological manifolds. **Prerequisite:** MATH 409.

MATH 437 Principles of Numerical Analysis

Credits 4. 3 Lecture Hours. 3 Lab Hours. Mathematical principles of numerical analysis and their application to the study of particular methods; fixed-point iteration, Newton's method; normed vector spaces and operators, Schur decomposition, convergent matrices, minimization methods, conjugate gradient method; polynomial interpolation of Lagrange and Hermite; best approximation, Bernstein and Weierstrass Theorems, numerical quadrature. Only one of the following will satisfy the requirements for a degree: MATH 417 or MATH 437. **Prerequisites:** MATH 304, MATH 309, MATH 311, or MATH 323; MATH 308; grade of C or better in MATH 409; ability to program; junior or senior classification.

MATH 439 Differential Geometry of Curves and Surfaces

Credits 3. 3 Lecture Hours. Local and global theory of parameterized curves; regular surfaces, local coordinates, first fundamental form, orientation, area; Gauss map, second fundamental form; Gauss Bonnet theorem; additional topics to be selected by the instructor. **Prerequisites:** MATH 308; MATH 304 or MATH 323.

MATH 442 Mathematical Modeling

Credits 3. 3 Lecture Hours. The construction of mathematical models from areas such as economics, game theory, integer programming, mathematical biology and mathematical physics. **Prerequisites:** MATH 304, MATH 309, MATH 311, or MATH 323; MATH 308 or equivalent.

MATH 446 Analysis on Metric Spaces

Credits 3. 3 Lecture Hours. Review of analysis on the real line; topology of metric spaces; completeness; compact and connected spaces; properties of the space of continuous functions; convergence and approximation; other topics may include the Baire Category theorem, the Stone-Weierstrass theorem, or Fourier series. **Prerequisites:** MATH 304, MATH 309, MATH 311, or MATH 323; grade of C or better in MATH 409; junior or senior classification.

MATH 447 Integration and Measure Theory

Credits 3. 3 Lecture Hours. Functions of bounded variation; Riemann-Stieltjes integration; Lebesgue measure and measurable functions; Lebesgue integration and L^p spaces; convergence of Fourier series; other topics may include the Stone-Weierstrass theorem and convergence in measure. **Prerequisites:** MATH 304, MATH 309, MATH 311, or MATH 323; MATH 446, or MATH 410 and MATH 436.

MATH 460 Tensors and General Relativity

Credits 3. 3 Lecture Hours. Vectors and tensors in special relativity, curvature, manifolds, covariant differentiation, Einstein field equations, Schwarzschild geometry and black holes, cosmology, gauge field theories. **Prerequisites:** MATH 308; PHYS 331 or MATH 323 or MATH 311; junior or senior classification.

MATH 467 Modern Geometry

Credits 3. 3 Lecture Hours. Modern development of Euclidean geometry (Hilbert axioms) with historical and philosophical context; independence of the parallel postulate; models of hyperbolic non-Euclidean geometry. **Prerequisite:** Grade of C or better in MATH 304, MATH 309, MATH 311, MATH 300 or MATH 323.

MATH 469 Introduction to Mathematical Biology

Credits 3. 3 Lecture Hours. Introduction to mathematical modeling techniques in the biological sciences; continuous versus discrete models; deterministic versus stochastic models; includes population dynamics and ecology, spread of infectious diseases, population genetics and evolution, spatial pattern formation. **Prerequisites:** MATH 304 or MATH 323; MATH 308 or equivalent.

MATH 470 Communications and Cryptography

Credits 3. 3 Lecture Hours. Introduction to coded communications, digital signatures, secret sharing, one-way functions, authentication, error control and data compression. **Prerequisites:** MATH 304, MATH 309, MATH 311, or MATH 323; CSCE 110, CSCE 111, CSCE 120, CSCE 206, ENGR 102, or ENGR 112; approval of instructor.

MATH 471 Communications and Cryptography II

Credits 3. 3 Lecture Hours. Additional topics in coded communications; information and entropy, elliptical curves, error corrections, quantum methods. **Prerequisites:** MATH 470 or consent of instructor.

MATH 472 Elliptic Curve Cryptography

Credits 3. 3 Lecture Hours. Theory of the group law on elliptic curves with applications to problems in cryptography; elliptic curves over finite fields, rational numbers, real and complex numbers; elliptic curve based cryptosystems, digital signatures, and factorization methods. **Prerequisites:** MATH 415 or MATH 433.

MATH 478 Topological Data Analysis

Credits 3. 3 Lecture Hours. Topological Data Analysis with a view toward persistent homology of point clouds for applications to data analysis; homology of simplicial complexes over a field; functorial clustering methods; persistent homology; real-world applications to data analysis. **Prerequisites:** MATH 304, MATH 309, MATH 311, or MATH 323.

MATH 482 Research Seminar

Credits 3. 3 Lecture Hours. Problems, methods and recent developments in mathematics, with emphasis on projects, and written and oral presentations. **Prerequisites:** MATH 409 or MATH 415 ; MATH 304, MATH 309, MATH 311 or MATH 323; junior or senior classification; approval of instructor.

MATH 485 Directed Studies

Credits 1 to 8. 1 to 8 Other Hours. Special problems in mathematics not covered by any other course in the curriculum. Work may be in either theory or laboratory. **Prerequisite:** Approval of department head; also taught at Galveston campus.

MATH 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of mathematics. May be repeated for credit. **Prerequisite:** Approval of instructor; also taught at Galveston campus.

MATH 490 The Putnam Challenge

Credit 1. 1 Lecture Hour. Intensive individualized training for preparation for the Putnam Exam, a national contest for mathematics majors. May be taken four times for credit. **Prerequisites:** Approval of instructor; junior or senior classification.

MATH 491 Research

Credits 0 to 3. 0 to 3 Other Hours. Active research of basic nature under supervision of Department of Mathematics or affiliated department graduate faculty member; a maximum of 6 hours of credit can be used in degree plans. Registration in multiple sections of this course is possible within a given semester provided that the per semester credit hour limit is not exceeded. **Prerequisites:** Mathematics or applied mathematical sciences major or minor; junior or senior classification or approval of mathematics advisor; also taught at Galveston campus.

MEEN - Mechanical Engineering (MEEN)

MEEN 210 Geometric Modeling for Mechanical Design

Credits 2. 1 Lecture Hour. 2 Lab Hours. Foundations of geometric modeling as applied to mechanical design through use of modern computer-aided design (CAD) and physical prototyping tools; basics of systematic design methodology; geometric visualization concepts: multiview orthographic, isometric, oblique, perspective; three-dimensional representations, surface and solid modeling; dimensioning and tolerancing; rapid prototyping using 3D printing. **Prerequisite:** Mechanical engineering major; grade of C or better in ENGR 102.

MEEN 221 Statics and Particle Dynamics

Credits 3. 3 Lecture Hours. Application of the fundamental principles of Newtonian mechanics to the statics and dynamics of particles; equilibrium of trusses, frames, beams and other rigid bodies. **Prerequisites:** For non-mechanical engineering majors; admission to an engineering major; Grade of C or better in PHYS 206 or PHYS 218; grade of C or better in MATH 251 or MATH 253, or concurrent enrollment.

MEEN 222/MSEN 222 Materials Science

Credits 3. 3 Lecture Hours. Mechanical, optical, thermal, magnetic and electrical properties of solids; differences in properties of metals, polymers, ceramics and composite materials in terms of bonding and crystal structure. **Prerequisites:** Grade of C or better in CHEM 107 or CHEM 119; grade of C or better in PHYS 206. **Cross Listing:** MSEN 222/MEEN 222.

MEEN 223 Principles of Materials and Manufacturing

Credits 2. 2 Lecture Hours. Structures of metals, polymers and ceramics, including structure-mechanical property relationships; defects and diffusion in materials; basic machining theory and processes, including geometric dimensioning and tolerancing (GD&T); overview of manufacturing processes for metals and polymers, including additive technologies. **Prerequisite:** Grade of C or better in CHEM 120, or CHEM 107 and CHEM 117; grade of C or better in PHYS 206.

MEEN 225 Engineering Mechanics

Credits 3. 3 Lecture Hours. Application of the laws of classical mechanics to simplified, plausibly real world problems or interest to mechanical engineering, including the analysis of cables, frames, trusses, beams, machines and mechanisms. **Prerequisite:** Mechanical engineering major; grade of C or better in PHYS 206; grade of C or better in MATH 251 or MATH 253, or concurrent enrollment.

MEEN 260 Mechanical Measurements

Credits 3. 2 Lecture Hours. 3 Lab Hours. Introduction to the basic principles of engineering experimentation including: instrumentation and measurement techniques, signal processing and data acquisition, statistical data analysis, and interpretation and reporting of results. **Prerequisite:** Grade of C or better in STAT 211; Grade of C or better in ECEN 215, MATH 308 and MEEN 315, or concurrent enrollment.

MEEN 285 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Directed studies in specific problem areas of mechanical engineering. **Prerequisites:** MEEN classification; approval by instructor and department head or delegate.

MEEN 289 Special Topics in...

Credits 0 to 4. 0 to 4 Other Hours. Selected topics in an identified area of mechanical engineering. May be repeated for credit. **Prerequisite:** Approval of instructor.

MEEN 291 Research

Credits 1 to 4. 1 to 4 Other Hours. Research conducted under the direction of faculty member in mechanical engineering. May be repeated 2 times for credit. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

MEEN 305 Solid Mechanics

Credits 3. 3 Lecture Hours. Applications of stress and deformation relationships for deformable bodies and mechanical elements relevant to mechanical engineers; to include axially loaded members, stability of columns, torsional members and beams, failure theories, combined loadings; introduction to structural design. **Prerequisite:** Grade of C or better in MEEN 225; grade of C or better in MEEN 210 or concurrent enrollment.

MEEN 315 Principles of Thermodynamics

Credits 3. 3 Lecture Hours. Theory and application of energy methods in engineering; conservation of mass and energy; energy transfer by heat, work and mass; thermodynamic properties; analysis of open and closed systems; the second law of thermodynamics and entropy; gas, vapor and refrigeration cycles. **Prerequisite:** Grade of a C or better in MEEN 221 or MEEN 225; grade of a C or better in MATH 251 or MATH 253.

MEEN 344 Fluid Mechanics

Credits 3. 3 Lecture Hours. Application of laws of statics, buoyancy, stability, energy and momentum to behavior of ideal and real fluids; dimensional analysis and similitude and their application to flow through ducts and piping; lift and drag and related problems. **Prerequisite:** Grade of C or better in MEEN 315 and MATH 308.

MEEN 345 Fluid Mechanics Laboratory

Credit 1. 3 Lab Hours. Introduction to basic fluid mechanics instrumentation; experimental verification and reinforcement of the analytical concepts introduced in MEEN 344. **Prerequisites:** Grade of C or better in MEEN 260; grade of C or better in MEEN 344 or concurrent enrollment.

MEEN 357 Engineering Analysis for Mechanical Engineers

Credits 3. 3 Lecture Hours. Practical foundation for the use of numerical methods to solve engineering problems; error estimation, Taylor series, numerical solution of linear and non-linear algebraic and differential equations; introduction to engineering optimization. **Prerequisite:** Grade of C or better in MATH 308.

MEEN 360 Materials and Manufacturing Selection in Design

Credits 3. 3 Lecture Hours. Selecting materials and manufacturing processes in design; emphasis on mechanical properties of materials; microstructure production and control; manufacturing processes for producing various classes of materials. **Prerequisite:** Grade of C or better in MEEN 223 and MEEN 260.

MEEN 361 Materials and Manufacturing in Design Laboratory

Credit 1. 3 Lab Hours. Experiments in materials characterization and manufacturing processes; emphasis on material mechanical properties; microstructure production and control; manufacturing processes for producing various shapes for components and structures. **Prerequisite:** Grade of C or better in MEEN 210 and MEEN 260; grade of C or better in MEEN 360 or concurrent enrollment.

MEEN 363 Dynamics and Vibrations

Credits 3. 2 Lecture Hours. 2 Lab Hours. Application of Newtonian and energy methods to model dynamic systems (particles and rigid bodies) with ordinary differential equations; solution of models using analytical and numerical approaches; interpreting solutions; linear vibrations. **Prerequisite:** Grade of C or better in MEEN 225 or MEEN 221, and MATH 308; grade of a C or better in MEEN 357 and MEEN 305, or concurrent enrollment.

MEEN 364 Dynamic Systems and Controls

Credits 3. 3 Lecture Hours. Mathematical modeling and analysis of different types of dynamic systems; introduction to feedback control, time and frequency domain analysis of control systems, stability, PID control, root locus; design of computer-based controllers. **Prerequisite:** Grade of C or better in MEEN 260, MEEN 363, and ECEN 215.

MEEN 365 Dynamic Systems and Controls Lab

Credit 1. 0 Lecture Hours. 3 Lab Hours. Introduction to basic control systems instrumentation; experimental verification of control system concepts; implementation of computer-based controllers; data acquisition and analysis. **Prerequisite:** Grade of C or better in MEEN 260, MEEN 363, and ECEN 215; grade of C or better in MEEN 364, or concurrent enrollment.

MEEN 368 Solid Mechanics in Mechanical Design

Credits 3. 2 Lecture Hours. 2 Lab Hours. Design of structural/mechanical members for stiffness, strength and stability under a variety of loading conditions; use of Static and Fatigue Failure Theories to estimate life of components. **Prerequisite:** Grade of a C or better in MEEN 305; grade of C or better in MEEN 210, or concurrent enrollment.

MEEN 381 Seminar

Credit 1. 2 Other Hours. Presentations by practicing engineers and faculty addressing: effective communications, engineering practices, professional registration, ethics, career-long competence, contemporary issues, impact of technology on society and being informed; preparation of a resume, a lifelong learning plan, two papers, two oral presentations and complete an online assessment of the mechanical engineering program. **Prerequisite:** Major in mechanical engineering.

MEEN 399 High Impact Experience for Mechanical Engineers

Credits 0. 0 Other Hours. Participation in an approved high-impact learning practice; reflection on professional outcomes from engineering body of knowledge; documentation and self-assessment of learning experience at mid-curriculum point. **Prerequisite:** Junior or senior classification.

MEEN 401 Introduction to Mechanical Engineering Design

Credits 3. 2 Lecture Hours. 3 Lab Hours. The design innovation process; need definition, functional analysis, performance requirements and evaluation criteria, conceptual design evaluation, down-selected to an embodiment; introduction to systems and concurrent engineering; parametric and risk analysis, failure mode analysis, material selection, and manufacturability; cost and life cycle issues, project management. **Prerequisite:** Grade of C or better in MEEN 360, MEEN 361; grade of C or better in MEEN 364, MEEN 365, MEEN 368, MEEN 461, and MEEN 464, or concurrent enrollment.

MEEN 402 Intermediate Design

Credits 3. 2 Lecture Hours. 3 Lab Hours. Product detail design and development process including case studies; project management, marketing considerations, manufacturing, detailed design specifications; failure modes, application of codes and standards, selection of design margins; product (component) development guidelines; intellectual property, product liability and ethical responsibility. **Prerequisite:** Grade of C or better in MEEN 401.

MEEN 404 Engineering Laboratory

Credits 3. 2 Lecture Hours. 3 Lab Hours. Systematic design of experimental investigations; student teams identify topics and develop experiment designs including: establishing the need; functional decomposition; requirements; conducting the experiment; analyzing and interpreting the results and written and oral reports documenting the objectives, procedure, analysis, and results and conclusion of two or three experiments. **Prerequisites:** Grade of C or better in MEEN 360, MEEN 361, MEEN 364 and MEEN 461; grade of C or better in MEEN 401 or concurrent enrollment.

MEEN 406 Energy Management in Industry

Credits 3. 3 Lecture Hours. Energy systems and components frequently encountered in industrial environments; application of basic principles of thermodynamics, heat transfer, fluid mechanics and electrical machinery to the analysis and design of industrial system components and systems; improved energy utilization. **Prerequisites:** Grade of C or better in MEEN 260 and MEEN 315.

MEEN 407/AERO 438 Intuitive and Counter-Intuitive Mechanisms

Credits 3. 2 Lecture Hours. 2 Lab Hours. Spatial descriptions and transformations; forward and inverse kinematics of mechanical manipulators; manipulation; dexterity and manipulability; principles of manipulator-mechanism design; mobility; motion planning; control, reachability and complexity measures; workspace analysis. **Prerequisites:** Senior classification. **Cross Listing:** AERO 438/MEEN 407.

MEEN 408 Mechanics of Robotic Manipulators

Credits 3. 3 Lecture Hours. Forward and inverse kinematics and differential kinematics of robot manipulators, path planning, motion planning, dynamics of robot manipulators and control algorithms; PD/PID control, computed torque algorithm. **Prerequisites:** MEEN 364 or equivalent; junior or senior classification.

MEEN 410 Internal Combustion Engines

Credits 3. 3 Lecture Hours. Thermodynamics of cycles for internal combustion engines and gas turbines, including fuels and combustion; performance characteristics of various types of engines. **Prerequisite:** MEEN 344 or equivalent.

MEEN 411 Mechanical Controls

Credits 3. 3 Lecture Hours. Application of classical and modern control theory techniques to modeling, analysis and synthesis of linear, mechanical control systems. **Prerequisites:** Grade of C or better in MEEN 364.

MEEN 417/NUEN 417 Basics of Plasma Engineering and Applications

Credits 3. 3 Lecture Hours. Basic plasma properties and confinement techniques; single particle orbits in electric and magnetic fields, moments of Boltzmann equation and introduction to fluid theory; wave phenomena in plasmas and introduction to plasma kinetic theory; analysis of laboratory plasmas and plasma applications including fusion, electric propulsion, materials processing and plasmas enhanced chemistry. **Prerequisites:** Grade of C or better in PHYS 207 or equivalent; senior classification in nuclear, mechanical or aerospace engineering, or physics. **Cross Listing:** NUEN 417/MEEN 417.

MEEN 421 Thermal-Fluids Analysis and Design

Credits 3. 3 Lecture Hours. Integration of thermodynamics, fluid mechanics and heat transfer through application to the design of various thermal systems comprised of several components requiring individual analyses; analysis of the entire system; representative applications of thermal-fluids analysis with a design approach. **Prerequisite:** Grade of C or better in MEEN 461.

MEEN 423 Machine Learning for Mechanical Engineers

Credits 3. 3 Lecture Hours. Machine learning techniques with applications to the analysis and design of mechanical, fluid, thermal, material and multidisciplinary systems; linear and kernel support vector machines; neural networks; Bayesian techniques; decision trees and random forests; dimension reduction and model selection; data management and learner validation strategies; tools and application studies. **Prerequisite:** Grade of C or better in MEEN 357.

MEEN 431 Advanced System Dynamics and Controls

Credits 3. 3 Lecture Hours. Unified framework for modeling, analysis, synthesis, design and simulation of mechanical systems with energy exchange across multiple domains; study of mechanical, electrical, hydraulic and thermal subsystems; Newtonian mechanics, rigid body dynamics, multiple degrees of freedom vibrations and control system design. **Prerequisites:** MEEN 364; junior or senior classification.

MEEN 432 Automotive Engineering

Credits 3. 3 Lecture Hours. Introduction to vehicle dynamics; application of engineering mechanics principles to analysis of acceleration and braking, cornering and handling; analysis and design of drive train, suspension, brakes, and tires to achieve desired performance. **Prerequisite:** MEEN 363.

MEEN 433 Mechatronics

Credits 3. 2 Lecture Hours. 3 Lab Hours. Basic principles of digital logic and analog circuits in mechanical systems; electrical-mechanical interfacing; sensors and actuators; digital control implementation; precision design and system integration. **Prerequisite:** MEEN 364 or equivalent.

MEEN 434 Dynamics and Modeling of Mechatronic System

Credits 3. 3 Lecture Hours. Mechatronic interactions in lumped parameter and continuum systems; review of integral and differential electromagnetic laws, including motions; lumped elements and dynamic equations of motion; linear and nonlinear actuators and transducers; field transformation and moving media; electromagnetic force densities and stress tensors. **Prerequisite:** MEEN 364.

MEEN 435 Compressed Air Systems

Credits 3. 3 Lecture Hours. Basic principles, thermodynamics, and performance of compressed air systems including various components, such as compressors, reciprocating, rotary, centrifugal, and axial, prime movers, coolers, intercoolers, aftercoolers, dryers, heat recovery, receivers, separators, filters, regulators, fault detectors, controllers etc.; exploration of performance and analysis and operating principles for both systems and components, energy consumption and economic analysis for system design and operation. **Prerequisite:** Grade of C or better in MEEN 315 or equivalent; junior or senior classification.

MEEN 436 Principles of Heating, Ventilating and Air Conditioning

Credits 3. 3 Lecture Hours. Application of thermodynamics fluid mechanics, and heat transfer to the design of HVAC equipment; selection of equipment, piping and duct layouts. **Prerequisite:** Grade of a C or better in MEEN 344 or equivalent.

MEEN 437 Principles of Building Energy Analysis

Credits 3. 3 Lecture Hours. Analysis of building energy use by applying thermodynamics and heat transfer to building heating and cooling load calculations; heat balance and radiant time series calculation methods; psychometric analysis, indoor air quality, effect of solar radiation on heating and cooling of buildings; required design project. **Prerequisites:** MEEN 315 or equivalent; junior or senior classification.

MEEN 439 Solar Energy Engineering

Credits 3. 3 Lecture Hours. Solar energy; solar angles and radiation; solar thermal systems; solar water heating and space heating; concentrated solar power; energy storage; solar photovoltaics; solar cell manufacturing; other solar energy technologies. **Prerequisite:** MEEN 315.

MEEN 440 Bio-inspired Engineering Design

Credits 3. 3 Lecture Hours. Expand design space available to engineering by developing and understanding of how nature solves problems; study of effective bio-inspired design and biomimetic applications to draw solutions from nature; enhance concept generation through the use of bio-inspired design; use current state of the art methods in bioinspired design; view nature's solutions to different problems from an engineering perspective. **Prerequisite:** MEEN 368, BMEN 361, or BAEN 375.

MEEN 441 Design of Mechanical Components and Systems

Credits 3. 3 Lecture Hours. Design of machine elements, characteristics of prime movers, loads and power transmission elements as related to mechanical engineering design. **Prerequisite:** MEEN 368.

MEEN 442 Computer Aided Engineering

Credits 3. 3 Lecture Hours. Effective and efficient use of modern computer hardware and software in modeling, design, and manufacturing; simulation of a broad spectrum of mechanical engineering problems. **Prerequisites:** Grade of C or better in MEEN 363 and MEEN 368.

MEEN 444 Finite Element Analysis in Mechanical Engineering

Credits 3. 3 Lecture Hours. Introduction to basic theory and techniques; one- and two-dimensional formulations for solid mechanics applications; direct and general approaches; broader aspects for field problems; element equations, assembly and solution schemes; computer implementation, programming and projects; error sources and application consideration. **Prerequisites:** MEEN 357 and 368 or equivalents.

MEEN 445 Mechanics of Compliant Materials

Credits 3. 3 Lecture Hours. Study of mechanics; three-dimensional analysis tools and techniques needed to model linear behavior of fluids and solids in response to imposed loads and deformations. **Prerequisite:** Grade of C or better in MEEN 344.

MEEN 451 Viscoelastic Materials

Credits 3. 3 Lecture Hours. Mechanical and mathematical basis for modeling linear viscoelastic materials which focus on polymeric solid materials; characterization of viscoelastic material properties from experimental tests; applications of stress and deformation relationships for viscoelastic structural members subjected to axial, torsional, and bending loads. **Prerequisites:** Grade of C or better in MEEN 368.

MEEN 453 Additive and Subtractive Processes in Custom Manufacturing

Credits 3. 3 Lecture Hours. Machining theory; traditional and non-traditional machining processes; CNC machines and tools; geometric dimensioning and tolerance (GD&T); additive manufacturing systems and processes; materials in additive manufacturing. **Prerequisites:** Grade of C or better in MEEN 360 and MEEN 361, or equivalent.

MEEN 454 Tribology-Mechanical Interface Design

Credits 3. 3 Lecture Hours. History and significance of tribology, rough surfaces, hertzian contact, rough surfaces in contact, friction of surfaces in contact, surface failures/wear, boundary lubrication, fluid properties, thick film lubrication, thin film lubrication, micro- and nano-tribology. **Prerequisites:** Grade of C or better in MEEN 344 and MEEN 368.

MEEN 455 Engineering with Plastics

Credits 3. 3 Lecture Hours. Polymer structure, processing, property characterization at the molecular, microscopic and macroscopic dimensional levels for thermosets, thermoplastics, elastomers, fibers and advanced fibrous nonparticle filled composites and smart multi-performance structures. **Prerequisite:** Grade of C or better in MEEN 360 or MSEN 222/MEEN 222.

MEEN 458 Processing and Characterization of Polymers

Credits 3. 3 Lecture Hours. Introduction of flow behavior in polymers; structure-property-process relationship; mixing rules for polymer blends; mechanical properties; laboratory demonstrations: injection molding, extrusion, melt mixing, and study of morphology using OM, SEM, and TEM. **Prerequisite:** Grade of C or better in PHYS 206, CHEM 120, or CHEM 107.

MEEN 459 Sound and Vibration Measurements

Credits 3. 3 Lecture Hours. Basic acoustics, review of vibration theory, wave propagation in vibrating systems, sound radiation from vibrating systems, sound and vibration sensors and instrumentation, data acquisition systems, measurement techniques, spectral analysis, spatial FFT analysis, design of experiments with vibro-acoustic systems, applications. **Prerequisites:** MEEN 363; MATH 308.

MEEN 460 Corrosion Engineering

Credits 3. 3 Lecture Hours. Basic corrosion phenomena are described, including mixed potential theory, types of corrosion, experimental methods, and prevention techniques. **Prerequisite:** MEEN 360 and MEEN 361, or equivalent.

MEEN 461 Heat Transfer

Credits 3. 3 Lecture Hours. Heat transfer by conduction, convection and radiation: steady and transient conduction, forced and natural convection, and blackbody and gray body radiation; multi-mode heat transfer; boiling and condensation; heat exchangers. **Prerequisite:** Grade of C or better in MEEN 344.

MEEN 464 Heat Transfer Laboratory

Credit 1. 3 Lab Hours. Basic measurement techniques in conduction, convection, and radiation heat transfer; experimental verification of theoretical and semi-empirical results; uncertainty analysis. **Prerequisites:** Grade of C or better in MEEN 345; grade of C or better or MEEN 461 or concurrent enrollment.

MEEN 467 Mechanical Behavior of Materials

Credits 3. 3 Lecture Hours. Fundamentals of flow and fracture in metals, emphasizing safe design by anticipating response of materials to complex stress and environmental service conditions; micromechanisms of flow, fatigue, creep and fracture; fracture mechanics approach to design; special emphasis given to microstructure-mechanical property relationship and damage tolerant design. **Prerequisite:** MEEN 360 and MEEN 361.

MEEN 469 Alternative Energy Conversion

Credits 3. 3 Lecture Hours. Design and analysis of alternative energy conversion processes and systems that are based on converting energy directly (e.g., fuel cells, photovoltaics), utilizing non-combustible heat sources (e.g., geothermal, ocean gradients, solar and nuclear fission and fusion) and obtaining energy from the environment (e.g., wind, hydroelectric, ocean tides and waves). **Prerequisite:** MEEN 315.

MEEN 471 Elements of Composite Materials

Credits 3. 3 Lecture Hours. Fundamentals concerned with relating structure of multiphase materials to physical properties; plastic, metallic and ceramic matrices reinforced with continuous and discontinuous fibers, whiskers and particulates. **Prerequisites:** Grade of C or better in MEEN 360, MEEN 361, and MEEN 368.

MEEN 472 Gas Dynamics

Credits 3. 3 Lecture Hours. Fundamental analysis of compressible flows and its application to supersonic airfoils/projectiles, jet and rocket nozzles, normal and oblique shock waves, explosion waves, shock tubes, supersonic wind tunnels, and compressible pipe flows. **Prerequisite:** MEEN 344.

MEEN 475 Materials in Design

Credits 3. 3 Lecture Hours. The heuristics of synthesis of material properties, configuration and processing in the optimization of material selection in the design process; product design and development overview, failure mode effects analysis, design margin establishment; role of the generic failure modes and codes and standards; fundamental characteristics of process methods. **Prerequisites:** Grade of C or better in MEEN 360 and MEEN 361.

MEEN 477/BAEN 477 Air Pollution Engineering

Credits 3. 3 Lecture Hours. Design of air pollution abatement equipment and systems to include cyclones, bag filters and scrubbers; air pollution regulations; permitting; dispersion modeling; National Ambient Air Quality Standards. **Prerequisite:** Grade of C or better in BAEN 340, CVEN 311/ EVEN 311, EVEN 311/CVEN 311, or MEEN 344. **Cross Listing:** BAEN 477/ MEEN 477.

MEEN 483 Optical Techniques for Engineers

Credits 3. 3 Lecture Hours. Basics of geometrical and physical optics with an emphasis on topics that often arise in multidisciplinary engineering applications such as high-speed imaging, flow visualization, particle diagnostics, chemical sensing, materials characterization, precision measurements, and a host of other applications involving cameras and lasers; related fundamentals covered in-depth, while selected set of applications discussed to outline the depth and breadth of the field. **Prerequisites:** PHYS 206 or equivalent; senior classification.

MEEN 484 Internship

Credits 0 to 4. 0 to 4 Other Hours. Professional internship with a private entity, governmental agency, research institute, higher education institute, or other organizations that provide work or research experience related to mechanical engineering. **Prerequisites:** Junior or senior classification; approval of internship provider and instructor.

MEEN 485 Directed Studies

Credits 1 to 6. 1 to 6 Other Hours. Special problems relating to a specific project in some phase of mechanical engineering; a commitment of two semesters with 6 hours 485 credit is required. **Prerequisites:** Approval of department head and senior classification.

MEEN 489 Special Topics in...

Credits 1 to 4. 0 to 4 Lab Hours. 1 to 4 Other Hours. Selected topics in an identified area of mechanical engineering. **Prerequisite:** Approval of instructor.

MEEN 491 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in mechanical engineering. May be repeated 2 times for credit. Registration in multiple sections of this course is possible within a given semester provided that the per semester credit hour limit is not exceeded. **Prerequisites:** Junior or senior classification and approval of instructor.

MEEN 496 Laser Material Processing for Manufacturing

Credits 3. 3 Lecture Hours. Fundamentals on laser and thermal processing of materials, laser absorption and reflection, optical and radiative property of materials, thermal and non-thermal processes, numerical simulation of lasermaterial processing, applications in semiconductor manufacturing, additive manufacturing, and micro/nanomanufacturing. **Prerequisites:** Grade of C or better in MEEN 315.

MEEN 497 Innovation Mindset for Design and Research

Credits 3. 3 Lecture Hours. Exploration of the key behaviors of innovators and how to increase innovativeness in one's work; exploration of additional learning orientations, including Design Thinking and Lean experimentation, and Leadership practices to increase innovation in teams. **Prerequisite:** Junior or senior classification.

MEEN 498 Computational Fluid Dynamics for Engineering and Biological Applications

Credits 3. 3 Lecture Hours. Numerical techniques for solving engineering and biological problems; survey of relevant governing equations such as Navier-Stokes and biochemical and species transport equations, and methods to solve them; introduction of rigorous methods for analysis of the methods and their results; broad view of CFD. **Prerequisites:** Grade of C or better in MEEN 344 and MEEN 357.

MEFB - Mid Grds Ed Field Based (MEFB)

MEFB 351 Introduction to Middle Grades: Adolescent Development, Philosophy and Organization

Credits 3. 2 Lecture Hours. 6 Lab Hours. Study of young adolescents in domains of physical, social, emotional, cognitive, interpersonal, moral growth and development; organizational structure of middle schools supporting development of young adolescents through teaming and interdisciplinary work; investigates roles and responsibilities of middle level teachers. **Prerequisite:** Junior classification.

MEFB 450 Social Studies Methods in the Middle Grades

Credits 3. 2 Lecture Hours. 6 Other Hours. Trends and issues related to middle grades curriculum development and instruction in social studies and humanities; integration of content, planning, teaching-learning experiences; evaluation of teaching and learning in social studies.

Prerequisites: Concurrent enrollment in RDNG 470, RDNG 490, and MEFB 452; admission to teacher education; senior classification.

MEFB 452 Curriculum and Instruction for Middle Grades

Credits 3. 2 Lecture Hours. 6 Other Hours. (2-6). Study of educational theory and instructional strategies appropriate to middle grades education including planning and development of interdisciplinary and multidisciplinary curricula; student centered learning and methodologies.

Prerequisite: Admission to teacher education; junior or senior classification; concurrent enrollment in MEFB 450, RDNG 470, and RDNG 490 or MEFB 460, MEFB 470, and RDNG 490.

MEFB 460 Math Methods in Middle Grades

Credits 3. 2 Lecture Hours. 6 Other Hours. Examines theories, provides practice in teaching methods essential to successful mathematics learning; focuses on content and criteria central to teaching mathematics for understanding, skill development, and problem solving; readings, discussions, analyses; modeling and practicing mathematics teaching and learning. **Prerequisites:** MASC 351 and MASC 450; admission to teacher education; senior classification. **Corequisites:** MEFB 452, MEFB 470, RDNG 490.

MEFB 470 Science Methods in Middle Grades

Credits 3. 2 Lecture Hours. 6 Other Hours. Problems-based-learning course integrating science content, scientific inquiry skills and field-based instruction; technology-mediated teaching, learning, and assessment.

Prerequisites: Grade of C or better in MASC 320, MASC 420; concurrent enrollment in MEFB 460, MEFB 452, and RDNG 490; admission to teacher education; senior classification.

MEFB 497 Supervised Clinical Teaching

Credits 6. 30 Other Hours. Culmination of teaching education program; integration and application of knowledge and skills learned from program of study while clinical teaching in accredited schools with university supervision. Must be taken on a satisfactory/ unsatisfactory basis.

Prerequisites: Admission and retention in teacher education program; successful completion of all coursework; senior classification.

MEPS - Molecular & Env Plant Sci (MEPS)

MEPS 291 Research

Credits 1 to 4. 1 to 4 Other Hours. Research conducted under the direction of faculty member in molecular and environmental plant sciences. May be repeated 3 times for credit. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

MEPS 485 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Individual problems or research not covered by other coursework. Report required. **Prerequisites:** Junior or senior classification and prior approval of instructor or department head.

MEPS 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of plant physiology. May be repeated for credit.

MEPS 491 Research

Credits 1 to 4. 1 to 4 Other Hours. Research conducted under the direction of faculty member in molecular and environmental plant sciences. May be repeated 3 times for credit. Registration in multiple sections of this course are possible within a given semester provided that the per semester credit hour limit is not exceeded. **Prerequisites:** Junior or senior classification and approval of instructor.

MGMT - Management (MGMT)

MGMT 209 Principles of Business Regulations and Law

Credits 3. 3 Lecture Hours. (BUSI 2301) Principles of Business Regulations and Law. Foundational information about the U.S. legal system and dispute resolution, and their impact on business; includes general principles of law, the relationship of business and the U.S. Constitution, state and federal legal systems, the relationship between law and ethics, contracts, sales, torts, agency law, intellectual property and business law in the global context. May not be used to satisfy degree requirements for majors in business. **Prerequisite:** Sophomore classification; for students other than business and agribusiness majors.

MGMT 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified area of business and management. May be repeated for credit. **Prerequisite:** Approval of instructor.

MGMT 309 Survey of Management

Credits 3. 3 Lecture Hours. Survey for non-business majors of the basic functions and responsibilities of managers; includes the environmental context of management, planning and decision making, organization structure and design, leading and managing people, and the controlling process; issues of globalization, ethics, quality and diversity integrated throughout the course. May not be used to satisfy degree requirements for majors in business. **Prerequisites:** Junior classification; for students other than business and agribusiness majors.

MGMT 311 Legal and Social Environment of Business

Credits 3. 3 Lecture Hours. Examination of legal and regulatory processes in the US and the effects of the governing process on the business world; critical evaluation of legal and social aspects of the business environment; analysis of legal and ethical principles and concepts from substantive and procedural areas of law; includes business entities, interaction of laws, constitutional law, contracts, agency law, consumer law, advertising, environmental law, anti-trust laws, employment relationships, diversity and discrimination, torts, alternate dispute resolution, trial procedures, international law. **Prerequisite:** Admission to upper division in Mays Business School, Agribusiness, or Maritime Business Administration; also taught at Galveston campus.

MGMT 312 Commercial Law for Accountants and Managers

Credits 3. 3 Lecture Hours. Continued examination of legal and regulatory laws affecting the business world; critical evaluation and analysis of legal and ethical principles and concepts in the areas of agency and employment law, business entities including all forms of partnerships, corporations and corporate governance, securities regulation, contract law, bankruptcy, property law, creditor collection laws and Uniform Commercial Code sections concerning contracts, security interests and negotiable instruments. **Prerequisite:** MGMT 311.

MGMT 363 Managing People in Organizations

Credits 3. 3 Lecture Hours. The role and importance of human behavior in organizations; models for understanding individual, group, and team dynamics, including individual differences, motivation, and leadership; managing organizational change; ethical issues in organizations; cross-cultural issues in managing people in organizations; the organizational context as determined by human resource management and organization design. **Prerequisites:** Admission to upper division in Mays Business School or Agribusiness.

MGMT 372 Advanced Concepts in Organizational Behavior

Credits 3. 3 Lecture Hours. Builds on the survey of organizational behavior in MGMT 363; review of core concepts and their application in organizational settings; includes personality and individual differences, job design, group and team dynamics, leadership and decision-making, conflict and cooperation, cross-cultural aspects of behavior in organizations. **Prerequisite:** MGMT 363.

MGMT 373 Managing Human Resources

Credits 3. 3 Lecture Hours. Strategic issues in managing human resources; shared responsibilities of line managers and human resource staff for developing and implementing human resource policies and procedures; human resource planning; job design, analysis and evaluation; staffing; compensation; performance appraisal; training and development; career management; labor relations; legal, ethical and international issues. **Prerequisite:** MGMT 363.

MGMT 376/SOCI 376 Entrepreneurial Perspectives

Credits 3. 3 Lecture Hours. Entrepreneurship as a career choice and its impact on society and economy; definitions of entrepreneurship; discovery of entrepreneurial opportunities and start-up funding; innovation and entrepreneurship theories for analyzing and predicting success of start-up and established entrepreneurial organizations.

Prerequisite: Admission to upper division in Mays Business School. **Cross Listing:** SOCI 376/MGMT 376.

MGMT 421 Management Data Analytics and Visualization

Credits 3. 3 Lecture Hours. Exploration of organization, analysis, and evaluation of functional and strategic business data, including that related to employee recruitment and retention, individual and team performance, compensation, business processes, stakeholder impact, resource allocation and the like, using technology and communication of audience-focused, actionable insights through data storytelling; incorporation of advanced Excel and other tools applied to workplace issues and managerial decision-making, and enhances critical thinking, oral and written communication, and a technological skill set for combining data, narratives and visuals and engaging a defined audience in a story about the data. **Prerequisite:** MGMT 363.

MGMT 422 Management Consulting

Credits 3. 3 Lecture Hours. The field of management consulting from the perspective of both the individual consultant and the consulting firm; fundamentals of diagnosing situations, planning and executing assignments, client management, common mistakes and ethical issues in consulting including a variety of diagnostic and problem-solving methodologies. **Prerequisite:** MGMT 363.

MGMT 424 Organizational Design, Change and Development

Credits 3. 3 Lecture Hours. Aspects of effectively planning for and introducing changes in organizational structures and procedures based on environmental demands; examination of the successful management of organizational and behavioral changes, focusing on planned and unplanned changes, and emphasizing development of change strategies and measurement of change effectiveness. **Prerequisite:** MGMT 363.

MGMT 425 Human Resource Selection

Credits 3. 3 Lecture Hours. Theory and application of methods for the recruitment and selection of managerial, non-professional and professional employees; exposure to scientific issues such as reliability and validity, legal issues such as equal opportunity and affirmative action, and selection techniques such as interviews and testing. **Prerequisite:** MGMT 373.

MGMT 427 Human Resource Compensation

Credits 3. 3 Lecture Hours. Theories and techniques of designing and managing programs of direct compensation and benefits, including the role of rewards in motivation, job evaluation, pay discrimination and comparable worth, internal and external equity comparisons and benefit plans. **Prerequisite:** MGMT 373.

MGMT 430/WGST 430 Employment Discrimination Law

Credits 3. 3 Lecture Hours. Legal issues surrounding employment discrimination, including disparate treatment and impact; intent; affirmative action; sexual harassment; pregnancy, sex, race, religious, salary, disability, age, and ethnic discrimination; policy issues and perspectives to aid human resource specialists and managers. **Prerequisites:** Admission to upper division in Mays Business School and senior classification. **Cross Listing:** WGST 430/MGMT 430.

MGMT 432 Managing the Nonprofit Organization

Credits 3. 3 Lecture Hours. Broad trends shaping the nonprofit sector, a primary driver of social change and key player in society and the economy that provides an array of goods and services; complex management challenges that confront nonprofits as they balance their mission and values against the requirements of effective management with limited resources. **Prerequisite:** MGMT 363.

MGMT 435 Labor Law and Policy

Credits 3. 3 Lecture Hours. Federal and state public policy and laws regulating human resource management including National Labor Relations Act, Railway Labor Act, Fair Labor Standards Act, employment discrimination statutes, statutes regarding public sector unionization, and other relevant legal authorities; various forms of dispute settlement including litigation, mediation, fact finding and arbitration; legal ramifications of strategic human resource management decision making. **Prerequisites:** Admission to upper division in Mays Business School and senior classification.

MGMT 439 Negotiations

Credits 3. 3 Lecture Hours. Overview of the various theories and processes of negotiation relevant to the broad spectrum of negotiation problems faced by employees and managers, and in situations outside of organizations; discovery of optimal solutions to problems and means to implement solutions through classroom simulations, role playing and case studies. **Prerequisite:** MGMT 363.

MGMT 440 Creativity and Innovation in Business

Credits 3. 3 Lecture Hours. Examines factors that may foster or stifle individual, team, organizational creative performance; presents techniques that may improve creative thinking skills. **Prerequisite:** MGMT 363.

MGMT 450/IBUS 450 International Environment of Business

Credits 3. 3 Lecture Hours. Broad survey of international business issues; analyzes the environment in which international businesses operate; examines international economic issues including trade theory, investment theory, foreign exchange and capital markets, and balance of payments; introduces multinational enterprises, global competition, international organizations, treaties and international law, national trade policies and the determinants of competitiveness of firms in international markets. **Prerequisite:** Admission to upper division in Mays Business School. **Cross Listing:** IBUS 450/MGMT 450.

MGMT 452/IBUS 452 International Management

Credits 3. 3 Lecture Hours. An overview of international management to include international dimensions of organizational behavior, theory, strategy and human resource management; application of theoretical ideas to real-world situations through case analyses, presentations, projects and interactive class discussion. **Prerequisite:** MGMT 450/IBUS 450 or IBUS 450/MGMT 450, or concurrent enrollment. **Cross Listing:** IBUS 452/MGMT 452.

MGMT 457/IBUS 457 Global Entrepreneurship

Credits 3. 3 Lecture Hours. Practical issues associated with taking small- and medium-size business global; includes importing and exporting, developing global strategies, evaluating market opportunities, regional impact on economies and people. **Prerequisite:** Admission to upper division in Mays Business School. **Cross Listing:** IBUS 457/MGMT 457.

MGMT 460 Managing Projects

Credits 3. 3 Lecture Hours. Application of management processes to complex interdisciplinary organizational environments through the study of program and project management; adoptions of traditional management theories to the project environment; master typical project management microcomputer software for project planning; resource allocation; project budgeting; and control of project cost, schedule and performance. **Prerequisite:** MGMT 363.

MGMT 464 The Political Environment of Business

Credits 3. 3 Lecture Hours. Role of business in contemporary society; the large corporation and its external environment; ownership and control controversy; private and collective choice processes; role of regulation; social issues including pollution, discrimination, consumer protection, corporate social and ethical responsibilities, corporate political activity; international business relations. **Prerequisites:** MGMT 363 and senior classification.

MGMT 465 Corporate Governance

Credits 3. 3 Lecture Hours. Overview of the theories and practice of corporate governance; history of corporations, role and relationship of boards of directors, shareholders and management; concepts of agency cost, shareholder activism, executive compensation and international corporate governance in globalized markets; ethical issues and corporate social responsibility. **Prerequisite:** MGMT 363.

MGMT 466 Strategic Management

Credits 3. 3 Lecture Hours. Strategic issues facing organizations, including top management decision making and social responsibility; environmental and industry analysis; establishing organizational mission and objectives; corporate, business and functional level strategy formulation; global and multidomestic strategies; strategic implementation and control; integrating operations, finance, marketing and human resource strategies; case analysis. **Prerequisite:** MGMT 311; MGMT 363; FINC 341; SCMT 364; MKTG 321; senior classification.

MGMT 470 Entrepreneurial Small Business

Credits 3. 3 Lecture Hours. Exploration of practical approaches to growing a small business, evaluating and projecting financial performance, raising capital, legal formations and issues, human resource management, business plan development, franchising and family business; networking opportunities with local business leaders, successful former student entrepreneurs and current student entrepreneurs operating at the student incubator. **Prerequisites:** Admission to upper division in Mays Business School and senior classification.

MGMT 475 Leadership Development

Credits 3. 3 Lecture Hours. Explores the evolution of leadership theory and practice with an emphasis on effective and ineffective leaders' traits, behaviors, and styles in profit and not-for-profit work organizations; reviews critical aspects of leader role behavior from theoretical and practical perspectives; examines leader effectiveness at the individual, group, and strategic level. **Prerequisite:** MGMT 363.

MGMT 476/SOCI 476 Entrepreneurship Practice

Credits 3. 3 Lecture Hours. Practical skills for creating new businesses; evaluating, planning and operational strategy, including assessing the technology; product and service markets, value creation model; financing strategies; legal, regulatory, socio-economic drivers, risks; leadership to develop management team, advisory board; go-to-market strategy; develop own entrepreneurial opportunities or those of faculty and entrepreneurs. **Cross Listing:** SOCI 476/MGMT 476.

MGMT 477 Entrepreneurship: The Lean Startup Approach

Credits 3. 3 Lecture Hours. Application of current lean startup methodologies working directly with existing student entrepreneurs and mentors in preparing for the launch of a real business at the student incubator (Startup Aggieland); act as advocates and consultants assisting with organizational structure, marketing and market validation, financial analysis and risk assessment. **Prerequisites:** Junior or senior classification and approval of instructor.

MGMT 478 Social Entrepreneurship

Credits 3. 3 Lecture Hours. Applying business principles and practices to solve social, economic and environmental problems; social entrepreneurship concepts and issues in scaling social enterprise ventures including management tools, organization structures, funding sources, impact measurement; experience in opportunity recognition, designing, planning, pitching social mission ventures; build social capital with social enterprise founders. **Prerequisites:** Junior or senior classification. **Cross Listing:** SOCI 450 and PSAA 465.

MGMT 479/SOCI 432 Technology Commercialization

Credits 3. 3 Lecture Hours. Examination of the process of introducing to the marketplace new products or services based upon scientific and technological innovations; practical skills for assessing the technology, identifying potential products and services, and quantifying market demand; focuses on value creation, financing, intellectual property law, regulatory, and socio-economic drivers. **Prerequisite:** Junior or senior classification or admission to upper division in Mays Business School; SOCI 376/MGMT 376 or MGMT 376/SOCI 376 and SOCI 476/MGMT 476 or MGMT 476/SOCI 476 recommended. **Cross Listing:** SOCI 432/MGMT 479.

MGMT 481 Seminar in Management

Credit 1. 1 Other Hour. Discussions and observation of current management practice in the public and private sectors of the nation; reading and discussion of current events and changes taking place in management theory and/or its application and practice in actual business and government situations. May be repeated for credit. **Prerequisites:** Admission to upper division in Mays Business School or admission to Maritime Administration, or approval of instructor; also taught at Galveston campus.

MGMT 484 Management Internship

Credits 1 to 4. 1 to 4 Other Hours. Internship in management: staffing; planning; organizing; leading and controlling. Enrollment is limited to those who have managerial responsibilities for the resources used by a business firm or the like. **Prerequisites:** Management major; MGMT 363; approval of instructor prior to internship.

MGMT 485 Directed Studies

Credits 1 to 6. 1 to 6 Other Hours. Directed study on selected problems in the area of management not covered in other courses. **Prerequisite:** Admission to upper division in Mays Business School; senior classification and approval of department head.

MGMT 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified area of management. Consult the professor offering a particular special topics course for details. May be repeated for credit. **Prerequisites:** Admission to upper division in Mays Business School and approval of instructor.

MICR - Microbiology (MICR)

MICR 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of microbiology. May be repeated for credit. **Prerequisite:** Approval of instructor.

MICR 291 Research

Credits 1 to 4. 1 to 4 Other Hours. Active research of basic nature under the supervision of a Department of Biology faculty member. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

MICR 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of microbiology. May be repeated once for credit.

MICR 491 Research

Credits 1 to 4. 1 to 4 Other Hours. Active research of basic nature under the supervision of a Department of Biology faculty member. **Prerequisites:** Junior or senior classification and approval of instructor.

MKTG - Marketing (MKTG)

MKTG 289 Special topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of marketing. May be repeated for credit.

MKTG 299 Marketing Professional Organization Involvement

Credits 0. 0 Other Hours. Participation in an approved professional marketing organization. May be repeated for credit. Must be taken on a satisfactory/unsatisfactory basis.

MKTG 321 Marketing

Credits 3. 3 Lecture Hours. Exploration of the activities and managerial decisions involved in the provision of products to customers; includes strategic marketing fundamentals, buyer behavior, market segmentation, managerial issues related to the marketing mix (product, pricing, distribution, and promotion) decision variables, and social and ethical issues. **Prerequisites:** Admission to upper division in Mays Business School, Agribusiness, or Maritime Business Administration; also taught at Galveston campus.

MKTG 322 Consumer Behavior

Credits 3. 3 Lecture Hours. Application of behavioral science to understand and predict consumer behavior; management of experiment design and execution; creation of solutions to real-world marketing problems in both business to business and business to consumer environments. **Prerequisite:** MKTG 321.

MKTG 323 Marketing Research

Credits 3. 3 Lecture Hours. Nature and uses of marketing research in business; methods of collecting, analyzing and interpreting data needed for business decisions, with specific application to problems in marketing. **Prerequisites:** MKTG 321; BUSN 203 or STAT 211.

MKTG 325 Foundations in Retailing and Services

Credits 3. 3 Lecture Hours. Retail strategies around the marketing mix such as channels of distribution, private labels, customer service levels, visual presentation, and pricing that influence a retail business model; including how service organizations require a distinctive approach to marketing strategy in development and execution. **Prerequisite:** MKTG 321.

MKTG 326 Innovations in Retailing

Credits 3. 3 Lecture Hours. Retail strategies such as channels of distribution, private labels, customer service levels, visual presentation, pricing, and marketing mix that influence a retail business model. **Prerequisite:** MKTG 321.

MKTG 335 Professional Selling

Credits 3. 3 Lecture Hours. Exploration of professional selling concepts including relationship-building, problem-solving, critical thinking and effective communication; application through role-playing. **Prerequisite:** MKTG 321.

MKTG 336 Managing Business to Business Relationships

Credits 3. 3 Lecture Hours. Exploration of customer relationship management concepts and tools; organizational buyer behavior, sales technology, sales tactics and value creating strategies to succeed in marketing roles in business-to-business organizations. **Prerequisite:** MKTG 321.

MKTG 337 Selling Financial Products and Services

Credits 3. 3 Lecture Hours. Exploration of financial products and services specific to the banking industry; study of marketing and sales skills to represent major banking products and services to clients and prospects of commercial banks; marketing and sales strategies and processes of commercial banks that result in successful positioning of the bank in its trade territory; application of consultative sales process, identification of personality styles/temperaments and effective presentation skills.

Prerequisite: MKTG 321.

MKTG 345 Social Media Strategy

Credits 3. 3 Lecture Hours. Marketing and promotional strategy related to social media, interactive media, and related technologies. **Prerequisite:** MKTG 321.

MKTG 347 Advertising and Creative Marketing Communications

Credits 3. 3 Lecture Hours. Advertising and integrated marketing communications; market segmentation and targeting; development of multi-media campaigns; emphasis on enhancing creativity, critical thinking, and communication skills. **Prerequisite:** MKTG 321.

MKTG 401/IBUS 401 Global Marketing

Credits 3. 3 Lecture Hours. Survey of the aspects involved in marketing goods and services in a global marketplace; social, political, legal and economic issues associated with conducting business globally.

Prerequisite: MKTG 321. **Cross Listing:** IBUS 401/MKTG 401.

MKTG 402/IBUS 402 International Marketing: Study Abroad

Credits 3. 3 Lecture Hours. Introduction to the facets of doing business in an international setting; provides exposure to a variety of foreign cultures; facilitates understanding of the international marketplace in which these students will function. **Prerequisites:** MKTG 321 or MKTG 409; junior classification; 2.5 GPR overall. **Cross Listing:** IBUS 402/MKTG 402.

MKTG 403/IBUS 403 International Market Entry Strategies

Credits 3. 3 Lecture Hours. A research-based course in which students prepare an analysis of a country, or region outside the U.S., and use it in the preparation of a marketing plan for a good or service to be introduced and marketed in that country. **Prerequisites:** MKTG 321 or MKTG 409; concurrent registration in IBUS 402/MKTG 402 or MKTG 402/IBUS 402; junior or senior classification. **Cross Listing:** IBUS 403/MKTG 403.

MKTG 404 Data Visualization for Marketers

Credits 3. 3 Lecture Hours. Summarization, analysis, and interpretation of complex data using graphical representation to inform and drive business decisions; use of data and design principles to effectively explore data and communicate insights from data using visualization techniques.

Prerequisites: MKTG 321.

MKTG 409 Principles of Marketing

Credits 3. 3 Lecture Hours. Survey of the activities and managerial decisions involved in creating and communicating value to customers; topics include strategic marketing, social and ethical issues, buyer behavior, marketing research, market segmentation and managerial issues related to the marketing mix, product, price, distribution and promotion. May not be used to satisfy degree requirements for a major in business. **Prerequisite:** Junior classification; for students other than business and agribusiness majors.

MKTG 425 Retail Merchandising

Credits 3. 3 Lecture Hours. Theories, concepts and practices relating to the merchandising of products for enhancing sales and profit growth of retail businesses; emphasis on retail math, purchasing decisions, vendor negotiations, communications skills, assortment planning and competitive analysis. **Prerequisite:** MKTG 321.

MKTG 426 Digital Merchandising

Credits 3. 3 Lecture Hours. Theories, concepts, and practices relating to the successful merchandising of products & services for a digital retail enterprise on a website, web analytics, mobile app, and mobile-optimized website. **Prerequisites:** MKTG 321.

MKTG 427 Retail Capstone

Credits 3. 3 Lecture Hours. Problems and opportunities faced by retail buying organizations; development of effective strategies through application-oriented activities, researching industry trends, development of buy plans, product assortment planning, competitor analysis, and the buyer's role in product development. **Prerequisite:** MKTG 321.

MKTG 430 Marketing Consulting

Credits 3. 3 Lecture Hours. Consulting tools and techniques, managing client relationships, preparing reports and presentations, problem-solving processes; semester-long client project. **Prerequisites:** MKTG 323.

MKTG 431 Marketing Analytics

Credits 3. 3 Lecture Hours. . Data driven marketing strategy, data handling and management techniques, use of statistical software to estimate marketing models, project based course focused on marketing decision making. **Prerequisite:** MKTG 321.

MKTG 435 Advanced Selling

Credits 3. 3 Lecture Hours. Exploration of in-depth strategic account planning, extensive role-play and team selling exercises, sales analytics, networking and prospecting, strategic goal setting and time management. **Prerequisites:** MKTG 335.

MKTG 436 Sales Leadership

Credits 3. 3 Lecture Hours. Exploration of characteristics of exceptional sales managers and managing a sales force; career and time management, recruitment, selection, training, motivating, and coaching for high-performance. **Prerequisite:** MKTG 335.

MKTG 437 Sales Analytics

Credits 3. 3 Lecture Hours. Application of the principles of data-driven decision-making in a sales context in both consumer and industrial markets, use various tools for generating insights from data in such areas as sales prediction, customer value analysis, sales training, and incentive design. **Prerequisite:** MKTG 335.

MKTG 438 Strategic Digital Marketing

Credits 3. 3 Lecture Hours. Implications of the internet and related digital technologies for marketing; evolution of the digital marketplace and impact on firms' marketing mix decisions; competitive advantage; public policy issues; future trends and developments. **Prerequisite:** MKTG 321.

MKTG 440 Services Marketing

Credits 3. 3 Lecture Hours. Focuses on the unique challenges of managing a service-based business; delivering quality service to customers and building strong customer relationships; applicable to for-profit and not-for-profit organizations that depend on service excellence for competitive advantage. **Prerequisite:** MKTG 321.

MKTG 441 Improving Healthcare Service

Credits 3. 3 Lecture Hours. Preparation for a career in healthcare leadership by focusing on opportunities to improve the service experience of patients, providers, and other stakeholders; improvement of population health; and enhancement of the efficient and effective use of healthcare resources. **Prerequisite:** MKTG 321.

MKTG 442 Innovation and Product Management

Credits 3. 3 Lecture Hours. Opportunity identification, concept generation, concept and program evaluation, development and launch of the various types of new products; specific topics include creativity, design, launch and management of new products. **Prerequisite:** MKTG 321.

MKTG 443/PHLT 426 The Business of Healthcare

Credits 3. 3 Lecture Hours. Preparation for contributing to the healthcare system by gaining an understanding of selected business of healthcare topics such as the role of healthcare in the economy, the cost of healthcare, the patient experience, technology and ethics. **Prerequisites:** Business and Public Health majors; junior or senior classification; approval of instructor. **Cross Listing:** PHLT 426/MKTG 443.

MKTG 444 HealthTech for Improving Customer Care

Credits 3. 3 Lecture Hours. Contemporary examination of the development, marketing and co-created value-in-use aspects of technology products (e.g., databases, applications, mobiles, wearables) in the health industry used to improve the delivery, payment and consumption of care. **Prerequisite:** MKTG 321.

MKTG 445 Account Planning and Research

Credits 3. 3 Lecture Hours. Concepts in account planning; gathering and analyzing data (database analysis, focus groups, interviews, surveys); compilation of research into a situation analysis and creative brief for use in a national advertising case competition. **Prerequisites:** MKTG 321, approval of instructor.

MKTG 447 Advanced Advertising: Case Competition

Credits 3. 3 Lecture Hours. Development of a fully integrated, multi-million dollar budgeted advertising campaign plan; participation in a national case competition. **Prerequisite:** MKTG 321; approval of instructor.

MKTG 448 Marketing Strategy

Credits 3. 3 Lecture Hours. Integrated perspective of marketing strategy and decision-making; creation, communication and delivery of value to customers; integration of elements of the marketing mix; determination and evaluation of alternative marketing strategies. **Prerequisite:** MKTG 323; graduating marketing senior.

MKTG 451 Healthcare Marketing Analytics

Credits 3. 3 Lecture Hours. Data-driven marketing strategy for healthcare industries, data handling and management techniques; use of statistical software to estimate marketing models; project-based course focused on healthcare industries to improve quality of health. **Prerequisites:** MKTG 321.

MKTG 484 Marketing Internship

Credits 3. 3 Other Hours. Directed internship of at least 300 hours of work under the supervision of a marketing professional providing students with on-the-job training that advances their career objectives; emphasis on business communication and personal professional development.

Prerequisites: Marketing major; MKTG 321; approval of instructor prior to internship.

MKTG 485 Directed Studies

Credits 1 to 3. 1 to 3 Other Hours. Directed study of selected problems in the area of marketing not covered in other courses. **Prerequisites:** MKTG 321; approval of department head; 2.5 GPR in major and overall.

MKTG 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified area of marketing. May be repeated once for credit.

Prerequisites: Admission to upper division in Mays Business School and approval of instructor.

MLSC - Military Science (MLSC)

MLSC 121 Introduction to the United States Army I

Credits 2. 1 Lecture Hour. 3 Lab Hours. Introduction to the United States Army and the Army Reserve Officer Training Corps (ROTC); its purpose in the Army and its advantages; Army customs, courtesies, traditions, and Army values; Army history and individual soldier skills with an emphasis on leadership; includes a leadership laboratory.

MLSC 122 Introduction to the United States Army II

Credits 2. 1 Lecture Hour. 3 Lab Hours. The second half of an introductory two-semester survey of the United States Army; principles of leadership, Army history, management theory and individual soldier skills; emphasis on critical thinking and problem solving skills; foundation for tactical and leadership concepts; includes a leadership laboratory.

MLSC 221 Tactics and Leadership Theory I

Credits 3. 2 Lecture Hours. 3 Lab Hours. Dimensions of creative and innovative leadership strategies through team dynamics and leadership theories that form the basis of the Army leadership framework (trait and behavior theories); infantry tactics, techniques and procedures; includes a leadership laboratory.

MLSC 222 Tactics and Leadership Theory II

Credits 3. 2 Lecture Hours. 3 Lab Hours. The second half of a two-semester survey on leadership theory and infantry tactics; emphasis on leading tactical teams in a complex environment; Army planning and orders process; adaptive leadership styles in the context of military operations; case studies on the importance of teamwork and tactics in real-world scenarios; includes a leadership laboratory.

MLSC 321 Adaptive Leadership and Tactical Operations I

Credits 3. 3 Lecture Hours. 1 Lab Hour. Theoretical and practical application of adaptive leadership as it relates to planning, executing and evaluating complex tactical operations; ability to assess risk, ethical decision-making, managing people and critical thinking skills in a tactical environment; includes a leadership laboratory.

MLSC 322 Adaptive Leadership and Tactical Operations II

Credits 3. 3 Lecture Hours. 1 Lab Hour. The second half of a two-semester survey on adaptive leadership and tactical operations; ethical decision-making, planning, executing and evaluating military operations at a tactical level; preparation to attend the Leadership, Development and Assessment Course (LDAC) for the Army's commissioning process; includes a leadership laboratory.

MLSC 421 The Army Officer and the Profession of Arms I

Credits 3. 3 Lecture Hours. 1 Lab Hour. Advanced study, research and practical application of Army training, operations and doctrine; the military as a profession, functioning as a member of a staff, and officership; law of land warfare, principles of war, and rules of engagement and their application; duties and responsibilities of a Second Lieutenant in the United States Army; includes a leadership laboratory.

MLSC 422 The Army Officer and the Profession of Arms II

Credits 3. 3 Lecture Hours. 1 Lab Hour. Dynamics of leadership in a complex world; cultural awareness, terrorism, non-governmental organizations, and operational security; off-site battlefield analysis and application of military concepts; maintaining an ethical climate in an organization, military support structures, and equal opportunity; duties and responsibilities of a Second Lieutenant in the United States Army; includes a leadership laboratory.

MLSC 485 Directed Studies

Credits 1 to 3. 1 to 3 Other Hours. Directed study of problems in the field of military science. **Prerequisite:** Junior or senior classification with approval of department head.

MLSC 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified field of military science. May be repeated for credit.

MLSC 491 Research

Credits 1 to 4. 1 to 4 Lecture Hours. Research conducted under the direction of a faculty member in military science. May be taken three times for credit. **Prerequisite:** Junior or senior classification or approval of instructor.

MMET - Mfg & Mech Engr Tech (MMET)

MMET 105 Engineering Graphics

Credits 2. 1 Lecture Hour. 3 Lab Hours. (ENGR 1204, ENGR 1304) Engineering Graphics. Graphical approach to the engineering design process as applied to products; methods of graphical communications, three-dimensional geometry, working drawings, data analysis, computer graphics, introduction to team dynamics and creative problem solving.

MMET 181 Manufacturing and Assembly Processes I

Credits 3. 2 Lecture Hours. 3 Lab Hours. A survey of metal manufacturing processes; traditional machining, non-traditional machining, welding, fabrication, casting and assembly. **Prerequisite:** Grade of C or better in MMET 105, ENGR 102, or ENGR 111, or concurrent enrollment.

MMET 201 Manufacturing and Materials

Credits 4. 3 Lecture Hours. 2 Lab Hours. Survey of metallic and non-metallic materials; selection and applications of materials; introduction to traditional and non-traditional manufacturing processes, assembly processes, and metrology. **Prerequisite:** Grade of C or better in ENGR 102 or ENGR 111; grade of C or better in CHEM 107 and CHEM 117 or CHEM 120; industrial distribution major.

MMET 206 Nonmetallic Materials

Credits 3. 2 Lecture Hours. 3 Lab Hours. Introduction to structure, properties, processing and application of forest products, plastics, ceramics and composites; laboratory includes processing, physical and mechanical testing, applications, surface treatment and material identification. **Prerequisite:** Grade of C or better in CHEM 120 or CHEM 107 and CHEM 117; manufacturing and mechanical engineering technology or industrial distribution major or approval of department.

MMET 207 Metallic Materials

Credits 3. 2 Lecture Hours. 2 Lab Hours. Introduction to structure, properties and engineering application of ferrous and nonferrous materials; beneficiation, production of ferrous and nonferrous metals, destructive and nondestructive testing, protective coatings, strengthening and heat treatment; laboratory includes metallographic procedures, mechanical testing, heat treatment, surface treatment, corrosion testing, recrystallization and failure analysis. **Prerequisite:** Grade of C or better in CHEM 120 or CHEM 107 and CHEM 117; manufacturing and mechanical engineering technology or industrial distribution major or approval of department.

MMET 275 Mechanics for Technologists

Credits 3. 3 Lecture Hours. (ENGR 2301, ENGR 2401) Mechanics for Technologists. Forces, moments and couples in 2-D and 3-D systems; equilibrium of rigid bodies; structural analysis; friction and applications; centroids and moments of inertia. **Prerequisites:** Grade of C or better in MATH 152 and PHYS 206 or PHYS 218; manufacturing and mechanical engineering technology major.

MMET 281 Manufacturing and Assembly Processes II

Credits 3. 2 Lecture Hours. 2 Lab Hours. Survey of Polymer manufacturing processes, casting, expansion, extrusion, molding and thermoforming; additive manufacturing processes, material extrusion, vat photopolymerization, material jetting, binder jetting, sheet lamination, powder bed fusion and directed energy deposition. **Prerequisite:** Grade of C or better in MMET 181 and MMET 206; manufacturing and mechanical engineering technology major or approval of department.

MMET 301 Mechanical Power Transmission

Credits 3. 2 Lecture Hours. 2 Lab Hours. Overview of the engineering concepts of mechanical power and the components within a system to provide transmission of that power into useful work; experimental application of the related theory as it relates to the industrial distributor; "real world" knowledge learned for application in industry. **Prerequisites:** Grade of C or better in ENGL 103 or ENGL 104; grade of C or better in MATH 151, MATH 152, PHYS 206, and ENGR 216/PHYS 216 or PHYS 216/ENGR 216; grade of C or better in CHEM 107 and CHEM 117 or CHEM 120; grade of C or better in MMET 201 or concurrent enrollment; junior or senior classification in industrial distribution.

MMET 303 Fluid Mechanics and Power

Credits 4. 3 Lecture Hours. 2 Lab Hours. Fluid mechanics and fluid power applications for technologists; fluid properties; conservation of energy and momentum; incompressible flow in pipes; standard symbols; components and control of hydraulic systems and pneumatic systems. **Prerequisites:** Grade of C or better in MMET 275; manufacturing and mechanical engineering technology major.

MMET 307 Computer Design Graphics

Credits 3. 3 Lecture Hours. Use of microcomputers with currently available CAD software as an aid in the design process and as a means of increasing engineering productivity; review of ANSI standards and an introduction to a variety of computer graphics applications encountered in industry; user-oriented. **Prerequisites:** Grade of C or better in MMET 105 or MMET 181.

MMET 313 Industrial Welding Processes

Credits 3. 2 Lecture Hours. 3 Lab Hours. Theory and practical applications of industrial welding and cutting processes; experience in operation of various machines and processes. **Prerequisite:** Grade of C or better in MMET 181 and MMET 207; junior or senior classification in manufacturing and mechanical engineering technology.

MMET 320 Quality Assurance

Credits 3. 2 Lecture Hours. 3 Lab Hours. Applied statistical process control and design-of-experiment techniques for quality improvement and process characterization; emphasis on organizations operating in a continuous-improvement, customer-driven environment; statistical thinking; control charts; capability analysis of product, process and measurement system; experimental process characterization, prediction models and input variable control. **Prerequisites:** Grade of C or better in STAT 211; junior or senior classification in manufacturing and mechanical engineering technology.

MMET 361 Product Design and Solid Modeling

Credits 3. 2 Lecture Hours. 2 Lab Hours. Design processes and methodologies including quality function deployment, materials and process selection, and design for manufacturing and assembly; fundamentals of modeling part geometry and mechanical assembly using parametric CAD software. **Prerequisites:** Grade of C or better in ENGR 216/PHYS 216 or PHYS 216/ENGR 216, MMET 181, MMET 206, MMET 207, and MMET 275; junior or senior classification in manufacturing and mechanical engineering technology.

MMET 363 Mechanical Design Applications I

Credits 3. 3 Lecture Hours. Principles of design of mechanical components; theories of failure; Soderberg and Goodman diagrams; fatigue and fracture design criteria; materials and their selection to engineering applications; component assembly aspects; design of fasteners and springs as examples. **Prerequisite:** Grade of C or better in MMET 376; junior or senior classification in manufacturing and mechanical engineering technology.

MMET 370 Thermodynamics for Technologists

Credits 4. 3 Lecture Hours. 2 Lab Hours. Thermal and mechanical energy transformations; relationships applied to flow and non-flow processes in power and refrigeration cycles; devices include compressors, turbines, heat exchangers, nozzles, diffusers, pumps and piston-cylinder models; computer modeling. **Prerequisites:** Grade of C or better in PHYS 206, and ENGR 216/PHYS 216 or PHYS 216/ENGR 216; junior or senior classification in manufacturing and mechanical engineering technology.

MMET 376 Strength of Materials

Credits 4. 3 Lecture Hours. 2 Lab Hours. Stress and strain; elastic moduli Poisson's ratio; torsion, bending, unsymmetrical bending; design of beams and shafts; deflection of beams; buckling of columns; material and strength characterization laboratory tests. **Prerequisites:** Grade of C or better in ENGL 103 or ENGL 104; grade of C or better in MMET 207, MMET 275, MATH 151, MATH 152, CHEM 107 and CHEM 117 or CHEM 120, PHYS 206, and ENGR 216/PHYS 216 or PHYS 216/ENGR 216; junior or senior classification in manufacturing and mechanical engineering technology.

MMET 380 Computer-Aided Manufacturing

Credits 3. 2 Lecture Hours. 3 Lab Hours. Basic concepts in computer-aided manufacturing with emphasis on a system approach to manufacturing activities; use of numerical control machine tools and other computer based software as applied to different industries. **Prerequisites:** Grade of C or better in MMET 181 and MATH 152; junior or senior classification in manufacturing and mechanical engineering technology.

MMET 383 Manufacturing Information Systems

Credits 4. 3 Lecture Hours. 3 Lab Hours. Use of information technology for manufacturing enterprise applications, including computer-integrated manufacturing, database, computer networking, web-technology and enterprise resource planning. **Prerequisites:** Grade of C or better in MMET 380; junior or senior classification in manufacturing and mechanical engineering technology.

MMET 401 Fluid Power Transmission

Credits 3. 2 Lecture Hours. 2 Lab Hours. Engineering concepts of hydraulics and pneumatic power and its components within a system to provide transmission of that power into useful work; experimental application of the related theory as it relates to the industrial distributor; real world knowledge learned for application in industry. **Prerequisites:** Grade of C or better in MMET 201, MMET 301, PHYS 207, and ENGR 217/PHYS 217 or PHYS 217/ENGR 217; junior or senior classification in industrial distribution.

MMET 402 Inspection Methods and Procedures

Credits 3. 2 Lecture Hours. 2 Lab Hours. Methods and procedures in nondestructive inspection of materials and industrial products; ultrasonics, dye penetrants, magnetic particle, radiography and supportive evaluation methods such as weld sectioning, polishing, etching and macroscopic analysis. **Prerequisites:** Grade of C or better in MMET 281 and MMET 376; junior or senior classification in manufacturing and mechanical engineering technology.

MMET 405 Weldability of Ferrous Metals

Credits 3. 3 Lecture Hours. Applied principles of metallurgy with reference to weldability of ferrous metals. **Prerequisites:** Grade of C or better in MMET 207 and MMET 313; junior or senior classification in manufacturing and mechanical engineering technology.

MMET 410 Manufacturing Automation and Robotics

Credits 3. 2 Lecture Hours. 3 Lab Hours. Hardware for automated work handling, conveyors, loaders, robots, storage devices; power sources and methods of control, electric motors, controllers, program logic controllers, robot programming; interfacing of equipment controls; and manufacturing work cells. **Prerequisites:** Grade of C or better in MMET 361, MMET 376, MMET 383 and ESET 300; junior or senior classification in manufacturing and mechanical engineering technology.

MMET 412 Production and Inventory Planning

Credits 3. 2 Lecture Hours. 2 Lab Hours. An introductory treatment of models and techniques for the planning of production and inventory systems. **Prerequisites:** Grade of C or better in MMET 320, MMET 383 and ISEN 302; senior classification in manufacturing and mechanical engineering technology.

MMET 414 Micro/Nano Manufacturing

Credits 3. 2 Lecture Hours. 3 Lab Hours. Product miniaturization and impact; review of atomic structure, electrical and physical properties of materials; ultraprecision machining; microlithography; dry and wet etching/sputtering techniques; isotropic and anisotropic processes; pattern transfer with additive processes; surface micromachining; microreplication processes; introduction to packaging technology and nanometrology; manufacturing of selected microsystems (MEMS) and their applications. **Prerequisites:** Grade of C or better in CHEM 107, PHYS 207, and ENGR 217/PHYS 217 or PHYS 217/ENGR 217; junior or senior classification in manufacturing and mechanical engineering technology.

MMET 418 Medical Manufacturing

Credits 3. 2 Lecture Hours. 3 Lab Hours. Surveys relevant regulations, biocompatibility of engineering materials, and emphasizes suitable techniques for medical device manufacturing. **Prerequisites:** Grade of C or better in MMET 181; junior or senior classification in manufacturing and mechanical engineering technology.

MMET 422 Manufacturing Technology Projects

Credits 2. 1 Lecture Hour. 3 Lab Hours. A capstone projects course utilizing a team approach to an analysis and solutions of manufacturing problems. **Prerequisite:** Grade of C or better in MMET 429; grade of C or better in MMET 410, MMET 412 and MMET 463, or concurrent enrollment; ENTC 399 or concurrent enrollment; must be taken in fall or spring semester; senior classification in manufacturing and mechanical engineering technology.

MMET 429 Managing People and Projects in a Technological Society

Credits 3. 3 Lecture Hours. Supervisory and project management duties and responsibilities in technology based organizations and the methods required to fulfill these functions. **Prerequisites:** Grade of C or better in ISEN 302 and MMET 361; grade of C or better in MMET 363, or concurrent enrollment; must be taken in the fall or spring semester immediately prior to MMET 422; senior classification in manufacturing and mechanical engineering technology.

MMET 463 Mechanical Design Applications II

Credits 3. 3 Lecture Hours. Applications of principles of analysis and design of machines and machine elements including linkages, robots, cam and follower systems, shafts, gears, clutches, belt and chain drives; introduction to the mathematical tools for the analysis and design of these machines and machine elements. **Prerequisites:** Grade of C or better in MMET 361 and MMET 363; senior classification in manufacturing and mechanical engineering technology.

MMET 485 Directed Studies

Credits 1 to 6. 1 to 6 Other Hours. Directed study of selected problems in an in an area of manufacturing and mechanical engineering technology not covered in other courses. May be repeated for credit. **Prerequisites:** Senior classification and approval of instructor.

MMET 491 Research

Credits 0 to 4. 0 Lecture Hours. 0 Lab Hours. 0 to 4 Other Hours.

Research conducted under the direction of faculty member in the college of engineering. May be repeated three times for credit. **Prerequisites:** Junior or senior classification and approval of instructor.

MODL - Modern Languages (MODL)

MODL 221/ENGL 221 World Literature

Credits 3. 3 Lecture Hours. (ENGL 2332) World Literature. Survey of world literature from the ancient world through the sixteenth century in relation to its historical and cultural contexts; texts selected from a diverse group of authors, traditions and genres; ENGL-221 also taught at Qatar campus. **Cross Listing:** ENGL 221/MODL 221.

MODL 222/ENGL 222 World Literature

Credits 3. 3 Lecture Hours. (ENGL 2333) World Literature. Survey of world literature from the seventeenth century to the present in relation to its historical and cultural contexts; texts selected from a diverse group of authors, traditions and genres; ENGL-222 also taught at Galveston and Qatar campuses. **Cross Listing:** ENGL 222/MODL 222.

MODL 285 Directed Studies

Credits 0 to 3. 0 to 3 Other Hours. Individual supervision of readings or assigned projects, selected for each student individually. Written and oral reports. No class meetings. **Prerequisite:** Approval of department head.

MODL 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of modern languages. May be repeated for credit. **Prerequisite:** Approval of department head.

MODL 485 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Individual supervision of readings or assigned projects, selected for each student individually. Written and oral reports. No class meetings. **Prerequisite:** Approval of department head.

MODL 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of modern languages. May be repeated for credit. **Prerequisite:** Approval of department head.

MSEN - Materials Science & Engr (MSEN)

MSEN 201 Fundamentals of Materials Science and Engineering

Credits 3. 3 Lecture Hours. Fundamental principles of materials science and engineering and their application toward complex engineering challenges; relationship between materials structure and structural and functional properties of engineered materials; property-performance relationships; principle classes of materials, as illustrated through key materials advances; current directions in the field. **Prerequisites:** Grade of C or better in CHEM 107 or CHEM 119 and PHYS 206.

MSEN 205 Materials in Society

Credits 2. 2 Lecture Hours. Introduction to the study and practice of materials science and engineering; current topics in materials research and development, focusing on the impact of advanced materials on engineering fields and society; application of scientific engineering principals to guiding materials engineering process, with examples drawn from real-life case studies. **Prerequisite:** Grade of C or better in MSEN 201, or concurrent enrollment; or approval of instructor.

MSEN 210 Thermodynamics of Materials

Credits 3. 3 Lecture Hours. Basic concepts and fundamental laws of thermodynamics; processes and thermodynamic engines; phase equilibria and phase diagrams of simple substances; chemical reactions of condensed phases; computational software for thermodynamic and phase diagram calculations. **Prerequisites:** Grade of C or better in MSEN 201, AERO 413, BMEN 343, CHEN 322, CVEN 306, MEEN 222/ MSEN 222, MMET 206, MSEN 222/MEEN 222, or NUEN 265, or concurrent enrollment; grade of C or better in MATH 152 or concurrent enrollment.

MSEN 222/MEEN 222 Materials Science

Credits 3. 3 Lecture Hours. Mechanical, optical, thermal, magnetic and electrical properties of solids; differences in properties of metals, polymers, ceramics and composite materials in terms of bonding and crystal structure. **Prerequisites:** Grade of C or better in CHEM 107 or CHEM 119; grade of C or better in PHYS 206. **Cross Listing:** MEEN 222/ MSEN 222.

MSEN 250 Soft Matter

Credits 3. 3 Lecture Hours. Structure, properties and function of various classes of soft matter including colloids, polymers, amphiphils, liquid crystals and biomacromolecules; basic concepts of viscoelasticity, glass transition, liquid-liquid and liquid-solid transitions and gelation; forces acting between mesoscopic objects; supramolecular self-assembly in soft condensed matter. **Prerequisites:** Grade of C or better in CHEM 120; MSEN 201, or concurrent enrollment.

MSEN 260 Structure of Materials

Credits 3. 3 Lecture Hours. Materials structure over many orders of scale; structure of non-crystalline materials; symmetry, unit cell and the atomic structure of crystalline materials; liquid crystals; structural defects in ordered solids; microstructures and hierarchical structures. **Prerequisites:** Grade of C or better in MSEN 201, AERO 413, BMEN 343, CHEN 322, CVEN 306, MEEN 222/MSEN 222, MMET 206, MSEN 222/ MEEN 222, or NUEN 265, or concurrent enrollment.

MSEN 281 Materials Science and Engineering Seminar

Credit 1. 1 Other Hour. Presentation of technical advances in the field of materials science and engineering; applications toward solving engineering challenges; presentations from visiting industry, academic speakers, and faculty; introduction to current research themes and focal points in industry. **Prerequisite:** Grade of C or better in MSEN 201, or concurrent enrollment.

MSEN 285 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Directed study of selected problems in the area of materials science and engineering. May be taken for credit 4 times. **Prerequisite:** Approval of instructor.

MSEN 289 Special Topics In...

Credits 1 to 3. 1 to 3 Lecture Hours. 0 to 3 Lab Hours. Selected topics in an identified area of materials science and engineering. May be repeated for credit. **Prerequisite:** Approval of instructor.

MSEN 291 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in materials science and engineering. May be taken three times for credit. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

MSEN 301 Unified Materials Lab I

Credits 3. 2 Lecture Hours. 3 Lab Hours. Integration of materials synthesis, structural characterization and property evaluation; theory and practice of experimental and simulation techniques; emphasis on relationship between processing parameters and resulting materials structure. **Prerequisites:** Grade of C or better in MSEN 210 and MSEN 260, or concurrent enrollment.

MSEN 302 Unified Materials Lab II

Credits 3. 2 Lecture Hours. 3 Lab Hours. Integration of materials synthesis, structural characterization and property evaluation; theory and practice of experimental and simulation techniques; emphasis on relationship between materials structure and resulting materials physical properties. **Prerequisite:** Grade of C or better in MSEN 301 and MSEN 380; grade of C or better in MSEN 320, or concurrent enrollment.

MSEN 305 Kinetics of Materials

Credits 3. 3 Lecture Hours. Application of physical principles that drive evolution of materials as they approach thermodynamic equilibrium states; includes Gibbs free energy, driving forces, point defects, diffusion in solids, interface and grain boundary motion, nucleation, growth, transformation diagrams, precipitation, phase separation, ordering and solidification. **Prerequisite:** Grade of C or better in MSEN 210.

MSEN 320 Deformation and Failure Mechanisms in Engineering Materials

Credits 3. 3 Lecture Hours. Survey of deformation and failure mechanisms in different materials, including metals, ceramics, polymers and composites; effect of atomistic structure, defects and microstructure on deformation and failure; deformation and failure mechanism maps and effects of temperature and deformation rate. **Prerequisite:** Grade of C or better in MSEN 260.

MSEN 325 Properties of Functional Materials

Credits 3. 3 Lecture Hours. Origins of functional materials properties from their electronic and molecular structure; electron theory in solids; electronic transport and dielectric behavior; optical and magnetic properties; current applications of functional materials. **Prerequisite:** Grade of C or better in MSEN 260.

MSEN 330 Numerical Methods for Materials Scientists and Engineers

Credits 3. 3 Lecture Hours. Computing platforms addressing scientific/engineering problems related to materials science and engineering; analyze data; implement mathematical models of materials behavior; numerical methods to solve materials-related problems. **Prerequisite:** Grade of C or better in MATH 307, MSEN 305, and MSEN 320.

MSEN 360 Materials Characterization

Credits 3. 2 Lecture Hours. 3 Lab Hours. Principles and techniques used in characterization of different materials, including metals, ceramics, polymers, composites and semiconductor systems; microstructural, chemical/compositional and surface analysis methods; interpretation and analysis of the characterization results. **Prerequisites:** Grade of C or better in MSEN 250 and MSEN 260.

MSEN 380 Communicating Materials Science and Engineering

Credit 1. 1 Lecture Hour. Effective communication of technical topics in materials science and engineering to technical and non-technical audiences; emphasis on written reports. **Prerequisite:** Grade of C or better in MSEN 301, or concurrent enrollment.

MSEN 399 High Impact Professional Development

Credits 0. 0 Other Hours. Student participation in an approved high-impact learning practice; reflection on professional outcomes from engineering body of knowledge; documentation and self-assessment of learning experience at mid-curriculum point. **Prerequisites:** Grade of C or better in MSEN 205 and MSEN 281; junior or senior classification.

MSEN 400 Design and Analysis of Materials Experiments

Credits 3. 2 Lecture Hours. 3 Lab Hours. Systematic design of experimental investigations; team approach to identification of topics and development of experiment designs including establishing the need, associated requirements and objective; conduction of experiments; characterization of materials; analysis and interpretation of results; documentation of the procedures, analysis, results and conclusions; presentation of written and oral reports. **Prerequisite:** Grade of C or better in MSEN 301; grade of C or better in MSEN 302 or concurrent enrollment.

MSEN 401 Materials Design I

Credits 3. 2 Lecture Hours. 3 Lab Hours. Design process; need definition, functional analysis, performance requirements, evaluation criteria, conceptual design evaluation; introduction to systems engineering; parametric and risk analysis, failure analysis, material selection and manufacturability; cost and life cycle issues, project management; industry-relevant design projects. **Prerequisite:** Grade of C or better in MSEN 281, MSEN 205 and MSEN 400.

MSEN 402 Materials Design II

Credits 3. 2 Lecture Hours. 3 Lab Hours. Development of innovative solutions to industry-relevant design challenges; structured framework and methodology for design activities; innovation, computational materials science, synthesis and processing and analysis and characterization of material components; project definition, management, customer interaction and effective team participation; presentations and design reviews. **Prerequisite:** Grade of C or better in MSEN 401.

MSEN 410 Materials Processing

Credits 3. 3 Lecture Hours. Synthesis, properties and processing of technologically important materials, metals, ceramics and polymers; thermodynamics and kinetics of different materials processing methods, casting, deformation processing, heat treatments, powder processing and sintering, coating, thin films processing, etc. **Prerequisite:** Grade of C or better in MSEN 250, MSEN 305, and MSEN 320; junior or senior classification.

MSEN 415 Defects in Solids

Credits 3. 3 Lecture Hours. Overview of point, line and surface defects in solids; relates defect properties to diffusion, deformation, phase transformations; focuses on atomic defects in crystals, with additional examples from liquid crystals, superconductors and ferromagnets; incorporates atomistic modeling to examine defect structure. **Prerequisite:** Grade of C or better in MSEN 260; junior or senior classification; or approval of instructor.

MSEN 418 Composites Processing and Performance

Credits 3. 3 Lecture Hours. Fundamental science and design of composites; processing and design interaction about multiphase composites; processing science, experimental characterization, laminate analysis; design structure and processing. **Prerequisite:** Grade of C or better in MSEN 320 or MEEN 360.

MSEN 420 Polymer Science

Credits 3. 3 Lecture Hours. Types of polymerization; molecular characteristics of polymer chains; single chain statistics and rubber elasticity; phase transitions, glass transition, viscoelasticity and time-temperature superposition; polymer structure at the molecular, microscopic and macroscopic level; polymer thermosets, thermoplastics, elastomers, fibers, and advanced nanoparticle-filled composites. **Prerequisite:** Grade of C or better in PHYS 206 and CHEM 120; junior or senior classification; or approval of instructor.

MSEN 426 Polymer Laboratories

Credits 3. 2 Lecture Hours. 3 Lab Hours. Laboratory to prepare those interested in polymer research with necessary experimental and analytical skills to conduct and analyze experimental work. **Prerequisite:** Grade of C or better in MSEN 250, junior or senior classification; or approval of instructor.

MSEN 430 Nanomaterials Science

Credits 3. 3 Lecture Hours. Nanotechnology and nanomaterials; types, fabrication, characterization methods and applications; current roles in technology and future impact of such systems on industry targeting. **Prerequisite:** Grade of C or better in MSEN 260, junior or senior classification; or approval of instructor.

MSEN 440 Materials Electrochemistry and Corrosion

Credits 3. 3 Lecture Hours. Survey of thermodynamic and kinetic fundamentals of electrochemistry; multiscale materials corrosion mechanisms; details of interfacial aqueous electrochemical mechanisms and the environmental effects when materials are exposed to different conditions. **Prerequisite:** Grade of C or better in MSEN 201, AERO 413, BMEN 344, CHEN 322, CVEN 306, MEEN 222/MSEN 222, MMET 207, MSEN 222/MEEN 222, or NUEN 265; or approval of instructor.

MSEN 444 Corrosion and Electrochemistry Lab

Credits 3. 2 Lecture Hours. 3 Lab Hours. Laboratory practice and principles for corrosion and electrochemistry methods; design, carry out and analyze a series of labs illustrating the most important techniques in the field; builds to an open-ended corrosion engineering problem resulting in preparation of a technical report for a hypothetical client. **Prerequisite:** Grade of C or better in MSEN 440, or approval of instructor.

MSEN 446 Corrosion Prevention and Control Methods

Credits 3. 3 Lecture Hours. Cathodic protection and coatings; functional engineering approach to controlling and preventing aqueous corrosion; impressed current, galvanic anodes, organic, inorganic and hybrid coatings; case studies in oil and gas, energy, automotive and different industries. **Prerequisites:** Grade of C or better in MSEN 440, or approval of instructor.

MSEN 448 Failure Analysis in Materials Science and Engineering

Credits 3. 3 Lecture Hours. Discussion and analysis of failure of engineering systems in terms of design, manufacturing, and service environments; broad background to common mechanisms of material failures in mechanical, electrical and chemical applications; emphasis on case studies and specific engineering disasters. **Prerequisites:** Grade of C or better in MSEN 320; or approval of instructor.

MSEN 458 Fundamentals of Ceramics

Credits 3. 3 Lecture Hours. Structure-property relationships of ceramics and ceramic composites; atomic bonding in ceramics; crystalline and glassy structures; phase equilibria and ceramic reactions; mechanical, electrical, thermal, dielectric, magnetic and optical properties; ceramic processing; different properties of ceramics will be related to their underlying structure. **Prerequisite:** Grade of C or better in MSEN 260; junior or senior classification; or approval of instructor.

MSEN 468 Fabrication and Characterization of Electronic Materials

Credits 3. 3 Lecture Hours. Properties, processing, and characterization of electronic materials; fabrication of semiconductors, patterning and etching of electronic and optical films; characterization of film structure, morphology, composition, and electronic and optical properties through different material analysis methods. **Prerequisites:** Grade of C or better in MSEN 325 or ECEN 370.

MSEN 470 Computational Materials Science and Engineering

Credits 3. 3 Lecture Hours. Modern methods of computational modeling and simulation of materials properties and phenomena, including synthesis, characterization and processing of materials, structures and devices; quantum, classical and statistical mechanical methods, including semi-empirical atomic and molecular-scale simulations and other modeling techniques using macroscopic input. **Prerequisite:** Grade of C or better in MATH 307, MSEN 305, and MSEN 320.

MSEN 472 Atomistic Simulation of Materials

Credits 3. 3 Lecture Hours. Modern methods of computational modeling and simulation of materials properties and phenomena at the atomistic scale; quantum, classical and statistical mechanical methods, including semi-empirical atomic and molecular-scale simulations, and other modeling techniques using macroscopic input. **Prerequisite:** Grade of C or better in MSEN 470, or approval of instructor.

MSEN 484 Internship

Credits 0 to 4. 0 to 4 Other Hours. Practical experience working in a professional materials science and engineering setting offered on an individual basis. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisites:** Junior or senior classification and approval of instructor.

MSEN 485 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Directed study of selected problems in the area of materials science and engineering. May be taken four times for credit. **Prerequisite:** Grade of C or better in MSEN 301.

MSEN 489 Special Topics In...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified area of materials science and engineering. May be repeated for credit. **Prerequisite:** Approval of instructor.

MSEN 491 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of a faculty member in materials science and engineering. May be taken four times for credit. **Prerequisites:** Grade of C or better in MSEN 301.

MSTC - Music Technology (MSTC)

MSTC 101 Introduction to Performance Technology

Credits 3. 3 Lecture Hours. 1 Lab Hour. Basic hardware, software, and aesthetic concepts of technology-based artistic performance; basic electricity, electronics, troubleshooting, audio and video design software, study of significant works, and participation in a production.

MSTC 150 History of Electronic Music

Credits 3. 3 Lecture Hours. Historical survey of electronic music, including key technological advancements, people and musical works; exploration of electronic music from different genres and countries.

MSTC 221 Fixed Media Composition

Credits 3. 3 Lecture Hours. 1 Lab Hour. Creation of music using digital audio workstation software; critical listening and analysis of music literature; application of technical and aesthetic concepts of digital audio, types of signal processing, and composition. **Prerequisites:** MSTC 101 or approval of instructor.

MSTC 223 Recording and the Producer

Credits 3. 3 Lecture Hours. Tools and techniques of studio recording; the studio as compositional tool; recorded literature examining the creative and ideological impact of the producer; recording projects applying course techniques and exploring aesthetic concepts. **Prerequisites:** Grade of C or better in MSTC 221.

MSTC 224 Composing Commercial Music

Credits 3. 3 Lecture Hours. Creation of music in a commercial production context; technical and business concepts including synchronization, rights, licensing, distribution, and related roles in the music industry; analysis of existing music and application of course techniques in creating new music. **Prerequisites:** MSTC 223 or approval of instructor.

MSTC 245 Survey of Artificial Intelligence in Music

Credits 3. 3 Lecture Hours. Survey of Artificial Intelligence (AI) techniques and applications in music and sound, history of technological developments, and related music literature; examination of the creative process, authorship, and aesthetics in the context of creative computing for music.

MSTC 311 Technology-Based Performance

Credits 1 to 3. 1 to 3 Lecture Hours. Performance using technology as the primary basis for musical structure; study of technology-based music literature and performance techniques; presentation in live or mediated formats. May be taken eight times for credit. **Prerequisites:** MSTC 101; junior or senior classification or approval of instructor.

MSTC 341 Programming for Composers

Credits 3. 3 Lecture Hours. Overview of how to make music by programming a computer; creation of applications, control interfaces, instruments, and intelligent agents for digital signal processing, interactivity, generative art, and multimedia; no programming experience required. **Prerequisites:** MSTC 221; junior or senior classification or approval of instructor.

MSTC 352 Electronic Music Literature through Practice

Credits 3. 3 Lecture Hours. Study of a selected body of electronic music literature by applying their techniques to create new music; critical listening, musical analysis, consideration of historical context, and application of techniques observed in the selected literature. May be taken four times for credit. **Prerequisites:** MSTC 221; junior or senior classification or approval of instructor.

MSTC 354 The Recording Medium

Credits 3. 3 Lecture Hours. Overview of how to make music by studying a selected medium and its signature advantages, limitations, and the literature exploring them; musical and historical analysis; application of these concepts in new compositions. May be taken four times for credit. **Prerequisites:** MSTC 221; junior or senior classification or approval of instructor.

MSTC 417 Intermedia Performance

Credits 3. 3 Lecture Hours. Composition and performance of music using technology to cross boundaries across media, disciplines, and other modes of expression and experience; intermedia literature, theory, aesthetics, and techniques in constructing, composing, and presenting intermedia art in real-time encounters, live or mediated. **Prerequisites:** MSTC 221; junior or senior classification or approval of instructor.

MSTC 489 Special Topics In...

Credits 1 to 4. 1 to 4 Other Hours. Special topics in an identified area of music technology. May be repeated for credit. **Prerequisites:** Junior or senior classification or approval of instructor.

MTDE - Multidisciplinary Engr (MTDE)

MTDE 252 Engineering Entrepreneurship Hour

Credit 1. 1 Lecture Hour. Engagement with successful technology entrepreneurs from technical sectors across engineering and the nation; challenges faced by and characteristics of successful entrepreneurs and their strategies in launching and sustaining businesses on technology innovation; network with highly successful entrepreneurs and develop relations valuable to professional careers; development of speaking and presentation skills; networking with industry professionals in support of entrepreneurship. **Prerequisites:** Grade of C or better in ENGR 102; or approval of instructor.

MTDE 285 Directed Studies

Credits 0 to 6. 0 to 6 Other Hours. Directed studies within the field of multidisciplinary engineering. **Prerequisite:** Sophomore classification and approval of multidisciplinary engineering director or delegate.

MTDE 289 Special Topics in...

Credits 1 to 4. 1 to 4 Other Hours. Selected topics in an identified area of multidisciplinary engineering. May be repeated for credit.

MTDE 291 Research

Credits 1 to 6. 1 to 6 Other Hours. Research conducted under the direction of faculty member in multidisciplinary engineering. **Prerequisite:** Sophomore classification and approval of multidisciplinary engineering director or delegate.

MTDE 311 Enterprise Basics for Technical Entrepreneurs

Credits 3. 3 Lecture Hours. Aspects of entrepreneurship for a technical enterprise; elements of a business including idea generation, startup financing, staffing, product design and production, marketing and selling a product; focus on the front end of the venture; product design and development, financing, identifying and attracting key personnel, and starting up company. **Prerequisites:** Grade of C or better in MTDE 252, or approval of instructor.

MTDE 312 Sales, Operations and Manufacturing for Technology Companies

Credits 3. 3 Lecture Hours. Challenges faced in a start-up entity with respect to product manufacturing, operations and supply chain management, product pricing strategies, and sales and marketing; focus on small start-up to young mid-size enterprises. **Prerequisites:** Grade of C or better in MTDE 252, or approval of instructor.

MTDE 313 Engineer to Chief Executive Officer

Credits 3. 3 Lecture Hours. Fundamental skills, experience, and training necessary to one day serve in the Chief Executive Officer (CEO) role; exploration of what it means to be the CEO and to take on those responsibilities along with the personal and professional commitments associated with this important position; study of critical area of communications and effective ways to interface with the key stakeholder groups represented by shareholders, board of directors, executive management team, employees, customers, the media and communities where the company does business. **Prerequisite:** Completion of one summer internship or co-op; or approval of instructor.

MTDE 314 Skills for Technology Leadership

Credits 3. 3 Lecture Hours. Insight into career paths for engineers and technologists; emerging technology learning and evaluation; technology talent evaluation and management; elements of technology strategy; technology management processes and frameworks; communicating complex technologies; technology leader's roles in various organizations. **Prerequisites:** Junior or senior classification.

MTDE 315 Startup Fundamentals - Launching, Growing and Exiting a Startup Company

Credits 3. 3 Lecture Hours. Fundamental skills, experience, and training necessary to launch a startup company; techniques for growing the startup including branding, sales, transitioning from prototypes to production, human resources and organization design, and its operations; exit opportunities, such as understanding financials and company evaluations, developing negotiating skills, and exit options including, a strategic buyout, IPO, liquidation and bankruptcy. **Prerequisites:** Grade of C or better in MTDE 252; or approval of instructor.

MTDE 320 Engineering for Sustainable Development

Credits 3. 3 Lecture Hours. Principles of sustainable development applied to multidisciplinary engineering design; systems thinking approaches with aims towards optimal balances of technology benefits for society, economy, and environment; impacts of engineering innovation within realistic constraints; circular economy with engineering and financial implications. **Prerequisites:** Grade of C or better in ENGR 216/PHYS 216; junior or senior classification, or approval of instructor; also taught at Qatar campus.

MTDE 333 Project Management for Engineers

Credits 3. 3 Lecture Hours. Basic project management for engineering; project development and economic justification; estimating; scheduling; network methods; critical path analysis; earned value management; project organizational structures; project risk assessment; resource allocation; ethics; characteristics of project managers. **Prerequisites:** Junior or senior classification, classification in the College of Engineering or Biological and Agricultural Engineering, or approval of instructor; also taught at Qatar campus.

MTDE 334 Agile Project Management

Credits 3. 3 Lecture Hours. Agile approach of project management within the context of broader engineering disciplines; agile approaches and lifecycles; agile teams and roles; hybrid projects and tailoring tools; enterprise environmental factors; organizational structures; risk assessment; and principles of agile leadership. **Prerequisites:** Grade of C or better in ENGR 216/PHYS 216 or PHYS 216/ENGR 216, or approval of instructor.

MTDE 371 STEM in National Security

Credits 3. 3 Lecture Hours. Collection and processing of information from overseas by the U.S. Intelligence Community (IC) using science, technology, engineering, and mathematics (STEM); analysis of collected information on technical topics such as technology or weapons; overview of how different IC organizations recruit for and use STEM backgrounds; and process of the intelligence cycle from a STEM perspective including technical collection techniques, cyber and counterintelligence issues, and production of technical analysis for policymakers using open source information. **Prerequisites:** Grade of C or better in PHYS 206; or approval of instructor.

MTDE 380 Seminar Series in Engineering Project Management

Credit 1. 1 Lecture Hour. Presentations by practicing engineers and professionals addressing engineering project management process and practice; discussion forum to better understand the opportunities and challenges of engineering project management and the analytical tools and skills required to be successful. **Prerequisites:** Grade of C or better in MTDE 333 or concurrent enrollment; or approval of instructor; junior or senior classification in the College of Engineering or biological and agricultural engineering (BAEN).

MTDE 381 Professional Development Seminar-Subsea Engineering

Credit 1. 1 Lecture Hour. Presentations by subsea engineering industry experts; relation of subsea engineering principles to real world scenarios; application of analytical reasoning through class presentations, discussions, assignments, reports, specific to subsea field development design and operations; proper design and operation of subsea production systems including subsea hardware, umbilicals, risers, flowlines, flow assurance, subsea architectures, multiphase flow and several related areas of subsea production systems. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisite:** Grade of C or better in MTDE 430, or concurrent enrollment; or approval of instructor.

MTDE 409 Patent Law for Engineers

Credits 3. 3 Lecture Hours. Exploration of how proprietary interests in technology are protected by patent law, with a focus on issues of patent validity, patent-eligible subject matter and the enforcement of patent rights.

MTDE 421 Technology Company Management, Leadership, and Corporate Culture

Credits 3. 3 Lecture Hours. Strategic challenges associated with enterprise management and leadership; establishing and maintaining a sustainable brand; developing an effective corporate culture; dealing with global competition; case studies in strategic thinking. **Prerequisites:** Grade of C or better in MTDE 311, MTDE 312, MTDE 313, or MTDE 314, or approval of instructor.

MTDE 430 Fundamentals of Subsea Engineering

Credits 3. 3 Lecture Hours. Orientation to subsea engineering fundamentals, including SURF (Subsea, Umbilicals/Controls, Risers, Flowlines) equipment and configurations; exposure to practical, industry focused problems; subsea equipment components; design considerations and design drivers; subsea production operations; integrity critical maintenance activities. **Prerequisites:** Junior or senior classification; enrolled in the College of Engineering or approval of instructor.

MTDE 432 Subsea Project Implementation

Credits 3. 3 Lecture Hours. Overview of the realization of a subsea development project; includes all stages from discovery to pre-commissioning of the subsea infrastructure. **Prerequisite:** Grade of C or better in MTDE 430 or concurrent enrollment.

MTDE 433 Transition from Fossil Fuels

Credits 3. 3 Lecture Hours. Current status of energy supplies; overview of energy source trends and forecast of what will be seen in the future; examination of renewable energy sources, their technology, what the challenges are and how will these be overcome; key consideration appraises how the transition will be founded on what we are doing now. **Prerequisites:** Junior or senior classification; enrolled in the College of Engineering.

MTDE 440 Subsea Hardware Design

Credits 3. 3 Lecture Hours. Basic elements that make up subsea hardware assemblies; understanding of how these elements work together in a system; decision, design, and project teaming processes for subsea hardware projects. **Prerequisite:** Grade of a C or better MTDE 430; or approval of instructor.

MTDE 441 Subsea Umbilical and Control System Design

Credits 3. 3 Lecture Hours. Practical view of subsea umbilical and controls system project realization from concept selection through installation and offshore acceptance testing. **Prerequisite:** Grade of C or better in MTDE 430, or concurrent enrollment.

MTDE 442 Subsea Pipeline Design

Credits 3. 3 Lecture Hours. Realization of pipeline projects from concept selection through installation and offshore acceptance testing; emphasis on practical applications of theory to project delivery. **Prerequisite:** Grade of C or better in MTDE 430 or approval of instructor.

MTDE 443 Subsea Riser Design

Credits 3. 3 Lecture Hours. Realization of subsea riser projects from concept selection through installation and offshore acceptance testing; emphasis on practical applications of theory. **Prerequisite:** Grade of C or better in MATH 251 or MATH 253, and MATH 308; or approval of instructor.

MTDE 445 The Hydrogen Economy

Credits 3. 3 Lecture Hours. Advances in the hydrogen economy and hydrogen production from renewable sources; hydrogen storage, transport, delivery and utilization of clean energy using decarbonization methods; design and operation of hydrogen production hubs and equipment; integrity of critical maintenance activities; case studies of commercial applications; current technological challenges and innovations; economic and risk analyses and their controls. **Prerequisites:** Junior or senior classification; enrollment in the College of Engineering or approval of instructor.

MTDE 446 Applied Reliability Engineering to Subsea Systems

Credits 3. 3 Lecture Hours. Overview of the application of reliability engineering to subsea systems and all stages from discovery to pre-commissioning of the subsea infrastructure. **Prerequisite:** Grade of C or better in MATH 251 and MATH 308; or approval of instructor.

MTDE 450 Flow Assurance Operability of Subsea Systems

Credits 3. 3 Lecture Hours. Hydrocarbon production and transport from offshore fields to the host facilities, including prevention and remediation of phenomena that hinder fluid flow in production systems; subsea architecture, hydrodynamic and thermal considerations, reservoir fluid characterization and analysis, solids management, thermal hydraulics and production chemistry. **Prerequisite:** Grade of C or better in MTDE 430 or approval of instructor.

MTDE 451 Subsea Production Operations

Credits 3. 3 Lecture Hours. Multiphase hydrocarbon production and transport from offshore fields to host facilities under both steady-state and transient conditions; including reservoir and SURF system management through chemical gas and water injection, surface and subsea processing, testing and maintenance through all phases of a subsea development. **Prerequisite:** Grade of C or better in MTDE 430 or approval of instructor.

MTDE 461 Product Lean Launch for Engineers

Credits 3. 2 Lecture Hours. 2 Lab Hours. Exercises in the creation of an engineering-centric business using lean startup principles; customer and market validation; value proposition creation; minimum viable product (MVP) development; customer value chain discovery; communication skill training; development of a business model canvas for a student-developed engineering product business idea. **Prerequisites:** Grade of C or better in MTDE 311, MTDE 312, MTDE 313, or MTDE 314; or approval of instructor.

MTDE 485 Directed Studies

Credits 0 to 6. 0 to 6 Other Hours. Directed studies within the field of multidisciplinary engineering. **Prerequisite:** Junior or senior classification and approval of multidisciplinary engineering director or delegate.

MTDE 489 Special Topics In...

Credits 1 to 4. 1 to 4 Other Hours. Selected topics in an identified area of multidisciplinary engineering. May be repeated for credit.

MTDE 491 Research

Credits 1 to 6. 1 to 6 Other Hours. Research conducted under the direction of faculty member in multidisciplinary engineering. **Prerequisite:** Junior or senior classification and approval of multidisciplinary engineering director or delegate.

MUSC - Music (MUSC)

MUSC 102 Fundamentals of Music

Credits 3. 3 Lecture Hours. (MUSI 1303) Fundamentals of Music. Introduction to the basic elements of music (pitch, rhythm, scales, intervals and triads) and how these elements interrelate to form musical compositions; the application of musical understanding to particular instruments such as the guitar, keyboard, recorder and voice.

MUSC 115 Fundamentals of Music Technology

Credits 3. 3 Lecture Hours. 1 Lab Hour. Introduction to technology used for professional music performance; discussion of recording technology and procedures, live settings, technology of musical instruments, and sound reinforcement.

MUSC 130 Introduction to Music Performance

Credits 3. 3 Lecture Hours. Introduction to music performance practices; consideration of artistic development, collaborative process, marketing, cross-cultural influence, and creative process; performance in individual, small ensemble, and large ensemble settings.

MUSC 140 Introduction to InterArts Performance

Credits 3. 3 Lecture Hours. Introduction of musical performance practices or styles that intersect with other art forms or mediums, such as dance, visual art, theatre, film, or video games; consideration of artistic, aesthetic, collaborative and creative development.

MUSC 200 Topics in Music

Credits 3. 3 Lecture Hours. Study of a particular musical topic in its sociohistorical context; emphasis on the aesthetic, historical, social, and cultural aspects of a musical style or genre rather than on technical analysis. May be repeated for credit.

MUSC 201 Music and the Human Experience

Credits 3. 3 Lecture Hours. (MUSI 1306) Music and the Human Experience. An introduction to music and related issues; designed to enhance the student's knowledge and perception of music; selected works in various styles within historical, psychological and aesthetic contexts; also taught at Qatar campus.

MUSC 203 Sonic Design

Credits 3. 3 Lecture Hours. Exploration of definitions, methodologies, and applications of sonic design; discussion and analysis of sound creation and its uses or meanings; individual and collaborative sonic design projects.

MUSC 204 Music Theory I

Credits 2. 2 Lecture Hours. 0 Lab Hours. (MUSI 1311) Music Theory I. Principles of music of western and global traditions including harmonic, rhythmic, melodic and phrase or period structures; written analysis of short musical excerpts; composition or transcription of musical examples in common practice; period, global and popular styles. **Prerequisites:** Grade of C or better in MUSC 208, or concurrent enrollment; major or minor in Music or Performance Studies, or approval of instructor.

MUSC 205 Music Theory II

Credits 2. 2 Lecture Hours. (MUSI 1312) Music Theory II. Study of notation and transmission methods of musics in western and global traditions; examination of structural principles of tonal harmony and voice leading including chromaticism, modulation and secondary functions; analysis of large musical forms including 12-bar blues, binary, ternary, rondo and sonata-allegro. **Prerequisites:** Grade of C or better in MUSC 210 or concurrent enrollment; grade of C or better in MUSC 204 and MUSC 208; major or minor in Music, or approval of instructor.

MUSC 206 Music Theory III

Credits 2. 2 Lecture Hours. Study of notation and transmission methods in musics of western and global traditions including extended harmonic, rhythmic and melodic and post-tonal principles; examination of structural principles of tonal and post-tonal harmony; includes mode mixture, enharmonicism, and extended chromaticism; analysis of chromatic and contemporary music from classical, popular, and global music genres. **Prerequisites:** Grade of C or better in MUSC 205 and MUSC 210; grade of C or better in MUSC 212 or concurrent enrollment; major or minor in Music; or approval of instructor.

MUSC 208 Musicianship I

Credit 1. 3 Lab Hours. Application of principles of western and global music theory studied in MUSC 204; focus on embodiment, improvisation, memorization, aural identification, analysis, sight-singing, rhythm, and keyboard skills; application of skills to performance, composition and pedagogical literature; case studies in global and non-traditional music practices. **Prerequisites:** Grade of C or better in MUSC 204 or concurrent enrollment; major or minor in Music or Performance Studies, or approval of instructor.

MUSC 210 Musicianship II

Credit 1. 3 Lab Hours. Application of principles of western and global music theory traditions studied in MUSC 205; focus on continued development of embodiment, improvisation, memorization, aural identification and analysis, sight-singing, rhythm, and keyboard skills; application of skills to performance, composition and pedagogical literature; case studies in global and non-traditional music practices. **Prerequisites:** Grade of C or better in MUSC 204 and MUSC 208; concurrent enrollment in MUSC 205; major or minor in Music; or approval of instructor.

MUSC 211 Collaborative Musicianship

Credits 3. 3 Lecture Hours. Project-based approach to Western music traditions; critical reflection on aesthetics and performance of Western music; cross-cultural influences; notation and ear training; knowledge applied to the creative process. **Prerequisites:** Major or minor in PERF, or approval of instructor.

MUSC 212 Musicianship III

Credit 1. 3 Lab Hours. 0 Other Hours. Application of advanced principles of western and global music theory traditions explored in MUSC 206; focus on expanded development of embodiment, improvisation, memorization, aural identification and analysis, sight-singing, rhythm, and keyboard skills in chromatic and post-tonal music; application of skills to performance literature, composition, and analysis; case studies in global and non-traditional music practices. **Prerequisites:** Grade of C or better in MUSC 205 and MUSC 210; concurrent enrollment in MUSC 206; major or minor in Music; or approval of instructor.

MUSC 220 Music History Survey

Credits 3. 3 Lecture Hours. Overview of historical developments in music from antiquity to the contemporary era; exploration of musical characteristics, significant composers or performers, and cultural-social context; selected works from within historical, psychological, societal, and aesthetic contexts.

MUSC 221 Guitar Heroes

Credits 3. 3 Lecture Hours. Survey of social, cultural and aesthetic transformations of music history centered on important classical guitarists; exploration of their performance and compositional/musical styles; analysis of how their contributions gave rise to and revived the guitar's popularity as a concert-level instrument in both the classical and folk idioms.

MUSC 222 Music of the Americas

Credits 3. 3 Lecture Hours. Evolution of music of the Americas and the Caribbean; influence of natives, people of forced relocation and people from European communities; the syncretic process of music making.

MUSC 224 History of Country and Western Music

Credits 3. 3 Lecture Hours. Examination of the development of country music; emphasis on how the sounds and meaning of music reflect culture, ideology, and history.

MUSC 225 History of Jazz

Credits 3. 3 Lecture Hours. (MUSC 1310) History of Jazz. Non-technical survey of jazz as America's classical music, from the earliest recorded blues through the most recent trends; examination of how jazz has broadly expressed issues of modern life.

MUSC 226 History of Rock

Credits 3. 3 Lecture Hours. Examination of the development of rock music; emphasis on how the sounds and meaning of music reflects culture, ideology and history; also taught at Galveston campus.

MUSC 230 Topics in Music Analysis

Credits 3. 3 Lecture Hours. Analysis of a particular musical style, genre, or period; focus on aesthetic characteristics, compositional aspects, and repertoire; analysis of written compositions, aural examples, and/or live performance. May be repeated for credit. **Prerequisites:** Major or minor in Music; grade of C or better in MUSC 204 and MUSC 208; or approval of instructor.

MUSC 235 Introduction to Composition

Credits 3. 3 Lecture Hours. Significant styles and techniques in contemporary music including classical, jazz and popular trends; contemporary sonic design achieved through written exercises, reading and critical listening.

MUSC 241 Music and Video Games

Credits 3. 3 Lecture Hours. 1 Lab Hour. Examination of the development of music in video games; exploration of theoretical issues and subjects within ludomusicology; emphasis on how the sounds and meaning of video game music reflect culture, ideology and history; creative music composition/sonic design for a video game.

MUSC 242 Music and Dance

Credits 3. 3 Lecture Hours. Study of dance-music relations in various sociocultural contexts; emphasis on the aesthetic, historical, social, and cultural aspects of music and dance rather than on technical analysis.

MUSC 243 Music and Visual Art

Credits 3. 3 Lecture Hours. Study of the relationship between music and the visual arts, including painting, animation, and live concerts.

MUSC 244 Music and Film

Credits 3. 3 Lecture Hours. Study of film music history and analysis.

MUSC 245 Individual Instruction - Composition I

Credit 1. 2 Other Hours. Instruction in composition; the writing of small-form musical compositions; techniques for composing for instrumental, vocal, electronic, and mixed-media settings; emphasis on historical and theoretical aspects that relate to particular compositional practices and techniques. May be taken four times for credit. **Prerequisites** Grade of C or better in MUSC 235; or approval of instructor.

MUSC 246 Music and Theatre

Credits 3. 3 Lecture Hours. Study of music in theatrical productions; explorations of aesthetic, historical, social, and cultural aspects of performances that combine music and theatre; focus on diegetic and incidental use of music in theatre.

MUSC 253 Individual Instruction - Guitar Performance I

Credit 1. 0 Lecture Hours. 0 Lab Hours. 2 Other Hours. Instruction in guitar performance; study of a broad range of literature; special emphasis on historical and theoretical aspects that relate to particular performance practices and techniques; individual lesson and group studio meeting. May be taken four times for credit. **Prerequisites:** Approval of instructor.

MUSC 254 Individual Instruction - Vocal Performance I

Credit 1. 2 Other Hours. Instruction in vocal performance; study of a broad range of literature; special emphasis on historical and theoretical aspects that relate to particular performance practices and techniques; individual lesson and group studio meeting. May be taken four times for credit. **Prerequisites:** Approval of instructor.

MUSC 255 Individual Instruction - Piano Performance I

Credit 1. 2 Other Hours. Instruction in piano performance; study of a broad range of literature; special emphasis on historical and theoretical aspects that relate to particular performance practices and techniques; individual lesson and group studio instruction. May be taken four times for credit. **Prerequisites:** Approval of instructor.

MUSC 256 Individual Instruction - String Performance I

Credit 1. 2 Other Hours. Instruction in string performance; study of a broad range of literature; special emphasis on historical and theoretical aspects that relate to particular performance practices and techniques; individual lesson and group studio instruction. May be taken four times for credit. **Prerequisites:** Approval of instructor.

MUSC 270 Individual Instruction: Woodwind Performance I

Credit 1. 2 Other Hours. Instruction in woodwind performance; study of a broad range of literature; special emphasis on historical and theoretical aspects that relate to particular performance practices and techniques; individual lesson and group studio instruction. May be taken four times for credit. **Prerequisites:** Approval of instructor.

MUSC 271 Individual Instruction - Brass Performance I

Credit 1. 2 Other Hours. Instruction in brass performance; study of a broad range of literature; special emphasis on historical and theoretical aspects that relate to particular performance practices and techniques; individual lesson and group studio instruction. May be taken four times for credit. **Prerequisites:** Approval of instructor.

MUSC 272 Individual Instruction - Percussion Performance I

Credit 1. 2 Other Hours. Instruction in percussion performance; study of a broad range of literature; special emphasis on historical and theoretical aspects that relate to particular performance practices and techniques; individual lesson and group studio instruction. May be taken four times for credit. **Prerequisites:** Approval of instructor.

MUSC 273 Individual Instruction - Electronic Music Performance I

Credit 1. 2 Other Hours. Instruction in electronic music performance; study of a broad range of literature; special emphasis on historical and theoretical aspects that relate to particular performance practices and techniques; exploration of new technologies; individual lesson and group studio instruction. May be taken four times for credit. **Prerequisites:** Approval of instructor.

MUSC 277 Marching Band

Credit 1. 4 Lab Hours. Auditioned playing and marching band; serves as the official university band for Texas A&M University; perform for football games, Corps of Cadets events, and mandated university functions; performance-based course designed to improve marching and playing skills. **Prerequisites:** Previous high school marching and playing experience.

MUSC 280 Ensemble Performance-University Concert Bands

Credit 1. 3 Lab Hours. Four select musical performing ensembles (Wind Symphony, Symphonic Winds, Symphonic Band, and Concert Band) composed of 65 to 100 members each and devoted to learning the extensive literature written for wind band; activities include at least two concerts per semester; occasional national and international tours each spring. Students may register in up to but no more than two different sections of this course. May be repeated for credit. **Prerequisite:** Satisfactory audition.

MUSC 282 Ensemble Performance--Jazz Ensemble

Credit 1. 3 Lab Hours. A select musical performing ensemble of 18 to 25 members devoted to performing all styles and periods of jazz music from big band to modern jazz; activities include at least 2 performances each semester. May be repeated for credit. **Prerequisite:** Satisfactory audition.

MUSC 283 Ensemble Performance-University Orchestras

Credit 1. 3 Lab Hours. Two select orchestral performing ensembles (Chamber Orchestra and Philharmonic Orchestra) devoted to the rehearsal and performance of orchestral literature of various historical backgrounds; activities include full ensemble rehearsal, individual practice and public performances with the development of knowledge, understanding and appreciation for aspects of music ranging from the Renaissance to the Modern Era. **Prerequisites:** Previous orchestral experience; successful audition.

MUSC 290 Ensemble Performance--Choir

Credit 1. 1 Other Hour. A select musical performing ensemble composed of 40 to 70 members devoted to learning and performing works from the vast repertory of choral music from all historical periods and styles; several performances, occasionally with orchestra, each semester on and off campus. Students may register in up to but no more than two different sections of this course. May be repeated for credit. **Prerequisite:** Satisfactory audition.

MUSC 300 Music Research and Writing

Credits 3. 3 Lecture Hours. Techniques and methodologies for researching and writing about music; major writing component. **Prerequisites:** Junior or senior classification; major or minor in Music, or approval of instructor.

MUSC 305 Music Entrepreneurship

Credits 3. 3 Lecture Hours. Exploration of career paths, best practices, and practicalities of life in the music business; professional development and preparation for careers in the music industry; mentorship; opportunities for collaborative creativity. **Prerequisites:** Junior or senior classification; major or minor in music, or approval of instructor.

MUSC 311 Music History I

Credits 3. 3 Lecture Hours. Overview of various musical expressions around the world between Classical Greco-Roman Antiquity and 1750. **Prerequisites:** Junior or senior classification.

MUSC 312 Music History II

Credits 3. 3 Lecture Hours. Overview of various musical expressions around the world between 1750 and 1900. **Prerequisites:** Junior or senior classification.

MUSC 315 Music History III

Credits 3. 3 Lecture Hours. Overview of various musical expressions around the world since 1900. **Prerequisites:** Junior or senior classification.

MUSC 323 Global Hip Hop

Credits 3. 3 Lecture Hours. Examination of global and diasporic networks of hip hop music and culture; emphasis on the musical, visual, embodied, and intellectual artistic expressions of hip hop; discussion of hip hop's engagement with youth culture, politics, activism, media and industry, identity, and historical contexts. **Prerequisite:** Junior or senior classification or approval of instructor.

MUSC 324/ANTH 324 Music in World Cultures

Credits 3. 3 Lecture Hours. Examination of music from an ethnomusicological perspective focusing on musical performance and the complex interrelationship of music to culture, society and daily life; examination of music from a variety of cultures through a series of case studies. **Prerequisite:** Junior or senior classification or approval of instructor. **Cross Listing:** ANTH 324/MUSC 324.

MUSC 327/AFST 327 Popular Musics in the African Diaspora

Credits 3. 3 Lecture Hours. Examination of a range of popular musics from the twentieth century that have emerged in conjunction with the historical global spread of peoples and cultures from the African continent; technical knowledge about music is not required; focus on social and cultural contexts for popular music. **Prerequisite:** Junior or senior classification or approval of instructor. **Cross Listing:** AFST 327/MUSC 327.

MUSC 330 Music Performance Project

Credits 3. 3 Lecture Hours. 1 Lab Hour. Investigation of a particular musical practice through discussion, analysis, and embodied performance; participation in a public performance; techniques and methods of performance project design, development, and production; emphasis on collaboration. May be repeated for credit. **Prerequisites:** Major or minor in Music; grade of C or better in MUSC 130; or approval of instructor.

MUSC 335 Sonic Improvisation

Credits 3. 3 Lecture Hours. Exploration of sonic improvisation in cultural, social, and performative settings; discussion and analysis of role and meaning of global improvisational performance practices; project-based study of improvisational techniques in sound and music; collaborative creation and performance of improvised sound and music. **Prerequisite:** Junior or senior classification.

MUSC 345 Advanced Composition

Credits 3. 3 Lecture Hours. Advanced instruction in composition; the writing of large-form musical compositions employing contemporary styles; techniques in writing for instrumental, vocal, electronic and mixed-media resources. **Prerequisites:** Grade of C or better in MUSC 235, or approval of instructor.

MUSC 353 Individual Instruction - Guitar Performance II

Credit 1. 2 Other Hours. Advanced instruction in guitar performance; study of a broad range of literature; special emphasis on historical and theoretical aspects that relate to particular performance practices and techniques; individual lesson and group studio meeting. May be taken four times for credit. **Prerequisites:** Junior or senior classification; MUSC 253, and approval of instructor.

MUSC 354 Individual Instruction - Vocal Performance II

Credit 1. 2 Other Hours. Advanced instruction in vocal performance; study of a broad range of literature; special emphasis on historical and theoretical aspects that relate to particular performance practices and techniques; individual lesson and group studio meeting. May be taken four times for credit. **Prerequisites:** Junior or senior classification; MUSC 254 or approval of instructor.

MUSC 355 Individual Instruction - Piano Performance II

Credit 1. 2 Other Hours. Advanced instruction in piano performance; study of a broad range of literature; special emphasis on historical and theoretical aspects that relate to particular performance practices and techniques; individual lesson and group studio instruction. May be taken four times for credit. **Prerequisites:** Junior or senior classification; MUSC 255; or approval of instructor.

MUSC 356 Individual Instruction - String Performance II

Credit 1. 2 Other Hours. Advanced instruction in string performance; broad range of literature with special emphasis on the historical and theoretical aspects that reveal the performance practices of specific periods; individual and group laboratory instruction. May be taken four times for credit. **Prerequisites:** Junior or senior classification; MUSC 256; or approval of instructor.

MUSC 370 Individual Instruction - Woodwind Performance II

Credit 1. 2 Other Hours. Advanced instruction in woodwind performance; study of a broad range of literature; special emphasis on historical and theoretical aspects that relate to particular performance practices and techniques; individual lesson and group studio instruction. May be taken four times for credit. **Prerequisites:** Junior or senior classification; MUSC 270; or approval of instructor.

MUSC 371 Individual Instruction - Brass Performance II

Credit 1. 2 Other Hours. Advanced instruction in brass performance; study of a broad range of literature; special emphasis on historical and theoretical aspects that relate to particular performance practices and techniques; individual lesson and group studio instruction. May be taken four times for credit. **Prerequisites:** Junior or senior classification; MUSC 271; or approval of instructor.

MUSC 372 Individual Instruction - Percussion Performance II

Credit 1. 2 Other Hours. Advanced instruction in percussion performance; study of a broad range of literature; special emphasis on historical and theoretical aspects that relate to particular performance practices and techniques; individual lesson and group studio instruction. May be taken four times for credit. **Prerequisites:** Junior or senior classification; MUSC 272; or approval of instructor.

MUSC 373 Individual Instruction - Electronic Music Performance II

Credit 1. 2 Other Hours. Advanced instruction in electronic music performance; study of a broad range of literature; special emphasis on historical and theoretical aspects that relate to particular performance practices and techniques; exploration of new technologies; individual lesson and group studio instruction. May be taken four times for credit. **Prerequisites:** Junior or senior classification; MUSC 273; or approval of instructor.

MUSC 375 Individual Instruction - Composition II

Credit 1. 2 Other Hours. Advanced instruction in composition; the writing of small-form musical compositions; techniques for composing for instrumental, vocal, electronic, and mixed-media settings; emphasis on historical and theoretical aspects that relate to particular compositional practices and techniques. May be taken four times for credit. **Prerequisites:** Junior or senior classification; MUSC 245; or approval of instructor.

MUSC 381 Small Ensembles

Credits 1 to 3. 1 to 3 Lecture Hours. Performance and research in ensemble settings covering a wide variety of genres from world cultures, including contemporary, historical, popular, folk and classical genres. **Prerequisites:** Performance Studies major or minor, junior or senior classification, or approval of instructor.

MUSC 386/THEA 386 Evolution of the American Musical

Credits 3. 3 Lecture Hours. Examination of the American musical from its heterogeneous origins to a thriving and diverse expression of the human condition; analysis and critical discourse on the development of the American musical through text, audio and visual recordings. **Prerequisites:** Junior or senior classification or approval of instructor. **Cross Listing:** THEA 386/MUSC 386.

MUSC 424 Topics in Ethnomusicology

Credits 3. 3 Lecture Hours. Study and application of ethnomusicological theory, method, and literature in a variety of historical and geographical contexts. May be taken four times for credit. **Prerequisite:** Junior or senior classification.

MUSC 430 Music Performance Studio

Credits 3. 2 Lecture Hours. 3 Lab Hours. Practice of conceiving, designing, researching, developing, rehearsing, and staging musical performance in small groups; application of best practices and strategies for collaborative creation; advanced techniques and skills for musical performance; discussion and critical analysis of musical performance. May be repeated for credit. **Prerequisites:** Major or minor in Music; grade of C or better in MUSC 130 and MUSC 330; or approval of instructor.

MUSC 441 Music Performance Capstone

Credits 3. 1 Lecture Hour. 5 Lab Hours. Design, development, and presentation of an individually-chosen performance-based project; major writing and oral communication components. **Prerequisites:** Music major; MUSC 430; junior or senior classification.

MUSC 479 Advanced Topics in Music Technology

Credits 3. 3 Lecture Hours. Theory, aesthetics, and application of advanced concepts and skills relating to music technology. May be taken 4 times for credit. **Prerequisites:** MUSC 316 or approval of instructor.

MUSC 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. ..Selected topics in an identified area of music. **Prerequisites:** Approval of instructor.

MUSC 491 Research

Credits 0 to 3. 0 to 3 Other Hours. Research conducted under the direction of a faculty member in music. **Prerequisites:** Junior or senior classification and approval of instructor.

MUST - Museum Studies (MUST)

MUST 221/ARCH 221 Foundations of Museum Studies

Credits 3. 3 Lecture Hours. Introduction to museums, cultural heritage and collections care; best practices for non-profit institutions, public engagement and the collection, preservation and exhibition of material culture; emphasis on archaeological, ethnographic, and historical collections, or other collections of cultural significance. **Cross Listing:** ARCH 221/MUST 221.

MUST 421/ANTH 421 Advanced Museum Studies

Credits 3. 2 Lecture Hours. 3 Lab Hours. Exploration of advanced topics in museum programs; preservation, research, education, outreach; development and implementation; emphasis on historical contexts, disciplinary intersections, ethical obligations and professional responsibilities; service to community, state and national interest and advancement of sciences. **Prerequisites:** Grade of C or better in MUST 221/ARCH 221, ARCH 221/MUST 221, or MAST 220; junior or senior classification. **Cross Listing:** ANTH 421/MUST 421.

MUST 484 Internship

Credits 0 to 3. 0 to 3 Other Hours. Provides students with the opportunity to gain practical experience in a variety of cultural heritage settings, including museums, archives, libraries, art galleries, conservation and preservation laboratories, and collection facilities. May be taken four times for credit. **Prerequisites:** Junior or senior classification or approval of instructor.

MXET - Multidiscip Engr Tech (MXET)

MXET 220 Science, Technology, Engineering and Mathematics (STEM) Education Foundations

Credits 2. 1 Lecture Hour. 2 Lab Hours. Introduction to Science, Technology, Engineering and Mathematics (STEM) education approaches, planning, and analyzing; foundations of K-12 workshops in prototyping, mobile app programming, engineering design, robotics, and Computer-Aided Design (CAD); focus on implementation, testing, documentation, demonstration, and classroom management. **Prerequisites:** Sophomore level classification; MXET major; or approval of instructor.

MXET 250 Robotic Systems Design

Credits 3. 2 Lecture Hours. 3 Lab Hours. Principles of robotic systems design, fabrication, programming, and testing; fundamentals of mechanisms, mechanical power transmission, dynamics of mechanisms, instrumentation, actuation, and computer simulation. **Prerequisites:** Freshman or sophomore classification; MXET major; or approval of instructor.

MXET 300 Mechatronics I – Mobile Robotic Systems

Credits 3. 2 Lecture Hours. 3 Lab Hours. Mechanical, electronic, software, control and communications aspects of embedded intelligence-based electromechanical systems with a focus on mobile robotic platforms. **Prerequisites:** Grade of C or better in MXET 375, PHYS 207, and ENGR 217/PHYS 217 or PHYS 217/ENGR 217; grade of C or better in ESET 359 or concurrent enrollment.

MXET 345 Numerical Methods in Robotics Applications

Credits 3. 2 Lecture Hours. 2 Lab Hours. Vectors and Matrices, Numerical Integration and Differentiation, Linear System of Equations, Root Finding, Curve Fitting, Ordinary Differential Equations, with applications in Manipulator Dynamics, Forward and Inverse Kinematics, Trajectory Generation, and Simulation Dynamics. **Prerequisites:** Grade of C or better in MATH 151, MATH 152; junior or senior classification in multidisciplinary engineering technology; or approval of instructor.

MXET 375 Applied Dynamic Systems

Credits 3. 2 Lecture Hours. 3 Lab Hours. Study of translational mechanical system dynamics, rotational mechanical system dynamics, electrical system dynamics modeling, electro-mechanical/mechatronics system dynamics, fluid power dynamics and 2 dimensional rigid body dynamics. **Prerequisites:** Grade of C or better in MMET 275; junior or senior classification in an engineering technology major.

MXET 400 Mechatronics II – Industrial Robotic Systems

Credits 3. 2 Lecture Hours. 3 Lab Hours. Study and analysis of industrial robotics and automation processes necessary for robot-centric work cell design and operation. **Prerequisites:** Grade of C or better in MXET 300; grade of C or better in ESET 462 or concurrent enrollment, junior or senior classification in multidisciplinary engineering technology.

MXET 450 Artificial Intelligence for Mechatronics

Credits 3. 2 Lecture Hours. 2 Lab Hours. Principles of Artificial Intelligence and Machine Learning; Reinforcement Learning; Path Planning; Decision Making; and Intelligent Control and their applications in designing Intelligent Autonomous Systems. **Prerequisites:** Grade of C or better in MATH 151, MATH 152, and MXET 300; grade of C or better in ESET 462 or concurrent enrollment; junior or senior classification in multidisciplinary engineering technology; or approval of instructor.

MXET 485 Directed Studies

Credits 1 to 6. 1 to 6 Other Hours. Directed study of selected problems in an area of multidisciplinary engineering technology not covered in other courses. May be repeated for credit. **Prerequisites:** Senior classification and approval of instructor.

MXET 491 Research

Credits 0 to 4. 0 Lecture Hours. 0 Lab Hours. 0 to 4 Other Hours. Research conducted under the direction of faculty member in the college of engineering. May be repeated three times for credit. **Prerequisites:** Junior or senior classification and approval of instructor.

NAUT - Nautical Science (NAUT)

NAUT 300 Intermediate Communications, Navigation and Seamanship

Credits 6. 6 Lecture Hours. Practical application of classroom studies aboard training ship during second training cruise; intermediate projects in communications, navigation, seamanship and rules of the road; thorough study made of U.S. Public Health requirements in first aid. **Prerequisites:** MART 200 or NAUT 200, 301, 303, METR 302, or approval of MART department head; junior or senior classification or approval of instructor.

NAUT 400 Advanced Communications, Navigation and Seamanship

Credits 6. 6 Lecture Hours. Practical application of classroom studies aboard training ship during third training cruise; advanced projects in communications, navigation, seamanship and rules of the road. **Prerequisites:** NAUT 200, 300, 302, 304 MART 321, 406; junior or senior classification or approval of instructor.

NRSC - Neuroscience (NRSC)

NRSC 201/VIBS 201 History of Neuroscience

Credit 1. 1 Lecture Hour. Wide spectrum of neuroscience discovery beginning at the turn of the 20th Century; emphasis on key discoveries and their rationale, experimental design, experimental methods, major findings and interpretation of results. **Prerequisites:** Sophomore classification. **Cross Listing:** VIBS 201/NRSC 201.

NRSC 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified area of neuroscience. May be repeated for credit. **Prerequisite:** Approval of instructor.

NRSC 401/VIBS 401 Developmental Neurotoxicology

Credits 3. 3 Lecture Hours. Effects of exposure to toxic substances on the developing nervous system; content to include mechanisms of toxicity of substances potentially devastating to the developing nervous system including lead, mercury and other heavy metals, alcohol, nicotine (smoking), pesticides, flame retardants, and others. **Prerequisites:** Grade of C or better in CHEM 258 or CHEM 228; junior or senior classification; VIBS 277 or NRSC 277 recommended. **Cross Listing:** VIBS 401/NRSC 401.

NRSC 407/VIBS 407 Core Ideas in Neuroscience

Credits 2. 2 Lecture Hours. General overview of selected core ideas across the full spectrum of neuroscience. **Prerequisite:** Junior or senior classification; background in science courses recommended. **Cross Listing:** VIBS 407/NRSC 407.

NRSC 428/BIOL 428 Cellular Neuroscience

Credits 3. 3 Lecture Hours. Cell biology, molecular biology and biophysics of neurons as it pertains to their fundamental role in the physiological basis of behavior; study of how neurons create, maintain and exploit electrical signals for information coding and transmission; principles of electrical and chemical signaling between neurons, and the role of intracellular signaling for signal modulation and synaptic plasticity; exploration of a broad range of state-of-the-art molecular tools currently used to study the nervous system, and the cellular basis for many of the most common neurological disorders affecting humans as well as the strategies and therapies for their treatment. **Prerequisites:** BIOL 213 and PSYC 235, or approval of instructor. **Cross Listing:** BIOL 428.

NRSC 434/BIOL 434 Regulatory and Behavioral Neuroscience

Credits 3. 3 Lecture Hours. Cell biology and biophysics of neurons; functional organization of the vertebrate nervous system; physiological basis of behavior. **Prerequisites:** BIOL 213; BIOL 319, BIOL 320, BIOL 388, BIOL 413, or PBSI 235, or approval of instructor. **Cross Listing:** BIOL 434/NRSC 434.

NRSC 444/BIOL 444 Neural Development

Credits 3. 3 Lecture Hours. Cellular and molecular mechanisms of nervous system development including neural induction and the basis of complex behaviors; use of a wide range of model organisms with a specific emphasis on vertebrate nervous system development. **Prerequisites:** BIOL 213, BIOL 319, BIOL 320, BIOL 413, BIOL 388, or PBSI 235. **Cross Listing:** BIOL 444/NRSC 444.

NRSC 485 Directed Studies

Credits 0 to 3. 0 to 3 Other Hours. Directed readings or research problems in selected areas designed to supplement existing course offerings conducted under the direction of a member of the Faculty of Neuroscience. May be repeated for credit. **Prerequisite:** Approval of member of the faculty of neuroscience.

NRSC 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of neuroscience. May be repeated for credit. **Prerequisite:** Approval of instructor.

NRSC 491 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of a member of the Faculty of Neuroscience. May be repeated for credit. **Prerequisites:** Junior or senior classification and approval of member of the faculty of neuroscience.

NUEN - Nuclear Engineering (NUEN)

NUEN 101 Principles of Nuclear Engineering

Credit 1. 1 Lecture Hour. Introduction to nuclear engineering including global and national energy requirements, radioactivity, radiation protection, and fission and fusion reactor concepts.

NUEN 102 Nuclear Engineering Practice

Credits 0. 0 Other Hours. Participation in an approved high-impact learning practice; reflection on professional outcomes from engineering body of knowledge; documentation and self-assessment of learning experience at mid-curriculum point. **Prerequisite:** NUEN 101.

NUEN 201 Introduction to Nuclear Engineering I

Credits 3. 3 Lecture Hours. Atomic and nuclear physics discoveries that have led to the development of nuclear engineering, atomic models, relativity, x-rays, types of nuclear reactors; problem solving techniques.

Prerequisites: Grade of C or better in MATH 251 and PHYS 207, or concurrent enrollment.

NUEN 265 Materials Science for Nuclear Energy Applications

Credits 3. 3 Lecture Hours. Materials science fundamentals with an emphasis on nuclear applications; topics will include bonding, crystal structures crystalline defects, mechanical properties and radiation effects in metal, ceramic and polymer materials. **Prerequisites:** Grade of C or better in CHEM 107 or CHEM 120; grade of C or better in PHYS 206.

NUEN 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of nuclear engineering. May be repeated for credit. **Prerequisite:** Approval of department head.

NUEN 301 Nuclear Reactor Theory

Credits 3. 3 Lecture Hours. An introduction to neutron diffusion theory, neutron moderation, conditions for criticality of nuclear reactors.

Prerequisites: Grade of C or better in NUEN 302 and MATH 308; grade of C or better in MATH 309 or concurrent enrollment.

NUEN 302 Introduction to Nuclear Engineering II

Credits 3. 3 Lecture Hours. Basic radioactivity, nuclear and neutron physics as applied to nuclear engineering. **Prerequisites:** Grade of C or better in NUEN 201; grade of C or better in MATH 308 or concurrent enrollment.

NUEN 303 Radiation Detection and Isotope Technology Laboratory

Credits 3. 2 Lecture Hours. 3 Lab Hours. Interaction of radiation with matter; behavior of various nuclear radiation detectors studied both theoretically and experimentally in laboratory; properties of radionuclides useful to industry considered and evaluated from engineering point of view; writing intensive course. **Prerequisite:** Grade of C or better in NUEN 309.

NUEN 304 Nuclear Reactor Analysis

Credits 3. 3 Lecture Hours. The group diffusion method, multi-region reactors, heterogeneous reactors, reactor kinetics, changes in reactivity. **Prerequisites:** Grade of C or better in NUEN 301 and MATH 309.

NUEN 309 Radiological Safety

Credits 3. 3 Lecture Hours. Interactions of nuclear radiations with matter and biological systems; theory and practice of radiation dosimetry as applied to radiation protection; design and application of radiation dosimetry systems for personnel monitoring, area radiation monitoring and accident situation; includes external and internal dosimetry as well as long-term risk analysis. **Prerequisites:** Grade of C or better in NUEN 302.

NUEN 315 Thermodynamics in Nuclear Systems

Credits 3. 3 Lecture Hours. Introduction of thermodynamic theory and application; thermodynamic properties and conservation of mass and energy; first and second laws of thermodynamics; energy transfer by heat, work and mass; analysis of open and closed systems; key thermodynamic components in nuclear systems including BWR, PWR and other types of reactors; application of thermodynamic cycles to nuclear power systems; and heat and mass balances throughout nuclear systems. **Prerequisites:** MEEN 221; MATH 251 or MATH 253.

NUEN 329 Analytical and Numerical Methods

Credits 3. 3 Lecture Hours. Introduction to use of numerical analysis and advanced analytical techniques for obtaining nuclear reactor flux distributions, temperatures and transients; use of digital computer in obtaining nuclear reactor design information. **Prerequisites:** Grade of C or better in MATH 309 and NUEN 301.

NUEN 330 Monte Carlo Radiation Transport and MCNP Code

Credits 3. 2 Lecture Hours. 2 Lab Hours. Principles of Monte Carlo method; statistical methods in Monte Carlo; random number generation; sampling methods for physical processes represented by Boltzmann transport equation; particle tracking in combinatorial geometry; ACE format cross-sections; introduction to MCNP code; MCNP applied to radiation shielding, criticality safety, reactor physics and detector modeling problems; MCNP output analysis; MCNP statistical tests; MCNP tallying procedures; Variance reduction techniques; introduction to develop Monte Carlo algorithms. **Prerequisite:** Grade of C or better in NUEN 302; grade of C or better or concurrent enrollment in NUEN 301; MCNP code single user license from RSICC, ORNL, USA; junior or senior classification.

NUEN 405 Nuclear Engineering Experiments

Credits 3. 2 Lecture Hours. 3 Lab Hours. Experimental measurements of basic nuclear reactor parameters; reactor operation and reactor safety.

Prerequisites: Grade of C or better in NUEN 303 and NUEN 304.

NUEN 406 Nuclear Engineering Systems and Design

Credits 3. 3 Lecture Hours. Nuclear plant systems; conventional and advanced generation power reactors, nuclear simulators, transient analysis using available software for reactor simulators; nuclear engineering design methodology; problem formulation, criteria, trade-off decisions and design optimization; case studies. **Prerequisite:** Grade of C or better in NUEN 304 and MEEN 461, or approval of instructor.

NUEN 410 The Design of Nuclear Reactors

Credits 4. 4 Lecture Hours. Application of reactor theory and other engineering disciplines in fundamental and practical design of nuclear reactor systems for power applications; use of computer in design operations. **Prerequisites:** Grade of C or better in NUEN 304, NUEN 406 and MEEN 461.

NUEN 416 Small Modular Reactors and Microreactors

Credits 3. 3 Lecture Hours. Advanced topics in small modular reactors (SMR) and microreactors (MR); unique applications in the field of nuclear energy; SMR and MR systems and applications for non-carbon emitting sources of electricity; issues for emerging countries with small electrical grids; utilization of modularity for construction and staging of plants; analysis of SMR and MR designs, technologies, economics, financing approaches and regulatory processes. **Prerequisites:** Grade of C or better in NUEN 302 or approval of instructor.

NUEN 417/MEEN 417 Basics of Plasma Engineering and Applications

Credits 3. 3 Lecture Hours. Basic plasma properties and confinement techniques; single particle orbits in electric and magnetic fields, moments of Boltzmann equation and introduction to fluid theory; wave phenomena in plasmas and introduction to plasma kinetic theory; analysis of laboratory plasmas and plasma applications including fusion, electric propulsion, materials processing and plasmas enhanced chemistry.

Prerequisites: Grade of C or better in PHYS 207 or equivalent; senior classification in nuclear, mechanical or aerospace engineering, or physics. **Cross Listing:** MEEN 417/NUEN 417.

NUEN 418 Fuel Assembly and 3-D Reactor Core Design and Modeling

Credits 3. 3 Lecture Hours. Application of state-of-the-art engineering-grade codes in the neutronic design, analysis and modeling of nuclear fuel assembly and core. **Prerequisites:** NUEN 304 and junior or senior classification.

NUEN 428 Computational Fluid Dynamics in Nuclear Thermal Hydraulics

Credits 3. 3 Lecture Hours. Computational fluid dynamics (CFD) as it relates to thermal hydraulics in nuclear power generation; computational model of important flow scenarios using appropriate mesh generation techniques; assessment of result validity through standard verification and validation practices. **Prerequisite:** Grade C or better in NUEN 329, MEEN 344, or equivalent.

NUEN 430 Computer Applications in Nuclear Engineering

Credits 3. 3 Lecture Hours. Applications of digital computers to solve nuclear engineering problems; nuclear data and cross-section libraries; deterministic methods for linear and non-linear nuclear systems, and Monte Carlo methods for linear nuclear systems. **Prerequisites:** NUEN 304, NUEN 329.

NUEN 431 Technical Communications Issues in the Nuclear Industries

Credit 1. 1 Lecture Hour. Introduction to a variety of topics that present communication challenges; opportunities to learn from a variety of visiting experts concerning the nuances and challenges of, as well as successful methods for, communicating with concerned audiences about technically challenging topics. **Prerequisite:** Junior or senior classification or approval of instructor.

NUEN 432 Nuclear Power Plant Fundamentals

Credits 3. 3 Lecture Hours. Understanding the operation of a nuclear electric general station; includes reactor water chemistry, material science, electrical science; mechanical science, civil engineering for nuclear power plant engineers, and digital process control systems. **Prerequisite:** Junior or senior classification in the college of engineering; non-NUEN majors.

NUEN 437 Fundamentals of Fusion Engineering

Credits 3. 3 Lecture Hours. Broad introduction to the engineering of fusion energy systems; fundamental knowledge regarding fusion physics and approaches to achieve fusion; engineering challenges such as energy conversion, tritium fuel cycle, fusion neutronics and wastes.

Prerequisites: Grade of C or better in MEEN 344 or equivalent; grade of C or better in NUEN 301.

NUEN 451 Nuclear Security System Design

Credits 3. 3 Lecture Hours. The science and engineering associated with the design, evaluation and implementation of systems to secure nuclear and radiological materials; adversary characterization, categorization of nuclear and radiological targets, calculation of consequences associated with failure to protect targets, detection and delay technologies, and mathematical methods for evaluation and managing risk. **Prerequisites:** Grade of C or better in NUEN 303 and NUEN 309 or equivalent, or approval of instructor.

NUEN 460 Nuclear Plant Systems and Transients

Credits 3. 3 Lecture Hours. Use of engineering principles to elucidate the nuclear, mechanical, electrical and functional interactions among nuclear plant components and systems; reactor protection systems, alarm and trip setpoints, normal and accident transients; components studied in detail include core, control rod drive mechanism, neutron source, neutron detectors, primary coolant system, and emergency core cooling system. **Prerequisites:** NUEN 301, NUEN 302, NUEN 304, NUEN 406, NUEN 430 or equivalents; MEEN 315, MEEN 344, MEEN 461 or equivalents; junior or senior classification.

NUEN 465 Nuclear Materials Engineering

Credits 3. 3 Lecture Hours. Explore applications of materials science principles in nuclear energy systems; includes crystal structures and defects, metallurgy, and materials thermochemistry; emphasis on nuclear fuel performance, structural material changes, and waste materials; laboratory demonstrations on materials behavior. **Prerequisites:** NUEN 265, MEEN 222/MSEN 222 or equivalent and NUEN 302.

NUEN 467 Deep Learning for Engineering Applications

Credits 3. 3 Lecture Hours. Fundamentals of deep learning along with its advanced applications in addressing engineering problems, emphasizing modeling and simulation, as well as complex system analysis; combination of theoretical knowledge with practical applications; hands-on coding practice to foster a robust understanding of deep learning techniques and learn how to leverage them to solve complex engineering challenges. **Prerequisites:** Grade of a C or better in MATH 309 or MATH 311.

NUEN 475 Environmental Nuclear Engineering

Credits 3. 3 Lecture Hours. Environmental aspects of nuclear power; natural radiation environment and the distribution of radioactivity added to the environment by human activities; evaluation of effects of radiation and radioactivity on the environment and on humans. **Prerequisite:** Grade of C or better in NUEN 309.

NUEN 479 Radiation Protection Engineering

Credits 3. 2 Lecture Hours. 3 Lab Hours. Analysis of radiation hazard situations and design of nuclear facilities from a safety standpoint. **Prerequisite:** NUEN 475.

NUEN 481 Seminar

Credit 1. 1 Lecture Hour. Designed to broaden the student's capability, performance and perspective in nuclear engineering through faculty, student and guest presentations. **Prerequisite:** NUEN 410 or registration therein or NUEN 479 or registration therein.

NUEN 484 Internship

Credits 0-1. 0 Lecture Hours. 0 Lab Hours. 0-1 Other Hours. Directed internship in an organization or a research or teaching laboratory within or outside Texas A&M University; under the supervision of a professional expert aligned with the student's professional objectives; consists of on-the-job training, research, teaching, management, or a combination of these. **Prerequisites:** Junior or senior classification or approval of instructor.

NUEN 485 Directed Studies

Credits 1 to 6. 1 to 6 Other Hours. Problems of limited scope approved on an individual basis intended to promote independent study; program enrichment for capable students; results presented in writing to staff.

Prerequisites: Junior or senior classification and approval of department head.

NUEN 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified area of nuclear engineering. May be repeated for credit.

Prerequisite: Approval of instructor.

NUEN 491 Research

Credits 1 to 4. 1 to 4 Other Hours. Research conducted under the direction of a faculty member in Nuclear Engineering. May be repeated 2 times for credit. Registration in multiple sections of this course is possible within a given semester provided that the per semester credit hour limit is not exceeded. **Prerequisites:** Junior or senior classification and approval of instructor.

NURS - Nursing (NURS)

NURS 301 Nursing Foundation

Credits 2. 1 Lecture Hour. 1 Lab Hour. Introduction to nursing skills including such activities as safety, assessment of vital signs, comfort measures, assistance with daily living activities, environmental concerns, positioning and transporting. We will become familiar with the nursing process, communication and documentation tools. An introduction to the simulation center is highlighted in this class. Orientation to clinical sites and expectations for clinical rotation, as well as mandatory clinical site requirements will be completed. **Prerequisites:** Admission to the BSN program or approval from the Associate Dean for Academic Affairs.

NURS 305 Nursing Dimensions and Informatics

Credits 3. 3 Lecture Hours. Exploration of the concepts of informatics and professional dynamics in nursing; introduction to basic computer competencies essential to nursing, including skills required to locate and evaluate information (info literacy), and process and communicate findings (info management) related to evidence-based nursing practice; roles and behaviors of the professional nurse; exploration of the influence of ethics and cultural/society issues on the nursing profession as well as opportunities for personal and professional development. **Prerequisites:** Admission to the BSN program or approval from the Associate Dean for Academic Affairs.

NURS 306 Foundations of Nursing Practice Theory

Credits 5. 5 Lecture Hours. Role of the professional nurse utilizing the nursing process as a systematic approach assisting individuals toward optimal health; discussion of the scope of human needs and fundamental principles of nursing concepts, nursing theories, health promotion strategies, health assessment techniques and communication skills in providing basic care for the adult. **Prerequisites:** Admission to the College of Nursing Program; concurrent enrollment and grade of C or better in NURS 307.

NURS 307 Foundations of Nursing Practice Clinical

Credits 3. 9 Lab Hours. Application of fundamental principles of nursing concepts, nursing theories, health promotion strategies, health assessment techniques and communication skills employed in providing basic care of the adult; implementation of the nursing process as a systematic approach by obtaining health histories, utilizing interviewing skills, performing physical and psychosocial assessments, establishing a baseline database and formulating initial nursing plans. **Prerequisites:** Admission to the College of Nursing Program; concurrent enrollment and grade of C or better in NURS 306.

NURS 312 Introduction to Pathophysiology

Credits 3. 3 Lecture Hours. An introduction to pathophysiological alterations in major regulatory mechanisms of the body. Provides a foundation for understanding general nursing practice, various diagnostic procedures and selected therapeutic regimens.

NURS 313 Nursing Fundamentals

Credits 5. 3 Lecture Hours. 2 Lab Hours. An introduction to the scope of human needs, utilization of the nursing process as a systematic approach to meeting those needs and the role of the professional nurse in assisting individuals toward optimal health. Clinical settings are utilized in the application of fundamental concepts, principles of nursing and communication skills that are employed in providing basic client care. **Prerequisite:** Admission to the BSN Program.

NURS 314 Health Assessment

Credits 3. 1 Lecture Hour. 2 Lab Hours. Concepts and principles underlying assessment of the health status of individuals are presented. Emphasis is placed on interviewing skills, health histories, and the physical and psychosocial findings in the well person. Development of communication in the nurse-client relationship and assessment skills are included. Students implement the nursing process by obtaining health histories, performing physical and psychosocial assessments, establishing a database, and formulating initial nursing plans.

NURS 315 Nursing and the Aged

Credits 3. 2 Lecture Hours. 0 Lab Hours. 1 Other Hour. An overview of health promotion strategies for age-related physical, emotional, social, and environmental transitions in aging; includes direct patient care, simulation, laboratory, and community experiences. **Prerequisites:** Junior or senior classification.

NURS 316 Pharmacology Principles

Credits 3. 3 Lecture Hours. Focuses on the basic drug classifications, concepts and principles of pharmacology, with special consideration for the nursing role in developing a comprehensive approach to the clinical application of drug therapy through the use of the nursing process. Nursing implications relative to the utilization of drug therapy are examined.

NURS 318 Professional Identity I - The Role of the Professional Nurse

Credits 3. 3 Lecture Hours. Professional identity of nursing and nursing's unique contributions to society through the use of distinct knowledge, skills, and attitudes; includes the roles and responsibilities of the professional nurse within various healthcare systems and care delivery models. **Prerequisites:** Junior classification and admission to the BSN Nursing Program.

NURS 319 Professional Identity II - Interprofessional Practice and Evidence-Based Decision-Making

Credits 3. 3 Lecture Hours. Principles of collaborative practice and the role of the professional nurse as coordinator of care within the healthcare team; concepts of evidence-based practice and its implications for quality of care and safety standards. **Prerequisites:** Grade of C or better in NURS 330 and NURS 340.

NURS 320 Adult Nursing I

Credits 6. 3 Lecture Hours. 0 Lab Hours. 3 Other Hours. Examination of the effects of chronic and acute illness on individuals and families; exploration of the disruption of illness on growth and development patterns of adults; use of clinical decision-making processes to assist adults in reaching their optimal level of wellness; includes direct patient care, simulation, interprofessional practice, laboratory, and community experiences. **Prerequisite:** Grade of C or better in NURS 306, NURS 307, and NURS 312; grade of C or better in NURS 316 or concurrent enrollment.

NURS 323 Nursing Care of Women, Families and Newborns

Credits 4. 2 Lecture Hours. 2 Lab Hours. Study of childbearing families and women's health in normal and high-risk situations; role of the nurse in meeting health needs of women, families and their newborns; supervised clinical experiences and/or simulation experiences in the application of the nursing process in meeting these health needs; promotes acquisition of skills in caring for women, families and newborns during uncomplicated and/or complicated health experiences in a variety of settings. **Prerequisites:** Grade of C or better in NURS 306 or NURS 313; grade of C or better in NURS 307 or NURS 314; grade of C or better in NURS 312, NURS 316, and NURS 320.

NURS 330 Management of Care I - The Fundamentals of Nursing Care Across the Lifespan

Credits 5. 3 Lecture Hours. 2 Other Hours. Foundational knowledge and skills utilizing a clinical judgment model as a systematic approach for nursing practice; application of fundamental health assessment techniques and care delivery skills for individuals across the lifespan; includes a clinical component. **Prerequisites:** Junior classification and admission to the BSN Nursing Program.

NURS 332 Management of Care II - Nursing Care of Adults with Common and Chronic Conditions

Credits 5. 3 Lecture Hours. 2 Other Hours. Implementation of nursing care using a holistic approach through the examination of the effects of common and chronic illnesses or injury in adults; emphasizing the use of a clinical judgment model to achieve an optimum level of health considering the individual's developmental stage, culture, and gender; includes a clinical component. **Prerequisites:** Grade of C or better in NURS 330 and NURS 340.

NURS 340 Patho-Pharm I - Connecting Pathophysiology and Pharmacology to Common Patient Conditions

Credits 4. 4 Lecture Hours. Abnormal functioning of human cells, tissues, and organ systems and pharmacotherapeutics to address common and chronic pathological changes across the lifespan; emphasis on the influences of nutrition, genetics, environment, culture, health determinants, age-related variations, and alternative therapies on selected diseases and pharmacotherapeutics. **Prerequisites:** Junior classification and admission to the BSN nursing program.

NURS 341 Patho-Pharm II - Connecting Pathophysiology and Pharmacology to Complex Patient Conditions

Credits 3. 3 Lecture Hours. Builds on concepts of NURS 340; related to the abnormal functioning of human cells, tissues, and organ systems and the pharmacotherapeutics to address complex and emergent conditions across the lifespan; influences of nutrition, genetics, environment, culture, health determinants, age-related variations, and alternative therapies for complex diseases and pharmacotherapeutics. **Prerequisites:** Grade of C or better in NURS 330 and NURS 340.

NURS 342 Mental Health Nursing Care Across the Lifespan

Credits 3. 2 Lecture Hours. 1 Other Hour. Principles and concepts of mental health, psychopathology, and treatment modalities relevant to improve the health of clients with mental health needs; development of complex knowledge, critical judgment, essential skills, and professional values within legal, ethical, and patient-centered care frameworks; responsibilities of professional nurses as providers of evidence-based care, patient safety, and individual, family, and group recovery; includes a clinical component. **Prerequisites:** Grade of C or better in NURS 330 and NURS 340.

NURS 343 Building Healthy Communities I - Wellness and Health Promotion Across the Lifespan

Credits 4. 3 Lecture Hours. 1 Other Hour. Examination of individual and population health prevention and promotion across the lifespan including concepts of health screenings, literacy, equity and access, policy, care delivery systems and roles, epidemiology, and the use of big data for assessing the health of communities; includes a clinical component. **Prerequisites:** Junior classification and admission to the BSN Nursing Program.

NURS 344 Building Healthy Communities II - Fostering Health Infrastructure

Credits 3. 2 Lecture Hours. 1 Other Hour. Unique role of the nurse in local, state, country, and global communities including design, implementation, and evaluation of culturally appropriate and targeted interventions; coordinating with community members to improve health outcomes, build knowledge and resilience, and facilitate recovery from disaster; includes a clinical component. **Prerequisites:** Grade of C or better in NURS 330, NURS 340, and NURS 343.

NURS 385 Directed Studies

Credits 1 to 3. 1 to 3 Other Hours. Individually supervised study in subject matter to be arranged with faculty. **Prerequisite:** Admission to the College of Nursing or approval from the associate dean of academic affairs.

NURS 386 Directed Clinical Studies

Credits 1 to 3. 1 to 3 Other Hours. Individually supervised study focusing on clinical skills in focused areas to be arranged with faculty. **Prerequisite:** Admission to the College of Nursing or approval from the associate dean of academic affairs.

NURS 405 Selected Topics in Nursing

Credit 1. 1 Lecture Hour. A broad introduction to selected topics of current interest in the role of professional nursing.

NURS 411 Evidence-Based Practice for Nurses

Credits 3. 3 Lecture Hours. A study of the principles and methodology of research in nursing practice, with emphasis on evidence based practice research; interpret research, identify its methods and significance, and analyze findings in order to be a consumer of nursing research and practitioner of evidence based practice. **Prerequisite:** Grade of C or better in NURS 306 or NURS 313; grade of C or better in NURS 307 or NURS 314; grade of C or better in NURS 312 and NURS 316, or with approval from the Associate Dean of Academic Affairs.

NURS 412 Care of Mental Health Clients

Credits 4. 2 Lecture Hours. 0 Lab Hours. 2 Other Hours. In-depth examination of mental health and psychiatric nursing practice; designed to provide the knowledge, skills, and attitudes necessary to provide holistic and patient-centered care to individuals experiencing mental health issues across the lifespan; includes direct patient care, simulation, interprofessional practice, laboratory, and community experiences. **Prerequisites:** Grade of C or better in NURS 306, NURS 307, and NURS 312.

NURS 413 Nursing Care of Children and Families

Credits 4. 3 Lecture Hours. 1 Lab Hour. A study of the factors influencing health promotion, protection and maintenance of infants, children and adolescents; examination of family theory, growth and development, primary health care, and acute, chronic, and terminal conditions; clinical experience in caring for healthy, at-risk, acutely and chronically ill infants, children, adolescents and their families. **Prerequisites:** Grade of C or better in NURS 306 or NURS 313, NURS 307 or 314, NURS 312, NURS 316, and NURS 320.

NURS 418 Professional Identity III - Development in the Professional Nurse Role

Credits 3. 3 Lecture Hours. Investigation of the roles and responsibilities of the professional nurse; strategies for development of personal nursing identity and professional growth; responsibilities related to quality outcomes, population health, health promotion, and health advocacy using principles of epidemiology, current research and data sets to guide healthcare decisions; methods to address health equity, healthcare access, and quality issues. **Prerequisites:** Grade of C or better in NURS 332 and NURS 341.

NURS 419 Professional Identity IV - The Professional Nurse Leader

Credits 3. 3 Lecture Hours. Examination of the various roles and responsibilities of the nurse leader, professional organizations and activities; principles of leadership and management and skills with strategies for professional development. **Prerequisites:** Grade of C or better in NURS 433, NURS 442, and NURS 418; grade of C or better and concurrent enrollment in NURS 435 and NURS 445.

NURS 420 Adult Nursing II

Credits 6. 3 Lecture Hours. 3 Other Hours. Examination of the effects of critical and complex illness on individuals and families; exploration of the effects of critical illness and injury on the growth and development of adults; use of clinical decision-making and collaborative practice to assist adults in reaching their optimal level of wellness; includes clinical practice with diverse populations in emergency and critical care settings, simulation, laboratory, and community experiences. **Prerequisite:** Grade of C or better in NURS 320 or concurrent enrollment.

NURS 421 Care of Community Health Clients

Credits 5. 5 Lecture Hours. The nursing process is utilized in the study of community/public health nursing practice and common health problems encountered in community settings. Health promotion, maintenance, counseling and coordination of care are utilized in providing care to individuals, families, aggregates and populations in community settings. Principles and skills of public health nursing practice are used to assess a community's health and diagnose community health needs. **Prerequisite:** Grade of C or better in NURS 306 or NURS 313, NURS 307 or NURS 314, NURS 312, NURS 316 and NURS 320.

NURS 424 Professional Issues

Credits 2. 2 Lecture Hours. The purpose of this course is to introduce health professions students to professional and ethical/legal issues in everyday practice in health care, develop self-awareness skills about their own values and those of others, and provide them with tools to engage in self-reflective practice leading to enhancement of patient-centered care and collaborative teamwork. **Prerequisites:** Admission to the College of Nursing.

NURS 430 Transition to Professional Nursing Practice

Credits 5. 3 Lecture Hours. 2 Other Hours. Course reflects content that will prepare senior students for transition of entry into practice. Theories and principles concerning human behavior in organizations, with emphasis on leadership roles encountered in professional nursing practice. Senior nursing students in collaboration with nursing faculty refine coordination of care for a diverse population of clients. A clinical practicum will focus on synthesizing and refining skills in the delivery and management of nursing care to various groups of clients. Concepts of clinical decision-making, and inter-professional dynamics are incorporated in the context of legal, ethical, and evidence-based practice. **Prerequisite:** Grade of C or better in NURS 305, NURS 306 or NURS 313, NURS 307 or NURS 314, NURS 315, NURS 320, NURS 411, NURS 412, and NURS 420.

NURS 431 Care of Vulnerable Populations

Credits 1 to 3. 1 to 3 Lecture Hours. Principles of caring for vulnerable populations; includes characteristics of the vulnerable, clinical issues associated with caring for individuals from vulnerable populations, social justice and resilience; activities include development of care plans for the vulnerable, teaching projects and capacity building; option to utilize 16 hours of community health clinical time to complete a mini-immersion experience. **Co-requisite:** NURS 421.

NURS 432 Relations in Healthcare: Teamwork and Communication

Credits 1 to 3. 1 to 3 Lecture Hours. Preparation for inter and intra professional teamwork and communication to improve the culture for professional collaboration with a shared mental model for excellence in quality and safety; goal for effective teamwork and communication is higher quality, safer patient care through highly effective medical teams that optimize the use of resources, information, and people to achieve the best clinical outcomes for patients.

NURS 433 Management of Care III - Nursing Care of Adults with Complex, High-Acuity Conditions

Credits 5. 3 Lecture Hours. 2 Other Hours. Critical thinking and problem-solving strategies for care of persons with acute and/or complex illness and injury; examination of effects of acute illnesses in relation to the injury and in relation to the individual's developmental stage, culture and gender. A holistic approach is used to analyze and intervene in alterations to the health of the individual and family and to help them reach their optimal level of wellness; includes a clinical component. **Prerequisites:** Grade of C or better in NURS 332 and NURS 341.

NURS 434 Case Studies in Patient Safety and Quality

Credits 2. 2 Lecture Hours. Application of evidence based quality improvement and risk reduction tools and strategies to various case studies with the goal of improving patient safety, outcome, and quality of care; case study evaluation of nursing practice and evidence based practice recommendations which highlight the nurse's professional role in patient safety and quality; application of intra/interprofessional communication and teamwork skills to promote a safe environment for healthcare delivery. **Prerequisite:** Junior or senior classification.

NURS 435 Management of Care IV - Synthesis of Knowledge, Skills and Attitudes for Professional Success

Credits 6. 3 Lecture Hours. 3 Other Hours. Concepts of clinical decision-making, delegation, teamwork and inter-professional dynamics are incorporated in the context of legal, ethical, and evidence-based practice. Concepts for building future practice excellence, growth in profession, providing value to employers, and life management skills are explored; includes a clinical component. **Prerequisites:** Grade of C or better in NURS 433 and NURS 442; grade of C or better and concurrent enrollment in NURS 419 and NURS 445.

NURS 436 Maternal and Child Health

Credits 5. 3 Lecture Hours. 2 Other Hours. Care of childbearing women, families, and children including treatment modalities; development of complex knowledge, critical judgment, essential skills, and professional values within legal, ethical, and patient-centered care frameworks; responsibilities of professional nurses as providers of evidence-based care, patient safety, and maximization of individual, family, and group health; includes clinical component. **Prerequisites:** Grade of C or better in NURS 332 and NURS 341.

NURS 442 Application of Pharmacology Principles Across the Lifespan

Credits 3. 2 Lecture Hours. 1 Other Hour. Exploration of complex indications, planning, and interventions of fluid or medication management for the nurse in various critical care or emergency settings across the lifespan; includes a clinical component. **Prerequisites:** Grade of C or better in NURS 332 and NURS 341.

NURS 445 Writing for Nursing Professionals - The Nurse's Role in Health Advocacy and Healthcare Quality

Credits 3. 3 Lecture Hours. Scholarly writing in a discipline-based course organized around a specific topic; focus on improvement of academic writing skills, through development of policy and quality improvement processes; includes a significant amount of individualized attention and guidance. **Prerequisites:** Grade of C or better in NURS 442, NURS 443, and NURS 418; grade of C or better and concurrent enrollment in NURS 435 and NURS 419.

NURS 456 Complementary and Alternative Medicine/Health Care

Credits 3. 3 Lecture Hours. This course is an introduction to the practice of complementary and alternative medicine (CAM)/health care. It will explore both conventional health care and CAM allowing the student to examine each of the entities to gain an understanding of what each practice offers. This knowledge will allow the future health care professional to better inform and facilitate the individual's move toward or maintenance of optimal health and health practices. Alternative health care modalities, such as herbal medicine, acupuncture and massage therapy, will be discussed. Websites and online resources pertinent to the topic will be explored and analyzed, including the National Center for Complementary and Alternative Medicine within the National Institutes of Health.

NURS 457 Introduction to Concepts of Forensic Nursing

Credits 3. 3 Lecture Hours. This course provides an introduction to forensic science as a collaborative approach to criminal investigation. General concepts and principles of forensic science will be explored with an emphasis on the role of the nurse working with victims of violence. Content to be addressed includes: forensic investigation, evidence collection and management, mechanisms of injury and death using post-mortem forensic analysis, interpersonal crimes of violence, and forensic nursing roles.

NURS 460 Nursing Dimensions and Informatics for the RN

Credits 3. 3 Lecture Hours. This course is designed to build on the informatics knowledge and skills of the practicing nurse. Emphasis is placed on the application of the ANA Standards for Nursing Informatics and Professional Practice and incorporation of information technology to support patient care and clinical decision-making. The course will assist the students to develop the professional role by incorporation of the philosophy of nursing, nursing theory, and clinical reasoning. The nurse's role in interprofessional practice will be explored. The influence of ethics and cultural/society issues on the nursing profession are explored as well as opportunities for personal and professional development.

NURS 461 Application of Evidence Based Practice for the RN

Credits 3. 3 Lecture Hours. This course is a study of basic research methodologies and an in depth examination of the professional nurse's role in the application of evidence into clinical practice.

NURS 462 Pathophysiology and Pharmacology for the RN

Credits 4. 4 Lecture Hours. Students will demonstrate the ability to incorporate the principles of pathophysiology and pharmacology in planning healthcare for individuals across the lifespan.

NURS 463 Health Assessment for the RN

Credits 3. 3 Lecture Hours. In this course, the concepts and principles underlying assessment of the health status of culturally diverse individuals are presented. An emphasis is placed on reviewing and renewing cognitive, affective, and psychomotor skills to obtain health histories and discover physical and psychosocial findings in the well person. The role of genetics in family histories is examined. Successful completion of the course requires students to successfully complete a head-to-toe health assessment examination with accurate documentation of the findings.

NURS 464 Health Promotion Across the Lifespan for the RN

Credits 3. 2 Lecture Hours. 1 Lab Hour. This course emphasizes the role of the nurse in health promotion across multiple settings with diverse populations. The student will apply principles of teaching/learning, case management, and genetics/genomics to improve the health of general and vulnerable populations.

NURS 465 Care of the Older Adult for the RN

Credits 2. 2 Lecture Hours. The student will develop competencies and knowledge necessary for providing care and promote health aging in the older adult.

NURS 466 Community Health for the RN

Credits 5. 4 Lecture Hours. 1 Lab Hour. In this course, students are introduced to community-based health care of culturally diverse populations. The role of the professional nurse as part of an interprofessional team in health promotion, disease prevention, and management of chronic health problems in community settings is explored. Students apply critical reasoning and information technology skills to develop and implement evidence-based projects that positively impact the quality of life of populations. Practicum experiences are individualized.

NURS 467 Leadership and Management for the RN

Credits 5. 3 Lecture Hours. 2 Lab Hours. In this course, theories and principles of human behavior in organizations are examined, including an exploration of leadership roles in professional nursing practice. The role of regulatory agencies in the provision of quality health care is explored. Students will participate in the evaluation and planning for quality improvement using nurse sensitive indicators. The students will discern the nurse's role in reducing the financial cost of health care. Practicum experiences are individualized.

NURS 468 Professional Practice Issues for the RN

Credits 2. 2 Lecture Hours. Professional practice issues such as those related to political action, socio-legal concerns, cultural diversity, and ethics are explored with an emphasis on the advocacy role of the nurse. The importance of the nurse leader as a role model for continued professional growth through lifelong learning is emphasized.

NURS 481 Seminar

Credit 1. 1 Lecture Hour. Exploration of the nature of nursing scholarship along with related research, clinical and educational career opportunities; discussion of various topics related to leadership, research and ethics as it relates to nursing. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisite:** Admission to the BSN Honors program.

NURS 489 Special Topics In...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified area of nursing. May be repeated for credit. **Prerequisites:** Admission to the BSN program or approval from the Associate Dean for Academic Affairs.

NURS 491 Research

Credits 1 to 4. 1 to 4 Other Hours. Research conducted under the direction of a doctorally prepared nursing faculty member; preparation for careers in research. May be taken for credit up to two hours. **Prerequisite:** Junior or senior classification and approval of instructor.

NUTR - Nutrition (NUTR)

NUTR 202 Fundamentals of Human Nutrition

Credits 3. 3 Lecture Hours. (BIOL 1322, HECO 1322) Fundamentals of Human Nutrition. Principles of nutrition with application to the physiologic needs of individuals; food sources and selection of an adequate diet; formulation of Recommended Dietary Allowances; nutritional surveillance; for non-nutrition majors only.

NUTR 203 Scientific Principles of Human Nutrition

Credits 3. 3 Lecture Hours. Chemistry and physiology of proteins, carbohydrates, lipids, vitamins and minerals; their ingestion, digestion, absorption, transport and metabolism. **Prerequisites:** CHEM 119 or concurrent enrollment; NUTR majors and minors only.

NUTR 204 Perspectives in Nutrition

Credit 1. 1 Lecture Hour. Examination of current trends in nutrition through critical review and appraisal of relevant literature to understand, write, and communicate the research evidence for nutrients, food and/or dietary patterns underlying human health and disease. **Prerequisites:** Concurrent enrollment in NUTR 203.

NUTR 210/FSTC 210 Horizons in Nutrition and Food Science

Credit 1. 1 Lecture Hour. Introduction to nutrition and food science career opportunities through presentations by nutrition and food science researchers and industry professionals; addresses issues of professionalism including portfolio development, teamwork, and critical thinking skills. **Cross Listing:** FSTC 210/NUTR 210.

NUTR 211 Scientific Principles of Foods

Credits 4. 3 Lecture Hours. 3 Lab Hours. Basic principles underlying selection, preparation and preservation of food in relation to quality standards, acceptability and aesthetics; introduction to composition, nutritive value, chemical and physical properties of foods; introduction to experimental study of foods. **Prerequisites:** CHEM 119; NUTR 202 or NUTR 203; Dietetics (DPD) track; or approval of instructor.

NUTR 222 Nutrition for Health and Health Care

Credits 3. 3 Lecture Hours. Analysis of nutrition with emphasis on providing a basic understanding of nutrition and its role in disease prevention and treatment.

NUTR 285 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Directed study of selected problems in the area of nutrition. **Prerequisites:** Approval of instructor; 2.0 GPR in major and overall.

NUTR 289 Special Topics in...

Credits 1 to 4. 1 to 4 Other Hours. Selected topics in an identified area of nutrition. May be repeated for credit. **Prerequisite:** Approval of instructor.

NUTR 291 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in nutrition. May be repeated 2 times for credit. **Prerequisites:** Freshman or sophomore classification and approval of department head.

NUTR 300/FSTC 300 Religious and Ethnic Foods

Credits 3. 3 Lecture Hours. Understanding religious and ethnic foods with application to product development, production, and nutritional practices; emphasis on different food rules and priorities with attention given to different religious and ethnic groups within the US and around the world. **Prerequisites:** Junior or senior classification or approval of instructor; basic knowledge of food science and nutrition helpful. **Cross Listing:** FSTC 300/NUTR 300.

NUTR 301 Nutrition Through Life

Credits 3. 3 Lecture Hours. Analysis of nutrition with emphasis on human biological needs through stages of the life cycle; biochemical, physiological and anthropometric aspects of nutrition. **Prerequisites:** NUTR 202 or NUTR 203; NUTR majors and minors only.

NUTR 303/ANSC 303 Principles of Animal Nutrition

Credits 3. 3 Lecture Hours. Scientific approach to nutritional roles of water, carbohydrates, proteins, lipids, minerals, vitamins, and other dietary components; emphasis on the comparative aspects of gastrointestinal tracts and on digestion, absorption, and metabolism of nutrients. **Prerequisites:** CHEM 119 and a grade of C or better in ANSC 113, or CHEM 222, CHEM 227 or CHEM 257; junior classification or approval of instructor. **Cross Listing:** ANSC 303/NUTR 303.

NUTR 304 Food Service Systems and Management

Credits 3. 3 Lecture Hours. 0 Lab Hours. Application of basic management principles in food service operations, including human resource management, personnel issues, ethics, and negotiation. **Prerequisites:** Grade of B or better in NUTR 211; junior or senior classification; Dietetics (DPD) track.

NUTR 306 Nutrition in Sports

Credits 3. 3 Lecture Hours. Exploration of energy systems and the macronutrient and micronutrient needs in different sport contexts. **Prerequisites:** NUTR 301.

NUTR 307 Quantity Food Production

Credits 4. 3 Lecture Hours. 3 Lab Hours. Principles of food service management used in selecting, storing, preparing, and serving food in quantity; emphasis is on menu planning, quality control, purchasing, production, food service equipment, and layout design. **Prerequisite:** Grade of B or better in NUTR 211; junior or senior classification; Dietetics (DPD) track.

NUTR 320/FSTC 320 Understanding Obesity - A Social and Scientific Challenge

Credits 3. 3 Lecture Hours. Perspectives of obesity in food science, nutrition, health and psychology; study of obesity factors in relation to genetics, exercise physiology and sociology with emphasis on food and nutrition. **Prerequisites:** Junior or senior classification or approval of instructor. **Cross Listing:** FSTC 320/NUTR 320.

NUTR 365 Nutritional Physiology of Vitamins and Minerals

Credits 3. 3 Lecture Hours. Fundamental nutritional significance of fat soluble and water soluble vitamins and minerals to human metabolism, cell biology and physiology; micro-nutrient groups as per metabolic function or biochemical and physiological actions; important dietary sources, absorption, storage, metabolism, (bio)chemistry, deficiency and toxicity of individual nutrients in this context and basis of DRIs. **Prerequisites:** NUTR 203 and NUTR 301; junior or senior classification.

NUTR 366 Nutrients and the Human Body I

Credits 4. 3 Lecture Hours. 3 Lab Hours. Exploration of the role of nutrients in maintaining normal organ systems; nutritional significance of vitamins, minerals, and other nutrients to normal and diseased organs; investigation of dietary sources, absorption, storage, metabolism, biochemistry, deficiency, and toxicity of nutrients on development and homeostasis of the integumentary, skeletal, muscular, and nervous systems. **Prerequisites:** NUTR 301 or concurrent enrollment; NUTR major; junior or senior classification or approval of instructor.

NUTR 367 Nutrients and the Human Body II

Credits 4. 3 Lecture Hours. 3 Lab Hours. Exploration of the role of nutrients in maintaining normal organ systems; nutritional significance of vitamins, minerals, and other nutrients to normal and diseased organs; investigation of dietary sources, absorption, storage, metabolism, biochemistry, deficiency, and toxicity of nutrients on development and homeostasis of the endocrine, digestive, urinary, cardiovascular, lymphatic, reproductive, adipose, and respiratory systems. **Prerequisites:** NUTR 366; NUTR majors; junior or senior classification or approval of instructor.

NUTR 400 Ethics in Nutrition and Healthcare

Credit 1. 1 Lecture Hour. Discussion of ethical issues and societal challenges experienced by professionals derived from scientific research and professional activities related to delivering wellness and healthcare services; review of sources, fundamental principles, scope of practice and applications of ethical behavior in the field of nutrition; application of ethical principles and scope of practice to different professional groups and organizations, including business, non-profits, government, health care, and science and technology. **Prerequisites:** NUTR major or minor or NUTR certificate; senior classification.

NUTR 403 Advanced Nutrition in Sports

Credits 3. 3 Lecture Hours. Examination of sports nutrition for specific athlete populations, training settings, and lessons on being a sports dietitian beyond the nutrition knowledge need. **Prerequisites:** NUTR 306.

NUTR 404 Nutrition Assessment and Planning

Credits 3. 3 Lecture Hours. Examines the methods of determining the nutritional status of individuals, dietary assessment techniques, planning nutritional care including diet modification and nutrition counseling.

Prerequisites: NUTR 203, NUTR 211 and NUTR 301; junior classification or approval of department head.

NUTR 406 Nutrition in Developmental Origins of Health and Diseases

Credits 3. 3 Lecture Hours. Overview of the connection between maternal nutrition and the Developmental Origins of Health and Diseases (DOHaD); focus on prenatal and perinatal nutrition and how it affects DOHaD; examination of the discovery of the DOHaD concept and how exposure status is remembered in the body over the long term; exploration of the associations between DOHaD-related diseases and specific nutrients; discussion of how genetic variation and sexual dimorphism influence these disease outcomes. **Prerequisites:** NUTR 301, NUTR 366, and NUTR 367; GENE 301 or GENE 302; junior or senior classification, or approval of instructor.

NUTR 407 Nutrition Care and Therapy

Credits 4. 3 Lecture Hours. 3 Lab Hours. Application of the Nutrition Care Process for clinical diagnoses and conditions; planning of nutritional care plans for complex patients, including the formulation and planning for enteral and parenteral nutrition support. **Prerequisites:** NUTR 203, NUTR 211, NUTR 301 and NUTR 404; junior classification; dietetics track; or approval of instructor.

NUTR 408 Professional Development in Nutrition and Dietetics

Credit 1. 1 Lecture Hour. Techniques in professional development with focus on knowledge requirements for a Registered Dietitian Nutritionist; emphasis on oral and written communication, professional leadership, interprofessional relationships, mentoring, and critical thinking.

Prerequisites: Senior classification; NUTR-DPD majors.

NUTR 409 Nutrition Education and Counseling

Credits 2. 2 Lecture Hours. Principles and techniques of nutrition education and counseling methods applied to diverse areas of the dietetic profession, including motivational interviewing, communication skills, and evaluation methods. **Prerequisites:** Grade of B or better in NUTR 404 or concurrent enrollment; junior or senior classification; Dietetics (DPD) track.

NUTR 410/FSTC 410 Nutritional Pharmacometrics of Food Compounds

Credits 3. 3 Lecture Hours. Nutritional pharmacokinetics and pharmacodynamics of food compounds; specific examples of toxicological and pharmacological effects of food compounds.

Prerequisites: NUTR 201, NUTR 202, NUTR 203, CHEM 222, or CHEM 227, or approval of instructor; junior or senior classification. **Cross Listing:** FSTC 410/NUTR 410.

NUTR 412 Nutritional Treatment of Disease

Credits 3. 3 Lecture Hours. Nutritional intervention in pathological conditions, based on biochemical, physiological and psychological effects of disease state; current research in clinical nutrition.

Prerequisites: NUTR 203; NUTR 301, BIOL 319 and BICH 410, or concurrent enrollment; senior classification or approval of instructor.

NUTR 430 Community Nutrition

Credits 3. 3 Lecture Hours. Principles of assessing nutrition problems in populations and planning nutrition programs to promote health in communities including nutrition education and food and nutrition policy; introduction to food and nutrition assistance programs. **Prerequisites:** NUTR 301; junior or senior classification.

NUTR 440 Microbes and Microbiome in Nutrition

Credits 4. 3 Lecture Hours. 3 Lab Hours. Contemporary approaches to nutrition-associated microbes and toxins with an emphasis on the alimentary (gastrointestinal) system including normal intestinal microbiota and dysbiosis; probiotic and prebiotic nutritional supplements; recombinant pharmabiotics; nutrient and microbiota modulation of gut-associated lymphoid tissue and mucosal immunity; foodborne pathogens; fermented products as functional foods, and food safety approaches. **Prerequisites:** NUTR 301 or concurrent enrollment; NUTR major; junior or senior classification or approval of instructor.

NUTR 450 Nutrition and Metabolism of Minerals

Credits 3. 3 Lecture Hours. The role of minerals in living systems and the exploration of their multitude of functions; chemical properties of minerals and how that relates to function in cells and tissues; consequences of mineral deficiencies based on known functions; insight into experimental approaches used to assess minerals in a living environment. **Prerequisite:** NUTR 203, BICH 303, or BICH 410, or approval of instructor.

NUTR 454 Nutrigenomics and Precision Nutrition

Credits 3. 3 Lecture Hours. Perspectives on the interaction between genetic variation and diet/nutrients; dietary and nutrient impacts on gene expression mediated by variation in individual genomes; modulation of the host epigenome by the microbiome; novel treatment of important diseases addressed through improved nutrition and the development of improved health through precision nutrition. **Prerequisites:** NUTR 202 or NUTR 203; GENE 301, GENE 302, GENE 310, or GENE 320/BIMS 320; junior or senior classification; or approval of instructor.

NUTR 469 Experimental Nutrition Laboratory

Credits 3. 2 Lecture Hours. 3 Lab Hours. Investigation of tools and molecular techniques used in studies of nutrition and metabolism (e.g. obesity, diabetes, cardiovascular disease, etc.); didactic and hands-on laboratory components; includes model systems, measurements of energy balance, body composition, RNA and protein analyses.

Prerequisites: Junior or senior classification or approval of instructor.

NUTR 471 Critical Evaluation of Nutrition and Food Science Literature - Evidence Based Reviews

Credits 3. 3 Lecture Hours. Evaluation of scientific literature, research methods within the literature, and the quality of scientific studies to produce an evidence-based review in areas specific to nutrition and food science. **Prerequisites:** NUTR 202 or NUTR 203; STAT 302; junior or senior classification; knowledge of technical writing helpful.

NUTR 475 Nutrition and Physiological Chemistry

Credits 3. 3 Lecture Hours. Fundamentals of physiology, biochemistry and nutrition and their relationship to the organismic and cellular metabolism of animals; biochemical basis of hormonal action.

Prerequisites: NUTR 301; NUTR 366 or BIOL 319; BICH 409, BICH 410, or BICH 440; senior classification; or approval of instructor.

NUTR 481 Seminar

Credit 1. 1 Lecture Hour. Critical review and synthesis of current peer-reviewed publications in the field of nutrition; structured evaluation of literature, independent research and experiences gained in classroom will culminate in a written professional paper and an oral presentation based on a nutrition topic of interest. **Prerequisite:** Senior classification; NUTR majors only.

NUTR 483 Practicum for Nutrition in Sports

Credits 3. 3 Other Hours. Exploration of applied aspects of sports nutrition; topics include team talks to athletes, one-on-one counseling, planning travel nutrition, needs assessments of athletes, pre and post workout fueling, and accompanying dietitians with grocery tours.

Prerequisites: NUTR 403.

NUTR 485 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Directed study on selected problems in the area of nutrition not covered in other courses. **Prerequisites:** Junior or senior classification; approval of department head; 2.0 GPR in major and overall.

NUTR 489 Special Topics in...

Credits 1 to 4. 1 to 4 Other Hours. Selected topics in an identified area of nutrition. May be repeated for credit. **Prerequisite:** Junior or senior classification.

NUTR 491 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of a faculty member in nutrition. May be repeated 3 times for credit. Registration in multiple sections of this course are possible within a given semester provided that the per semester credit hour limit is not exceeded.

NVSC - Naval Science (NVSC)

NVSC 101 Introduction to Naval Science

Credits 2. 2 Lecture Hours. 1 Lab Hour. Seapower and the naval service; mission, organization, regulations, and broad warfare components of the Navy; overview of officer and enlisted rank and rating structures, procurement and recruitment, training and education, promotion and advancement, and retirement policies. Basic tenets of naval courtesy and customs, discipline, naval leadership, and ship's nomenclature. Major challenges facing Naval officers; areas of equal opportunity, fraternization and drug/alcohol abuse.

NVSC 200 Naval Science for the Merchant Marine Officer

Credits 3. 3 Lecture Hours. (STCW Course). Organization of the U.S. Navy (including the U.S. Navy Control of Shipping Organization) with discussion of the Merchant Marine Naval Reserve commission in order to provide a sound basis for liaison between the U.S. Navy and the Merchant Marine. Seapower will be analyzed and naval damage control procedures and underway replenishment procedures will be introduced.

NVSC 205 Naval Sea Power and Maritime Affairs

Credits 3. 2 Lecture Hours. 2 Lab Hours. Naval history survey emphasizing major developments in strategy, tactics, technology, and effects of political climate; significant naval engagements and officers; includes an introduction to the role of seapower in national policy and diplomacy, Mahan's naval strategy and the affects of maritime policy on global stability.

NVSC 210 Leadership and Management I

Credits 3. 3 Lecture Hours. 1 Lab Hour. Principles of leadership and management and their application to duties and responsibilities for Junior Naval Officers; management theory, professional responsibility and human resource management programs; skills in leadership and management, communication, counseling, evaluations; administration of discipline developed through participation in case studies, experiential exercises and situational problems.

NVSC 301 Navigation

Credits 3. 2 Lecture Hours. 2 Lab Hours. Theory, principles and procedures of ship navigation in coastal and open ocean environments; piloting, ocean and tidal currents, weather, introduction to USN electronic and satellite navigational systems, guided participation in case studies involving maritime accidents.

NVSC 303 Evolution of Warfare

Credits 3. 3 Lecture Hours. Art and concepts of land warfare; its evolution from the beginning of recorded history to present day; influence that leadership, political, economic, sociological and technological development have had on warfare throughout history.

NVSC 320 Naval Ships Systems I: Engineering

Credits 3. 3 Lecture Hours. 1 Lab Hour. Study of engineering concepts and their application in U.S. Naval vessels; basic ship design, hydrodynamic forces, fluid dynamics, stability, propulsion, closed thermodynamic systems, electrical systems, shipboard power generation and distribution, shipboard safety, organization and firefighting.

Prerequisites: Junior or senior classification.

NVSC 401 Naval Ships Systems II: Weapons

Credits 3. 3 Lecture Hours. 1 Lab Hour. Types and purpose of major weapons systems and platforms of the U.S. Naval forces; theory and operational principles of radar, sonar and communication circuits; fire control problem geometry, principles of ballistics, propulsion, launching and guidance of weapons; principles of electronic warfare and nuclear weapons.

NVSC 402 Leadership and Ethics

Credits 3. 3 Lecture Hours. 1 Lab Hour. Theoretical concepts of Western moral traditions and ethical philosophy; topics include leadership, values, military ethics, Just War Theory, Uniform Code of Military Justice and Naval regulations; examination of ethical foundation for the development of leadership and communication skills; should be taken the semester of graduation.

NVSC 404 Naval Operations and Seamanship

Credits 3. 2 Lecture Hours. 2 Lab Hours. Relative motion, formation tactics, ship maneuvering behavior and characteristics, applied aspects of ship handling, afloat communications and ship employment; naval warfare, operations concepts, command and control, and joint warfare; review and analysis of case studies involving moral, ethical and leadership issues. **Prerequisite:** NVSC 301 or MART 204; junior or senior classification.

NVSC 410 Fundamentals of Maneuver Warfare

Credits 3. 3 Lecture Hours. Study of the foundational concepts and history of the United States Marine Corps as the premier Maneuver Warfare organization; evolution of amphibious and expeditionary doctrine over time and amid emerging technological challenges; exploration of theoretical concepts utilizing historical case studies. **Prerequisite:** Grade of C or better in NVSC 303.

NVSC 485 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Directed study in problems in the field of naval science not covered by other courses in department.

Prerequisite: Approval of department head.

OCEN - Ocean Engineering (OCEN)

OCEN 201 Introduction to Ocean Engineering

Credits 3. 3 Lecture Hours. Survey of ocean engineering; concepts and theories of wave-structure interaction; sources of technical information; coastal and ocean structures, moorings, laboratory models; underwater systems; naval architecture; ocean instrumentation; materials and corrosion; hydrographic surveying and positioning, graphics laboratory, recent developments in ocean engineering. **Prerequisite:** Ocean engineering majors.

OCEN 213 Principles of Materials Engineering

Credits 3. 2 Lecture Hours. 2 Lab Hours. Description of properties of materials using a unified approach; discussion of the chemical structure, crystalline structure, microstructure, interface structure, and phase diagrams for materials; develop bulk properties and characteristics of metals, polymers, and ceramics; mechanical, electrical, magnetic, thermal, and optical properties for these materials. **Prerequisite:** Ocean Engineering majors.

OCEN 214 Mechanics of Deformable Bodies

Credits 3. 3 Lecture Hours. Concepts of stress, strain and deformation; factor of safety; stress-strain relationships and material properties; stress concentrations; area moments of inertia; axially loaded members, torsionally loaded members, bending of beams; shear and moment diagrams; stresses due to combined loading; thin-walled pressure vessels; transformation of stress including Mohr's circle; beam deflections and buckling stability. **Prerequisites:** Grade of C or better in OCEN 221; grade of C or better in MATH 308 or concurrent enrollment.

OCEN 221 Engineering Mechanics - Statics

Credits 3. 3 Lecture Hours. General principles of mechanics; concurrent force systems; statics of particles; equivalent force/moment systems; centroids and center of gravity; equilibrium of rigid bodies; trusses, frames and machines; internal forces in structural members; moments of areas. **Prerequisite:** Grade of C or better in MATH 251 or MATH 253, or concurrent enrollment; also taught at Galveston campus.

OCEN 265 Introduction to Geotechnical Engineering

Credits 3. 2 Lecture Hours. 2 Lab Hours. Physical properties of soils, classification systems, soil exploration, permeability, consolidation, compaction and shear strength; laboratory tests conducted to determine the physical and engineering soil properties needed for application in geotechnical engineering design. **Prerequisite:** Grade of C or better in OCEN 214 or CVEN 305.

OCEN 285 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Directed study on selected current problems in the ocean and/or maritime industry; enables individuals or groups to undertake and complete with credit some specialized investigation not covered by other courses. **Prerequisite:** Approval of department head.

OCEN 300 Ocean Engineering Wave Mechanics

Credits 3. 3 Lecture Hours. Physical and mathematical fundamentals of ocean wave behavior; mechanics of wave motion; use of statistics and probability to develop design wave criteria. **Prerequisite:** Grade of C or better in OCEN 311; grade of C or better in OCEN 362 or concurrent enrollment.

OCEN 311 Fluid Statics and Dynamics

Credits 3. 3 Lecture Hours. Fluid properties; statics; kinematics; ideal gas law; conservation of mass; linear momentum and Newton's Second Law; conservation of energy; Bernoulli's equation; control volume analysis, similitude and hydraulic models; homogeneous flow in pipes; fluid drag, boundary layer basics. **Prerequisite:** Grade of C or better in OCEN 221.

OCEN 336 Fluid Dynamics Laboratory

Credit 1. 2 Lab Hours. Introduction to laboratory techniques, calibration principles, reports and fluid measurements; determination of fluid properties; visualization of types of flow; experiments in closed conduit flow of air, water and oil; fluid drag and turbomachinery tests; open channel and gravity wave demonstrations. **Prerequisite:** Grade of C or better in OCEN 311 or OCEN 311/EVEN 311, or concurrent enrollment.

OCEN 341 Engineering Economics and Project Management

Credits 3. 3 Lecture Hours. Analysis of engineering economics and management, using costs and benefits of various engineering options; project scheduling covered in detail including PERT, GANT and CPM methods; time value of money, cash flows, analysis techniques, interest rates, inflation, depreciation, optimization, statistics, network analysis and critical path programming. **Prerequisites:** Junior or senior classification; enrollment in the OCEN program; also taught at Galveston campus.

OCEN 344 Reinforced Concrete Structures

Credits 3. 3 Lecture Hours. Analysis and design of reinforced concrete beams, columns, slabs and footings using ultimate strength methods. **Prerequisites:** Grade of C or better in OCEN 345 and OCEN 213; also taught at Galveston campus.

OCEN 345 Theory of Ocean Engineering Structures

Credits 3. 3 Lecture Hours. Functions of and loadings on ocean engineering structures, including sea walls, harbor structures, sea-going vessels, offshore structures and underwater vehicles; analysis of structures including trusses, beams, plates, shells and arches; introduction to stress and failure analysis; introduction to finite element analysis (FEA) including computational mechanics of ocean engineering structures using FEA. **Prerequisite:** Grade of C or better in OCEN 214.

OCEN 351 Rigid Body Dynamics For Ocean Engineers

Credits 3. 3 Lecture Hours. General principles in mechanics; position, velocity and acceleration; application of Newton's laws to rigid body dynamics; kinematics of rectilinear and curvilinear motions; stationary and moving frames of reference; work-energy and impulse momentum principles for applications to ocean engineering systems. **Prerequisites:** Grade of C or better in MATH 308 or concurrent enrollment; grade of C or better in OCEN 221.

OCEN 352 Vibrations and Control for Ocean Engineers

Credits 3. 3 Lecture Hours. Fundamentals of mechanical vibration; vibration responses to harmonic and random excitations; vibration of single-degree-of-freedom and multiple-degree-of-freedom; modal analysis and resonance; optimum control theories and examples; state-space representation; applications of the optimum feedback control; compensator design using Separation Principle. **Prerequisite:** Grade of C or better in OCEN 351.

OCEN 361 Applied Numerical Methods

Credits 3. 3 Lecture Hours. Application of numerical methods to ocean-related engineering problems; development, evaluation and comparison of various techniques for root finding, curve fitting, numerical integration, simultaneous linear algebraic equations, matrix methods, probability and statistics and ordinary differential equations in ocean-related engineering applications. **Prerequisite:** Grade of C or better in MATH 308 or concurrent enrollment.

OCEN 362 Hydromechanics

Credits 3. 3 Lecture Hours. Kinematics of fluids; differential analysis of fluid flow; homogeneous, incompressible, irrotational and turbulent flows; Euler equations; Navier-Stokes equations; flow of viscous fluids; pumps; introduction to water waves. **Prerequisites:** Grade of C or better in OCEN 311 and MATH 308.

OCEN 363 Dynamics and Vibrations

Credits 3. 3 Lecture Hours. Application of Newtonian and energy methods to model dynamic systems with ordinary differential equations; dynamics and vibrations of linear single- and multi-degree of freedom systems of particles and rigid bodies; solutions of models using analytical approaches; interpreting solutions; application to simple floating systems. **Prerequisites:** Grade of C or better in OCEN 221; grade of C or better in MATH 308 or concurrent enrollment.

OCEN 399 Leadership and Experience

Credits 0. 0 Other Hours. Participation in an approved high-impact learning practice; reflection on professional outcomes from engineering body of knowledge; documentation and self-assessment of learning experience at mid-curriculum point. **Prerequisites:** OCEN 201; junior or senior classification or approval of instructor.

OCEN 400 Basic Coastal Engineering

Credits 3. 3 Lecture Hours. Mechanics of wave motion; wave refraction, diffraction and reflection; wave forecasting; shore processes; planning of coastal engineering projects; design of seawalls, breakwaters, beach nourishment and fixed and floating installations; dredging; risk analysis. **Prerequisites:** Grade of C or better in OCEN 300.

OCEN 401 Underwater Acoustics for Ocean Engineers

Credits 3. 3 Lecture Hours. Fundamentals of underwater acoustics, SONAR equations, propagation of underwater sound, acoustic transducers and arrays, noise in the ocean environment, design and prediction of SONAR systems, ocean engineering applications of underwater sound. **Prerequisite:** Grade of C or better in OCEN 311.

OCEN 402 Principles of Naval Architecture

Credits 3. 3 Lecture Hours. Elementary principles of naval architecture; ship geometry and hydrostatics; load line and classification regulations; concept of intact and damaged stability; resistance and propulsion of water-borne vehicles; applications to the design consideration of semi-submersibles, catamarans and drilling rigs. **Prerequisite:** Grade of C or better in OCEN 311.

OCEN 403 Dynamics of Offshore Structures

Credits 3. 3 Lecture Hours. Prediction of loads due to wind, current and waves; introduction to concepts of linear structural dynamics and to the design of ocean structures; mooring and towing analysis; fluid-structure interactions; vibration of submerged structures; offshore pipelines; introduction to risk analysis. **Prerequisite:** Grade of C or better in OCEN 300, OCEN 345, and OCEN 362; grade of C or better in OCEN 363 or concurrent enrollment.

OCEN 405 Finite Element Analysis in Engineering Design

Credits 3. 3 Lecture Hours. Introduction to the fundamental theory and techniques; direct approach and energy formulation; element equations, assembly and solution schemes; computer implementation, design considerations; applications to field problems; original computer project required. **Prerequisite:** Grade of C or better in OCEN 345.

OCEN 406 Capstone Design I

Credit 1. 1 Lecture Hour. Part one of a two-course sequence; development and presentation of detailed proposals for offshore or coastal engineering projects, which will form the basis for OCEN 407 design projects; includes formulation of project objectives, design constraints, delineation of alternatives, scheduling and analysis of economic and environmental impact. **Prerequisites:** Grade of C or better in OCEN 300; grade of C or better in OCEN 400, OCEN 402, and OCEN 403, or concurrent enrollment.

OCEN 407 Design of Ocean Engineering Facilities II

Credits 3. 0 Lecture Hours. 6 Lab Hours. Design of structures, equipment and systems for the ocean; environmental, logistical and reliability requirements; complete design process followed through group design project; delineation of alternatives, constraints, economics and environmental consequences included to strengthen real-life problem solving skills. **Prerequisites:** Grade of C or better in OCEN 400, OCEN 402, OCEN 403, and OCEN 406.

OCEN 408 Underwater and Moored System Design

Credits 3. 3 Lecture Hours. Basic principles of thermodynamics, fluid dynamics and human respiration physiology applied to design of underwater habitats, submersibles and diving bells; breathing gas supply for diving systems; heat transfer for underwater systems; pressure vessel design; remotely operated vehicles; subsea flowlines and manifold systems; and design of towed and moored systems. **Prerequisite:** Grade of C or better in OCEN 311.

OCEN 410 Ocean Engineering Laboratory

Credits 2. 1 Lecture Hour. 2 Lab Hours. Fundamental techniques and instrumentation for field and laboratory measurements pertaining to ocean engineering experiment planning; data analysis and data presentation; written reports describing planning, analysis and results of experiments. **Prerequisites:** Grade of C or better in OCEN 400, OCEN 402, and OCEN 403.

OCEN 411 Environmental Nearshore Hydrodynamics

Credits 3. 3 Lecture Hours. Fundamentals of current and shallow water wave motions; beach response to nearshore processes; coastal sediment and pollutant transport including nearshore currents, longshore onshore-offshore transport and shoreline configuration; facilities for shoreline stabilization, backshore protection and inlet stabilization; environmentally conscious coastal engineering design. **Prerequisites:** Grade of C or better in OCEN 300.

OCEN 415 Offshore Structure Design

Credits 3. 3 Lecture Hours. Design of large structures using diffraction analysis; design project: design of a fixed offshore structure including dynamics effects. **Prerequisite:** Grade of C or better in OCEN 345, or concurrent enrollment.

OCEN 421 Naval Architecture Design II

Credits 3. 2 Lecture Hours. 3 Lab Hours. Ship motion and mooring; theory and practice of naval architecture, basic principles and design calculations; hull structural design considerations; ship resistance and propulsion power prediction; propeller selection concepts; dynamic positioning systems; mobile offshore drilling unit (MODU) design considerations; practical design work on a vessel or MODU of the student's choosing under the guidance of the instructor. **Prerequisites:** Grade of C or better in OCEN 362 and OCEN 402.

OCEN 451 Robotic Marine Vehicles for Ocean Engineers

Credits 3. 3 Lecture Hours. Theoretical and practical overview of robotic marine vehicles, including both surface and subsurface vehicles, operating in remote and coastal areas; design and deployment of seaborn robotic systems; hydrodynamic and hydrostatic properties of the vessel, the propulsion, control system and navigation strategies and path planning; underwater acoustics, focusing on the fundamentals necessary to design and predict SONAR performance for underwater communications and obstacle avoidance. **Prerequisite:** Grade of C or better in OCEN 311.

OCEN 459 Mechanical Vibrations

Credits 3. 3 Lecture Hours. Basic theory of vibrating systems with single and multiple degrees of freedom and principles of transmission and isolation of vibrations. **Prerequisites:** Grade of C or better in OCEN 361 and OCEN 363.

OCEN 460 Data Science for Ocean Engineers

Credits 3. 3 Lecture Hours. Engineering analysis of large amounts of complex raw and processed information; identifying data patterns and surveying well-known data science techniques; communicating through the language of data science; constructing prototype data analytics pipelines demonstrations. **Prerequisite:** Junior or senior classification; approval of instructor.

OCEN 461 Ocean Instrumentation and Control Theory

Credits 3. 3 Lecture Hours. Electrical systems components; analog and digital filters-amplifiers; network analysis; instrument behavior and displacement, velocity, acceleration, force, and flow measurements; simple feedback and control theory for linear electromechanical systems; digital data acquisition. **Prerequisites:** Grade of C or better in ECEN 215.

OCEN 463 Hydrodynamics of Offshore Structures

Credits 3. 3 Lecture Hours. Introduction to offshore structures; wave force formulation; wave forces on small structures; floating structure dynamics; modeling dynamics systems of rigid body motion; structure response statistics. **Prerequisite:** Grade of C or better in OCEN 345 and OCEN 363.

OCEN 465 Subsea Pipeline Design

Credits 3. 3 Lecture Hours. Design and construction practices of submarine oil/gas pipelines and risers; pipe selections, coating, insulation; route selection; operation and installation stresses; stability during laying and operation due to wave and current action; cost analysis considering long term operability and safety. **Prerequisite:** Grade of C or better in OCEN 300.

OCEN 467 Offshore Random Processes

Credits 3. 3 Lecture Hours. Basic probability theory and engineering statistics; irregular structural excitation and response; random vibration theory with application to offshore processes and structures; development of extreme values used in design of ocean structures. **Prerequisites:** Grade of C or better in OCEN 361, OCEN 363, and OCEN 403; also taught at Galveston campus.

OCEN 474 Port and Harbor Engineering

Credits 3. 3 Lecture Hours. Engineering background and specific skills for design of marine facilities and harbors; includes development of design criteria, channel design, evaluation of operations and extreme loads, dredging and disposal. **Prerequisites:** Junior or senior classification or approval of instructor.

OCEN 481 Seminar

Credit 1. 1 Lecture Hour. Responsibilities and obligations of new ocean engineers; professional ethics, membership in professional societies and professional registrations; case studies and lectures presented by staff and practicing engineers. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisite:** Grade of C or better in OCEN 406.

OCEN 485 Directed Studies

Credits 1 to 6. 1 to 6 Other Hours. Special problems in various areas of ocean engineering assigned to individual students or to groups; readings and assignments given and frequent consultations held. **Prerequisite:** Approval of program head.

OCEN 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified field of ocean engineering. May be repeated for credit. **Prerequisite:** Approval of instructor.

OCEN 491 Research

Credits 1 to 4. 1 to 4 Other Hours. Research conducted under the direction of faculty member in ocean engineering. May be repeated 2 times for credit. Registration in multiple sections of this course is possible within a given semester provided that the per semester credit hour limit is not exceeded. **Prerequisites:** Approval of instructor.

OCNG - Oceanography (OCNG)

OCNG 101 Succeeding in Oceanography

Credit 1. 1 Lecture Hour. Introduction to the study of the ocean and to the departmental and university resources available to assist and enhance the pursuit of a degree in oceanography or ocean studies; variety of guest lecturers will present on career pathways, internship, and research opportunities.

OCNG 203 Communicating Oceanography

Credits 3. 3 Lecture Hours. Learn and practice basic writing skills for ocean science; basic background on the research being conducted in the Department of Oceanography through seminars given by Oceanography graduate students. **Prerequisites:** OCNG 251; majors in OCNG and OCNS.

OCNG 251 The Blue Planet - Our Oceans

Credits 3. 3 Lecture Hours. (GEOL 1345, GEOL 1445*) The Blue Planet - Our Oceans. Overview of the ocean environment; interrelation of the subdisciplines of ocean sciences; importance of the oceans to human beings; human impact on the oceans; also taught at Galveston campus.

OCNG 252 The Blue Planet - Our Oceans Laboratory

Credit 1. 2 Lab Hours. (GEOL 1145, GEOL 1445*) The Blue Planet - Our Oceans Laboratory. Hands-on laboratory experiments and exercises demonstrating principles of ocean sciences; emphasis on the unique interdisciplinary nature of the ocean and current ocean issues relevant to today's society.

OCNG 281 Seminar

Credit 1. 1 Other Hour. Basic background on the research being conducted in the Department of Oceanography through seminars given by Oceanography graduate student; basic writing skills for ocean science through instruction and assignments during the semester. **Prerequisites:** OCNG 251; OCNG 252; or approval of instructor.

OCNG 289 Special Topics in...

Credits 1 to 4. 1 to 4 Other Hours. Selected topics in an identified area of oceanography. May be repeated for credit. **Prerequisites:** Approval of instructor.

OCNG 291 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in oceanography. May be repeated 2 times for credit. Registration in multiple sections of this course is possible within a given semester provided that the per semester credit hour limit is not exceeded. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

OCNG 303 Professional Communication in Oceanography

Credits 3. 3 Lecture Hours. Exploration of the fundamental skills required for effective communication of various forms of writing and for oral presentations of various lengths and purposes; addresses preparation for various ocean science-related careers. **Prerequisite:** OCNG 203; COMM 203 or COMM 205, junior or senior classification or approval of instructor.

OCNG 310 Physical Oceanography

Credits 4. 3 Lecture Hours. 2 Lab Hours. Elements of the physics of the sea; descriptive aspects as well as cause and effect relations in respect to currents, thermal structure and waves; intended for majors in the physical sciences or engineering. **Prerequisites:** MATH 152; PHYS 206; PHYS 226, PHYS 216/ENGR 216, or ENGR 216/PHYS 216; junior or senior classification.

OCNG 320 Biological Oceanography

Credits 4. 3 Lecture Hours. 2 Lab Hours. Biological aspects of the marine environment; marine organisms; productivity of the sea; marine pollution and fouling; use of the sea. **Prerequisites:** OCNG 251; BIOL 112, BIOL 107, or ECCB 205; junior or senior classification or approval of instructor.

OCNG 330 Geological Oceanography

Credits 4. 3 Lecture Hours. 2 Lab Hours. History of Oceanography; physiographic provinces of the oceans, their origins and sediments; geological sampling techniques and geophysical methods; coasts and beaches, paleoceanography; global tectonics. **Prerequisites:** OCNG 251, GEOL 101 or GEOG 203, or approval of instructor.

OCNG 340 Chemical Oceanography

Credits 4. 3 Lecture Hours. 2 Lab Hours. A basic understanding of the chemistry of the ocean and the chemical fluxes with the atmosphere, continents and seafloor; special emphasis will be placed on the application of chemical concepts and measurements to the other oceanographic disciplines. **Prerequisites:** CHEM 120 and OCNG 251.

OCNG 350 Marine Pollution

Credits 3. 3 Lecture Hours. Sources and fates of marine pollutants; types of pollutants including plastics, oil and sound; impact of pollution on society. **Prerequisite:** Junior or senior classification or approval of instructor.

OCNG 355 The Blue Frontier - Harnessing Ocean Resources for Future Sustainability

Credits 3. 3 Lecture Hours. Survey of Blue Economy industries and practices and examination of sustainable and equitable use and management of ocean resources. **Prerequisites:** OCNG 251; junior or senior classification.

OCNG 404 Ocean Observing Systems

Credits 3. 3 Lecture Hours. Investigate the rationale behind ocean observing systems; familiarize with the relevant social, scientific design, technology and policy issues associated with observing systems. **Prerequisite:** OCNG 251 or approval of instructor.

OCNG 411 Global Oceanography

Credits 3. 3 Lecture Hours. The ocean's large-scale circulation and water mass structure based on the interpretation of modern observations; emphasis on the ocean's role in global climate and physical-chemical property fluxes in basin to global scale budgets. **Prerequisite:** OCNG 251.

OCNG 412/GEOG 410 Global Change

Credits 3. 3 Lecture Hours. The interaction of the earth, atmosphere, oceans, cryosphere and life, including the impact of human society on the environment and climate; global change modeling; politics, policy and decision making; and personal awareness. **Prerequisite:** Junior or senior classification. **Cross Listing:** GEOG 410/OCNG 412.

OCNG 413 Polar Regions of the Earth: Science, Society and Discovery

Credits 3. 3 Lecture Hours. Overview of disciplines and topics that define modern polar science in the north and the south; includes history of the Polar Regions, polar geosciences, major polar scientific projects, and special topics; participate as individuals and teams in education, outreach and science projects. **Prerequisite:** Junior or senior classification.

OCNG 425 Microbial Oceanography

Credits 3. 3 Lecture Hours. Diversity and ecology of microorganisms in the ocean; role in the Earth system both in the contemporary ocean and the geological past. **Prerequisites:** Junior or senior classification, OCNG 251, or approval of instructor.

OCNG 443 Oceanographic Field and Laboratory Methods

Credits 3. 2 Lecture Hours. 2 Lab Hours. Development of skills needed to collect, prepare and analyze oceanographic samples; perform data analysis, interpretation and reporting for common oceanographic analyses. **Prerequisite:** OCNG 251 and CHEM 120; junior or senior classification or approval of instructor.

OCNG 451 Mathematical Modeling of Ocean Climate

Credits 4. 3 Lecture Hours. 2 Lab Hours. Problem-based course in theoretical and computer techniques applied to mathematical solutions of ocean climate, including ocean circulation, climate variability, El Niño. **Prerequisite:** MATH 308.

OCNG 453 Hydrothermal Vents and Mid-Ocean Ridges

Credits 3. 3 Lecture Hours. Exploration of the creation of various types of hydrothermal fluids, the associated chemical behavior of vent and plume fluids, and the ecology of hydrothermal vent systems; emphasis on the interdependence of the geological, chemical, and biological aspects of hydrothermal systems. **Prerequisite:** OCNG 251; BIOL 112; CHEM 120; junior or senior classification or approval of instructor.

OCNG 456 MATLAB Programming for Ocean Sciences

Credits 3. 2 Lecture Hours. 2 Lab Hours. Computation techniques for oceanographic data processing using MATLAB; focus on the analysis of oceanographic-related data sets and real-world oceanographic applications; analyze individual data sets. **Prerequisite:** Junior or senior classification or approval of the instructor.

OCNG 461 Advanced Oceanographic Data Analysis and Communication

Credits 3. 3 Lecture Hours. Project design and planning for oceanographers; oceanographic data organization and analysis; synthesis and interpretation of data analysis; technical report writing and presentation. **Prerequisites:** OCNG 203; STAT 211 or STAT 303; junior or senior classification.

OCNG 469 Python for Geosciences

Credits 3. 3 Lecture Hours. 1 Lab Hour. Core language Python programming, scientific programming analysis methods, analysis of large geophysical data sets, plotting geophysical data, interpolation. **Prerequisite:** Junior or senior classification.

OCNG 470 Data Analysis Methods in Geosciences

Credits 4. 3 Lecture Hours. 2 Lab Hours. Topics and methods encountered while performing research in the geosciences; conceptualization of a scientific problem, data collection and processing, appropriate analysis techniques and data archiving and management; multi-disciplinary approach with an emphasis on real-world applications from environmental, atmospheric, and oceanographic sciences. **Prerequisite:** Junior or senior classification; MATH 151; STAT 211, STAT 301, STAT 302, or STAT 303, or concurrent enrollment; or approval of instructor.

OCNG 481 Seminar

Credit 1. 1 Lecture Hour. Analysis, review and critique of current research themes in oceanography based on reading assignments and seminar presentations. May be taken four times for credit. **Prerequisite:** Junior or senior classification.

OCNG 484 Internship

Credits 0 to 3. 0 Lecture Hours. 0 to 3 Other Hours. Directed internship in a private firm, government agency or non-governmental organization to provide work experience related to the student's degree program and career objectives. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisite:** OCNG major or approval of instructor.

OCNG 485 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Special reading assignments, problems and discussion on oceanographic topics of mutual interest to student and instructor. **Prerequisites:** OCNG 251 or approval of instructor. An honors section is also available.

OCNG 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified area of oceanography. May be taken two times for credit. **Prerequisite:** OCNG 251 or approval of instructor. An honors section is also available.

OCNG 491 Research

Credits 0 to 9. 0 to 9 Other Hours. Research conducted under the direction of faculty member in oceanography. Registration in multiple sections of this course is possible within a given semester provided that the per semester credit hour limit is not exceeded. Honors section also available. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisites:** Junior or senior classification and approval of instructor.

PBSI - Psyc & Brain Sciences (PBSI)

PBSI 105 Psychology as a Major and Profession

Credit 1. 1 Lecture Hour. Development of building blocks essential to success at Texas A&M University and majors in the Department of Psychological and Brain Sciences; introduction to understanding how adjusting to college life and exploring strategies will help manage time and motivation; examination of methods for effective studying and test preparation; information about graduate school and careers with and without a graduate-level degree; intended to be taken during first semester in the major. **Prerequisites:** First semester students in psychology.

PBSI 107 Introduction to Psychology

Credits 3. 3 Lecture Hours. (PSYC 2301) Introduction to Psychology. Introductory course dealing with elementary principles of human behavior; also taught at Galveston and Qatar campuses.

PBSI 206/AFST 206 Black Psychology

Credits 3. 3 Lecture Hours. Critical examination of psychological experience, theories, and methods from perspectives grounded in the "Black experience." **Cross Listing:** AFST 206/PBSI 206.

PBSI 208 Stereotypes, Prejudice, and Minority Experience

Credits 3. 3 Lecture Hours. Overview of theory and research relating to stereotyping, prejudice, discrimination, and minority experiences from a social psychological perspective. **Prerequisites:** PBSI 107.

PBSI 209/AFST 209 Psychology of Culture and Diversity

Credits 3. 3 Lecture Hours. Introduction to various issues surrounding an increasingly interconnected and globalized world by critically examining the dynamic relationship between psychological processes and diverse (e.g., motivation, memory, self, prejudice) socio-cultural contexts. **Prerequisites:** PBSI 107. **Cross Listing:** AFST 209/PBSI 209.

PBSI 210/WGST 210 Psychological Aspects of Human Sexuality

Credits 3. 3 Lecture Hours. Interface between human sexuality, reproductive development and gender roles across the lifespan; theoretical and research literature promotes understanding of hormonal influences, learning processes, cultural differences, sexual response and love and attraction. **Prerequisite:** PBSI 107. **Cross Listing:** WGST 210/PBSI 210.

PBSI 225 Lifespan Development

Credits 3. 3 Lecture Hours. (PSYC 2314) Lifespan Development. Major theoretical perspectives and empirical research examining psychological processes across the lifespan; changes across the lifespan in emotional, cognitive, personality and social processes; stages of the lifespan including infancy, childhood, adolescence, adulthood and the end of life.

PBSI 235 Introduction to Behavioral and Cognitive Neuroscience

Credits 3. 3 Lecture Hours. Physiological bases of sensation, motor functions, emotion, motivation and complex psychological processes. **Prerequisites:** PBSI 107 or BIOL 111.

PBSI 245 Introduction to Psychological Science Methods

Credits 3. 3 Lecture Hours. (PSYC 2317) Introduction to Psychological Science Methods. Basic elements of statistics and research methods in the psychological and brain sciences; topics include ethics in psychological research, measurement, research design and descriptive and inferential statistics.

PBSI 251 Survey of Industrial/Organizational Psychology

Credits 3. 3 Lecture Hours. Literature and research in the basic theories and practices of I/O psychology including selection, testing, job analysis, performance appraisal, training, employee motivation, job satisfaction, leadership, and group processes within organizations.

PBSI 285 Directed Studies

Credits 0 to 3. 0 to 3 Other Hours. Directed readings or research problems in selected areas designed to supplement existing course offerings; individual report required. **Prerequisites:** Approval of instructor; major in psychology.

PBSI 289 Special Topics in...

Credits 1 to 4. 1 to 4 Other Hours. Selected topics in an identified area of psychology. May be repeated for credit. **Prerequisite:** PBSI 107.

PBSI 291 Research

Credits 0 to 3. 0 to 3 Other Hours. Research conducted under the supervision of a chosen faculty member in the department of psychology; involves discussion and weekly presentation of student research projects. May be repeated for credit. **Prerequisites:** PBSI 285; freshman or sophomore classification.

PBSI 300/WGST 300 Psychology of Women

Credits 3. 3 Lecture Hours. Theoretical and research literature relevant to psychological assumptions about the female personality; challenges to and verification of these assumptions by recent experimental studies. **Prerequisite:** PBSI 107. **Cross Listing:** WGST 300/PBSI 300.

PBSI 301 Elementary Statistics for Psychology

Credits 4. 3 Lecture Hours. 2 Lab Hours. Practical knowledge of statistics up through analysis of variance. Practice sessions devoted to numerical problems. Will not satisfy mathematics requirement in College of Liberal Arts curricula. **Prerequisites:** Grade of C or better in PBSI 107 and PBSI 245; major in psychology.

PBSI 302 Research Methods and Design in Psychology

Credits 4. 3 Lecture Hours. 2 Lab Hours. Research techniques in psychology with emphasis on the experimental method; laboratory exercises applied to specific problems in psychology. **Prerequisites:** Grade of C or better in PBSI 107 and PBSI 301; major in psychology.

PBSI 303 Psychology of Women of Color

Credits 3. 3 Lecture Hours. Interdisciplinary theories to study the unique yet intersectional experiences of women from different racial groups, ethnicities, nationalities and cultural backgrounds; scholarly research from the diversity science field; contemporary topics that have developed in a global context; examination of complex issues, which affect women of color across the lifespan. **Prerequisites:** Grade of C or better in AFST 201, PBSI 107, or WGST 200, or approval of instructor. **Cross Listing:** AFST 303 and WGST 303.

PBSI 304 Psychology of Sport and Physical Activity

Credits 3. 3 Lecture Hours. The relationship of psychology to sport, exercise and human performance; including history, application of learning principles, social psychology, personality variables, psychological assessment, youth sport, the female sport experience, psychology of coaching, exercise and human performance.

PBSI 305 Psychology of Adjustment

Credits 3. 3 Lecture Hours. Adjustment problems of normal people; application of psychological principles to family, school and community life.

PBSI 306 Psychological Disorders

Credits 3. 3 Lecture Hours. Survey of psychopathology; models of diagnosis and assessment, anxiety and depression, eating disorders, substance abuse, sexual dysfunctions, schizophrenia, bipolar illness, character disorders, children's disorders and aging. **Prerequisites:** PBSI 107; PBSI 301 and PBSI 302 recommended; also taught at Galveston campus.

PBSI 307 Developmental Psychology

Credits 3. 3 Lecture Hours. Growth and development of normal child from infancy to adolescence with emphasis on elementary school years. **Prerequisite:** PBSI 107; PBSI 245, MATH 140, MATH 168, MATH 142, MATH 147, MATH 151, MATH 171, MATH 152, MATH 148, MATH 172, MATH 150, PHIL 240 or STAT 201.

PBSI 310 Career Readiness and Preparation

Credit 1. 1 Lecture Hour. Exploration of various career paths in the preparation of upper-level undergraduate psychology and neuroscience majors for either entering the job market or pursuing graduate school in psychology or related fields; assistance in preparing for and succeeding in graduate school, and how to apply for a job or to graduate school. **Prerequisites:** Junior or senior classification; Psychology and Neuroscience-BCN majors.

PBSI 311 Psychology of Animal Behavior

Credits 3. 3 Lecture Hours. Problems, principles, and methods of animal psychology; animal learning, motivation, discriminative processes and abnormal, social and instinctual behaviors. **Prerequisites:** PBSI 107, BIOL 111, or BIOL 113.

PBSI 315 Social Psychology

Credits 3. 3 Lecture Hours. Social psychological variables operating on the individual; results of experimental laboratory findings; interaction of personality and social behavior. **Prerequisites:** PBSI 107.

PBSI 316/COMM 316 Media Psychology

Credits 3. 3 Lecture Hours. Examine the role of media and its impact on human behavior, emotions and thoughts; topics include mass media, social media and how they influence individual and societal functioning across a range of important psychological topics; e.g., self-image, sexual behavior, mental health, violence. **Prerequisites:** PBSI 107. **Cross Listing:** COMM 316/PSYC 316.

PBSI 319 History and Systems of Psychology

Credits 3. 3 Lecture Hours. Historical analysis of pre-scientific psychology in philosophy and physiology through the period of the psychological "schools." **Prerequisite:** PBSI 107.

PBSI 320 Sensation-Perception

Credits 3. 3 Lecture Hours. Review of sensory physiology, sensory and perceptual phenomena and the major perceptual theories; current research in the field. **Prerequisites:** PBSI 235.

PBSI 323 Psychology of Adolescence

Credits 3. 3 Lecture Hours. Psychological problems of normal teenage individual; ways and means of aiding youth to meet these problems constructively. **Prerequisites:** PBSI 107; PBSI 245 or one of the following: MATH 140, MATH 168, MATH 142, MATH 147, MATH 151, MATH 171, MATH 152, MATH 148, MATH 172, MATH 150, PHIL 240, STAT 201; PBSI 301 and PBSI 302 recommended.

PBSI 330 Personality

Credits 3. 3 Lecture Hours. Review of personality theories, techniques of assessment and research relevant to understanding individual differences. **Prerequisites:** PBSI 107; PBSI 301 and PBSI 302 recommended.

PBSI 332 Neuroscience of Learning and Memory

Credits 3. 3 Lecture Hours. Brain mechanisms of learning and memory from molecular to behavioral levels; synaptic plasticity, model systems, multiple memory systems, diseases of learning and memory. **Prerequisites:** PBSI 235, PBSI 340, VIBS 277, or NRSC 277.

PBSI 333 Biology of Psychological Disorders

Credits 3. 3 Lecture Hours. Neurobiology and clinical explanation of molecular mechanisms underlying psychiatric disorders and their drug treatments; depression and bipolar, anxiety disorders, mood disorders, psychosis and schizophrenia. **Prerequisites:** PBSI 235, PBSI 340, VIBS 277, or NRSC 277.

PBSI 336 Drugs and Behavior

Credits 3. 3 Lecture Hours. Physiological, pharmacological and behavioral effects of psychoactive drugs, including short-term and long-term effects of psychoactive drugs, properties of addictive drugs, etiology of addiction, and treatments of drug addiction and withdrawal. **Prerequisites:** PBSI 235, PBSI 340, VIBS 277, or NRSC 277.

PBSI 340 Psychology of Learning

Credits 3. 3 Lecture Hours. Survey of significant concepts, experimental methods and principles of learning. **Prerequisites:** PBSI 107, BIOL 111, or BIOL 113.

PBSI 345 Human Cognitive Processes

Credits 3. 3 Lecture Hours. Human cognition and information processing: perception, attention, memory, reasoning and problem solving; experimental methods and data, and contemporary theories of human cognition. **Prerequisites:** PBSI 107; PBSI 245 or one of the following: MATH 140, MATH 168, MATH 142, MATH 147, MATH 151, MATH 171, MATH 152, MATH 148, MATH 172, MATH 150, PHIL 240, STAT 201; PBSI 301 and PBSI 302 recommended.

PBSI 346 Psychology of Language

Credits 3. 3 Lecture Hours. Examines theories of how language is acquired, comprehended, produced, stored and used in normal and brain-impaired individuals. **Prerequisites:** PBSI 107; PBSI 301 and PBSI 302 recommended.

PBSI 350 Cognitive Neuroscience

Credits 3. 3 Lecture Hours. Research in cognitive neuroscience; methodological advances that enable the study of the human brain safely in the laboratory; complex aspects of the mind like emotion, social behavior and consciousness. **Prerequisites:** PBSI 107; PBSI 235; PBSI 301, PBSI 302, and NRCS 277 recommended.

PBSI 352 Organizational Psychology

Credits 3. 3 Lecture Hours. Literature and research in basic theories and practices of organizational psychology including employee motivation, leadership, job satisfaction, counterproductive work behaviors, organizational commitment, culture, climate, communication, and group processes within organizations. **Prerequisites:** PBSI 107; PBSI 245 or one of the following: MATH 140, MATH 168, MATH 142, MATH 147, MATH 151, MATH 171, MATH 152, MATH 148, MATH 172, MATH 150, PHIL 240, STAT 201; PBSI 301 and PBSI 302 recommended.

PBSI 353 Personnel Psychology

Credits 3. 3 Lecture Hours. Literature and research in basic theories and practices of personnel psychology including job analysis, testing and validation, selection, performance appraisal, training, and legal issues in employment decision making. **Prerequisites:** PBSI 107; PBSI 245 or one of the following: MATH 140, MATH 168, MATH 142, MATH 147, MATH 151, MATH 171, MATH 152, MATH 148, MATH 172, MATH 150, PHIL 240, STAT 201; PBSI 301 and PBSI 302 recommended.

PBSI 354 Conflict and Negotiation

Credits 3. 3 Lecture Hours. Examination of the field of conflict and negotiation, including the structure and causes of common interpersonal, intragroup, and intergroup conflicts, effective negotiation strategies, ethics, mediation, and the development of negotiating skills. **Prerequisite:** PBSI 107.

PBSI 360 Health Psychology and Behavioral Medicine

Credits 3. 3 Lecture Hours. Health psychology emphasizing behavioral and lifestyle factors in health and illness, prevention and modification of health-compromising behaviors, health care utilization, and psychological management of chronic disorders and psychological management of chronic disorders and terminal illnesses. **Prerequisites:** PBSI 107; junior or senior classification.

PBSI 365 Psychology of Aging

Credits 3. 3 Lecture Hours. Examination of the psychological aspects of the aging process including physiology and health, memory and intellectual functioning, personality and social relationships, emotional health and late life transition. **Prerequisite:** PBSI 107.

PBSI 371 Forensic Psychology

Credits 3. 3 Lecture Hours. Interface between psychology and the legal system; role of psychological theories and data, as well as mental health expertise, in the resolution of criminal trials and civil disputes; legal system's impact on the practice of psychology. **Prerequisites:** PBSI 107; PBSI 306 recommended.

PBSI 375 Qualitative Methods in the Psychological Sciences

Credits 3. 3 Lecture Hours. Research methods and approaches to engaging in qualitative analysis; topics include epistemological and ontological assumptions of qualitative research, ethical considerations, focus groups, interviews, qualitative surveys, thematic analysis, and use of qualitative software. **Prerequisites:** Junior or senior classification; grade of C or better in PBSI 107.

PBSI 389 Careers in Psychology

Credits 3. 3 Lecture Hours. Exploration of graduate study and professional careers in the field of psychology, including teaching, research, and clinical practice; content will include graduate admissions, licensure types, areas of specialization and professional skills related to training and practice in the field of psychology. **Prerequisites:** PBSI 107; approval of instructor.

PBSI 407 Behavioral Disorders of Children

Credits 3. 3 Lecture Hours. Behavior problems related to childhood; psychological aspects of mental retardation, emotional disturbance, physical handicaps and other disorders; causative factors, preventative and therapeutic methods explored; where feasible, practical experience included as requirement. **Prerequisites:** PBSI 306; PBSI 307 or equivalent.

PBSI 408 Pain Psychology

Credits 3. 3 Lecture Hours. Critical and transdisciplinary approach to the study of pain including an examination of personal and historical conceptions of pain, understanding of biopsychosocial mechanisms of pain, and consideration of sociodemographic and global pain disparities. **Prerequisites:** PBSI 107; PBSI 302 and PBSI 360 recommended; junior or senior classification.

PBSI 411 Psychology of Self

Credits 3. 3 Lecture Hours. Overview of psychological theory and research on issues related to the self, the self-concept and identity, and how these phenomena are integral to the human experience and to mental health and well-being. **Prerequisite:** PBSI 107 or approval of instructor.

PBSI 414 Behavior Principles

Credits 3. 3 Lecture Hours. Behavioral analysis of humans' complex interactions with their environments: how behavioral repertoires are constructed during maturation process; how existent behaviors are strengthened, weakened or eliminated; and how features of environment exercise control over behavioral components within a repertoire. **Prerequisites:** 9 hours of psychology; PBSI 107; junior or senior classification; PBSI 301 and PBSI 302 recommended.

PBSI 421 Existential Psychology

Credits 3. 3 Lecture Hours. Study of major theoretical perspectives and contemporary research in existential psychology; focus on theory and research examining major topics in existential psychology including the causes and consequences of mortality awareness, self-knowledge, authenticity, belief in free-will and the experience of meaning in life. **Prerequisite:** PBSI 107.

PBSI 425 Psychology of Emotion

Credits 3. 3 Lecture Hours. Examination of the theories and approaches in the psychological study of emotion; topics related to emotion, including predictors of happiness, causes and consequences of emotion, and the role of emotion in society; identification of facial expressions of emotion; examination of techniques that promote happiness. **Prerequisites:** PBSI 107.

PBSI 432 Diversity and Inclusion in Organizations

Credits 3. 3 Lecture Hours. Psychological and organizational theory and research on the experience of diversity and inclusion in organizations. **Prerequisites:** PBSI 315, PBSI 352, PBSI 353, or approval of instructor.

PBSI 440 Hormones and Behavior

Credits 3. 3 Lecture Hours. Principles of hormones and the endocrine system; relationships among hormones, the nervous system and a variety of behaviors in vertebrates including humans. **Prerequisites:** PBSI 235, PBSI 340, VIBS 277, or NRSC 277, or approval of instructor.

PBSI 445 Psychological and Social Determinants of Health Disparities

Credits 3. 3 Lecture Hours. Critical examination of macrosocial factors and position within racial and social statuses that most often affect health, causing disparities, through intermediary mechanisms and process, such as health behavior, stress, medical care and a broad range of social, psychological, cultural and religious resources.

PBSI 450 Clinical Psychology

Credits 3. 3 Lecture Hours. Analysis of the field of clinical psychology with a particular focus on the theoretical and scientific bases for the practice of clinical psychology. **Prerequisites:** Grade of C or better in PBSI 306; PBSI 301 and PBSI 302 recommended.

PBSI 470 Psychological Testing and Measurement

Credits 3. 3 Lecture Hours. Theories and techniques of measurement of psychological concepts; a range of measurement models and procedures; critical tasks of evaluating strategies for measuring psychological concepts and drawing inferences and interpretations from commonly used psychological assessments. **Prerequisites:** PBSI 301 recommended; junior or senior classification or approval of instructor.

PBSI 471 Research Writing in Neuroscience

Credit 1. 1 Lecture Hour. Development of written communication skills; comprehension and communication of neuroscience research concepts to both academics and lay people. **Prerequisite:** PBSI 235; junior or senior classification.

PBSI 475 Communicating Neuroscience Concepts

Credit 1. 1 Lecture Hour. Development of written communication skills; written assignments include summaries of research in the field of neuroscience. **Prerequisite:** PBSI 235; junior or senior classification.

PBSI 483 Teaching Scholars

Credits 0 to 3. 0 to 3 Other Hours. Acquisition of experience in educational programs and knowledge about the scientific basis for educational strategies and development of materials in conjunction with serving as a course teaching assistant. **Prerequisites:** Major or minor within the PBSI department; junior or senior classification; approval of instructor.

PBSI 484 Field Experiences

Credits 0 to 6. 0 to 6 Other Hours. Participation in an approved mental health, mental retardation, school, industrial or other approved setting; field experiences supervised by an appropriate professor within an area of student interest; course requirements vary with the setting, the supervising professor and the needs of the individual student. May be repeated for credit. **Prerequisites:** PBSI 301 and PBSI 302; 12 hours of psychology; GPR of 2.5 or better in all psychology courses; major in psychology; approval of instructor.

PBSI 485 Directed Studies

Credits 0 to 6. 0 to 6 Other Hours. Directed readings or research problems in selected areas designed to supplement existing course offerings. May be repeated for credit. **Prerequisite:** Approval of instructor.

PBSI 489 Special Topics in...

Credits 1 to 4. 1 to 4 Other Hours. Selected topics in an identified area of psychology. May be repeated for credit. **Prerequisites:** PBSI 107 and approval of instructor.

PBSI 491 Research

Credits 0 to 6. 0 to 6 Other Hours. Research conducted under the supervision of a chosen faculty member in the department of psychology. May be repeated for credit. **Prerequisites:** Junior or senior classification; approval of instructor.

PBSI 603 Motivation and Cognitive Processes

Credits 3. 3 Lecture Hours. Selected topics in areas of motivation and higher mental processes; symbolic processes in perceptual organization; learning and remembering, reasoning and creativity. **Prerequisite:** Graduate classification or approval of instructor.

PBSI 606/NRSC 606 Learning

Credits 3. 3 Lecture Hours. Procedural and theoretical issues in study of basic learning mechanisms in animals and humans, including Pavlovian and instrumental conditioning. Application of this work to other domains and relevant biological mechanisms also discussed. **Prerequisite:** Graduate classification or approval of instructor. **Cross Listing:** NRSC 606/PBSI 606.

PBSI 607 Methods and Statistics in Psychological Science I

Credits 3. 2 Lecture Hours. 3 Lab Hours. Experimental methods and statistics; developing a general frame of reference for approaching experimental research problems and associated statistical tests; t-tests, ANOVA, MANOVA. **Prerequisite:** Graduate classification or approval of instructor.

PBSI 608 Introduction to Clinical Ethics and Techniques

Credits 3. 3 Lecture Hours. Ethical and legal issues in clinical practice; development of listening and interpretation skills; supervised practicum in interviewing non-clinical subjects; structured role-play of clinical situations. **Prerequisite:** Graduate classification or approval of instructor.

PBSI 609/NRSC 609 Physiological Psychology

Credits 3. 2 Lecture Hours. 3 Lab Hours. Current research and methodological procedures on physiological bases of sensation-perception, memory and learning, arousal-sleep-attention, emotions and motivation. **Prerequisite:** Graduate classification or approval of instructor. **Cross Listing:** NRSC 609/PBSI 609.

PBSI 610 Organizational Psychology

Credits 3. 3 Lecture Hours. Current literature and research in employee motivation, satisfaction, leadership, communication, group conflict and other group processes. **Prerequisite:** Graduate classification or approval of instructor.

PBSI 611 Personnel Psychology

Credits 3. 3 Lecture Hours. Application of psychological principles and research methods to the areas of selection, placement, job analysis, performance appraisal and training. **Prerequisites:** PBSI 251 or PBSI 353 or graduate classification or approval of instructor.

PBSI 613 Practicum in Psychological Assessment

Credits 1 to 4. 1 to 4 Other Hours. Application of psychological assessment across the life-span; assessment of cognitive, intellectual, academic, and memory abilities and adaptive behavior; assessment of personality, behavioral style, and systems/environment; integration of assessment measures in comprehensive psychological evaluations; attendance required at Practicum Seminar designed to integrate research, coursework, and applied training and supervisory instruction from a faculty supervisor; at least 3 credits and no more than 18 credits applied to degree plan. **Prerequisites:** PBSI 623 and PBSI 624, or approval of instructor.

PBSI 614 Practicum in Psychology

Credits 1 to 6. 1 to 6 Other Hours. Practical on-the-job experience for graduate students. Activities will be guided by psychologists in the following areas: behavior modification, social, clinical, experimental and industrial. Supervision will be provided by members of University staff. May be taken more than once but not to exceed 18 hours of credit toward a graduate degree. **Prerequisite:** PBSI 608 or approval of instructor.

PBSI 615/NRSC 615 Perceptual Processes

Credits 3. 3 Lecture Hours. Complex sensory and perceptual phenomena with emphasis on the relationship between perception and motivation, cognition, creativity and instinctive/ethological; learning/experiential factors in higher level perceptual processes. **Prerequisite:** Graduate classification or approval of instructor. **Cross Listing:** NRSC 615/PBSI 615.

PBSI 616 Treatment of Problem Behavior in Children and Families

Credits 3. 3 Lecture Hours. Current methods of treating families with children displaying aggressive, hyperactive, underachieving and other problem behaviors in natural settings; behavior of children and adolescents at home, school and at play. **Prerequisite:** Approval of instructor.

PBSI 619 Advanced Methods in Social Psychology

Credits 3. 3 Lecture Hours. A survey of advanced methodological considerations in social and personality psychology; theory development; experimental design; non-experimental design; power; replicability; meta-analysis; open science; mediation and moderation. **Prerequisites:** Graduate classification or approval of instructor.

PBSI 620 Theories of Social Psychology

Credits 3. 3 Lecture Hours. Current theories of social psychology and a review of related studies to these theories; theories of attitude change, prosocial behavior, aggression, equity, coalition formation, social learning and S-R theory applied to social behavior. **Prerequisite:** Graduate classification or approval of instructor.

PBSI 621 Seminar in Social Psychology

Credits 3. 3 Other Hours. Survey of research in social psychology; attitudes and persuasion; self-regulation; motivation; self and identity; applied social problems; existential social psychology; social psychology of emotion; and social cognition; course content will vary by semester. May be repeated up to four times for credit. **Prerequisite:** Graduate classification or approval of instructor.

PBSI 622 Affective Science

Credits 3. 3 Lecture Hours. Overview of theories and approaches in the interdisciplinary field of affective science; historical and contemporary approaches focused on emotional and affective processes. **Prerequisite:** Graduate classification or approval of instructor.

PBSI 623 Psychological Assessment I

Credits 3. 3 Lecture Hours. Principles of psychological testing; uses and critical evaluation of tests of achievement, intelligence, aptitude and personality. **Prerequisites:** Enrollment in Clinical Psychology Program or approval of instructor.

PBSI 624 Psychological Assessment II

Credits 3. 3 Lecture Hours. Theory and application of psychological assessment of children, adolescents, and adults; assessment of cognitive, intellectual, academic, and memory abilities and adaptive behavior; integration of assessment measures in comprehensive psychological evaluations. **Prerequisite:** Enrollment in Clinical Psychology Program or approval of instructor.

PBSI 626 Psychopathology

Credits 3. 3 Lecture Hours. Various symptom categories in psychopathology including differing theoretical conceptualizations of these symptom categories, and theories and research concerning etiology and treatment. **Prerequisite:** Enrollment in Clinical Psychology Program or approval of instructor.

PBSI 627 Psychological Assessment of Children and Adolescents

Credits 3. 3 Lecture Hours. Theory and application of psychological assessment of toddlers, children, and adolescents; assessment of cognitive, intellectual, academic, and memory abilities and adaptive behavior; assessment of personality, behavioral style, family functioning, and child-focused systems; integration of assessment measures in comprehensive psychological evaluations. **Prerequisites:** PBSI 623 and PBSI 624, or approval of instructor.

PBSI 629 Pain Psychology

Credits 3. 3 Lecture Hours. Theory and research on the psychology of pain; examination of historical and personal conceptions of pain; readings and discussions of biopsychosocial mechanisms of pain; consideration of sociodemographic and global pain disparities. **Prerequisites:** Graduate classification or approval of instructor.

PBSI 630 Health Psychology and Behavioral Medicine

Credits 3. 3 Lecture Hours. Theory, research and practice of health psychology emphasizing the prevention and modification of health compromising behaviors; psychological management of stress, pain and chronic/terminal illness; effective interventions for specific health behaviors/disorders. **Prerequisite:** Graduate classification or approval of instructor.

PBSI 631 Academic Career Development in Psychological and Brain Sciences

Credit 1. 1 Lecture Hour. Strategies and career planning for a research and teaching oriented academic track; focus on developing a multi-year plan for placement in a position to be maximally competitive for an academic job and preparation in how to assemble a strong application package. **Prerequisite:** Graduate classification or approval of instructor.

PBSI 632 Equity and Diversity Considerations for Scholars: A Critical Orientation to Research

Credits 3. 3 Lecture Hours. Introduction to diverse science practices and publishing; knowledge production; contextualization of research; researcher positionality; epistemic exclusion; decolonial perspectives; citational politics **Prerequisites:** Graduate classification; approval of instructor.

PBSI 633 Gender and Minority Issues in Clinical Psychology

Credits 3. 3 Lecture Hours. Human behavior and mental health as a function of culture, gender and sexual orientation; discussion of absolutist, relativist and universalist perspectives in cross-cultural psychology; psychology of stereotype and prejudice; adjustment through acculturation and biculturalism; learning about our own and other cultures. **Prerequisite:** Graduate classification or approval of instructor.

PBSI 635 Behavioral and Cellular Research Seminar

Credits 2. 2 Other Hours. Expose graduate students to neuroscience research, theory, and proposal development; research presentations by guest speakers, faculty, and graduate students; Discussions, readings and presentations on issues related to research design, statistics, methodology, ethics, IACUC, grant writing, presentation skills, job talks, and other relevant topics. May be taken four times for credit.

Prerequisite: Graduate classification or approval of instructor.

PBSI 636 Seminar in Developmental Psychology

Credits 3. 3 Other Hours. Cognitive development; social and emotional development; developmental abnormalities in connection with social/emotional and cognitive development; language acquisition; family processes; and development during infancy; recent developments in these fields; topics will vary from semester to semester. May be repeated for credit up to three times as topics change. **Prerequisites:** Graduate classification or approval of instructor.

PBSI 637 Clinical Interventions I

Credits 3. 3 Lecture Hours. Theory, research and techniques related to evidence-based behavioral and cognitive-behavioral approaches to clinical interventions; ethical, professional, multicultural and history/systems issues in therapeutic psychological interventions. **Prerequisite:** Enrollment in Clinical Psychology Graduate Program or approval of instructor.

PBSI 638 Clinical Interventions II

Credits 3. 3 Lecture Hours. Theory, research, and techniques related to evidence-based interpersonal, psychodynamic, group therapy, and family therapy approaches to clinical interventions; ethical, professional, multicultural, and history/systems issues in therapeutic psychological interventions. **Prerequisite:** Enrollment in Clinical Psychology Graduate Program or approval of instructor.

PBSI 639 Pediatric Psychology

Credits 3. 3 Lecture Hours. Application of clinical/counseling/school psychology to children and adolescents with chronic illnesses or disabilities and their families; theoretical foundations and models for consultation, assessment and intervention strategies; unique ethical and professional issues associated with research and service delivery in child health psychology/pediatric behavioral medicine. **Prerequisite:** PBSI 685, EPSY 685, PBSI 691, or EPSY 691, or approval of instructor; graduate classification.

PBSI 642/NRSC 642 Neuroimaging Data Analysis

Credits 3. 3 Lecture Hours. Physics of magnetic resonance imaging; experimental design for fMRI; linear and nonlinear image registration; data denoising; data filtering and smoothing; volume and surface methods; General Linear Models and multivariate approaches to subject-level data; mixed effects modeling, random effects modeling, permutation methods for linear models; functional connectivity. **Prerequisite:** Graduate classification or approval of instructor; coursework in regression models recommended. **Cross Listing:** NRSC 642/PBSI 642.

PBSI 648 Decision Making

Credits 3. 3 Lecture Hours. Research and theory in decision making, including classic theories, heuristics and biases, framing, neural systems, neuroeconomics, reinforcement learning, emotion, and neuropsychology.

Prerequisites: Graduate classification.

PBSI 649/NRSC 649 Seminar in Behavioral Neuroscience

Credits 3. 3 Other Hours. Behavioral neuroscience; including behavioral pharmacology, neuropharmacology, methods and techniques, drug reinforcement, behavioral toxicology, pain perception and ingestive behavior. May be repeated up to three times for credit. **Prerequisite:** Graduate classification or approval of instructor. **Cross Listing:** NRSC 649/PBSI 649.

PBSI 650 Clinical Psychopharmacology

Credits 3. 3 Lecture Hours. Survey of topics in clinical psychopharmacology, including pharmacodynamics, major neurotransmitter systems, and therapeutic applications and limitations.

Prerequisite: Graduate classification or approval of instructor.

PBSI 651/AFST 651 Cultural Psychology

Credits 3. 3 Lecture Hours. Surveys key readings in the field of cultural psychology; discussion and examination of relationship between psychological processes (e.g., motivation, memory, self perception, prejudice) and sociocultural contexts. **Prerequisites:** Enrollment in a graduate program or approval of instructor. **Cross Listing:** AFST 651/PBSI 651.

PBSI 652 Statistics and Research Methods in Industrial/Organizational Psychology I

Credits 3. 3 Lecture Hours. The first of two courses in statistics and research methods; integrates research design, appropriate methodology, and advanced statistical techniques used by industrial/organizational psychologists (e.g., General Linear Model); current topics pertinent to the content domain draws heavily from the application of quantitative psychology literature to workplace problems; statistical software packages will be used to enhance conceptual understanding.

Prerequisites: Graduate classification or approval of instructor.

PBSI 653 Statistics and Research Methods in Industrial/Organizational Psychology II

Credits 3. 3 Lecture Hours. The second of two courses in statistics and research methods; integrates research design, appropriate methodology, and advanced statistical techniques used by industrial/organizational psychologists (e.g., Generalized Linear Model, nonlinear regression); current topics pertinent to the content domain draws heavily from the application of quantitative psychology literature to workplace problems; statistical software packages will be used to enhance conceptual understanding. **Prerequisites:** PBSI 652; graduate classification or approval of instructor.

PBSI 654 Psychometrics and Survey Design in Industrial/Organizational Psychology

Credits 3. 3 Lecture Hours. Study of psychological measurement for testing and assessment purposes in I/O psychology; classical and modern test theories are introduced as well as their implications for test construction and survey design; emphasis on skill acquisition through developing, administering and scoring predictor or criterion tests and presenting results. **Prerequisites:** PBSI 652; PBSI 653; graduate classification or approval of instructor.

PBSI 655/NRSC 655 Foundations in Cognitive Neuroscience

Credits 3. 3 Lecture Hours. Experimental design in cognitive neuroscience; basics of cognitive neuroscience methods; perception versus imagery; attention; motor control; short-term and long-term memory; volition and consciousness; executive function; decision making; affect and psychopathology; social cognition. **Prerequisite:** Graduate classification or approval of instructor. **Cross Listing:** NRSC 655/PBSI 655.

PBSI 656 Advanced Selection

Credits 3. 3 Lecture Hours. An in-depth analysis of psychological principles and employee selection methods with a focus on applied practice and current topics; emphasis on the application of evidence-based best practices to the selection process; importance of job and work analysis, testing and assessment, psychometrics, validation procedures, and measurement in light of ethical, legal, diversity and international issues. **Prerequisites:** Graduate classification or approval of instructor.

PBSI 657 Training and Performance Management

Credits 3. 3 Lecture Hours. A comprehensive review of theory, research, current topics and practice associated with training and performance management; training as an organizational subsystem is emphasized as the model for the design, implementation and evaluation of training programs; appraisal and management of work performance for various organizational purposes. **Prerequisites:** Graduate classification or approval of instructor.

PBSI 658 Work Attitudes and Motivation

Credits 3. 3 Lecture Hours. A critical analysis of major theories, current research and practical or current issues associated with employee attitudes and motivation in the workplace; topics include job satisfaction, organizational commitment, work engagement, stress, absenteeism, turnover, motivation, job design and quality of work, and work values; key methodological and measurement issues; application of social psychology literature to workplace problems. **Prerequisites:** Graduate classification or approval of instructor.

PBSI 659 Groups, Teams and Leadership

Credits 3. 3 Lecture Hours. An in-depth review of the factors leading to effective groups, teams and leadership in organizations; topics include strategies for building high performance teams and techniques for assessing, selecting and developing leaders; the course integrates theory, research and current topics with experiential learning; application of social psychology literature to workplace problems. **Prerequisites:** Graduate classification or approval of instructor.

PBSI 660 Self and Identity

Credits 3. 3 Lecture Hours. An overview of the historical and current issues related to the study of the self and identity.

PBSI 670 Professional Seminar in Social Psychology

Credits 2. 1 Lecture Hour. 2 Lab Hours. Survey of recent theoretical, methodological and empirical developments in social psychology; different topics each semester will include theory and research on attitudes and persuasion, social cognition, interpersonal relationships, group processes, social development, and personality and social behavior. May be taken for credit up to eight times. **Prerequisite:** Graduate classification or approval of instructor.

PBSI 671/NRSC 671 Methods and Statistics in Psychological Science II

Credits 3. 2 Lecture Hours. 3 Lab Hours. Intensive practical study of designs of special interest to psychological scientists; repeated measures designs. **Prerequisite:** Graduate classification or approval of instructor. **Cross Listing:** NRSC 671/PBSI 671.

PBSI 672 Qualitative Methods in Psychological Sciences

Credits 3. 3 Lecture Hours. Overview of psychology qualitative methods; assumptions of qualitative research; focus groups; qualitative analysis software; thematic analysis. **Prerequisites:** Graduate classification or approval of instructor.

PBSI 673 Psychometric Theory and Methods

Credits 3. 3 Lecture Hours. Overview of methods for the construction and evaluation of psychological measurements including unidimensional scales and multi-variate analytical techniques; approaches include classical test theory, factor analysis, unidimensional scaling, latent trait theory, profile and discriminant analysis. **Prerequisites:** PBSI 607 and PBSI 671/NRSC 671 or equivalents.

PBSI 674 Covariance Structure Models and Causal Analysis

Credits 3. 3 Lecture Hours. Advanced introduction to structural equation models and causal analysis; emphasis on underlying theory and assumptions as well as practical application for the behavioral sciences. **Prerequisites:** PBSI 671/NRSC 671 or STAT 608 or approval of the instructor.

PBSI 675 Clinical Psychology and the Legal System

Credits 3. 3 Lecture Hours. Survey of theoretical and applied topics relevant to clinical psychology in the legal system; includes assessment of adjudicative competence, criminal responsibility and risk assessment; correctional psychology and offender rehabilitation. **Prerequisite:** Approval of instructor.

PBSI 678/CPSY 678 Couples Therapy

Credits 3. 3 Lecture Hours. Theory and practice of marital therapy emphasizing systems and communication approaches; effective strategies and techniques; therapy with specific marital problems and obstacles to effective therapy. **Prerequisite:** PBSI 637, CPSY 631, or equivalent. **Cross Listing:** CPSY 678/PBSI 678.

PBSI 680 Seminar in Organizational Psychology

Credits 3. 3 Other Hours. Areas of organizational psychology: job stress, socialization processes, motivation, leadership, person perception in organizations, conflict management. May be repeated up to five times for credit; content will vary by semester. **Prerequisite:** PBSI 610 or approval of instructor.

PBSI 681 Industrial/Organizational Psychology

Credits 1 to 3. 1 to 3 Other Hours. Both research and applied colloquia provided by I/O psychologists and individuals in related disciplines. **Prerequisite:** Graduate classification or approval of instructor.

PBSI 682 Seminar in Personnel Selection and Placement

Credits 3. 3 Other Hours. Personnel selection and placement including job analysis and evaluation, psychological testing, test development, psychometric theory, theories of test fairness, validity generalization, utility theory, performance appraisal and selection/placement decision models. May be repeated up to five times for credit; content will vary by semester. **Prerequisite:** PBSI 611 or approval of instructor.

PBSI 683 Professional Seminar

Credits 1 to 3. 1 to 3 Other Hours. Guidance in searching for and securing internships and jobs upon graduation; review of internship requirements and expectations; professional development sessions and preparation of application materials; assistance in the transition from student to professional, e.g., professional identity, affiliation and networks. May be taken for credit up to three hours. **Prerequisites:** Graduate classification or approval of instructor.

PBSI 684 Professional Internship

Credits 0 to 12. 0 to 12 Other Hours. Full-time internship experience in a departmentally-approved internship training facility. May be taken up to 12 hours for credit. **Prerequisite:** Approval of instructor.

PBSI 685 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Directed individual study of selected problem in psychology or special topics to fit small group requirements. **Prerequisite:** Approval of instructor.

PBSI 689 Special Topics in...

Credits 1 to 4. 1 to 4 Other Hours. Selected topics in an identified area of psychology. May be repeated for credit. **Prerequisite:** Graduate classification or approval of instructor.

PBSI 690 Cognoscenti - Professional Issues in Cognitive Psychology

Credits 2. 2 Lecture Hours. Introduce students to current themes in research, theory and practice in cognitive psychology; presentations by guest speakers from within and outside the University. **Prerequisite:** Graduate classification or approval of instructor.

PBSI 691 Research

Credits 1 to 23. 1 to 23 Other Hours. Research for thesis.

PBSI 695 Manuscript Development and Publication of Academic Research in Psychological and Brain Sciences

Credits 3. 3 Lecture Hours. Development of research writing and instruction on the process of publishing in scientific, peer-reviewed scientific academic journals and books; exploration of the many different aspects of publishing research; review of the mechanics of the process ranging from choosing topics, writing the paper, the submission process, the review process, dealing with rejection, responding to requests for revision and resubmission and acceptance and publication; discussion of the benefits of publishing and how publishing factors into career considerations and aspirations. **Prerequisite:** Graduate classification.

PBSI 696 Principles and Methods for Teaching in Psychology

Credits 3. 3 Lecture Hours. Practical issues related to college teaching; reflection on and improvement of teaching skills; developing course objectives and teaching philosophies; improving teaching tools; understanding teaching-learning situations; advising students; ethics in teaching. **Prerequisite:** Graduate classification or approval of instructor.

PBSI 697 Seminar in the Teaching of Introductory Psychology

Credits 3. 3 Lecture Hours. Introductory methods relevant to teaching psychology; for graduate students assisting in the teaching of PSYC 107. **Prerequisite:** Graduate classification or approval of instructor.

PERF - Performance Studies (PERF)

PERF 101 Introduction to Performance Studies

Credits 3. 3 Lecture Hours. Survey of topics in the interdisciplinary field of performance studies, including forms of performance, performance in everyday life and performance in global and intercultural contexts; in-class performance exercises and discussions; major writing component.

PERF 156 Dress in World Cultures

Credits 3. 3 Lecture Hours. Relationship of dress to humans as biological, aesthetic and social beings; dress as cultural performance.

PERF 223 Aesthetics of Activism

Credits 3. 3 Lecture Hours. The use of performance in activist contexts to achieve social and political change; examination of activism, including struggles for social justice, economic equality and civil rights, as performance; examination of the arts, including performance, theatre, music, dress and design, as tools for activism.

PERF 284 Internship

Credits 0 to 4. 0 to 4 Lecture Hours. Supervised experience program conducted in the area of the student's interest in performance studies. May be taken three times for credit. **Prerequisites:** PERF 101 or FILM 101/VIST 101.

PERF 285 Directed Studies

Credits 0 to 3. 0 to 3 Other Hours. Directed Studies in specific problems in identified areas of performance studies. May be taken for credit up to 3 hours. **Prerequisites:** Approval of instructor and department head; PERF majors and minors only.

PERF 289 Special Topics in...

Credits 3. 3 Other Hours. Selected topics in performance studies. May be taken for credit seven times. **Prerequisite:** Approval of instructor.

PERF 291 Research

Credits 0 to 3. 0 to 3 Other Hours. Research conducted under the direction of faculty member in performance studies. May be taken two times for credit. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

PERF 292 Cooperative Education in Performance Studies

Credits 0 to 3. 0 to 3 Other Hours. Educational work assignment by a student in the field of his or her career interest and course of study; supervision of the student by the cooperating employer and the instructor; technical report on a related subject area approved by the instructor. May be taken two times for credit. **Prerequisite:** PERF 101.

PERF 301 Performance in World Cultures

Credits 3. 3 Lecture Hours. Application of the tools of performance studies to explore the enactment of the arts in world cultures and the ways the people of every society express themselves in performance; examination of different genres of performance through music, theatre, verbal art and dress. **Prerequisite:** Junior or senior classification or approval of instructor; PERF-301 also taught at Galveston campus.

PERF 303 Creating Performance

Credits 3. 3 Lecture Hours. Live and mediated performance; techniques and skills for performance; practical experience; discussion and critical analysis of performance; strategies for devising performance. **Prerequisites:** Major or minor in PERF; junior or senior classification or approval of instructor.

PERF 308 Performing Arts Administration

Credits 3. 3 Lecture Hours. Planning and managing artistic events and performances; basic concepts of management theories, creating budgets, production management, and grant applications; attendance of departmental events required. **Prerequisite:** Approval of instructor.

PERF 310 History of Performance in the Ancient World

Credits 3. 3 Lecture Hours. Historical approach to performance in the ancient world; primary and secondary evidence for performance practice; application of historical methods in the study of performance. **Prerequisites:** Junior or senior classification, or approval of instructor.

PERF 311 History of Performance in the Common Era

Credits 3. 3 Lecture Hours. Historical approach to performance practices and texts in the Common Era to 1800; transmission of performance styles, techniques and genres across cultures; applications of historical methods in the study of performance. **Prerequisites:** Junior or senior classification or approval of instructor.

PERF 312 History of Performance Modern Era

Credits 3. 3 Lecture Hours. Development of performance practices and texts in the 19th-21st centuries; performance styles, techniques and genres in and across cultures; application of historical methods in the study of performance. **Prerequisites:** Junior or senior classification or approval of instructor.

PERF 320 Research Methods in Performance and Visual Studies

Credits 3. 3 Lecture Hours. Study and practice of research methods used in performance and visual studies; discussion of practical, ethical, and epistemological aspects of research. **Prerequisites:** Junior or senior classification.

PERF 321 Collaborative Design Process

Credits 3. 3 Lecture Hours. 1 Lab Hour. Principles and practical application of techniques for designing theatre, music and other types of live performance; practical aspects of designing and producing live performances: plays, music events, devised performances, performance art; topics include lighting, sets and space, clothing and costume design, sound; may include specialized techniques such as masks, props, makeup. May be repeated for credit. **Prerequisites:** Junior or senior classification, major or minor in PERF, or approval of instructor.

PERF 322 Collaborative Performing

Credits 3. 3 Lecture Hours. 1 Lab Hour. Acting, movement, music and directing techniques for plays and other types of performances focusing on collaboration among all participants; principles of realistic and non-realistic acting, including non-Western styles of performance, music and physical movement and principles of stage direction. May be repeated for credit. **Prerequisites:** Junior or senior classification, major or minor in PERF, or approval of instructor.

PERF 325 Dance in World Cultures

Credits 3. 3 Lecture Hours. Examination of international relationships between dance, culture, identity, gender, youth and politics; relationships between dancing, gender and politics in specific cultures and in globalization; variety of dance practices around the globe. **Prerequisite:** Junior or senior classification.

PERF 326 Dance and Identity in the United States

Credits 3. 3 Lecture Hours. Analysis of dance events as complex sites for social action; examines dances performed by diverse groups of people; considers such issues as identity, community, diversity, gender and representation in the United States. **Prerequisite:** Junior or senior classification.

PERF 328 Japanese Traditional Performing Arts

Credits 3. 3 Lecture Hours. Study of various genres of Japanese performing arts from the 7th century to the present; understanding the genres in their historical and cultural contexts and recognizing shared aesthetic values. **Prerequisites:** Junior or senior classification or approval of instructor.

PERF 330 Public Scholarship in Performance and Visual Studies

Credits 3. 3 Lecture Hours. Examination of the mediums and means through which scholars of the performing and visual arts engage diverse audiences; exploration of the ethics of public scholarship; survey of contemporary and historical presentational methods including performance, exhibition, installation, data visualization, criticism, and more. **Prerequisites:** Grade of C or better in PERF 320; junior or senior classification.

PERF 333 Movement in Performance Studies

Credits 3. 3 Lecture Hours. Embodied practices in performance studies; examination of the role movement plays in aesthetics, communication, religion, society, individual experience and politics; investigation of varied movement practices.

PERF 338 Performing Communities

Credits 3. 3 Lecture Hours. Consideration of socio-cultural, aesthetic and ethical issues in arts-based community engagement; development of a community-based performance project. **Prerequisites:** Junior or senior classification.

PERF 343 Role-Playing as Performance

Credits 3. 3 Lecture Hours. Performance-based course; exploration of real-world applications and ethics of role-playing situations and scenarios. **Prerequisites:** Junior or senior classification.

PERF 399/FILM 399 Star Studies

Credits 3. 3 Lecture Hours. Examination of stardom as a cultural, economic, creative, and performative force; may focus on national or global star industries; topics include examination of film, theater, television, sports, or social media stardom depending on the term. **Prerequisites:** Grade of C or better in FILM 251/ENGL 251 or FILM 299. **Cross Listing:** FILM 399/PERF 399.

PERF 407 Performing Literature

Credits 3. 3 Lecture Hours. Analysis and performance of poetry, prose and drama; emphasis on translating analytical decisions into performance; solo performance, readers theatre, chamber theatre, and technology in/as performance. **Prerequisite:** Junior or senior classification.

PERF 430 Performance and Visual Studies Studio

Credits 3. 3 Lecture Hours. Discussion and application of best practices and strategies for research project design and execution; design and development of a research project; advanced topics within Performance and Visual Studies. **Prerequisites:** Grade of C or better in PERF 320 and PERF 330; junior or senior classification.

PERF 446 Design as Performance

Credits 3. 3 Lecture Hours. Design as performance using research methods and the production of new work; disciplines of design, performance, installation and performance as research. **Prerequisites:** Junior or senior classification.

PERF 450 Seminar in 20th-21st Century Performance

Credits 3. 3 Lecture Hours. Social, political and aesthetic issues and problems in 20th-21st century performance idioms; study of genres, styles, artistic movements; may include performance. May be taken two times for credit when content varies. **Prerequisites:** Junior or senior classification or approval of instructor.

PERF 451 Seminar in Historical Performance

Credits 3. 3 Lecture Hours. Historical contexts for performance genres, styles or movements prior to the 20th century; texts, performance practices and contexts of performance genres, styles or movements prior to the 20th century; emphasis on historical methods; production participation may be required. May be taken two times for credit if content differs. **Prerequisites:** Junior or senior classification or approval of instructor.

PERF 452 Seminar in Global Performance

Credits 3. 3 Lecture Hours. Intersection of cultures in performances; representations and expressions of culture; focus on culture as the ground for performance; may culminate in a performance. May be taken two times for credit if content differs. **Prerequisites:** Junior or senior classification or approval of instructor.

PERF 453 Seminar in Performance Ethnography

Credits 3. 3 Lecture Hours. Theories and methods of ethnographic research; ethnographic research in the study of performance; ethnography of performance; ethnographic field work may be required. **Prerequisites:** Junior or senior classification or approval of instructor.

PERF 454 Seminar Performing the City

Credits 3. 3 Lecture Hours. Vernacular and aesthetic performance traditions in a city or cities; politics, culture, economics and geography of city or cities; may include a faculty-led field trip. **Prerequisites:** Junior or senior classification or approval of instructor.

PERF 455 Seminar in Gender, Sexuality, and Performance

Credits 3. 3 Lecture Hours. Performance of gender and sexuality; emphasis on feminist theory and queer theory, their intersection with performance studies and applications to performance practice; in-depth examination of works by artists who are women, queer, and/or gender non-conforming. **Prerequisite:** Junior or senior classification or approval of instructor.

PERF 456 Seminar in Identity, Intersectionality, and Performance

Credits 3. 3 Lecture Hours. Performance as site for expressing and constructing intersectional social identities; race, ethnicity, gender, class and other identities in performance; social identities in the performance of everyday life; countering oppression using performance. **Prerequisite:** Junior or senior classification or approval of the Instructor.

PERF 457 Seminar in Performance and Technology

Credits 3. 3 Lecture Hours. The intersection of performance and technology. The use of technology in artistic practice; the impact of technology on live performance; performance studies approaches to the study of science and technology. **Prerequisite:** Junior or senior classification or approval of instructor.

PERF 460 Seminar in Performance Theory

Credits 3. 3 Lecture Hours. . In-depth examination of one or more contemporary theories of performance. Emphasis on problems, research, and innovations relevant to performing and analyzing performance.

Prerequisite: Junior or senior classification, or approval of instructor.

PERF 461 Seminar in Folklore

Credits 3. 3 Lecture Hours. Expressive forms in vernacular culture; folklore genres and traditions of expression; local and regional customs; material culture and narrative; processes of meaning-making; aesthetics in vernacular performance. **Prerequisites:** Junior or senior classification or approval of instructor.

PERF 481 Capstone Seminar: Performance as Research

Credits 3. 1 Lecture Hour. 5 Lab Hours. Capstone senior project on an individually-chosen research topic, presentation of a performance or interdisciplinary project; major writing and oral communication components. **Prerequisites:** Performance studies major; completion of all performance studies coursework or taken concurrently with this course; approval of instructor, advisor and department head.

PERF 483 Performance Practicum

Credits 1 to 3. 1 to 3 Other Hours. Faculty-supervised performance experience in a public setting as part of a department production or an approved external production. May be taken four times for credit. **Prerequisite:** Junior or senior classification and approval of instructor.

PERF 484 Internship

Credits 0 to 6. 0 to 6 Other Hours. Supervised experience program conducted in the area of the student's interest in performance studies. May be taken three times for credit. **Prerequisites:** PERF 101 or FILM 101/VIST 101; junior or senior classification.

PERF 485 Directed Studies

Credits 0 to 3. 0 to 3 Other Hours. Directed Studies in specific problems in identified areas of performance studies. May be taken for credit up to 3 hours. **Prerequisites:** Approval of instructor and department head; PERF majors and minors only.

PERF 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in performance studies. May be repeated for credit. **Prerequisite:** Approval of instructor.

PERF 491 Research

Credits 0 to 3. 0 to 3 Other Hours. Research conducted under the direction of faculty member in performance studies. May be taken two times for credit. **Prerequisites:** Junior or senior classification and approval of instructor.

PERF 492 Cooperative Education in Performance Studies

Credits 0 to 3. 0 to 3 Other Hours. Educational work assignment by a student in the field of his or her career interest and course of study; supervision of the student by the cooperating employer and the instructor; technical report on a related subject area approved by the instructor. May be taken two times for credit. **Prerequisites:** PERF 101; junior or senior classification.

PETE - Petroleum Engineering (PETE)

PETE 201 Introduction to Petroleum Engineering

Credit 1. 1 Lecture Hour. Overview and history of the petroleum industry and petroleum engineering; nature of oil and gas reservoirs, exploration and drilling, formation evaluation, well completions and production, surface facilities, reservoir mechanics, improved oil recovery; impact of ethical, societal, environmental considerations; career development resources, including professional society. **Prerequisite:** Approval of department head.

PETE 219 Foundations of Petroleum Data Analytics

Credits 2. 1 Lecture Hour. 3 Lab Hours. . Introduction to petroleum data analytics and computations; use of pre-built computational functions and packages for purposes of interpolation, gradient approximation, calculation of area under the curve, vector and matrix manipulation, and solving ordinary differential equations relevant to petroleum engineering; use of pre-built statistical functions and packages to solve petroleum engineering problems; exploratory data analysis and data preprocessing on large petroleum engineering and geophysical datasets; big-data visualization to generate insights and discover relationships; regression, classification, and clustering relevant to petroleum engineering; neural networks for regression and classification on petroleum engineering data; basic evaluation of data-driven models and basic computations using equations specific to petroleum engineering. **Prerequisite:** Grade of C or better in ENGR 102; concurrent enrollment in PETE 301.

PETE 225 Introduction to Drilling Systems

Credits 3. 2 Lecture Hours. 3 Lab Hours. Introduction to petroleum drilling systems, including fundamental petroleum engineering concepts, quantities and unit systems, drilling rig components, drilling fluids, pressure loss calculations, casing, well cementing, and directional drilling. **Prerequisites:** Grade of C or better in MATH 152, PHYS 206, and ENGR 216/PHYS 216 or PHYS 216/ENGR 216; grade of C or better in CHEM 107 and CHEM 117, or concurrent enrollment.

PETE 285 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Special problems in various areas of petroleum engineering assigned to individual students or to groups. **Prerequisites:** Approval of department head.

PETE 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of petroleum engineering. May be repeated for credit. **Prerequisite:** Approval of instructor.

PETE 291 Research

Credits 1 to 4. 1 to 4 Other Hours. Research conducted under the direction of a faculty member in petroleum engineering. May be taken two times for credit. Registration in multiple sections of this course is possible within a given semester. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

PETE 300 Summer Practice

Credits 0. Required. No Credit. Industry practice to familiarize the petroleum engineering student with practices and equipment of the petroleum industry. Approval of advisor required.

PETE 301 Petroleum Engineering Numerical Methods

Credits 3. 2 Lecture Hours. 3 Lab Hours. Use of numerical methods in a variety of petroleum engineering problems; numerical differentiation and integration; root finding; numerical solution of differential equations; curve fitting and interpolation; computer applications; introduction to the principles of numerical simulation methods. **Prerequisite:** Grade of C or better in MATH 308; concurrent enrollment in PETE 219; junior or senior classification, petroleum engineering majors only; or approval of instructor.

PETE 310 Reservoir Fluids

Credits 3. 2 Lecture Hours. 3 Lab Hours. Thermodynamic behavior of naturally occurring hydrocarbon mixtures; evaluation and correlation of physical properties of petroleum reservoir fluids including laboratory and empirical methods. **Prerequisite:** Grade of C or better in CHEM 107, CHEM 117, MATH 308, PETE 311 and PETE 315.

PETE 311 Reservoir Petrophysics

Credits 3. 2 Lecture Hours. 3 Lab Hours. Systematic theoretical and laboratory study of physical properties of petroleum reservoir rocks; lithology, porosity, elastic properties, strength, acoustic properties, electrical properties, relative and effective permeability, fluid saturations, capillary characteristics and rock-fluid interactions such as adsorption and absorption. **Prerequisite:** Grade of C or better in MATH 251, PHYS 207, and ENGR 217/PHYS 217 or PHYS 217/ENGR 217; grade of C or better in CHEM 107, CHEM 117, and GEOL 104, or concurrent enrollment.

PETE 314 Transport Processes in Petroleum Production

Credits 3. 3 Lecture Hours. Basics and applications of fluid mechanics including statics, mass, energy, momentum balances, laminar and turbulent flow, Reynolds number, Moody diagram, non-Newtonian fluid flow, multi-phase flow, flow in porous media, non-Darcy flow; heat transfer, heat conduction, convection and heat exchangers; emphasis on analogies and similarities within mass, energy and momentum transport. **Prerequisite:** Grade of C or better in PETE 315, junior or senior classification, petroleum engineering majors only; or approval of instructor.

PETE 315 Petroleum Engineering Thermodynamics

Credits 3. 3 Lecture Hours. Laws of thermodynamics; volumetric properties of pure fluids; heat effects; applications to flow processes; phase behavior and equations of state. **Prerequisites:** Grade of C or better in MATH 251 and MEEN 221.

PETE 321 Formation Evaluation

Credits 4. 3 Lecture Hours. 3 Lab Hours. Well-log interpretation for formation evaluation of hydrocarbon-bearing reservoirs; basic rock physics principles; theory of tool operation; analysis of open hole logs and core measurements to estimate hydrocarbon reserves and petrophysical properties of the formation such as porosity, net pay thickness, water/hydrocarbon saturation, permeability and saturation-dependent capillary pressure; formation evaluation of clay-free and shaly-sand formations as well as basic introduction to formation evaluation of organic-shale formations. **Prerequisites:** Grade of C or better in PETE 301, PETE 310, PETE 311, and GEOL 404, junior or senior classification, petroleum engineering majors only; or approval of instructor.

PETE 323 Fundamentals of Reservoir Engineering

Credits 3. 3 Lecture Hours. Determination of reserves; material balance methods; aquifer models; fractional flow and frontal advance; displacement, pattern and vertical sweep efficiencies in waterfloods; enhanced oil recovery processes; design of optimal recovery processes; introduction and performance analysis of unconventional reservoirs. **Prerequisites:** Grade of C or better in PETE 301, PETE 310, PETE 311, and GEOL 404, junior or senior classification, petroleum engineering majors only; or approval of instructor.

PETE 324 Well Testing

Credits 3. 3 Lecture Hours. Analysis of well performance under varied reservoir conditions including evaluation of unsteady, pseudo-steady and steady state flow; well testing methods used to determine well and reservoir parameters; applications to conventional and unconventional wells producing gas and/or liquids; fundamentals of preparing and operating well test equipment to monitor, measure and gather samples for evaluating well performance. **Prerequisites:** Grade of C or better in PETE 301, PETE 310, PETE 311, and GEOL 404, junior or senior classification, petroleum engineering majors only; or approval of instructor.

PETE 325 Petroleum Production Systems

Credits 3. 2 Lecture Hours. 3 Lab Hours. Petroleum operation and oil field equipment including onshore and offshore production systems; wellbore inflow and outflow and backpressure analysis; downhole completion and sand control equipment; artificial lift equipment and design; stimulation, workover/completion nomenclature; flow assurance; produced fluids, fluid separation and metering, safety systems, pressure boosting and monitoring. **Prerequisites:** Grade of C or better in PETE 301, PETE 310, and PETE 314, junior or senior classification, petroleum engineering majors only; or approval of instructor.

PETE 335 Technical Presentations I

Credit 1. 1 Lecture Hour. Preparation of a written technical paper proposal on a subject related to petroleum technology and an oral presentation of the proposal in a formal technical conference format. **Prerequisites:** Grade of C or better in COMM 203, COMM 205, COMM 243, or ENGL 210; junior or senior classification.

PETE 336 Petroleum Technical Presentation I

Credit 1. 3 Lab Hours. Preparation of a written technical paper on a subject related to petroleum technology. **Prerequisites:** Grade of C or better in ENGL 210; junior or senior classification, petroleum engineering majors only or approval of department head; Qatar campus.

PETE 337 Junior Student Paper Contest

Credits 0. No Credit. Presentation of a technical proposal on a subject related to petroleum technology judged by petroleum professionals at the junior level departmental student paper contest. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisite:** Grade of C or better in PETE 336 or concurrent enrollment, or grade of C or better in PETE 335.

PETE 353 Petroleum Project Evaluation

Credits 3. 3 Lecture Hours. Economic analysis and investment decision methods in petroleum and mineral extraction industries; depletion, petroleum taxation regulations, and projects of the type found in the industry; mineral project evaluation case studies. **Prerequisites:** Grade of C or better in PETE 301 and PETE 310, or concurrent enrollment.

PETE 355 Drilling Engineering

Credits 3. 3 Lecture Hours. Design and evaluation of well drilling systems; identification and solution of drilling problems; wellbore hydraulics, well control, casing design; well cementing directional drilling, offshore drilling. **Prerequisites:** Grade of C or better in CVEN 305, PETE 225, and PETE 314; grade of C or better in PETE 321 and PETE 325, or concurrent enrollment.

PETE 401 Reservoir Simulation

Credits 2. 1 Lecture Hour. 3 Lab Hours. Solution of production and reservoir engineering problems using state-of-the-art commercial reservoir simulation software, using data commonly available in industry; emphasis on reservoir description, reservoir model design and calibration, production forecasting and optimization, economic analysis and decision making under uncertainty. **Prerequisites:** Grade of C or better in PETE 310, PETE 321, PETE 323, PETE 324, and PETE 353.

PETE 402 Integrated Asset Development

Credits 3. 1 Lecture Hour. 6 Lab Hours. Capstone design encompassing previously acquired skills; project teams formed to solve practical petroleum engineering problems using current tools; technical content of the projects may include any combination of drilling and completion, formation evaluation, inflow/outflow design and analysis, and application of reservoir engineering principles. **Prerequisites:** Grade of C or better in PETE 355, PETE 401, PETE 404, and PETE 410.

PETE 404 Integrated Reservoir Modeling

Credits 3. 3 Lecture Hours. Geophysical, geological, petrophysical and engineering data with geostatistical methods to create reservoir descriptions for dynamic reservoir modeling (simulation); geostatistical concepts such as variogram modeling, kriging and sequential Gaussian simulation; combines several techniques to quantify uncertainty in a realistic dynamic reservoir simulation. **Prerequisite:** Grade of C or better in PETE 401, or concurrent enrollment.

PETE 406 High Performance Drilling Design and Operational Practices

Credits 3. 3 Lecture Hours. Preparation in achieving differentiating drilling performance in the most complex wells; includes training in the underlying physics of each type of performance limiter and real time and engineering practices to address the limitation; performance management workflows and change models required to effectively change the way organizations conduct work essential in achieving higher performance. **Prerequisite:** Grade of C or better in PETE 355.

PETE 408 Probabilistic Reserves Evaluation

Credits 3. 3 Lecture Hours. Oil and gas reserves definitions and reporting regulations; probabilistic reserves estimation methods; unconventional resources characterization; reserves valuation techniques. **Prerequisite:** Grade of C or better in PETE 353 or approval of instructor.

PETE 409 Enhanced Oil Recovery

Credits 3. 3 Lecture Hours. Fundamentals and theory of enhanced oil recovery; polymer flooding, surfactant flooding, miscible gas flooding and steam flooding; application of fractional flow theory; strategies and displacement performance calculations. **Prerequisites:** Grade of C or better in PETE 310 or approval of instructor.

PETE 410 Production Engineering

Credits 3. 3 Lecture Hours. Fundamental production engineering design, evaluation and optimization for oil and gas producing well; well deliverability; formation damage and skin analysis; well completion selection; technologies that improve oil and gas well performance including artificial lift and well stimulation. **Prerequisites:** Grade of C or better in PETE 321, PETE 323, PETE 324 and PETE 325.

PETE 412 Surface Production Facilities

Credits 3. 3 Lecture Hours. Overview of separation and treatment of production fluid; fundamentals of gas-liquid separation; design and performance analysis of two- and three-phase separators; oil desalting, sweetening and stabilization; water treatment; overview of gas separation, dehydration and sweetening. **Prerequisite:** Senior classification or approval of instructor; Qatar campus.

PETE 413 Natural Gas Engineering

Credits 3. 3 Lecture Hours. Flow of natural gas in reservoirs and wellbores and gathering systems; deliverability testing; production surveillance and monitoring; production forecasting; flow measurement; and compressor sizing. **Prerequisites:** Grade of C or better in PETE 323, PETE 324, and PETE 325.

PETE 416 Solving Common Production Engineering Problems

Credits 3. 3 Lecture Hours. Application of petroleum engineering tools, methods and techniques to solve real problems that petroleum engineers encounter in producing individual wells; focus primarily on problems associated with single-phase gas wells and uses Microsoft Excel to solve many of these problems. **Prerequisite:** Grade of C or better in PETE 410.

PETE 418 Deterministic Reserves Evaluation

Credits 3. 3 Lecture Hours. Oil and gas reserves definitions and reporting regulations; deterministic estimation methods; unconventional resources characterization; reserves valuation techniques. **Prerequisite:** Grade of C or better in PETE 353 or approval of instructor.

PETE 419 Petroleum Data Analytics and Machine Learning

Credits 3. 3 Lecture Hours. Working knowledge about data analytics suitable for petroleum engineers and geoscientists; emphasis on implementing data-driven methods on various types of subsurface data; assembly of data-driven workflows and application of them on various types of subsurface data generated during petroleum engineering and geoscience operations and work on case studies that integrate various domains of petroleum engineering and geoscience; emphasis on the use of supervised learning, classification and regression, unsupervised learning, transformations, clustering, and feature extraction, and neural networks using open-source Python computational platforms; facilitation of understanding the basics of machine learning, data science and data analysis and their applications to petroleum engineering and geoscience. **Prerequisite:** Grade of C or better in PETE 219 and PETE 301 or approval of instructor.

PETE 426 Unconventional Reservoir Methods and Analysis

Credits 3. 3 Lecture Hours. Unconventional reservoirs and the latest practices of reservoir characterization, horizontal drilling and completion optimization methodologies, reservoir engineering and production. **Prerequisite:** Grade of C or better in PETE 323.

PETE 435 Technical Presentations II

Credit 1. 1 Lecture Hour. Preparation of a written technical paper on a subject related to petroleum technology and an oral presentation of the paper in a formal technical conference format. **Prerequisites:** PETE 337.

PETE 436 Petroleum Technical Presentation II

Credit 1. 3 Lab Hours. Preparation of a written technical paper on a subject related to petroleum technology and an oral presentation of the paper in a formal technical conference format. **Prerequisites:** Grade of C or better in PETE 336; senior classification, petroleum engineering majors only or approval of department head; Qatar campus.

PETE 437 Senior Student Paper Contest

Credits 0. No credit. Presentation of a technical petroleum engineering topic judged by petroleum professionals at the senior level departmental student paper contest. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisite:** Grade of C or better in PETE 435 or PETE 436.

PETE 453 Petroleum Entrepreneurship

Credits 3. 3 Lecture Hours. Exploration of the various aspects of entrepreneurship with a focus on petroleum asset valuation and prospect analysis in the energy sector; exposure to all aspects of the journey including business idea generation, raising early stage capital, staffing the enterprise, developing the business plan and selling the concept to investors. **Prerequisites:** Grade of C or better in PETE 353.

PETE 485 Directed Studies

Credits 1 to 5. 1 to 5 Other Hours. Special problems in various phases of petroleum engineering assigned to individual students or to groups. **Prerequisites:** Junior or senior classification and approval of department head.

PETE 489 Special Topics in...

Credits 1 to 4. 1 to 4 Other Hours. Selected topics in an identified field of petroleum engineering. May be repeated for credit. **Prerequisite:** Approval of instructor.

PETE 491 Research

Credits 1 to 4. 1 to 4 Other Hours. Research conducted under the direction of a faculty member in petroleum engineering. May be taken two times for credit. Registration in multiple sections of this course is possible within a given semester. **Prerequisites:** Junior or senior classification and approval of instructor.

PHIL - Philosophy (PHIL)

PHIL 107 Introduction to the Health Humanities

Credits 3. 3 Lecture Hours. Introduction to the methods and approaches of the health humanities; exposure to key scholarship in this field as well as major methods and approaches; application of such skills to the analysis of cultural case studies such as illness narratives or contemporary debates in scientific bioethics. **Cross Listing:** COMM 107, ENGL 107, and HHUM 107.

PHIL 111 Contemporary Moral Issues

Credits 3. 3 Lecture Hours. (PHIL 2306) Contemporary Moral Issues. Representative ethical positions and their application to contemporary social problems; also taught at Galveston campus.

PHIL 202 The Human Experience

Credits 3. 3 Lecture Hours. Introduction to classic transformative texts in the history of the arts, sciences, and humanities; interdisciplinary methods and approaches within the humanities; key ethical and moral debates across the human experience. **Cross Listing:** ARSC 202 and HIST 202.

PHIL 205 Technology and Human Values

Credits 3. 3 Lecture Hours. Interaction of personal and societal values with technology and man's self-image, the future and value change.

PHIL 208 Philosophy of Education

Credits 3. 3 Lecture Hours. Basic social ideas and concepts of human nature in Western civilization; their implications for theories of education.

PHIL 240 Introduction to Logic

Credits 3. 3 Lecture Hours. (PHIL 2303) Introduction to Logic. Introduction to formal methods of deductive and inductive logic including, but not limited to, truth-tables, formal deduction and probability theory; also taught at Galveston campus.

PHIL 251 Introduction to Philosophy

Credits 3. 3 Lecture Hours. (PHIL 1301) Introduction to Philosophy. Perennial problems of philosophy such as the existence of God, the mind/body relationship, the limits of knowledge, the foundations of moral judgment, man and the state; also taught at Galveston campus.

PHIL 252/AFST 252 Introduction to Hip-Hop Philosophy

Credits 3. 3 Lecture Hours. Introduction to philosophy by way of the major themes and subjects of Hip-Hop; critical advocacy of various philosophical ideals. **Cross Listing:** AFST 252/PHIL 252.

PHIL 282 Ethics in a Digital Age

Credits 3. 3 Lecture Hours. Exploration of the intersection between ethical and social theories, principles, and values and the interconnected digital world; examination of the interplay between these domains for topics such as cybercrime, privacy, surveillance, security, intellectual property rights, artificial intelligence, cyber warfare, internet governance, computing professionalism, and cyber policy and law.

PHIL 283 Latin American Philosophy

Credits 3. 3 Lecture Hours. Major philosophers in the history of Latin American philosophy, such as Unamuno, Ortega y Gasset, Vasconcelos, Caso and Gutiérrez.

PHIL 285 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Directed studies in specific problem areas of philosophy. **Prerequisite:** Approval of department head.

PHIL 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of philosophy. May be repeated for credit. **Prerequisite:** Approval of instructor.

PHIL 291 Research

Credits 0 to 3. 0 to 3 Other Hours. Research conducted under the direction of faculty member in the department of philosophy and humanities. May be taken two times for credit. **Prerequisites:** Freshman or sophomore classification and approval of department head.

PHIL 305 Philosophy of the Natural Sciences

Credits 3. 3 Lecture Hours. Critical analysis of scientific methods and achievements; the nature and types of explanation, discovery and confirmation, models and theories. **Prerequisite:** Junior or senior classification or approval of instructor.

PHIL 307 Philosophy of the Social Sciences

Credits 3. 3 Lecture Hours. Nature and objectivity of the social sciences, their paradigms and patterns of explanation. **Prerequisite:** Junior or senior classification or approval of instructor.

PHIL 314 Environmental Ethics

Credits 3. 3 Lecture Hours. Moral basis of duties to preserve or protect plants, animals and environmental systems; foundations of environmental law and policy; the idea of nature in philosophy; critique of social and economic analyses of environmental values. **Prerequisite:** Sophomore classification or approval of instructor; also taught at Galveston campus.

PHIL 315 Military Ethics

Credits 3. 3 Lecture Hours. Major ethical issues in modern military practice: ethics of leadership, just war theory, killing of the innocent and the moral status of the rules of war.

PHIL 317 Climate Ethics

Credits 3. 3 Lecture Hours. Ethical and value questions related to climate change and climate policy; moral responsibility for and theoretical approaches to climate change; climate justice; ethical analysis of mitigation, adaptation and geoengineering policies. **Prerequisites:** Junior or senior classification.

PHIL 320 Philosophy of Mind

Credits 3. 3 Lecture Hours. Relation of mind to body, nature of thought and knowing, the free will problem, death and immortality. **Prerequisite:** Junior or senior classification or approval of instructor.

PHIL 330 Philosophy of Art

Credits 3. 3 Lecture Hours. Theories of artistic creation and aesthetic response as exemplified in art forms such as painting, music, poetry, architecture, dance, theater, sculpture and motion pictures.

PHIL 331/RELS 331 Philosophy of Religion

Credits 3. 3 Lecture Hours. Philosophical problems of Western religion such as the existence of God, the problem of evil, types of theism, rational, empirical and mystical approaches to God. **Cross Listing:** RELS 331/PHIL 331.

PHIL 332 Social and Political Philosophy

Credits 3. 3 Lecture Hours. Metaphysical commitments and political theory, the nature and proper ends of the state, freedom, equality, authority, and justice, considering such writers as Plato, Aristotle, Machiavelli, Locke, Rousseau, Marx, Dewey. **Prerequisite:** Junior or senior classification or approval of instructor.

PHIL 334 Philosophy of Law

Credits 3. 3 Lecture Hours. Traditional legal issues such as definitions of law, relationship between law and morality, and punishment considered from a legal perspective. **Prerequisite:** Junior or senior classification or approval of instructor.

PHIL 336 Advanced Topics in Philosophy of Law

Credits 3. 3 Lecture Hours. Focused study of a specific topic in philosophy of law; critical engagement with conceptual and normative questions; sample topics include First Amendment debates, professional ethics in law, legal restriction of immigration, environmental law and privacy. May be taken three times for credit. **Prerequisites:** Junior or senior classification, or approval of instructor.

PHIL 341 Symbolic Logic

Credits 3. 3 Lecture Hours. Elementary symbolic logic beginning with propositional calculus and first order predicate logic, and their applications. **Prerequisite:** PHIL 240.

PHIL 342 Symbolic Logic II

Credits 3. 3 Lecture Hours. Advanced topics in logic such as the theory of identity, higher order logics, logic of sets, elements of modal logic. **Prerequisite:** PHIL 240 or PHIL 341, or approval of instructor.

PHIL 351 Theory of Knowledge

Credits 3. 3 Lecture Hours. Major topics in epistemology such as the problem of induction, perception theory, memory and the problem of other minds. **Prerequisites:** Junior or senior classification or approval of instructor.

PHIL 352/AFST 352 Africana Philosophy

Credits 3. 3 Lecture Hours. Presentation of the seminal ideas of several influential Africana thinkers; recovery of the neglected traditions in which these thinkers locate themselves. **Prerequisite:** Junior or senior classification or approval of instructor. **Cross Listing:** AFST 352/PHIL 352.

PHIL 353/AFST 353 Radical Black Philosophies of Race and Racism

Credits 3. 3 Lecture Hours. Critical evaluation of white supremacy, colonialism and the modern construction of race; examination of the historical background for contemporary theories of race. **Prerequisite:** Junior or senior classification or approval of instructor. **Cross Listing:** AFST 353/PHIL 353.

PHIL 361 Metaphysics

Credits 3. 3 Lecture Hours. Topics concerning the fundamental nature of reality such as what exists, the mental and the physical, universals and individuals, space and time, God. **Prerequisites:** Junior or senior classification or approval of instructor.

PHIL 371 Philosophy of Literature

Credits 3. 3 Lecture Hours. Philosophical analysis of the major recurrent themes in world literature including fate, the meaning of tragedy, death, odyssey, good and evil, time and eternity, hope and salvation; works selected from a variety of cultures and historical periods.

PHIL 376/FILM 376 Philosophy, Film and Evil

Credits 3. 3 Lecture Hours. Application of philosophical methods and analyses to the medium of film; survey of various depictions and treatments of evil within the genre of science fiction; investigation of depictions and treatments of evil arising from consideration of human encounters with alien others. **Prerequisite:** Junior or senior classification or approval of instructor. **Cross Listing:** FILM 376/PHIL 376.

PHIL 381 Ethical Theory

Credits 3. 3 Lecture Hours. Values and conduct such as moral relativism, self-interest, utilitarianism, rules, nature of valuation, ethical language and argumentation. **Prerequisite:** Junior or senior classification or approval of instructor; also taught at Galveston campus.

PHIL 383 Ethics of Artificial Intelligence

Credits 3. 3 Lecture Hours. Ethical, social, and epistemic aspects of the development of artificial intelligence (AI); foundational normative principles and their application; consequences of AI; responsible use and regulation. **Prerequisites:** Junior or senior classification, or approval of instructor.

PHIL 409 Studies in Gender and Philosophy

Credits 3. 3 Lecture Hours. Analysis, from a gender-studies perspective, of a single figure or concept in the history of philosophy. May be repeated 1 time for credit with a different focus. **Prerequisites:** Junior or senior classification or approval of instructor.

PHIL 410 Classical Philosophy

Credits 3. 3 Lecture Hours. Major philosophers from 600 B.C. to the end of the third century A.D. including the Pre-Socratics, Socrates, Plato, Aristotle, Hellenistic and Roman philosophy and the Neo-Platonists. **Prerequisite:** Junior or senior classification or approval of instructor.

PHIL 411 Medieval Philosophy

Credits 3. 3 Lecture Hours. Major philosophers from the early Christian centuries through the 14th century, emphasizing such writers as Augustine, Aquinas, Duns Scotus and William of Ockham. **Prerequisite:** Junior or senior classification or approval of instructor.

PHIL 412 Seventeenth-Century Philosophy

Credits 3. 3 Lecture Hours. Significant seventeenth-century texts in metaphysics, epistemology, moral psychology, and political philosophy; authors such as Descartes, Hobbes, Spinoza, Leibniz, and Locke. **Prerequisite:** Junior or senior classification or approval of instructor.

PHIL 413 Eighteenth-Century Philosophy

Credits 3. 3 Lecture Hours. Significant eighteenth-century texts from philosophers such as Berkeley, Rousseau, Hume, and Kant. **Prerequisite:** Junior or senior classification or approval of instructor.

PHIL 414 Nineteenth Century Philosophy

Credits 3. 3 Lecture Hours. Contributions of such philosophers as Hegel, Marx, Kierkegaard, Nietzsche, Husserl, Mill and Bradley. **Prerequisite:** Junior or senior classification or approval of instructor.

PHIL 415 American Philosophy

Credits 3. 3 Lecture Hours. The thought of philosophers such as Peirce, James, Royce, Santayana, Mead, Dewey and Whitehead. **Prerequisite:** Junior or senior classification or approval of instructor.

PHIL 416 Recent British and American Philosophy

Credits 3. 3 Lecture Hours. Major philosophers in contemporary Anglo-American thought such as Moore, Russell, Wittgenstein, Ayer, Quine, Austin and Ryle. **Prerequisites:** PHIL 240.

PHIL 417 Phenomenology

Credits 3. 3 Lecture Hours. Phenomenology from its nineteenth-century origins to the present; authors such as Brentano, Husserl, Scheler, Heidegger, Merleau-Ponty, Levinas, Henry, Marion. **Prerequisite:** Junior or senior classification or approval of instructor.

PHIL 418 Existentialism

Credits 3. 3 Lecture Hours. Existentialism from its nineteenth-century origins to the present; philosophers such as Kierkegaard, Nietzsche, Buber, Rosenzweig, Sartre, de Beauvoir, and Camus. **Prerequisite:** Junior or senior classification or approval of instructor.

PHIL 419 Current Continental Philosophy

Credits 3. 3 Lecture Hours. Major thinkers concerned with "postmodern" topics in hermeneutics, poststructuralism, critical theory, deconstructionism, contemporary Marxist strategies, semiotics and feminist theory. **Prerequisite:** Junior classification or approval of instructor.

PHIL 424 Philosophy of Language

Credits 3. 3 Lecture Hours. The nature of language; the various uses of language and their philosophical import; the nature of meaning, truth, reference and issues surrounding formal representations of natural languages. **Prerequisites:** PHIL 240 and junior or senior classification; or approval of instructor.

PHIL 425 Philosophical Inquiry in Schools

Credits 3. 3 Lecture Hours. In-depth engagement with the theory and practice of pre-college (K-12) philosophy. **Prerequisites:** Junior or senior classification or approval of instructor.

PHIL 451 Probability, Decision Theory and Game Theory - How Should I Choose

Credits 3. 3 Lecture Hours. Formal epistemology, including the relation between full and partial belief, Bayesian and other interpretations of probability, and confirmation theory; decision theory and game theory, including topics such as risk vs uncertainty; utility and expected utility; causal and evidential decision theory; zero sum and nonzero sum games such as prisoner's dilemma. **Prerequisite:** 3 hours of core MATH and 3 hours of PHIL.

PHIL 452 Social Choice, Polarization and Democracy - How Should We Choose

Credits 3. 3 Lecture Hours. Social choice theory; strategic voting, gerrymandering; Arrow's impossibility theorem; Gibbard–Satterthwaite theorem; interpersonal utility comparison; the Rawls-Harsanyi debate; political polarization; echo chambers. **Prerequisite:** 3 hours of core MATH and 3 hours of PHIL.

PHIL 464/RELS 464 Modern Jewish Thought and Philosophy

Credits 3. 3 Lecture Hours. An overview of modern Jewish thought and philosophy spanning Jewish European thinkers from the 18th century to the 20th century. **Prerequisite:** Junior or senior classification or approval of instructor. **Cross Listing:** RELS 464/PHIL 464.

PHIL 465/RELS 465 Ethics After the Holocaust

Credits 3. 3 Lecture Hours. Analysis of the Holocaust as a challenge to previous ethical theories; ethical theories developed in response to the Holocaust. **Prerequisites:** Junior or senior classification, or approval of instructor. **Cross Listing:** RELS 465/PHIL 465.

PHIL 470 Animal Welfare, Ethics and Law

Credits 3. 3 Lecture Hours. Key conceptions of animal welfare; approaches to animal ethics; analysis of important ideas in animal law; consideration of animal contexts such as agricultural, experimental, wild, companion and zoo animals. **Prerequisites:** Junior or senior classification, or approval of instructor.

PHIL 480 Medical Ethics

Credits 3. 3 Lecture Hours. Critical analysis of major ethical issues in medicine including truth-telling, confidentiality, paternalism, genetics, abortion, infanticide, euthanasia and social justice in health care.

PHIL 482 Ethics and Engineering

Credits 3. 2 Lecture Hours. 2 Lab Hours. Development of techniques of moral analysis and their application to ethical problems encountered by engineers, such as professional employee rights and whistle blowing; environmental issues; ethical aspects of safety, risk and liability and conflicts of interest; emphasis on developing the capacity for independent ethical analysis of real and hypothetical cases. **Prerequisite:** Junior classification.

PHIL 484 Professional Internship

Credits 0 to 6. 0 to 6 Other Hours. Practical experience in an institutional or organizational setting appropriate to analysis and understanding of issues in some area of applied philosophy. May be taken five times for credit. **Prerequisite:** Approval of instructor and department head.

PHIL 485 Directed Studies

Credits 0 to 6. 0 to 6 Other Hours. Directed studies in specific problem areas of philosophy. **Prerequisite:** Approval of department head.

PHIL 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified area of philosophy; also taught at Galveston campus. May be repeated for credit.

PHIL 491 Research

Credits 0 to 3. 0 to 3 Other Hours. Research conducted under the direction of faculty member in the department of philosophy and humanities. May be taken two times for credit. **Prerequisites:** Junior or senior classification and approval of dean of college.

PHIL 497 Independent Honors Studies

Credits 1 to 3. 1 to 3 Other Hours. Directed independent studies in specific philosophical problems. **Prerequisites:** Junior or senior classification either as Honors students or with overall GPR of 3.25; letter of approval from head of student's major department.

PHLT - Public Health (PHLT)

PHLT 265 First Generation Scholars I

Credit 1. 1 Lecture Hour. First year experience; coverage of a range of topics for success inside and outside of the college classroom such as, self-efficacy, self-awareness, sense of purpose, active engagement in and out the classroom and social integration. **Prerequisite:** Approval of instructor; freshman classification; PHLT majors.

PHLT 266 First Generation Scholars II

Credit 1. 1 Lecture Hour. First year experience; coverage of a range of topics for success inside and outside of the college classroom such as, self-efficacy, self-awareness, sense of purpose, active engagement in and out the classroom and social integration. **Prerequisite:** Approval of instructor; freshman classification; PHLT majors only.

PHLT 270 Broad Street Learning Community I

Credits 3. 3 Lecture Hours. Introduction to the program, development of critical thinking skills and international perspectives; introductory for the Public Health Studies Broad Street Honors Learning Community. **Prerequisites:** Admission to Broad Street Society Honors Learning Community; public health major.

PHLT 289 Special Topics In...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified area of public health. May be taken three times for credit.

Prerequisite: PHLT major or approval of instructor.

PHLT 301 Public Health Concepts

Credit 1. 1 Lecture Hour. Familiarization with public health including aspects such as different disciplines within the profession; local, national and international agencies that have interest in public health and public health code of ethics.

PHLT 302 Foundations of Public Health

Credits 3. 3 Lecture Hours. History, philosophy, development and careers of public health; core values, ethics, concepts, functions and essential services of public health; population health and health improvement.

Prerequisites: Public health major or minor; junior or senior classification; or approval of instructor.

PHLT 303 Social Context of Population Health

Credits 3. 3 Lecture Hours. Exploration of social determinants of population health and the socio-cultural roots of health improvement; socio-economic, behavioral and other factors that impact human health and contribute to health improvement and health disparities.

Prerequisites: Public health major or minor; junior or senior classification.

PHLT 304 Biological Basis of Public Health Diseases & Disorders

Credits 3. 3 Lecture Hours. Biological Basis of Public Health Diseases & Disorders. Overview of the underlying science of human health and disease, considering biological mechanisms in the individual and in populations; topics include a broad set of categories of adverse health events: infectious and chronic diseases, exposure to pathogens and toxins, nutritional deficiencies, child and maternal health, biological bases of mental and behavioral health and addiction; examination of the interactions between biologic and sociocultural factors and the biology of epidemics; foundational understanding of opportunities to promote and protect health across the life course; application of disease knowledge in community and allied health professions. **Prerequisites:** Public health major; junior or senior classification.

PHLT 305 Epidemiology in Public Health

Credits 3. 3 Lecture Hours. Principles of epidemiology, a systematic approach to collecting and evaluating information on distributions of health outcomes in populations; history of epidemiology, descriptive epidemiology, epidemiologic methods, association and causation, evidence-based public health and applications. **Prerequisites:** Public Health major or minor; junior or senior classification.

PHLT 306 Border Health

Credits 3. 3 Lecture Hours. United States-Mexico border public health system; includes issues important to public health at the border; addresses health challenges. **Prerequisite:** Public health major; junior or senior classification; or approval of instructor.

PHLT 307 Public Health in the Global Context

Credits 3. 3 Lecture Hours. Frameworks for understanding public health on a global scale; description of current and emerging global health priorities, such as emerging infectious diseases and chronic diseases; health systems reforms; cultural competence, human rights and ethics in global health; science and technological innovation for global health; global institutions and partnerships. **Prerequisite:** Public health major; junior or senior classification; or approval of instructor.

PHLT 308 Comparative Global Health Systems

Credits 3. 3 Lecture Hours. Public health issues from population health and comparative perspectives at the global level; exploration of different public health systems in developing and developed countries.

Prerequisites: Public health major; junior or senior classification; or approval of instructor.

PHLT 309 Population Health Promotion

Credits 3. 3 Lecture Hours. Exploration of the application of social determinants of health to population health promotion; identification of socio-economic, behavioral, cultural, societal and political factors that influence population health promotion; utilization of a socio-ecological approach in health promotion to address major health-related needs and concerns of populations; use public health planning models, theories and methods for effective health promotion. **Prerequisite:** Public health major; junior or senior classification; or approval of instructor.

PHLT 310 Public Health Writing

Credit 1. 1 Lecture Hour. Strategies to become more familiar with types of writing required as public health students or public health professionals; strengthens and increases general writing skills; establishes a foundation for continued development in writing. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisites:** Public health major; junior or senior classification; or approval of instructor.

PHLT 311 Narrative Approach to Public Health

Credit 1. 1 Lecture Hour. Familiarization with the writing style required for public health; instruction in writing styles and narrative techniques to increase and strengthen writing abilities in public health disciplines such as environmental and occupational health, health promotion and community health sciences, health policy and management, epidemiology and biostatistics. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisites:** Public health major; junior or senior classification; or approval of instructor.

PHLT 313 Health Care and Public Health System

Credits 3. 3 Lecture Hours. Two distinct systems – health care system: an individual and medical services model and the public health system: population level disease prevention and health education. **Prerequisites:** Public health major; junior or senior classification; or approval of instructor.

PHLT 314 Public Health Data Management and Assessment I

Credits 2. 2 Lecture Hours. Familiarization with using the CDC software Epi-Info for managing, analyzing and assessing population health data; focus on using Epi-Info to produce descriptive data reports including tables and graphs. **Prerequisite:** Public health major; junior or senior classification; or approval of instructor.

PHLT 315 Public Health Data Management and Assessment II

Credits 2. 2 Lecture Hours. Continuation of PHLT 314; familiarization with using the CDC software Epi-Info for managing, analyzing and assessing population health data; focus on using Epi-Info to generate inferential statistics such as confidence intervals and p-values. **Prerequisite:** Public health major; grade of C or better in PHLT 314.

PHLT 316 Public Health Data Management and Assessment

Credits 3. 3 Lecture Hours. Familiarization with descriptive statistics and with using the CDC software Epi-Info for managing, analyzing and assessing population health data; focus on using Epi-Info to produce descriptive data reports including tables and graphs; to analyze and assess data for decision making. **Prerequisites:** Public health major or minor; junior or senior classification.

PHLT 322 Concepts in Health Education

Credits 3. 3 Lecture Hours. Preparation as peer health educators and campus community leaders; experiential learning; includes various health topics, program development, presentation and public speaking, communication, and group facilitation. **Prerequisites:** Grade of C or better in PHLT 302 or concurrent enrollment.

PHLT 330 The Environment and Public Health

Credits 3. 3 Lecture Hours. Public health core knowledge address factors that pose risks and hazards in homes and workplaces; methods for defining environmental contamination; identifying contaminants, pathogens and toxins; assessing risks and causality; ameliorating hazards. **Prerequisites:** Public health major or minor; junior or senior classification.

PHLT 331 Occupational Safety and Health I

Credits 3. 3 Lecture Hours. Regulations and topics of relevance to occupational health professionals; includes legislation and regulations, workers' compensation, accident investigation, industrial hygiene, ergonomics and fire prevention with an emphasis on the health professionals' role. **Prerequisites:** Public health major; junior or senior classification; or approval of instructor.

PHLT 332 Occupational Safety and Health II

Credits 3. 3 Lecture Hours. Occupational safety and health topics including behavior-based safety, workplace violence, preparedness, hazardous materials, construction, transportation, required written programs and professional resources. **Prerequisites:** Grade of C or better in PHLT 331; public health major or minor.

PHLT 333 Accident Investigation

Credits 3. 3 Lecture Hours. Principles of accident investigation and how accidents happen in the workplace; integrates procedural, systematic, corrective and formative applications for the occupational health professional. **Prerequisite:** Public health major; junior or senior classification; or approval of instructor.

PHLT 334 Fire Safety and Workplace Hazards

Credits 3. 3 Lecture Hours. Principles of fire safety and other workplace hazards such as electrical hazards, chemical hazards, respiratory hazards, falls, confined spaces, bloodborne pathogens, hearing loss, ergonomics and machine hazards. **Prerequisite:** Public health major; junior or senior classification; or approval of instructor.

PHLT 335 Hazardous Materials

Credits 3. 3 Lecture Hours. Principles of managing materials in the workplace; role of the health and safety professional in hazardous material management and hazard communication. **Prerequisite:** Public health major; junior or senior classification; or approval of instructor.

PHLT 336 Health Disparities and Diversity in Society

Credits 3. 3 Lecture Hours. Exploration of in-depth racial, ethnic, and cultural dimensions that underlie health and health disparities; emphasis on culture, social economic status and governmental policies as they influence the adaptation of health practices. **Prerequisites:** Junior or senior classification.

PHLT 342/HLTH 342 Human Sexuality

Credits 3. 3 Lecture Hours. Many aspects of human sexuality; physiology and function of human reproductive system, factors involved in learning sex roles, biological and emotional motivations associated with the sexual aspects of life and their relationship to marriage and family planning. **Prerequisites:** Junior or senior classification. **Cross Listing:** HLTH 342/PHLT 342.

PHLT 353/HLTH 353 Drugs and Society

Credits 3. 3 Lecture Hours. Use and abuse of drugs in today's society; physiological, sociological and psychological factors involved. **Prerequisite:** Grade of C or better in BIOL 320, HLTH 210, HLTH 231, and HLTH 240. **Cross Listing:** HLTH 353/PHLT 353.

PHLT 354/HLTH 354 Medical Terminology for the Health Professions

Credits 3. 3 Lecture Hours. Designed for students interested in pursuing a career in a health, medical, scientific or other helping profession; develop medical word power skills combined with related health and disease knowledge. **Prerequisite:** Junior or senior classification. **Cross Listing:** HLTH 354/PHLT 354.

PHLT 360 Women's Health

Credits 3. 3 Lecture Hours. A broad range of health issues that are either unique to women or of special importance to women; information for the health consumer; preparation as an advocate of healthy lifestyles; awareness of the role health plays in the life of all women. **Prerequisites:** Junior or senior classification. **Cross Listing:** HLTH 334 and WGST 334.

PHLT 363/HLTH 333 Spirituality and Health

Credits 3. 3 Lecture Hours. Exploration of the relationship between spirituality, religion, health, health education and spiritual health; identification of techniques to measure spiritual health/wellness and enlighten healthcare professionals to the role spiritual health plays in healing; identification of spirituality topics important to health care professionals. **Prerequisites:** Junior or senior classification; School of Public Health majors. **Cross Listing:** HLTH 333/PHLT 363.

PHLT 370 Broad Street Learning Community II

Credits 3. 3 Lecture Hours. International perspectives on public health and healthcare, comparative historical, political and cultural effects on public health; second course in the Broad Street Learning Community sequence. **Prerequisites:** Grade of B or better in PHLT 270.

PHLT 403/HLTH 403 Consumer Health

Credits 3. 3 Lecture Hours. Selection, evaluation and understanding of health information, medical services, advertising of products and sociocultural factors in consumer health protection. **Prerequisite:** Grade of C or better in HLTH 210. **Cross Listing:** HLTH 403/PHLT 403.

PHLT 405/HLTH 405 Rural Health

Credits 3. 3 Lecture Hours. Issues facing rural health care; emphasis on understanding the geographical characteristics of rural communities and their affect on health care delivery. **Prerequisites:** Junior or senior classification; School of Public Health major. **Cross Listing:** HLTH 405/PHLT 405.

PHLT 410 Public Health Communication

Credits 3. 3 Lecture Hours. Exploration of different communication approaches for addressing public health challenges; basic concepts of public health-specific communication, including risk communication, the use of mass media and evaluation of public health communication programs. **Prerequisites:** PHLT 310; public health major.

PHLT 411 Project Management in Public Health

Credits 3. 3 Lecture Hours. Exploration of successful project management and administration in public health settings; includes project development, budgeting and implementation. **Prerequisites:** Public health major; junior or senior classification; or approval of instructor.

PHLT 412 Health Advocacy and Policy

Credits 3. 3 Lecture Hours. Concepts of legal, ethical, economic and regulatory dimensions of public health policy; the roles, influences and responsibilities of the different agencies and branches of government; advocacy for the public's health at all levels of society. **Prerequisites:** Grade of C or better in PHLT 313; public health major; junior or senior classification.

PHLT 413 Public Health Informatics

Credits 3. 3 Lecture Hours. Broad range of knowledge and skills encompassed by PHI; bridging public health data/information needs, information technology and stakeholders; creating user requirements to guide system design; evidence-based public health; electronic health records. **Prerequisites:** Grade of C or better in PHLT 302.

PHLT 414 Applications of Epidemiology in Public Health

Credits 3. 3 Lecture Hours. Application of the concept of distribution, determinants and measurement of health and disease outcomes in populations in real life situations through lectures, case studies and presentations. **Prerequisites:** Grade of C or better in PHLT 305; public health major.

PHLT 415 Emergency Management in Public Health

Credits 3. 3 Lecture Hours. Principles and practices of emergency management at the local, state, national and international levels; explores stages of emergency management such as preparedness, response and recovery; includes population health and the basic processes, approaches and interventions; emergency management systems in the United States; actors in emergency management. **Prerequisites:** Public health major; junior or senior classification; or approval of instructor.

PHLT 416 Public Health Leadership and Ethics

Credits 3. 3 Lecture Hours. Overview of major leadership and ethical theories, current leadership and ethical issues and their impact on public health practice. **Prerequisite:** Public health major; junior or senior classification; or approval of instructor.

PHLT 420/HLTH 415 Health Education Methodology

Credits 3. 3 Lecture Hours. Theory and practice in the development and use of creative and traditional health education strategies in secondary schools and community settings; emphasis is given to cognitive, affective and behavioral teaching strategies. **Prerequisite:** Grade of C or better in HLTH 231, BIOL 320, and COMM 203; grade of C or better in HLTH 222, HLTH 240, HLTH 332, or HLTH 331; grade of C or better in ENGL 103 or ENGL 104. **Cross Listing:** HLTH 415/PHLT 420.

PHLT 425/HLTH 425 Health Program Evaluation

Credits 3. 3 Lecture Hours. Theory and practice in evaluation of health programs in school and community; analysis of test results; evaluation of standardized health tests. **Prerequisite:** Grade of C or better in HLTH 222, HLTH 231, HLTH 240, HLTH 331, BIOL 320, and COMM 203; grade of C or better in ENGL 103 or ENGL 104. **Cross Listing:** HLTH 425/PHLT 425.

PHLT 426/MKTG 443 The Business of Healthcare

Credits 3. 3 Lecture Hours. Preparation for contributing to the healthcare system by gaining an understanding of selected business of healthcare topics such as the role of healthcare in the economy, the cost of healthcare, the patient experience, technology and ethics. **Prerequisites:** Business and Public Health majors; junior or senior classification; approval of instructor. **Cross Listing:** MKTG 443/PHLT 426.

PHLT 432 Human Factors and Ergonomic Health and Safety

Credits 3. 3 Lecture Hours. Principles of ergonomics including principles of anatomy, physiology, instrument design, and work environments; emphasis on ergonomic design, implementing ergonomic programs. **Prerequisites:** Public health major or minor; junior or senior classification.

PHLT 433 Industrial Inspections and Audit Techniques

Credits 3. 3 Lecture Hours. Principles of conducting industrial audits for fire, safety and security; emphasis on the role of the health and safety professional, assessing safety programs and meeting regulatory requirements. **Prerequisites:** Public health major; junior or senior classification; or approval of instructor.

PHLT 434 Project Cost Benefit and Economics

Credits 3. 3 Lecture Hours. Estimation and management of project costs; emphasis on improving accuracy of cost projection, making better modifications to cost on work in-progress. **Prerequisites:** Public health major; junior or senior classification; or approval of instructor.

PHLT 436 Infectious Disease in the Developing World: Risks, Challenges, and Solutions

Credits 3. 3 Lecture Hours. Study of the challenges of infectious disease control in the developing world; topics include common infectious diseases, how they spread, social and economic consequences and the factors that influence prevalence. **Prerequisites:** Public Health Studies major; junior or senior classification, or approval of instructor.

PHLT 440/HLTH 440 Contemporary Issues for Community Health Interns

Credits 3. 3 Lecture Hours. Preparatory course for advanced students in the community health internship program. **Prerequisites:** Grade of C or better in HLTH 222, HLTH 231, HLTH 240, HLTH 331, BIOL 320, and COMM 203; grade of C or better in ENGL 103 or ENGL 104; admission into internship program. **Cross Listing:** HLTH 440/PHLT 440.

PHLT 441 Strategies for Population Health Improvement

Credits 3. 3 Lecture Hours. The three core functions of public health and strategies for improving population health; case studies exploring multiple types of interventions; engagement in class discussion, break-out groups and group assignments. **Prerequisites:** Grade of C or better in PHLT 411; public health major; junior or senior classification.

PHLT 445 Applications of Public Health

Credits 3. 3 Lecture Hours. Combines knowledge and skills related to public health experience and coursework to address public health issues; process of developing, implementing and evaluating public health interventions; role assignment and responsibilities in group assignments and presentations. **Prerequisites:** Grade of C or better in PHLT 441; public health major; junior or senior classification.

PHLT 470 Global Public Health Systems and Practice Experiences

Credits 1 to 3. 1 to 3 Lecture Hours. Study abroad experiences led by School of Public Health faculty in select countries; lectures prior to departing and lectures and classes in country; engage in public health practice and research activities in country; visit public health agencies and programs in country. May be taken for credit up to six hours. **Prerequisite:** Junior or senior classification; approval of instructor.

PHLT 481 Seminar

Credit 1. 1 Other Hour. Discussions of the transition from the college environment to professional school and/or career environments, including professional development. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisites:** Grade of C or better in PHLT 302; grade of C or better in ENGL 103 or ENGL 104; junior or senior classification.

PHLT 484 Internship

Credits 0 to 12. 0 to 12 Other Hours. Internship at a selected community, public, or private health agency; on-the-job training in the areas of public health studies industry; development of evaluations, objectives and goals determined based on the requirements of the degree program. **Prerequisites:** Junior or senior classification; grade of C or better in public health coursework; instructor approval; Public Health major.

PHLT 485 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Directed study of selected problems in the area of public health studies. May be taken four times for credit. **Prerequisite:** Approval of instructor.

PHLT 489 Special Topics In...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified area of public health. May be repeated for credit. **Prerequisites:** PHLT major; junior or senior classification or approval of instructor.

PHLT 491 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in public health studies. May be taken two times for credit. **Prerequisite:** PHLT 485; junior or senior classification and approval of instructor; 3.0 TAMU GPA.

PHYS - Physics (PHYS)

PHYS 101 Freshman Physics Orientation

Credit 1. 1 Lecture Hour. Critical thinking skills and problem solving in physics: time management and teaming skills. **Prerequisite:** Physics majors; non-majors requires approval of instructor.

PHYS 102 Physics Orientation

Credit 1. 1 Lecture Hour. Critical thinking skills and problem solving in physics: time management and teaming skills. For physics majors. Registration by non-majors requires approval of instructor.

PHYS 104 Contemporary Issues in Science - Cosmos, Earth and Humanity

Credits 3. 3 Lecture Hours. Science for citizens; interdisciplinary survey of contemporary issues in the science of our universe or cosmos, Earth and humanity, including the big bang, evolution, genetics, vaccines and drugs; future outlook on humanity, including artificial intelligence, cryptography and cybersecurity; critically analyze science presented in the news, on television and on social media; ethical implications of research. **Cross Listing:** ARSC 104 and BIOL 104.

PHYS 109/ASTR 109 Big Bang and Black Holes

Credits 3. 3 Lecture Hours. Designed to give an intuitive understanding of the Big Bang and Black Holes, without mathematics, and de-mystify them for the non-scientist. **Cross Listing:** ASTR 109/PHYS 109.

PHYS 119/ASTR 119 Big Bang and Black Holes: Laboratory Methods

Credit 1. 2 Lab Hours. Hands-on understanding of the concepts surrounding the Big Bang and Black Holes; emphasis on the evidence-based decision making process, methods and presentation; for non-scientists. Companion course for ASTR 109/PHYS 109/PHYS 109/ASTR 109. **Prerequisite:** ASTR/PHYS 109/ASTR 109 or registration therein. **Cross Listing:** ASTR 119/PHYS 119.

PHYS 123 Physics for Future Presidents

Credits 3. 3 Lecture Hours. Physics needed to be an effective policy maker or world leader but appropriate for any citizen, since all citizens need to understand the world in which they live and work; fundamental principles of physics made comprehensible and usable by those not in science- or math-related fields. **Prerequisite:** Basic math skills; also taught at Galveston campus.

PHYS 125 Soft Matter Physics for Non-physicists

Credits 3. 2 Lecture Hours. 2 Lab Hours. Modern physics in action with hands-on physics experience in simple experiments for non-physics majors; introduction to thermodynamics and soft matter physics; heat, temperature, thermodynamic efficiency, phase transitions, mechanical properties of soft matter, heat transfer mechanisms; physical measurements.

PHYS 148 Introduction to Quantum Mechanics

Credits 3. 3 Lecture Hours. The basic level of concepts of quantum mechanics such as wave-particle duality, complementarity, quantum interference and entanglement, and their applications to fields such as quantum communication and quantum computing. **Prerequisites:** High school physics and calculus.

PHYS 150 Introduction for Programming for Physics

Credits 3. 3 Lecture Hours. Physics-oriented introductory programming; basics of programming and applications of programming for physics; programming in the context of physics, such as variables, expressions, flow control, functions and data visualization, applied to physics topics such as energy minimization, Newtonian dynamics and chaos.

PHYS 201 College Physics

Credits 4. 3 Lecture Hours. 3 Lab Hours. (PHYS 1301 and 1101, 1401) College Physics. Fundamentals of classical mechanics, heat, and sound. Primarily for architecture, education, premedical, pre dental, and preveterinary medical students; also taught at Galveston campus.

PHYS 202 College Physics

Credits 4. 3 Lecture Hours. 3 Lab Hours. (PHYS 1302 and 1102, 1402) College Physics. Continuation of PHYS 201. Fundamentals of classical electricity and light; introduction to contemporary physics. **Prerequisite:** PHYS 201; also taught at Galveston campus.

PHYS 205 Concepts of Physics

Credits 4. 3 Lecture Hours. 3 Lab Hours. General survey physics course for K-8 preservice teachers integrating physics content and laboratory activities relevant to physics-related subject matter included in the current Texas and national standards for elementary school science; includes aspects of mechanics, waves, electricity, magnetism and modern physics. **Prerequisite:** Major in interdisciplinary studies or interdisciplinary technology or approval of instructor.

PHYS 206 Newtonian Mechanics for Engineering and Science

Credits 3. 3 Lecture Hours. (PHYS 2325, PHYS 2425*) Newtonian Mechanics for Engineering and Science. Calculus-based introductory Newtonian mechanics; laws of physical motion for solution of science and engineering problems. **Prerequisites:** Grade of C or better in MATH 151 or MATH 171, or equivalent; also taught at Galveston and Qatar campuses.

PHYS 207 Electricity and Magnetism for Engineering and Science

Credits 3. 3 Lecture Hours. (PHYS 2326, PHYS 2426*) Electricity and Magnetism for Engineering and Science. Calculus-based electricity and magnetism; electromagnetic phenomena; basic laws of electricity and magnetism; science and engineering problems involving charges, electromagnetic fields, and electrical circuits. **Prerequisites:** Grade of C or better in PHYS 206; grade of C or better in MATH 152 or MATH 172 or equivalent; also taught at Galveston and Qatar campuses.

PHYS 216/ENGR 216 Experimental Physics and Engineering Lab II - Mechanics

Credits 2. 1 Lecture Hour. 3 Lab Hours. Description and application of laws of physical motion to the solution of science and engineering problems; using sensing, control and actuation for experimental verification of physics concepts while solving engineering problems. **Prerequisites:** Grade of C or better in MATH 151 or MATH 171 or equivalent; grade of C or better in ENGR 102; grade of C or better and concurrent enrollment in PHYS 206; also taught at Galveston campus. **Cross Listing:** ENGR 216/PHYS 216.

PHYS 217/ENGR 217 Experimental Physics and Engineering Lab III - Electricity and Magnetism

Credits 2. 1 Lecture Hour. 3 Lab Hours. Electromagnetism and electromechanical systems; use of sensing, control and actuation to demonstrate key physical relationships through the transducer relationships linking pressure, temperature and other physical stimuli to changes in electric and magnetic fields. **Prerequisites:** Grade of C or better in MATH 152 or MATH 172, or equivalent; grade of C or better in PHYS 206 or equivalent; grade of C or better in PHYS 216/ENGR 216 or ENGR 216/PHYS 216; grade of C or better and concurrent enrollment in PHYS 207; also taught at Galveston campus. **Cross Listing:** ENGR 217/PHYS 217.

PHYS 221 Optics and Thermal Physics

Credits 3. 3 Lecture Hours. Wave motion and sound, geometrical and physical optics, kinetic theory of gases, laws of thermodynamics.

Prerequisites: PHYS 207 or PHYS 208, or concurrent enrollment; MATH 221, MATH 251, or MATH 253, or concurrent enrollment; MATH 308 or concurrent enrollment; also taught at Qatar campus.

PHYS 222 Modern Physics for Engineers

Credits 3. 3 Lecture Hours. Atomic, quantum, relativity and solid state physics. **Prerequisites:** PHYS 207 or PHYS 208; MATH 308 or concurrent enrollment; also taught at Qatar campus.

PHYS 225 Electronic Circuits and Applications

Credits 3. 1 Lecture Hour. 4 Lab Hours. Linear circuit theory and applications of solid-state diodes, bipolar and field-effect transistors, operational amplifiers and digital systems. **Prerequisites:** PHYS 207 and PHYS 227, or PHYS 208; MATH 308.

PHYS 226 Physics of Motion Laboratory for the Sciences

Credit 1. 2 Lab Hours. (PHYS 2125, PHYS 2425*) Physics of Motion Laboratory for the Sciences. The first semester laboratory to accompany a two-semester course sequence in introductory physics; topics include material covered in a typical calculus-based introductory physics course on the principles of mechanics and motion. **Prerequisites:** MATH 151 or MATH 171; concurrent enrollment in PHYS 206; also taught at Galveston campus.

PHYS 227 Electricity and Magnetism Laboratory for the Sciences

Credit 1. 2 Lab Hours. (PHYS 2126, PHYS 2426*) Electricity and Magnetism Laboratory for the Sciences. The second semester laboratory to accompany a two-semester course sequence in introductory physics; topics include material covered in a typical calculus-based introductory physics course on the principles of electricity and magnetism. **Prerequisites:** MATH 152 or MATH 172; PHYS 206 or PHYS 218; concurrent enrollment in PHYS 207; also taught at Galveston campus.

PHYS 285 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Special work in laboratory or theory to meet individual requirements in cases not covered by regular curriculum; intended for use as lower-level credit. **Prerequisite:** Approval of instructor.

PHYS 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 6 Lab Hours. Selected topics in an identified area of physics. May be repeated for credit. **Prerequisite:** Approval of instructor.

PHYS 291 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in physics. May be repeated 2 times for credit. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

PHYS 302 Advanced Mechanics I

Credits 3. 3 Lecture Hours. Classical mechanics of particles and rigid bodies; review of Newtonian mechanics and foundations of Lagrangian and Hamiltonian formalism. **Prerequisite:** PHYS 309 and PHYS 331; PHYS 332 or concurrent enrollment, or approval of instructor.

PHYS 303 Advanced Mechanics II

Credits 3. 3 Lecture Hours. Applications of Lagrangian and Hamiltonian methods to selected problems of classical mechanics. **Prerequisite:** PHYS 302.

PHYS 304 Advanced Electricity and Magnetism I

Credits 3. 3 Lecture Hours. Electrostatics; dielectrics; electrical current and circuits; magnetic fields and materials; induction; Maxwell's equations. **Prerequisites:** PHYS 331; PHYS 332 or concurrent enrollment, or approval of instructor.

PHYS 305 Advanced Electricity and Magnetism II

Credits 3. 3 Lecture Hours. Radiation and optics. Electromagnetic waves; radiation; reflection and refraction; interference; diffraction; special relativity applied to electrodynamics. **Prerequisite:** PHYS 304.

PHYS 309 Modern Physics

Credits 3. 3 Lecture Hours. Special relativity; concepts of waves and particles; introductory quantum mechanics. **Prerequisite:** PHYS 221; MATH 308; also taught at Qatar campus.

PHYS 327 Experimental Physics I

Credits 2. 1 Lecture Hour. 2 Lab Hours. Laboratory experiments in modern physics and physical optics with an introduction to current, state-of-the-art recording techniques. **Prerequisites:** PHYS 225; PHYS 309.

PHYS 328 Experimental Physics II

Credit 1. 1 Lecture Hour. 1 Lab Hour. Laboratory experiments in modern physics and physical optics with an introduction to current, state-of-the-art recording techniques. **Prerequisites:** PHYS 327 or concurrent enrollment.

PHYS 331 Theoretical Methods for Physicists I

Credits 3. 3 Lecture Hours. Applications involving vectors; vector and additional methods for advanced electricity and magnetism; relationship and solutions of classical wave equation, heat equation, and Schrodinger equation; harmonic motion on finite or periodic lattice and in continuum; tensor and matrix notation in classical mechanics and electricity and magnetism. **Prerequisite:** PHYS 221 and MATH 308; or approval of instructor.

PHYS 332 Theoretical Methods for Physicists II

Credits 3. 3 Lecture Hours. Methods to solve the important equations of theoretical physics, emphasizing the effects of boundary conditions and quantization on their solutions and restricted to the essential physical symmetries associated with free space, spheres, cylinders, and rectangles; if time permits, introduction to symmetries in physics and to asymptotic methods. **Prerequisites:** PHYS 331; physics majors.

PHYS 401 Computational Physics

Credits 3. 3 Lecture Hours. Introduction to computational and simulational techniques widely used in physics applications and research, including trajectory integration, wave motion analysis, molecular dynamics, Monte Carlo methods, statistical mechanics of spin systems, phase transitions, quantum evolution, bound state problems, and variational methods. **Prerequisites:** PHYS 332; knowledge of a high level language.

PHYS 408 Thermodynamics and Statistical Mechanics

Credits 3. 3 Lecture Hours. Basic concepts and principles of thermodynamics; introduction to methods of statistical mechanics to calculate properties of systems in thermodynamic equilibrium.

Prerequisite: PHYS 412.

PHYS 412 Quantum Mechanics I

Credits 3. 3 Lecture Hours. Postulates of wave mechanics; wave packets; harmonic oscillator; central field problem; hydrogen atom; approximation methods. **Prerequisites:** PHYS 302; PHYS 309; PHYS 332; junior or senior classification.

PHYS 414 Quantum Mechanics II

Credits 3. 3 Lecture Hours. Continuation of PHYS 412. Electron spin; addition of angular momenta; atomic structure; time dependent perturbations; collision theory; application of quantum mechanics to atomic, solid state, nuclear or high energy physics. **Prerequisite:** PHYS 412.

PHYS 415 Nuclear and Particle Physics

Credits 3. 3 Lecture Hours. Matter at the smallest scales and fundamental interactions between them; physics of atomic nuclei; physics of hadrons, quarks, leptons; fundamental strong and weak interactions; gauge bosons; state-of-the-art nuclear and particle physics; how knowledge was obtained; experimental confirmation of theoretical ideas; modern tools and instruments; foundations of nuclear technology; future perspectives. **Prerequisites:** Grade of C or better in PHYS 309.

PHYS 416 Physics of the Solid State

Credits 3. 3 Lecture Hours. A survey of solid state physics; an introduction to crystal structures and the physics of electrons, lattice vibrations and photons; applications to semiconductors; magnetism; superconductivity; physics of nanostructures; brief introduction to selected current topics in condensed matter physics. **Prerequisites:** PHYS 304 and PHYS 412.

PHYS 418 High Energy Physics

Credits 3. 3 Lecture Hours. A broad spectrum of elementary particle physics along with historical and recent publication, covering symmetry in quarks and leptons, fundamental interactions, relativistic kinematics, Feynman diagrams, Dirac equation, cross-sections for particle reactions, unification of fundamental forces, accelerators and detectors and other current topics. **Prerequisite:** Grade of C or better in PHYS 309 or equivalent.

PHYS 419 Physics of Optoelectronic Devices

Credits 3. 3 Lecture Hours. Basic concepts of light-matter interaction, optics of semiconductors, nanostructures with quantum confinement and their interaction with light; physical principles of selected state-of-the-art optoelectronic devices; emerging concepts and technologies; examples of modern, state-of-the-art devices and emerging technologies. **Prerequisites:** Grade of C or better in PHYS 309 or PHYS 222.

PHYS 425 Physics Laboratory

Credits 2. 6 Lab Hours. Experiments in nuclear, atomic, and molecular physics using modern instrumentation and equipment of current research. **Prerequisite:** PHYS 327 or equivalent.

PHYS 426 Physics Laboratory

Credits 2. 6 Lab Hours. Experiments in solid state and nuclear physics. Modern instrumentation and current research equipment are employed. **Prerequisite:** PHYS 327 or equivalent.

PHYS 485 Directed Studies

Credits 1 to 12. 1 to 12 Other Hours. Special work in laboratory or theory to meet individual requirements in cases not covered by regular curriculum. **Prerequisite:** Approval of instructor; also taught at Galveston campus.

PHYS 489 Special Topics in...

Credits 1 to 4. 1 to 4 Other Hours. Selected topics in an identified field of physics. May be repeated for credit. **Prerequisite:** Approval of instructor; also taught at Qatar campus.

PHYS 491 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in physics. May be repeated for credit. Registration in multiple sections of this course is possible within a given semester provided that the per semester credit hour limit is not exceeded. **Prerequisites:** Junior or senior classification and approval of instructor; also taught at Qatar campus.

PLPA - Plant Pathology (PLPA)

PLPA 291 Research

Credits 1 to 4. 1 to 4 Other Hours. Research conducted under the direction of faculty member in plant pathology. May be repeated 3 times for credit. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

PLPA 301 Plant Pathology

Credits 3. 3 Lecture Hours. Introduction to fundamental principles of plant pathology; diagnosis, cause and control of plant diseases. **Prerequisites:** BIOL 113, BIOL 101, or BIOL 111.

PLPA 303 Plant Pathology Laboratory

Credit 1. 2 Lab Hours. Isolation, identification of plant pathogens and clinical diagnosis and control of plant diseases. **Prerequisite:** PLPA 301 or registration therein.

PLPA 334 Turfgrass Pathology

Credits 3. 3 Lecture Hours. 0 Lab Hours. Recognizing turfgrass problems and understanding biological mechanisms in the disease process; principles of disease management strategies. **Prerequisite:** Junior or senior classification.

PLPA 485 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Special problems for advanced undergraduates to permit study of subject matter not available in existing courses. **Prerequisites:** PLPA 301 and prior approval of instructor or department head.

PLPA 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of plant pathology. May be repeated for credit. **Prerequisite:** PLPA 301 or approval of instructor.

PLPA 491 Research

Credits 1 to 4. 1 to 4 Other Hours. Research conducted under the direction of faculty member in plant pathology. May be repeated 3 times for credit. Registration in multiple sections of this course are possible within a given semester provided that the per semester credit hour limit is not exceeded. **Prerequisites:** Junior or senior classification and approval of instructor.

POLS - Political Science (POLS)

POLS 200 Foundations of Political Science

Credits 3. 3 Lecture Hours. Survey of the scholarly discipline of political science and its theoretical foundations, principal subfields, major research questions and modes of scholarship.

POLS 203 Introduction to Political Theory

Credits 3. 3 Lecture Hours. Introduction to the study of political theory, with attention to major themes in the history of political thought; discussion of the nature of politics; examination of method in political theory and its relation to the discipline of political science.

POLS 206 American National Government

Credits 3. 3 Lecture Hours. (GOVT 2305) American National Government. Survey of American national government, politics, and constitutional development; also taught at Galveston and Qatar campuses.

POLS 207 State and Local Government

Credits 3. 3 Lecture Hours. (GOVT 2306) State and Local Government. Survey of state and local government and politics with special reference to the constitution and politics of Texas; also taught at Galveston and Qatar campuses.

POLS 209 Introduction to Political Science Research

Credits 3. 3 Lecture Hours. Introduction to the philosophy and practice of social science and to modes of research in major subfields of political science. **Prerequisite:** Political science majors must have completed POLS 209 before they enroll in their last 18 hours of 300- and 400-level POLS courses; may take no more than 6 hours of upper division (300- and 400-level courses) before completing POLS 209; political science majors.

POLS 229 Introduction to Comparative Politics

Credits 3. 3 Lecture Hours. A comparison of political institutions, processes and issues across a wide variety of political systems.

POLS 231 Introduction to World Politics

Credits 3. 3 Lecture Hours. Analysis of contemporary world from point of view of nation-state; political problems, factors involved in foreign policies and relations of nations; also taught at Galveston campus.

POLS 232 Introduction to Maritime Public Policy

Credits 3. 3 Lecture Hours. Introduction to maritime public policy; social, economic, political and cultural contexts of public policy; study of policy analysis and policymakers; examines public problems, policy choice, and limits of governmental action; Galveston campus.

POLS 233 Politics and Policy in the United States

Credits 3. 3 Lecture Hours. Survey of institutions of American government, mass political behavior, and policy fields of significant contemporary importance.

POLS 285 Directed Studies

Credits 0 to 3. 0 to 3 Other Hours. Individual instruction in selected aspects of political science not adequately covered by other courses. **Prerequisite:** Approval of department head.

POLS 289 Special Topics in...

Credits 3. 3 Other Hours. Selected topics in an identified area of political science and public policy. May be taken for credit seven times. **Prerequisite:** POLS 206 or approval of department head.

POLS 291 Research

Credits 0 to 6. 0 to 6 Other Hours. Research conducted under the direction of a faculty member in political science. May be taken three times for credit. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

POLS 302 The Mass Media and Politics

Credits 3. 3 Lecture Hours. Examination of mass media impact on politics and political behavior, and governmental impact on the mass media. **Prerequisite:** POLS 206 or approval of department head; junior or senior classification. **Cross Listing:** COMM 302 and JOUR 302.

POLS 304 Latino Politics in the United States

Credits 3. 3 Lecture Hours. Survey of historical and contemporary issues in Latino politics in the U.S.; race and ethnicity in the context of U.S. politics; comparisons of racial and ethnic group experiences in the U.S. with those experienced by racial and ethnic groups elsewhere; Latino access to the political system through political participation. **Prerequisite:** Junior or senior classification.

POLS 306 Contemporary Political Problems and Issues

Credits 3. 3 Lecture Hours. Major contemporary political problems and issues with primary emphasis on the U.S. Each term one to three problems or issues will be examined in some depth. Students may register in up to but no more than two different sections of this course. May be repeated for credit. **Prerequisite:** POLS 206 or approval of department head. **NOTE:** POLS 306 courses taken in a study abroad program may not count toward this limit; please consult with the undergraduate advisor.

POLS 308 Game Theoretic Methods in Political Science

Credits 3. 3 Lecture Hours. Core concepts of game theory to study strategic interaction in politics; game theory using simple mathematical models to describe social situations, understand political and social phenomena; emphasis on model building skills and problem solving. **Prerequisites:** POLS 206 and junior or senior classification or approval of department head.

POLS 309 Polimetrics

Credits 3. 3 Lecture Hours. Theory, techniques, and application of quantitative analysis in political science; focus on quantitative techniques commonly used to evaluate empirical theories of politics. **Prerequisites:** POLS 209 and 9 additional hours of political science or approval of instructor.

POLS 312 Ethnic Conflict

Credits 3. 3 Lecture Hours. Examination of government institutions designed to structure ethnic relations; source of ethnic conflict; mechanisms to facilitate the peaceful resolution of ethnic conflict. **Prerequisite:** Junior or senior classification.

POLS 313 Public Opinion

Credits 3. 3 Lecture Hours. Role of public opinion in a democratic political system—its formation, properties and patterns, with special attention to problems of linking public opinion to public policy. **Prerequisite:** POLS 206 or approval of department head.

POLS 314 Interest Groups

Credits 3. 3 Lecture Hours. Role of interest groups in politics; types of groups and resources; internal dynamics; group strategies/tactics (including PACs); forms of indirect and direct lobbying; influence of groups in political arena. **Prerequisite:** POLS 206 or approval of department head.

POLS 315 Political Parties

Credits 3. 3 Lecture Hours. Organization, history, and activities of political parties and functions they serve in national, state and local politics in the United States and elsewhere. **Prerequisite:** POLS 206 or approval of department head.

POLS 316 Urban Politics

Credits 3. 3 Lecture Hours. Politics at the community level; urban and metropolitan political systems. **Prerequisites:** POLS 206 and POLS 207 or approval of department head.

POLS 317 Women in Politics

Credits 3. 3 Lecture Hours. Role of women in the political system; treatment of women in political theory; effect of law on women's status; women as political leaders; current policy issues of concern to women. **Prerequisite:** POLS 206.

POLS 318 Theories of International Relations

Credits 3. 3 Lecture Hours. Examination of major paradigms of international relations; focus on theory development and application to cases. **Prerequisites:** POLS 206, POLS 209, and junior or senior classification or approval of department head.

POLS 319 The American Presidency

Credits 3. 3 Lecture Hours. The American Presidency and the primary relationships and responsibilities of the office, dealing with the public, decision making, influencing Congress, and implementing policy. **Prerequisite:** POLS 206 or approval of department head.

POLS 320 Race and Politics in the United States

Credits 3. 3 Lecture Hours. The politics of race in the United States: contrast of the political experiences of racial groups with the ideals and realities of democratic political systems. **Prerequisites:** POLS 206 and POLS 207 and junior or senior classification.

POLS 322 Western European Government and Politics

Credits 3. 3 Lecture Hours. Political institutions and ideas of major European countries. Prospects for political integration. **Prerequisite:** POLS 206 or approval of department head.

POLS 323 Political Systems of Latin America

Credits 3. 3 Lecture Hours. Survey of the major features of the political process in Latin America; key political groups and sources and characteristics of their political power; studies of selected countries. **Prerequisite:** POLS 206 or approval of department head.

POLS 324 Politics of Global Inequality

Credits 3. 3 Lecture Hours. Examination of the causes and consequences of economic inequality between rich and poor states; evaluation of competing explanations for poverty of less-developed countries; development strategies employed by poor states; and structure of global economic relations. **Prerequisite:** Junior or senior classification.

POLS 325 African Politics

Credits 3. 3 Lecture Hours. Survey of African politics from pre-colonial period to contemporary era; examination of local experience of democracy, governance, economic development in light of varied colonial experiences, independence movements, international political economy, informal sources of political power. **Prerequisites:** POLS 206 and POLS 207; junior or senior classification.

POLS 326 Government and Politics of Eastern Europe

Credits 3. 3 Lecture Hours. Political, social and economic transformations in the post-Communist Eastern and Southern European countries; examination of the interrelations between political, economic and social issues that impact the building of new governments and institutions in these countries. **Prerequisites:** POLS 206 and POLS 207; junior or senior classification.

POLS 327 Congressional Politics

Credits 3. 3 Lecture Hours. Congressional elections, decision-making structure and processes in Congress, and their implications for representation and public policy in the United States. **Prerequisite:** POLS 206 or approval of department head.

POLS 328 Globalization and Democracy

Credits 3. 3 Lecture Hours. Examination of the political and economic origins of globalization; effects of globalization on advanced industrial democracies; effect on less developed nations; evaluation of the economic, social, cultural and political consequences of globalization. **Prerequisite:** Junior or senior classification.

POLS 333 International Cooperation

Credits 3. 3 Lecture Hours. Contemporary issues, problems, and solutions in international cooperation. **Prerequisites:** POLS 206; junior or senior classification or approval of department head.

POLS 335 International Conflict

Credits 3. 3 Lecture Hours. Examination of major theoretical explanations of war and conflict resolution. **Prerequisites:** POLS 206; junior or senior classification or approval of department head.

POLS 338 Government and Politics of the Former Soviet Union

Credits 3. 3 Lecture Hours. Major political issues of the post-communist transition in the former Soviet Union. **Prerequisite:** POLS 206 or approval of department head.

POLS 340/PSAA 340 Public Administration

Credits 3. 3 Lecture Hours. American public administration; development of public service; the political and constitutional context; organization theory; leadership and decision-making; personnel and resource staff functions; administrative law and regulation; ethics and administrative accountability. **Prerequisite:** Grade of C or better in POLS 206; junior or senior classification. **Cross Listing:** PSAA 340/POLS 340.

POLS 342 Politics and Bureaucracy

Credits 3. 3 Lecture Hours. Public bureaucracy in the context of a political environment; role of experts, the use of political power and problems of bureaucratic accountability and responsibility. **Prerequisite:** POLS 206 or approval of department head.

POLS 347 Politics of Energy and the Environment

Credits 3. 3 Lecture Hours. U.S. energy and environmental problems and politics and the political, legal, and institutional factors influencing their development and implementation. **Prerequisites:** POLS 206 or approval of department head; junior or senior classification or approval of instructor; also taught at Galveston campus.

POLS 349 Early Political Thought

Credits 3. 3 Lecture Hours. Political thought from Greek antiquity to Renaissance. **Prerequisite:** POLS 206 or approval of department head.

POLS 350 Modern Political Thought

Credits 3. 3 Lecture Hours. Political thought from Machiavelli to Marx. **Prerequisite:** POLS 206 or approval of department head.

POLS 352 Empirical Democratic Theory

Credits 3. 3 Lecture Hours. Examination of empirical political science theory about the nature and consequences of democratic government in the modern era; study of scientific theory that accounts for the rise, characteristics and behavior of democratic political systems. **Prerequisites:** POLS 206, POLS 207, and POLS 209; junior or senior classification.

POLS 353 Constitutional Rights and Liberties

Credits 3. 3 Lecture Hours. Legal issues, controversies and significant developments in constitutional rights and liberties, and the impact of these developments upon American politics, culture and social institutions. **Prerequisite:** POLS 206 or approval of department head; also taught at Galveston campus.

POLS 355 United States Constitutional Development

Credits 3. 3 Lecture Hours. Leading decisions of the Supreme Court. Trends in our constitutional development since 1789; expansion through judicial interpretation of powers delegated to national government. **Prerequisites:** POLS 206 and HIST 105 or approval of department head.

POLS 357 National Judicial Politics

Credits 3. 3 Lecture Hours. Political factors that influence judicial selection; decision making and policy-making roles and impact of the U.S. Supreme Court and Federal Court System. **Prerequisites:** POLS 206, POLS 209, and junior or senior classification or approval of department head.

POLS 358 Comparative Judicial Politics

Credits 3. 3 Lecture Hours. Survey of the major features of court systems of the world; examination of the role played by courts in the politics of selected nations of the world; comparison of judicial decision making in selected counties; the impact of courts in developing democracies. **Prerequisites:** POLS 206 and 207; junior or senior classification.

POLS 359 American Political Thought

Credits 3. 3 Lecture Hours. American political thought from colonial times to the present. **Prerequisite:** POLS 206 or approval of department head.

POLS 362 Latin American Political Thought

Credits 3. 3 Lecture Hours. Survey of various traditions in the history of Latin American political thought; key texts in the history of political theory in the Spanish-American continent. **Prerequisites:** POLS 206; junior or senior classification or approval of instructor.

POLS 364 Global Political Thought

Credits 3. 3 Lecture Hours. Global perspective on the history of political ideas and contemporary political philosophy; confrontation and conversion of East Asia and Middle Eastern concepts of political problems and Western perspectives; impact of culture on the shaping of political ideas. **Prerequisite:** Junior or senior classification.

POLS 365 Asian Governments and Politics

Credits 3. 3 Lecture Hours. Contemporary political systems of Asia, political institutions, actors and processes. **Prerequisite:** POLS 206 or approval of department head.

POLS 366 Political Conflicts of the Middle East

Credits 3. 3 Lecture Hours. The internal, regional and international politics of the Middle East; study of selected political conflicts; the influence of the region's cultures, religions, natural resources and outside political forces. **Prerequisites:** Grade of C or better in POLS 206; junior or senior classification or approval of instructor; Galveston campus.

POLS 367/WGST 367 Women in Government in Comparative Perspective

Credits 3. 3 Lecture Hours. Examination of women's representation in government based on comparison across multiple nation-states; focus on legislative and executive branches of democratic governments. **Prerequisites:** POLS 206; junior or senior classification or approval of department head. **Cross Listing:** WGST 367/POLS 367.

POLS 368 Latin American Legislatures

Credits 3. 3 Lecture Hours. Survey of the major features of the legislative branch in Latin America; examination of the role played by legislatures in the politics of selected countries; studies of executive-legislative relations in selected countries; participation by traditionally excluded groups in legislatures. **Prerequisites:** POLS 206, junior or senior classification or approval of department head.

POLS 369 Theories of Democracy

Credits 3. 3 Lecture Hours. Definitions and justifications of democratic political systems; criticisms of democratic legitimacy, difficulties encountered by actual democratic regimes; methodological problems of assessing the fulfillment of democratic goals. **Prerequisite:** POLS 206 or approval of instructor.

POLS 375 Campaigns and Elections

Credits 3. 3 Lecture Hours. Theories of voter choice; effects of mass media and campaign finance regulations on the conduct and outcome of elections; effects of elections on policy; emphasis on U.S. national elections. **Prerequisite:** POLS 206 or approval of department head.

POLS 412 International Political Economy

Credits 3. 3 Lecture Hours. Politics of international economic relations; interactions between political and economic realms in the contemporary world. **Prerequisites:** POLS 206; junior or senior classification or approval of department head.

POLS 413 American Foreign Policy

Credits 3. 3 Lecture Hours. Evolution of U.S. foreign policies since World War II. Policy process; role of executive, legislative, bureaucratic and private institutions; current foreign policy issues and problems. **Prerequisite:** POLS 206 or approval of department head.

POLS 415 Contemporary Issues in American Foreign Policy

Credits 3. 3 Lecture Hours. Detailed analysis of a selected aspect of American foreign policy. **Prerequisite:** POLS 206 or approval of department head.

POLS 420 Nuclear Politics

Credits 3. 3 Lecture Hours. Examination of nuclear weapons in world politics, including nuclear nonproliferation, deterrence and strategic stability, arms control and disarmament, decision-making in nuclear crises and contemporary nonproliferation challenges. **Prerequisite:** POLS 206; POLS 209 and junior or senior classification or approval of department head.

POLS 423 U.S.-Latin American Relations

Credits 3. 3 Lecture Hours. Political, economic and social relations between the United States and Latin American nations from independence to the present. **Prerequisites:** POLS 206, POLS 207 and POLS 323; junior or senior classification.

POLS 424 Comparative Governmental Institutions

Credits 3. 3 Lecture Hours. Study of the politics and structure of governmental institutions in a comparative venue; examination of the building blocks by which patterns of governments and institutions can be identified across various political systems of the world; role of institutions across different types of political systems and how they are affected by global economic factors. **Prerequisites:** POLS 206 and POLS 207; junior or senior classification.

POLS 429 Issues in World Politics

Credits 3. 3 Lecture Hours. Selected issues of importance in contemporary world politics. May be taken two times for credit as content varies. **Prerequisite:** POLS 206 or approval of department head.

POLS 432 The Politics of European Union

Credits 3. 3 Lecture Hours. Examination of the institutional, economic and political forces that led to the development of the European Economic Union; impact of the European Union on world affairs. **Prerequisites:** POLS 206 and POLS 207; junior or senior classification.

POLS 435 Voting Behavior

Credits 3. 3 Lecture Hours. Voting decisions, electoral behavior and consequences for the political system. **Prerequisite:** POLS 206 or approval of department head.

POLS 439 Foreign Policy Decision Making

Credits 3. 3 Lecture Hours. Examination of decision processes in contemporary world politics; individual, group and organizational aspects of decision making in the context of world events. **Prerequisites:** POLS 206, POLS 209, and junior or senior classification or approval of department head.

POLS 447 National Security Policy

Credits 3. 3 Lecture Hours. Need for national security policy, the factors involved in determining defense policy and the resulting problems; special attention to the United States. **Prerequisite:** POLS 206 or approval of department head.

POLS 454 Contemporary Political Ideas

Credits 3. 3 Lecture Hours. Contemporary political ideas such as liberalism, socialism, communism and fascism; role of ideology in political change. **Prerequisite:** POLS 206 or approval of department head.

POLS 455 Traditions of Political Theory

Credits 3. 3 Lecture Hours. Survey of particular schools or historical periods of normative political theory. May be taken three times. **Prerequisites:** POLS 206 and POLS 207; junior or senior classification.

POLS 461 Jurisprudence

Credits 3. 3 Lecture Hours. History of legal philosophy from the ancient Greeks to the present; exploration of recurring themes such as natural law, legal positivism, legal realism, sociological jurisprudence and Marxist jurisprudence; exposure to various issues, such as liberty, privacy, obedience, responsibility and punishment. **Prerequisite:** POLS 206 or approval of department head.

POLS 462/WGST 462 Women and the Law

Credits 3. 3 Lecture Hours. The legal status of American women from the adoption of the Constitution to the present: constitutional developments; the 19th Amendment and the proposed Equal Rights Amendment; employment; family law; reproductive rights; education; sexual equality in context of other claims to equality; law and social norms. **Prerequisite:** POLS 206 or approval of department head. **Cross Listing:** WGST 462/ POLS 462.

POLS 475 Government and the Economy

Credits 3. 3 Lecture Hours. Constitutional and legal framework of governmental involvement in economy; governmental budget in management of business cycle; regulation of business activities; governmental economic planning in democratic societies. **Prerequisite:** POLS 206 or approval of department head.

POLS 481 Research Seminar

Credits 3. 3 Other Hours. In-depth study of topics associated with particular sub-field of political science; experience designing and implementing major, original research project. **Prerequisites:** POLS 206, POLS 207, POLS 209, 9 credits in POLS at or above 300 level; junior or senior political science major or approval of instructor.

POLS 484 Internship

Credits 0 to 3. 0 to 3 Other Hours. Directed internship in a public organization to provide students with on-the-job training and applied research experience with professionals in settings appropriate to the student's degree plan and career objectives. May be taken for credit up to three hours. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisite:** Majors only; approval of department head.

POLS 485 Directed Studies

Credits 0 to 6. 0 to 6 Other Hours. Individual instruction in selected aspects of political science not adequately covered by other courses. **Prerequisite:** Approval of department head; also taught at Qatar campus.

POLS 489 Special Topics in...

Credits 1 to 4. 1 to 4 Other Hours. Selected topics in an identified area of political science and public policy. May be repeated for credit. **Prerequisite:** POLS 206 or approval of department head.

POLS 491 Research

Credits 0 to 6. 0 to 6 Other Hours. Research conducted under the direction of a faculty member in political science. May be taken three times for credit. **Prerequisites:** Junior or senior classification and approval of instructor.

POLS 497 Independent Honors Studies

Credits 0 to 4. 1 to 4 Other Hours. Directed independent studies for upper division Honors students, regardless of academic major, in selected aspects of political science. **Prerequisites:** Junior or senior classification either as Honors student or with overall GPR of 3.25; letter of approval from head of student's major department.

PORT - Portuguese (PORT)

PORT 101 Beginning Portuguese I

Credits 4. 4 Lecture Hours. 1 Lab Hour. (PORT 1411) Beginning Portuguese I. Elementary language study with aural, oral, written, and reading practice; preparation for conversation; part of class preparation done in language laboratory. Students with prior knowledge of or instruction in Portuguese are required to take a placement test before enrolling for the first time in a college Portuguese course.

PORT 102 Beginning Portuguese II

Credits 4. 4 Lecture Hours. 1 Lab Hour. (PORT 1412) Beginning Portuguese II. Continuation of PORT 101; part of class preparation done in language laboratory. Students with prior knowledge of or instruction in Portuguese are required to take a placement test before enrolling for the first time in a college Portuguese course. **Prerequisite:** PORT 101 with a grade of C or better.

PORT 201 Intermediate Portuguese I

Credits 3. 3 Lecture Hours. (PORT 2311) Intermediate Portuguese I. Readings of average difficulty; review of grammar, practice in conversation and composition. Students with prior knowledge of or instruction in Portuguese are required to take a placement test before enrolling for the first time in a college Portuguese course. **Prerequisite:** PORT 102 with a grade of C or better.

PORT 202 Intermediate Portuguese II

Credits 3. 3 Lecture Hours. (PORT 2312) Intermediate Portuguese II. Continuation of PORT 201 with more advanced material. Students with prior knowledge of or instruction in Portuguese are required to take a placement test before enrolling for the first time in a college Portuguese course. **Prerequisite:** PORT 201 with a grade of C or better.

POSC - Poultry Science (POSC)

POSC 201 General Avian Science

Credits 3. 3 Lecture Hours. Introduction to the poultry industry to include past, present and future industry dynamics; avian anatomy/physiology as they impact commercial production; management principles and practices of breeding, incubation, brooding, nutrition, disease control and marketing technology.

POSC 285 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Directed studies in specific problem areas of poultry science. **Prerequisite:** Approval of instructor.

POSC 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of poultry science. May be repeated for credit. **Prerequisite:** Approval of instructor.

POSC 291 Research

Credits 1 to 2. 1 to 2 Other Hours. Research conducted under the direction of faculty member in poultry science. May be repeated 2 times for credit. **Prerequisites:** Freshman or sophomore classification and approval of instructor and department head.

POSC 302 Avian Science Laboratory

Credit 1. 2 Lab Hours. Field trips and application of basic skills in production of poultry meat and eggs. Recommended supplement to POSC 201. **Prerequisite:** Junior or senior classification or approval of instructor.

POSC 304 Judging

Credits 3. 6 Other Hours. Intensive, individualized training in selection standards for meat and egg strains of poultry, grading standards for egg and live and ready-to-cook poultry, and organizing and managing poultry shows; practice requires visits to processing plants. May be repeated for credit. **Prerequisite:** Junior or senior classification or approval of instructor.

POSC 308 Avian Anatomy and Physiology

Credits 3. 2 Lecture Hours. 3 Lab Hours. Anatomy and physiology of the major body systems of the bird, including the cardiovascular, gastrointestinal, respiratory, endocrine and reproductive systems; influence of the environment on bird physiology, including effects of stress. Laboratory exercises include dissection and microscopic analysis of the major body system and assessment of environmental conditions. **Prerequisites:** BIOL 111; POSC 201; junior or senior classification or approval of instructor.

POSC 309 Poultry Meat Production

Credits 4. 3 Lecture Hours. 2 Lab Hours. Modern integrated broiler and turkey production; housing and equipment, nutrition, flock health, pest control, grower relations, marketing and financial management; lab involves blood testing, growth trials, posting birds, processing, and observation of a local integrated poultry operation. **Prerequisite:** Junior or senior classification or approval of instructor.

POSC 313 Game Birds and Ornamental Fowl

Credits 3. 3 Lecture Hours. Commercial game bird production; nutrition, incubation, rearing, breeder care, diseases, marketing, housing requirements and economic considerations; management of rare and ornamental fowl. **Prerequisite:** Junior or senior classification or approval of instructor.

POSC 319 Breeder and Hatchery Management

Credits 3. 2 Lecture Hours. 2 Lab Hours. Housing and equipment, incubation technology, embryology, nutrition and flock health; lab involves hatchery management, blood testing, semen evaluation, artificial insemination, basic embryology and observation of a local hatchery. **Prerequisite:** Grade of C or better in POSC 308; junior or senior classification or approval of instructor.

POSC 326 Commercial Egg Industry

Credits 3. 3 Lecture Hours. Production, management, marketing, economics and integration of commercial laying hen operations. **Prerequisite:** Junior or senior classification or approval of instructor.

POSC 333 Instincts and Behavior

Credits 3. 3 Lecture Hours. Investigation of the reasoning behind evolved reproductive strategies with integration of veterinary and avian science perspectives; examination of individual differences in behavior and their development in particular environments. **Prerequisite:** Junior or senior classification or approval of instructor.

POSC 381 Investigation of Professional Development in Poultry Science

Credits 2. 2 Other Hours. An investigation of career options and the research process as applied to poultry science. **Prerequisite:** Junior or senior classification or approval of instructor.

POSC 405 Egg and Poultry Meat Processing

Credits 3. 3 Lecture Hours. Principles of egg and poultry meat processing, understanding egg and poultry meat markets, egg and meat grading, product safety, packaging and consumer acceptance of shell eggs and poultry meat, specifically turkey and broilers. **Prerequisite:** Junior or senior classification or approval of instructor.

POSC 406 Poultry Further Processing

Credits 4. 3 Lecture Hours. 2 Lab Hours. Science and practice of value-added products; physical, chemical, microbiological and functional characteristics of value-added poultry products as they affect consumer acceptance, efficiency of production and regulatory approval. **Prerequisites:** CHEM 222; DASC 326 or FSTC 326/ANSC 326; POSC 309; POSC 405; junior or senior classification or approval of instructor.

POSC 411 Poultry Nutrition

Credits 3. 3 Lecture Hours. Principles of poultry nutrition with emphasis on all major nutrient classes and their relationships with the avian digestive system. **Prerequisites:** CHEM 222 or equivalent; junior or senior classification or approval of instructor.

POSC 412 Poultry Feed Formulation

Credit 1. 1 Lecture Hour. Practical feeding of poultry with emphasis on specific nutrient requirements of various species and computer least cost diet formulations. **Prerequisites:** POSC 411; junior or senior classification or approval of instructor.

POSC 414 Avian Genetics and Breeding

Credits 3. 2 Lecture Hours. 2 Lab Hours. Basic concepts of avian genetics and breeding principles; inheritance of economically important qualitative and quantitative traits; statistical analysis of breeding results; application of molecular genetics; mating systems analyses; breeder management; and incubation of hatching eggs. **Prerequisites:** BIOL 111; junior or senior classification or approval of instructor.

POSC 427 Animal Waste Management

Credits 3. 3 Lecture Hours. An applied approach to current and emerging issues relating to responsible management of animal waste; the role of biological aspects of production management decisions evaluated in an examination of regulatory and environmental requirements; current case studies and exposure to field situations. Field trips may be required for which departmental fees may be assessed. **Prerequisite:** Junior or senior classification or approval of instructor.

POSC 429 Advanced Food Bacteriology

Credits 4. 3 Lecture Hours. 2 Lab Hours. Microbiology of foodborne human pathogens of food animals, raw and processed food, and human disease; methods to control incidence of pre- and post-harvest contamination. **Prerequisites:** ANSC 326/FSTC 326, FSTC 326/ANSC 326, BIOL 351 or VTPB 405; junior or senior classification.

POSC 444 International Poultry Production

Credits 3. 3 Lecture Hours. Two-week intensive and comparative on-site study of international poultry production; rearing and husbandry, housing and equipment, nutrition, flock health and processing. **Prerequisite:** Junior or senior classification.

POSC 454 Animal Welfare

Credits 3. 3 Lecture Hours. Issues from an animal's perspective; opportunities to study the general questions that typically affect the welfare of an animal; insight to practices that can be used to improve the welfare of an animal. **Prerequisite:** Junior or senior classification.

POSC 481 Poultry Science Systems

Credits 2. 1 Lecture Hour. 2 Lab Hours. Individual and team approaches for the collection, interpretation, synthesis and presentation of information on integration of all aspects of the poultry industry to address issues facing it; emphasis on oral and written communication. **Prerequisite:** Senior classification.

POSC 484 Internship

Credits 0 to 5. 0 to 5 Other Hours. A supervised internship in the poultry industry to provide practical experience in a real world setting that is consistent with the student's professional interests. **Prerequisites:** Junior or senior classification and approval of department head.

POSC 485 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Directed study of selected problems not covered by other courses in the department. Content of course will be adapted to interest and needs of students. **Prerequisites:** Junior or senior classification and approval of instructor.

POSC 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of poultry science. May be repeated for credit. **Prerequisites:** Junior or senior classification and approval of instructor.

POSC 491 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in poultry science. May be repeated 3 times for credit. Registration in multiple sections of this course are possible within a given semester provided that the per semester credit hour limit is not exceeded. **Prerequisites:** Junior or senior classification and approval of instructor and department head.

PVFA - Perf Vis Fine Arts (PVFA)

PVFA 101 First Year Experience

Credits 0. 0 Lecture Hours. Development of self-efficacy, self-awareness and a sense of purpose; active engagement in the learning environment inside and outside of the classroom; social integration within the university community. Must be taken on a satisfactory/unsatisfactory basis.

PVFA 111 Creating with Care

Credits 3. 3 Lecture Hours. Foundations of care and respect in art making and creative practices; strategies for fostering inclusive and equitable performance works and workspaces; safety and consent in staging intimacy and combat on stage and screen.

PVFA 201 Introduction to Artificial Intelligence in the Arts

Credits 3. 2 Lecture Hours. 2 Lab Hours. Investigation of how artificial intelligence (AI) can be integrated into the creative processes; understanding the basics of AI and how these technologies can enhance and transform their artistic practice; exploration of accessible AI tools, techniques, and methodologies across various artistic fields including visual arts, music, dance, theatre, and design; hands-on exercises and projects to learn how AI can collaborate with human creativity.

PVFA 240 Archiving and Documenting the Performing and Visual Arts

Credits 3. 3 Lecture Hours. Introduction to archiving and documenting artistic processes, performances, and materials; discussion of archival and preservation principles and practices; consideration of ethical, political, and social issues in archiving and documenting the arts; examination of examples of archives and repositories related to the performing and visual arts.

PVFA 289 Special Topics in...

Credits 1 to 4. 1 to 4 Other Hours. Selected topics in an identified area of performance, visualization and fine arts. May be repeated for credit. **Prerequisites:** Approval of instructor.

PVFA 291 Research

Credits 1 to 4. 1 to 4 Other Hours. Research conducted under the direction of a faculty member in performance, visualization and fine arts. May be taken two times for credit. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

PVFA 300 School of Performance, Visualization & Fine Art Study Abroad

Credits 1 to 18. 1 to 18 Other Hours. School of Performance, Visualization & Fine Art Study Abroad. For students in approved study abroad programs participating in reciprocal educational exchange programs. May be repeated for credit. **Prerequisites:** Junior or senior classification; approval of assistant dean for international programs and initiatives.

PVFA 301 Artificial Intelligence, Ethics and Social Impact in the Arts

Credits 3. 3 Lecture Hours. Examination of the ethical challenges of Artificial Intelligence in creative fields, including on AI authorship, deepfakes, fairness in AI art, and the future of work; investigation of how AI reshapes creativity and its broader social impact. **Prerequisites:** PVFA 201; junior or senior classification or approval of instructor.

PVFA 310 Performance in Virtual and Augmented Realities

Credits 3. 1 Lecture Hour. 6 Lab Hours. Engage in virtual and augmented realities from the performer's perspective; understand and explore the dimensions of space, time, and energy within virtual installations; investigate and expand the limitations of technology to satisfy the needs of the performer; create performances based on the influence and limitations of technology. **Prerequisites:** Junior or senior classification or instructor approval.

PVFA 409 Artificial Intelligence in the Arts Capstone

Credits 3. 1 Lecture Hour. 5 Lab Hours. Culminating project that emphasizes an innovative and comprehensive solution for a complex problem in Artificial Intelligence (AI) and creative work; appropriate publication and exhibition venues; development of a detailed outline of the goal and completion schedule. **Prerequisites:** PVFA 201 and PVFA 301; junior or senior classification or instructor approval.

PVFA 483 Interdisciplinary Arts Practicum

Credits 1 to 3. 1 to 3 Other Hours. Faculty-supervised, project-based, collaborative art making experience with artist(s) in residence. May be taken four times for credit. **Prerequisites:** Junior or senior classification or approval of instructor.

PVFA 485 Directed Studies

Credits 1 to 6. 1 to 6 Other Hours. Directed studies in identified areas of performance, visualization and fine arts. May be repeated for credit. **Prerequisites:** Junior or senior classification; approval of assistant dean for international programs and initiatives.

PVFA 489 Special Topics in...

Credits 0 to 4. 0 to 4 Other Hours. Selected topics in an identified field of performance, visualization and fine arts. May be taken up to 9 credit hours. **Prerequisites:** Junior or senior classification; approval of assistant dean for international programs and initiatives.

PVFA 491 Research

Credits 1 to 4. 1 to 4 Other Hours. Research conducted under the direction of a faculty member in performance, visualization and fine arts. May be taken two times for credit. **Prerequisites:** Junior or senior classification; approval of assistant dean.

RDNG - Reading (RDNG)

RDNG 291 Research

Credits 1 to 4. 1 to 4 Other Hours. Research conducted under the direction of faculty member in reading. May be repeated two times for credit. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

RDNG 351 Foundational Skills of Decoding for Elementary Students

Credits 3. 3 Lecture Hours. Foundational skills of decoding including print awareness, phonological and phonemic awareness, phonics and fluency. **Prerequisite:** Concurrent enrollment in RDNG 373.

RDNG 371 Multicultural and Interdisciplinary Literature for Middle Grades

Credits 3. 3 Lecture Hours. Focuses on multicultural and interdisciplinary literature appropriate for middle grades students; implements and evaluates effective multicultural, interdisciplinary instruction through selection, use and development of literature in middle grades classroom. **Prerequisite:** Junior classification.

RDNG 372 Reading and Writing across the Middle Grades Curriculum

Credits 3. 3 Lecture Hours. Foundational skills of both reading and writing for middle grades; includes theoretical models of reading and writing; instructing middle grade students in teaching evidence-based strategies for vocabulary development, comprehension of literary text, comprehension of informational text, writing informational and persuasive essays, science lab reports, historical perspectives, and constructed responses. **Prerequisite:** Junior or senior classification.

RDNG 373 Foundational Skills of Language Comprehension for Elementary Students

Credits 3. 3 Lecture Hours. Foundational skills of oral language development, vocabulary development, comprehension of literary text, comprehension of informational text, and beginning strategies and reading comprehension skills. **Prerequisite:** Concurrent enrollment in RDNG 351.

RDNG 460 Language and Reading

Credits 3. 3 Lecture Hours. Relationship between language and reading, dialect and reading, and linguistics.

RDNG 465 Reading in the Middle and Secondary Grades

Credits 3. 3 Lecture Hours. Reading needs of middle and secondary school students with emphasis upon curriculum organization for reading development and assessment of student progress in content area reading. **Prerequisites:** Junior or senior classification; SEED minor.

RDNG 467 Reading and the Language Arts

Credits 3. 2 Lecture Hours. 3 Lab Hours. Recent trends, issues and research on the impact of listening, oral language, process writing, grammar, spelling and handwriting on the development of reading strategies and communicative competence. Application of research in field settings. **Prerequisites:** RDNG 351 and RDNG 473; admission to teacher education; must be taken concurrently with TEFB 410, TEFB 412 and TEFB 413.

RDNG 468 Essential Foundations of Language and Literacy for All Learners

Credits 3. 3 Lecture Hours. Relationship among literacy, language, dialect and linguistics; role of the child, community and school through stages of literacy and second language learning; literacy instructional procedures for all learners including dyslexia. **Prerequisite:** EDUC majors.

RDNG 470 Reading/Language Arts Methods in Middle Grades Education

Credits 3. 2 Lecture Hours. 6 Other Hours. Investigate current trends and issues in teaching listening, oral language, process writing, spelling, grammar and handwriting; explores relationships among the development of various language arts and the development of reading strategies and communicational competencies of middle school learners; application of best instructional practices informed by research. **Prerequisite:** Senior classification; admission to teacher education; concurrent enrollment in MEFB 450, MEFB 452, and RDNG 490.

RDNG 472 Teaching Writing in Elementary and Middle Grade Classrooms

Credits 3. 3 Lecture Hours. Focuses on effective methods of writing instruction and assessment for the middle grades; reviews and reinforces sound writing practices; exposes students to theory and research in the area of writing instruction. **Prerequisite:** Junior or senior classification.

RDNG 473 Assessment in Reading Instruction

Credits 3. 3 Lecture Hours. Evaluation and use of commonly used achievement tests, development of criterion referenced tests and interpretation and construction of informal measures for assessing reading skills. **Prerequisites:** Grade of C or better in RDNG 351 and RDNG 373.

RDNG 490 Assessment in Reading Instruction in Middle Grades

Credits 3. 2 Lecture Hours. 6 Other Hours. Evaluation of middle grades students reading performance; selection, understanding, and implementation of formal and informal evaluation procedures in classroom reading assessment, diagnosis, and instruction. **Prerequisite:** Concurrent enrollment and grade of C or better in MEFB 452; concurrent enrollment and grade of C or better in MEFB 450 and RDNG 470, or MEFB 460 and MEFB 470; admission to teacher education; senior classification.

RDNG 491 Research

Credits 1 to 4. 1 to 4 Other Hours. Research conducted under the direction of faculty member in reading. May be repeated 2 times for credit. **Prerequisites:** Junior or senior classification and approval of instructor.

RELS - Religious Studies (RELS)

RELS 200 Religions of the World

Credits 3. 3 Lecture Hours. Introduction to academic study of religion and some of the world's major religions; emphasis on the nature of religion, diversity of practice across religious traditions, religious appropriation and functions of religion.

RELS 201/JWST 201 Introduction to Jewish Studies

Credits 3. 3 Lecture Hours. Exploration of Jewish history, culture, identity, and art throughout the millennia and in the modern world; focus on material in multiple media and approaches from a variety of disciplines.

Cross Listing: JWST 201/RELS 201.

RELS 202 Religion in America

Credits 3. 3 Lecture Hours. Survey of major themes in religion in America; examines how religion has influenced and been influenced by American history, culture, economics, politics and social consciousness.

RELS 209 Religions of the Ancient World

Credits 3. 3 Lecture Hours. Religious traditions, ideas and practices of ancient cultures; connections to modern religious traditions.

RELS 212/HIST 212 Holy War

Credits 3. 3 Lecture Hours. Concepts of holy war in Jewish, Christian and Muslim history; language and literature of holy war; motivations for waging holy war; the relationship between war, martyrdom, pilgrimage and sainthood; religious orders engaging in holy war; political aims of holy war; practices of holy war; perspectives of those attacked in holy wars. **Cross Listing:** HIST 212/RELS 212.

RELS 220 History of Christianity: Origins to the Reformation

Credits 3. 3 Lecture Hours. History of Christian doctrine, ecclesiastical organization, and religious practice, origins through Reformation, with emphasis on religion and society; life and teachings of Jesus; apostolic church; patristic period; Christianization of Roman Empire and northern Europe; monasticism; medieval church; Gregorian reform; heresy; papal monarchy; schism and conciliarism; reformations of the sixteenth century. **Cross Listing:** CLAS 220 and HIST 220.

RELS 221/HIST 221 History of Islam

Credits 3. 3 Lecture Hours. Key themes in Islam and Islamic history; Orientalism; pre-Islamic Arabia; the Qur'an; Sunni-Shi'i sectarian divisions; Islamic law; theology; sciences; mystical traditions; rituals of the Muslim faith; cross-cultural and religious encounters; holy war; ritual practices; fundamentalism; women in Islam; Islam in the West. **Cross Listing:** HIST 221/RELS 221.

RELS 222/HIST 222 History of Christianity, Reformation to Present

Credits 3. 3 Lecture Hours. History of Christian religion from the era of the Reformation (sixteenth century) to the present, with emphasis on social, cultural, political and economic history in relation to Christian structures and theological movements. **Cross Listing:** HIST 222/RELS 222.

RELS 251/CLAS 251 Classical Mythology

Credits 3. 3 Lecture Hours. Introduction to the most important myths of Greeks and Romans; ancient and modern methods of interpreting myths; the role of myths in ancient literature; readings in English. **Cross Listing:** CLAS 251/RELS 251.

RELS 257/COMM 257 Communication, Religion and the Arts

Credits 3. 3 Lecture Hours. Introduction to artistic, religious communication; survey of communication art and media art practices across religious contexts; consideration of communication aesthetics that mediate religious experience. **Cross Listing:** COMM 257/RELS 257.

RELS 285 Directed Studies

Credits 0 to 3. 0 to 3 Other Hours. Readings and/or assigned projects for specific needs of students minoring in religious studies; directed independent or individual study in an identified area of religious studies. **Prerequisite:** Approval of instructor.

RELS 289 Special Topics in...

Credits 1 to 4. 1 to 4 Other Hours. Selected topics in an identified area of religious studies. May be repeated for credit.

RELS 291 Research

Credits 0 to 3. 0 to 3 Other Hours. Research conducted under the direction of a faculty member in Liberal Arts. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

RELS 304/HUMA 304 Asian Religions

Credits 3. 3 Lecture Hours. Beliefs and practices of Hinduism, Jainism, Sikhism, Buddhism, Confucianism, Taoism and Shinto with particular attention to their philosophical presuppositions. **Cross Listing:** HUMA 304/RELS 304.

RELS 312 Contemplation in the Modern World

Credits 3. 3 Lecture Hours. Interdisciplinary approach to examining contemplative practices: origins in philosophy and religious traditions, goals and techniques of contemplation, contemplation in relation to cultural and social problems or needs.

RELS 317/ANTH 317 Introduction to Biblical Archaeology

Credits 3. 3 Lecture Hours. Application of archaeology in biblical research; basic overview of the material cultures that are the setting for the biblical narratives. **Cross Listing:** ANTH 317/RELS 317.

RELS 321 Political Islam and Jihad

Credits 3. 3 Lecture Hours. Interaction between Islamic movements and politics in various Middle Eastern countries; the meaning and evolution of jihad; the role of Islam as a tool for political and social mobilization. **Prerequisite:** Junior or senior classification, or approval of instructor. **Cross Listing:** HUMA 321 and INTA 321.

RELS 326/SOCI 326 Sociology of Religion

Credits 3. 3 Lecture Hours. Institution of religion and religious-related behavior; relationship between dynamic and structural religion and contemporary society. **Prerequisite:** SOCI 205. **Cross Listing:** SOCI 326/RELS 326.

RELS 331/PHIL 331 Philosophy of Religion

Credits 3. 3 Lecture Hours. Philosophical problems of western religion such as the existence of God, the problem of evil, types of theism, rational, empirical, and mystical approaches to God. **Cross Listing:** PHIL 331/RELS 331.

RELS 340/ANTH 340 Folklore and the Supernatural

Credits 3. 3 Lecture Hours. Traditional expressions of the supernatural such as superstition, belief tale and divination classified as folklore genres and their relationships to the cultures in which they develop; theories drawn from anthropology, folklore and related social sciences.

Prerequisite: Junior or senior classification or approval of instructor.

Cross Listing: ANTH 340/RELS 340.

RELS 347/HIST 347 Rise of Islam, 600-1258

Credits 3. 3 Lecture Hours. Late-Antiquity; Pre-Islamic Arabia; the rise of Islam and a historical survey of the development of the Islamicate civilizations from c. 600 to the Mongol Conquests c. 1258 with an emphasis on politics, religion, society and culture. **Prerequisite:** Junior or senior classification or approval of instructor. **Cross Listing:** HIST 347/RELS 347.

RELS 350 Religions, Utopias, and Happiness

Credits 3. 3 Lecture Hours. Thematic exploration of the science of happiness; exploration and critique of self-help culture; consideration of religious contributions to happiness; evaluation of individual and collective notions of happiness. **Prerequisites:** Junior or senior classification.

RELS 356 Ritual and Expression in Ancient Religions

Credits 3. 3 Lecture Hours. Expressive practices such as rituals, re-enactments, processions and dance in ancient religious traditions. **Prerequisites:** Junior or senior classification.

RELS 360/ENGL 365 The Bible as Literature

Credits 3. 3 Lecture Hours. Narrative, structural, and thematic study of the Hebrew and Christian Scriptures in English translation. **Prerequisite:** Junior or senior classification. **Cross Listing:** ENGL 365/RELS 360.

RELS 365/HIST 365 Religion in Early America

Credits 3. 3 Lecture Hours. Religion in North America from colonial beginnings to eve of Civil War; relations between European Christianity, Native Americans and African Americans; religious pluralism, reform movements, social and political change. **Prerequisite:** Junior or senior classification. **Cross Listing:** HIST 365/RELS 365.

RELS 366/HIST 366 Religion in Modern America

Credits 3. 3 Lecture Hours. Religion in America from the Civil War to contemporary period; relationship of religion and racial formation, capitalism, gender, sexuality, immigration; religious pluralism; evangelicalism; role of religious politics and social movements.

Prerequisite: Junior or senior classification. **Cross Listing:** HIST 366/RELS 366.

RELS 367 Christianity and American Identity

Credits 3. 3 Lecture Hours. Examination of interaction of religious ideas, especially Christian, with claims and conceptions of American identity and vice-versa; themes include American founding, civil religion and Americanization. **Prerequisites:** Junior or senior classification, or approval of instructor.

RELS 390 Researching Religion

Credits 3. 3 Lecture Hours. Methods and approaches to inquiries in the study of religion; historical and contemporary topics and issues in the study of religion; analysis of artifacts, documents and primary sources; current scholarship in the study of religion.

RELS 392/ENGL 392 Studies in Literature, Religion and Culture

Credits 3. 3 Lecture Hours. Exploration of literature treating significant religious topics in the context of cultural setting; features current faculty research on such topics as Tolkien and the making of myth, C.S. Lewis, texts and cultures of the Middle East and Victorian women writers and religion. May be repeated one time for credit. **Prerequisites:** 3 credits of literature at 200-level or above; junior or senior classification. **Cross Listing:** ENGL 392/RELS 392.

RELS 403/ANTH 403 Anthropology of Religion

Credits 3. 3 Lecture Hours. Cross-cultural, theoretical analysis of religion as a cultural phenomenon; exploring the relationships between religion, culture, society and the individual; also taught at Galveston campus. **Cross Listing:** ANTH 403/RELS 403.

RELS 418 Intellectual History from the Ancient Near East to the Early Middle Ages

Credits 3. 3 Lecture Hours. Political, social, cultural and religious histories of significant figures, groups, schools of thought and movements in western Afro-Eurasia from the Assyrian Empire to the later Roman Empire; developments in political theory, literature, sociology, arts, architecture, music, philosophy, law, sciences and education. **Prerequisite:** Junior or senior classification. **Cross Listing:** CLAS 418 and HIST 418.

RELS 419/HIST 419 Intellectual History, 500 to 1600

Credits 3. 3 Lecture Hours. Political, social, cultural and religious histories of significant figures, groups, schools of thought and movements in western Afro-Eurasia from the rise of Islam to the Renaissance; developments in political theory, literature, sociology, arts, architecture, music, philosophy, law, sciences and education. **Prerequisite:** Junior or senior classification. **Cross Listing:** HIST 419/RELS 419.

RELS 420 Nature, Sustainability and Religion

Credits 3. 3 Lecture Hours. Interaction between religion and the environment; examination of religious traditions and their concepts of the natural world; emphasis on cultural contexts and environmental sustainability. **Prerequisite:** Junior or senior classification.

RELS 425/HIST 425 The Sacred and Profane in History

Credits 3. 3 Lecture Hours. Case studies of the sacred in varied times and regions; holy persons; holy places; holy objects; language and literature of the sacred; competing concepts of the holy within society; gender and the holy; institutions promoting holy people and places; the impact of social, political, cultural and intellectual developments on the relationship between the sacred and the profane. **Prerequisites:** Junior or senior classification. **Cross Listing:** HIST 425/RELS 425.

RELS 430/AFST 430 African American Muslim Culture

Credits 3. 3 Lecture Hours. Exploration of popular culture and its impact on African American Muslims' intersectional identity formation and faith tradition through films, documentaries, readings, and lectures on and about Muslims emanating from enslaved narratives and the colonial period to the contemporary era. **Prerequisites:** Junior or senior classification, or approval of instructor. **Cross Listing:** AFST 430/RELS 430.

RELS 436/ANTH 436 Ancient Egypt I

Credits 3. 3 Lecture Hours. Archaeology and history of ancient Egypt from earliest times to the end of the New Kingdom period. **Prerequisites:** Junior or senior classification or approval of instructor. **Cross Listing:** ANTH 436/RELS 436.

RELS 438/ANTH 438 Ancient Egypt II

Credits 3. 3 Lecture Hours. Archaeology and history of ancient Egypt from the end of the New Kingdom to the end of the Graeco-Roman period. **Prerequisites:** Completion of ANTH 436/RELS 436 or RELS 436/ANTH 436 recommended but not required; junior or senior classification or approval of instructor. **Cross Listing:** ANTH 438/RELS 438.

RELS 464/PHIL 464 Modern Jewish Thought and Philosophy

Credits 3. 3 Lecture Hours. An overview of modern Jewish thought and philosophy spanning Jewish European thinkers from the 18th century to the 20th century. **Prerequisite:** Junior or senior classification or approval of instructor. **Cross Listing:** PHIL 464/RELS 464.

RELS 465/PHIL 465 Ethics After the Holocaust

Credits 3. 3 Lecture Hours. Analysis of the Holocaust as a challenge to previous ethical theories; ethical theories developed in response to the Holocaust. **Prerequisites:** Junior or senior classification, or approval of instructor. **Cross Listing:** PHIL 465/RELS 465.

RELS 471/HISP 471 Hispanic Religions

Credits 3. 3 Lecture Hours. Exploration of the history and practice of Hispanic religion, including spirit possession, evil eye, consumption of sacred substances, healing traditions, ex-votos, relics, prophecy, omens, monsters, astrology, witchcraft, the Inquisition, festivals, pilgrimage, mystics and religious contributions of diverse ethnic groups. **Prerequisite:** Junior or senior classification or approval of instructor. **Cross Listing:** HISP 471/RELS 471.

RELS 474/HISP 474 Diversity Lessons from Medieval Spain

Credits 3. 3 Lecture Hours. Crucible of cultures—Christian, Jewish, and Muslim—that was medieval Spain and modern implications of that experience in diversity. **Prerequisites:** ENGL 104 and junior or senior classification. **Cross Listing:** HISP 474/RELS 474.

RELS 480/COMM 480 Religious Communication

Credits 3. 3 Lecture Hours. The role of religious communication as manifested in speeches, sermons, debates, campaigns, and social movements throughout history. **Prerequisite:** Junior or senior classification or approval of instructor. **Cross Listing:** COMM 480/RELS 480.

RELS 481 Advanced Seminar in Religious Studies

Credits 3. 3 Lecture Hours. Intensive reading, study and discussion of topics in religious studies; interdisciplinary methods. May be taken four times for credit. **Prerequisites:** Junior or senior classification, or approval of instructor.

RELS 484 Internship

Credits 0 to 4. 0 to 4 Other Hours. Directed internship in a public or private organization to provide students with applied experience; opportunity to observe first hand issues and problems covered in religious studies courses; designed to enhance and clarify the student's career objectives. May be taken for credit up to six hours. **Prerequisites:** Approval of instructor.

RELS 485 Directed Studies

Credits 0 to 6. 0 to 6 Other Hours. Readings and/or assigned projects for specific needs of students minoring in religious studies; directed independent or individual study in an identified area of religious studies. **Prerequisite:** Junior or senior classification; approval of instructor.

RELS 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of religious studies. May be repeated for credit. **Prerequisite:** Junior or senior classification, or approval of instructor.

RELS 491 Research

Credits 0 to 3. 0 to 3 Other Hours. Research conducted under the direction of a faculty member in Liberal Arts. May be taken 3 times for credit. **Prerequisites:** Junior or senior classification and approval of instructor.

RPTS - Rec, Park & Tourism Sci (RPTS)

RPTS 209 Park and Tourism Operations

Credits 3. 2 Lecture Hours. 2 Lab Hours. Planning, execution and supervision of field maintenance and operations.

RPTS 304 Administration of Recreation Resource Agencies

Credits 3. 3 Lecture Hours. Contemporary issues and related administrative practices associated with the provision of recreation services and settings; addresses principles associated with recreation resource agency administration; personnel and customer-related administrative issues in recreation resource agencies; concepts and principles relevant to commercial and non-profit recreation resource agencies. **Prerequisites:** RPTS 201.

RPTS 321 Event Management and Operations II

Credits 3. 3 Lecture Hours. Advanced principles and applications of event management, including practical knowledge relating to contracting, media, fund raising, compliance and oversight, risk management, site logistics, sponsorships and vendor management. **Prerequisites:** HMGT 211 and HMGT 320.

RPTS 324 Event Management Final Assessment

Credits 0. 0 Other Hours. Demonstration of academic knowledge in management of events; document event coordination experience through completion of volunteer work and a website portfolio. **Prerequisites:** Enrollment in Professional Event Manager certificate; grade of C or better in HMGT 211 and HMGT 320; grade of C or better in RPTS 321 or concurrent enrollment.

RPTS 403 Financing and Marketing Recreation, Park and Tourism Resources

Credits 4. 3 Lecture Hours. 2 Lab Hours. Public sources of funding for facility development and of approaches to marketing recreation, park, and tourism services; applying knowledge to case study situations. **Prerequisites:** RPTS 304 or RPTS 423; senior classification.

RPTS 404/SOCI 404 Sociology of the Community

Credits 3. 3 Lecture Hours. Organization of American communities examining the bases of community, types of communities and the changes faced by communities. **Prerequisite:** SOCI 205; SOCI-404 also taught at Galveston campus. **Cross Listing:** SOCI 404/RPTS 404.

RPTS 460/ECCB 460 Nature, Values, and Protected Areas

Credits 3. 3 Lecture Hours. Writing-intensive discussion of the ways in which protected areas reflect human values about nature; identify stakeholders in and around protected areas, exploring how interests either conflict or coincide; evaluate social, economic, cultural, and ecological trade-offs of different approaches to conservation.

Prerequisite: Junior or senior classification or approval of instructor.

Cross Listing: ECCB 460/RPTS 460.

RUSS - Russian (RUSS)

RUSS 101 Beginning Russian I

Credits 4. 3 Lecture Hours. 2 Lab Hours. (RUSS 1411) Beginning Russian I. Elementary language study with oral, written and reading practice. Attention given to background for conversation. Part of class preparation will be done in language laboratory.

RUSS 102 Beginning Russian II

Credits 4. 3 Lecture Hours. 2 Lab Hours. (RUSS 1412) Beginning Russian II. Continuation of RUSS 101. Part of class preparation will be done in language laboratory. **Prerequisite:** RUSS 101.

RUSS 201 Intermediate Russian I

Credits 3. 3 Lecture Hours. (RUSS 2311) Intermediate Russian I. Continuation and review of grammar, selected readings; material to develop conversational and reading ability. **Prerequisite:** RUSS 102.

RUSS 202 Intermediate Russian II

Credits 3. 3 Lecture Hours. (RUSS 2312) Intermediate Russian II. Continuation of RUSS 201. Readings taken from standard works. **Prerequisite:** RUSS 201.

RUSS 211 Russian Conversation

Credits 3. 3 Lecture Hours. Development of conversational skills in Russian; building of active vocabulary; exercises with emphasis on correct diction; oral presentations; skits; dialogues; discussion of current events; conducted in Russian. **Prerequisite:** RUSS 102 or equivalent.

RUSS 221 Field Studies I

Credits 3. 3 Lecture Hours. Russian language and culture, taught in the former Soviet Union; supervised travel of cultural interest; participation in courses and activities at a Russian university or institute; exams, written and oral reports. **Prerequisites:** RUSS 102 with a grade of B or higher; concurrent enrollment in RUSS 222.

RUSS 222 Field Studies II

Credits 3. 3 Lecture Hours. Russian language and literature taught in the former Soviet Union in cooperation with a Russian university or institute; exams, written and oral reports. **Prerequisites:** RUSS 102 with a grade of B or higher; concurrent enrollment in RUSS 221.

RUSS 245/FILM 245 Contemporary Russia in Its Own Films

Credits 3. 3 Lecture Hours. Exploration of contemporary Russian and late Soviet films; focus on present-day cultural conditions in the Russian Federation and in the diaspora; taught in English. **Cross Listing:** FILM 245/RUSS 245.

RUSS 285 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Individual supervision of readings or assigned projects in Russian, selected for each student individually.

Prerequisite: Approval of instructor and department head.

RUSS 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of Russian. May be repeated for credit. **Prerequisite:** Approval of instructor.

RUSS 301 Advanced Grammar and Composition I

Credits 3. 3 Lecture Hours. Review of grammar at an advanced level; readings of literary texts for analysis and emulation; development of oral and written skills; required for modern languages majors in Russian; conducted in Russian. **Prerequisite:** RUSS 202 or RUSS 222 or registration therein.

RUSS 302 Advanced Grammar and Composition II

Credits 3. 3 Lecture Hours. Continuation of RUSS 301; review of grammar at an advanced level; readings of literary texts for analysis and emulation; development of oral and written skills; required for modern languages majors in Russian; conducted in Russian. **Prerequisite:** RUSS 202 or RUSS 222 or concurrent enrollment.

RUSS 322 Masterpieces of Russian Literature

Credits 3. 3 Lecture Hours. Selected works of Russian literature, representative of its major authors and most important literary movements; literary analysis and evaluation of each work's cultural background; conducted in Russian. **Prerequisite:** RUSS 202 or RUSS 222 or registration therein. May be retaken with approval of department head.

RUSS 410 Seminar in Russian Studies

Credits 3. 3 Lecture Hours. Exploration of a significant topic, event, or period in Russian literature and culture; taught in English. May be repeated for credit. **Prerequisite:** RUSS 202 or RUSS 222; junior or senior classification, or approval of instructor.

RUSS 441/EURO 441 The Russian Novel I - Tolstoy and Dostoevsky

Credits 3. 3 Lecture Hours. Study of the major works of Tolstoy and Dostoevsky; discussion of the literary nature and purpose of novels, especially in the context of Russian culture; taught in English. **Prerequisites:** RUSS 201 or concurrent enrollment; junior or senior classification, or approval of instructor. **Cross Listing:** EURO 441/RUSS 441.

RUSS 442/EURO 442 The Russian Novel II - The Twentieth Century

Credits 3. 3 Lecture Hours. Study of major Russian novels from ca. 1900 to the end of Stalinism; exploration of topics relevant to Russia's experience in the 20th century; taught in English. **Prerequisites:** RUSS 201 or concurrent enrollment; junior or senior classification, or approval of instructor. **Cross Listing:** EURO 442/RUSS 442.

RUSS 443/EURO 443 Contemporary Russian Prose

Credits 3. 3 Lecture Hours. Study of Russian and Soviet 20th century prose literature, with emphasis on post-Stalinist and post-glasnost writers; taught in English. **Prerequisite:** Junior or senior classification, or approval of instructor. **Cross Listing:** EURO 443/RUSS 443.

RUSS 444/EURO 444 Russian Drama

Credits 3. 3 Lecture Hours. Introduction to the masterpieces of Russian drama from the 19th century to the present; includes such authors as Pushkin, Chekhov, Gorky, Arbuzov, Rozov and Petrushevskaya; taught in English. **Prerequisite:** Junior or senior classification, or approval of instructor. **Cross Listing:** EURO 444/RUSS 444.

RUSS 446/EURO 446 Russian Artistic Culture I - Beginnings to 1900

Credits 3. 3 Lecture Hours. Masterpieces of Russian art, including architecture, dance, theater, music, and literature, from its beginnings until ca. 1900; taught in English. **Prerequisites:** Junior or senior classification, or approval of instructor. **Cross Listing:** EURO 446/RUSS 446.

RUSS 447/EURO 447 Russian Artistic Culture II - 1890 to Present

Credits 3. 3 Lecture Hours. Masterpieces of Russian art, including architecture, dance, theater, music, film, and literature, from ca. 1890 to the present; taught in English. **Prerequisites:** Junior or senior classification, or approval of instructor. **Cross Listing:** EURO 447/RUSS 447.

RUSS 485 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Individual supervision of readings or assigned projects, selected for each student individually; written and oral reports. **Prerequisite:** Approval of instructor and department head.

RUSS 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of Russian language, literature and civilization. **Prerequisite:** Approval of instructor.

RUSS 491 Research

Credits 1 to 3. 1 to 3 Other Hours. Research conducted under the direction of faculty member in Russian. May be taken three times for credit. **Prerequisites:** Junior or senior classification and approval of department head.

RWFM - Rang Wild & Fish Mgmt (RWFM)

RWFM 101 Exploring Rangeland, Wildlife and Fisheries Management

Credit 1. 1 Lecture Hour. Exploration of knowledge, skills and abilities required for varied careers within rangeland, wildlife and fisheries management; development of a professional portfolio and résumé; exploration of career options through team approach; conduct one service project.

RWFM 103 Introduction to Outdoor Enterprise Management

Credits 3. 3 Lecture Hours. Overview of the interface between consumptive and non-consumptive use of fish and wildlife resources and conservation; addresses the array of issues in conservation and consumptive/non-consumptive use of fish and wildlife resources.

RWFM 202 Concepts in Applied Plant Biology

Credits 3. 2 Lecture Hours. 2 Lab Hours. Overview of diversity in form and function present in the plant kingdom with linkage to the human condition; emphasis on the full spectrum of plant groups ranging from the lower plants to the highly advanced seed plants; selected families and genera considered in detail regarding important ecological and anthropogenic values; exploration of the structural, reproductive and ecological attributes from the cellular level to the whole organism; basic concepts of botanical classification and nomenclature.

RWFM 291 Research

Credits 1 to 4. 1 to 4 Other Hours. Research conducted under the direction of faculty member in wildlife and fisheries sciences. May be repeated 3 times for credit. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

RWFM 301 Wildland Watershed Management

Credits 3. 2 Lecture Hours. 2 Lab Hours. Elements of watershed management including range, forest and other natural resources and principles and practices of wildland management for protection, maintenance and improvement of water resource values. **Prerequisite:** Junior or senior classification or approval of instructor.

RWFM 302 Wildland Plants of North America

Credits 3. 2 Lecture Hours. 2 Lab Hours. Familiarization with the distribution and economic value of important wildland plants including range, forest and other natural resources in Texas and North America and fundamentals of sight identification of these plants; plant collection required. **Prerequisite:** Junior or senior classification or approval of instructor.

RWFM 305 Principles and Practices of Wildlife and Fisheries Management

Credits 3. 3 Lecture Hours. A broad survey of the diverse fields of wildlife, fisheries, and aquaculture management; exploration of professions for students interested in pursuing related careers; overview of the history and philosophical underpinnings of modern wildlife and fisheries management; emphasis on key subfields of each field that are translatable into post-graduate careers.

RWFM 306 Wildlife and the Changing Environment

Credits 3. 3 Lecture Hours. Using an ecosystem approach, analyzes changes in the North American environment; effects of these changes on wildlife populations; and reviews areas of major, current concern. **Prerequisites:** Junior or senior classification; restricted to non-majors.

RWFM 308 Fish and Wildlife Laws and Administration

Credits 3. 3 Lecture Hours. Review and analysis of state and federal laws and international treaties and conventions affecting fish and wildlife; their application and administration; organizational structure of state, federal and international agencies; their objectives, policies and practices. **Prerequisites:** Grade of C or better in ECCB 205 or BIOL 357; junior classification or approval of instructor.

RWFM 309/VTBP 301 Wildlife Diseases

Credits 3. 3 Lecture Hours. Basic mechanisms of diseases as they occur in wildlife populations; interplay of habitat requirements, individual physiological requirements and disease producing mechanisms of varied wildlife species. **Prerequisite:** Junior classification or approval of department head. **Cross Listing:** VTPB 301/RWFM 309.

RWFM 313 Vegetation Sampling Methods and Designs in Ecosystems

Credits 3. 2 Lecture Hours. 2 Lab Hours. Basis for vegetation sampling in ecosystems including range, forest and other natural resources; methods for conducting sampling; selection of sampling unit appropriate for vegetation type; sampling statistics; mean comparisons; regression analysis; sampling design principles; development of sampling plan; presentation and interpretation of sampling data. **Prerequisites:** Any MATH course satisfying university core curriculum, junior or senior classification or approval of instructor.

RWFM 314 Principles of Rangeland Management Around the World

Credits 3. 3 Lecture Hours. Basic knowledge of world rangeland ecosystems, how these systems are managed in diverse cultural settings; principles of underlying ecological processes influenced by various land management practices; foster understanding of the values that people in different countries place on rangeland resources; use of these values to enhance geologically sustainable and socially acceptable rangeland management practices. **Prerequisite:** Junior or senior classification or approval of instructor.

RWFM 316 Range Ecology

Credits 3. 2 Lecture Hours. 2 Lab Hours. Organization and distribution of rangeland ecosystems of the world, with emphasis on North America; community dynamics and functions stressed including biotic history, succession, disturbance regimes, competitive interactions, herbivory, energy flow and nutrient cycling; conservation of rangeland resources. **Prerequisites:** ECCB 205, ECCB 215, RWFM 302, and RWFM 314, junior or senior classification or approval of instructor.

RWFM 317 Vegetation Management

Credits 3. 3 Lecture Hours. Familiarization with practices that cause changes in rangeland vegetation composition for multiple uses; understanding of criteria for range improvement practices; comparison of expected responses of livestock forage production, watershed parameters and wildlife to vegetation changes following range improvements; systems concept for planning, analysis and implementation of range improvement practices. **Prerequisites:** RWFM 314, junior or senior classification or approval of instructor.

RWFM 321 Communicating Natural Resources

Credits 3. 3 Lecture Hours. Principles of effectively communicating natural resource science to a diverse stakeholder group; development of critical skills for obtaining and retaining employment in the Rangeland, Wildlife, and Fisheries Management fields; experience in audience identification, mixed-media presentations and interpersonal communications skills unique to the culture of diverse natural resources stakeholders. **Prerequisite:** RWFM major.

RWFM 322 Community Development and Sustainability

Credits 3. 3 Lecture Hours. Analysis of the elements comprising a community, community assessment techniques and community development processes engaged by stakeholders and residents to improve living conditions; definitions and principles associated with community development. **Prerequisites:** Junior or senior classification, or approval of instructor.

RWFM 323 Parks and Protected Area Management

Credits 3. 3 Lecture Hours. Focus on key aspects of parks and protected area management; significance of parks and protected areas in society; visitor use; systems and techniques for management; agencies and organizations involved, and factors that influence parks and protected area management. **Prerequisites:** Junior or senior classification, or approval of instructor.

RWFM 325 Watershed Analysis and Planning

Credits 3. 3 Lecture Hours. Provide an integrated framework for watershed planning that addresses the related biophysical, social and economic issues; comprehensive in scope and approach giving students the tools and techniques for developing sound watershed management policy and practice; water issues, problems and regulations for Texas. **Prerequisites:** Junior or senior classification, or approval of instructor.

RWFM 330 Conservation Principles and the Role of Hunting

Credits 3. 2 Lecture Hours. 2 Lab Hours. Integration of past conservation actions and icons with modern day policies; exploration of conservation funding mechanisms; instruction in hands-on learning related to firearm safety, components; hunter education certification; field exercises on departmental facilities and field trip to state conservation agency. **Prerequisites:** Junior or senior classification, or approval of instructor.

RWFM 333 Rangeland, Wildlife & Fisheries Field Techniques

Credits 3. 3 Other Hours. Rangeland, Wildlife & Fisheries Field Techniques. Techniques of natural resource principles in rangeland, wildlife and fisheries management within a field practicum setting; analyze and assess management scenarios through critical thinking exercises, field measurements, conservation planning, and integration of social, legal and regulatory, and economic factors and constraints.

RWFM 336 Research Methods in the Human Dimensions of Natural Resources

Credits 3. 3 Lecture Hours. Fundamentals of conducting research in the human dimensions of natural resources (HDNR); explanation of the scientific method; emphasis on identifying problems, sampling, data collection, questionnaire design, data analysis and interpretation, ethics, reporting and applications. **Prerequisites:** Junior or senior classification; or approval of instructor.

RWFM 344 Principles of Nature-Based Enterprises

Credits 3. 3 Lecture Hours. 0 Lab Hours. 0 Other Hours. Study of market opportunities for nature-based enterprises; principles for developing nature-based enterprises; examination of diverse forms of nature-based enterprises. **Prerequisites:** Junior or senior classification or approval of instructor.

RWFM 345 Human Dimensions of Natural Resource Management and Policy

Credits 3. 3 Lecture Hours. Social science principles that can help identify and address problems in natural resource and environmental management with two goals; exploration of concepts that help explain why people affect the environment as they do; introduction to methods for influencing and understanding human behavior that can be used to promote community and environmental sustainability. **Prerequisite:** Junior or senior classification.

RWFM 346 Park Ecology and Management

Credits 3. 1 Lecture Hour. 4 Lab Hours. Classroom and hands-on exposure to outdoor recreation resources management in a major national park facing complex challenges; interactive problem-solving to understand natural resources, management strategies and issues related to a park's broader region; includes one intensive week in Smoky Mountains National Park. May be taken two times for credit. **Prerequisites:** Junior or senior classification; or approval of instructor.

RWFM 349 Rangeland and Wildlife Animal Nutrition

Credits 3. 3 Lecture Hours. Connection of the life history of wild and domestic animals with the quality of their habitat by examining the transfer of energy and nutrients from foods to body tissues and activities for survival, growth and reproduction; exploration of the use of nutrition for management and conservation of rangelands and wildlands. **Prerequisite:** BIOL 357, or ECCB 205 and BIOL 112, or ECCB 205 and ANSC 107; ANSC 108; junior or senior classification.

RWFM 350 Wildlife and Fisheries Population Dynamics

Credits 3. 2 Lecture Hours. 3 Lab Hours. Development of a background in population dynamics of wildlife and fisheries species, and basic estimation of those parameters; theoretical components, how populations are measured, underlying heuristic theories of population dynamics, and methods for assessing wildlife and fisheries population dynamics and estimating population sizes. **Prerequisites:** STAT 302 or MATH 140, or approval of instructor.

RWFM 351 Geographic Information Systems for Resource Management

Credits 3. 2 Lecture Hours. 2 Lab Hours. Geographic Information Systems (GIS) approach to solving spatial problems and managing natural resources, including the acquisition, management, manipulation, analysis, and mapping of spatial and non-spatial databases; identification of natural and relevant features from various data sources; integration of relevant technologies and data; extensive use of GIS software to solve real-world problems. Only one of the following will satisfy the requirements for a degree: AGSM 461, ECCB 351, ECCB 651, BAEN 651, or RENR 651. **Prerequisites:** Junior or senior classification or approval of instructor. **Cross Listing:** AGSM 461 and ECCB 351.

RWFM 354 Wildlife Anatomy and Physiology

Credits 3. 2 Lecture Hours. 3 Lab Hours. Fundamental knowledge of the anatomy and physiology of wild animals; comparative form and function of all major vertebrate systems; familiarity with anatomical or physiological characteristics of various groups limit or allow their exploitation of different habitat types; examination and recognition of interactions between animals and their environment. **Prerequisite:** RWFM majors; BIOL 111 and BIOL 112.

RWFM 370 Aquatic Vegetation Identification and Management

Credits 3. 3 Lecture Hours. Identification and management of common and problematic aquatic vegetation species; aquatic plant ecology and management of aquatic vegetation as aquatic animal habitat; management methods include physical, chemical and biological methods as well as propagation and introduction and restoration. **Prerequisites:** Junior or senior classification, or approval of instructor.

RWFM 371 Fisheries and Small Impoundment Management

Credits 3. 3 Lecture Hours. Practices and principles with a focus on the variations in regional management techniques in North America, from north to south; history of fisheries and pond management, the pond environment, stocking strategies for recreational small impoundments, fisheries management in small bodies of water, water quality management, problem troubleshooting in small impoundments and management opportunities. **Prerequisites:** Junior or senior classification, or approval of instructor.

RWFM 375 Conservation of Natural Resources

Credits 3. 3 Lecture Hours. Principles and philosophies associated with the development, management and use of natural resources; ecological and social implications inherent in management alternatives involving the natural environment and use of renewable natural resources.

RWFM 400/ECCB 452 Study Abroad in Natural Resources

Credits 2 to 12. 2 to 12 Lecture Hours. Focus on an individual student effort assessing the ecological and human dimensions of biodiversity conservation and nature tourism; exposure to the ecological aspects of managing natural resources, especially wildlife populations and their habitat, as well as the economic, social, and cultural factors affecting biodiversity conservation and nature tourism in a developing country. May be taken two times for credit. **Prerequisite:** Junior or senior classification or approval of instructor. **Cross Listing:** ECCB 452/ RWFM 400.

RWFM 401 Rangeland Plant and Herbivory Dynamics

Credits 3. 3 Lecture Hours. Evaluation of the effects of herbivory at the plant population and community levels; developmental plant morphology and plant resistance to grazing; foraging strategies of herbivores relating to landscape and plant attributes along with animal nutritional needs; manipulation of the grazing process to meet management objectives; focus on resilience, adaptive management and alternative goods and services along with grazing topics. **Prerequisite:** RWFM 314.

RWFM 402 Wildlife Tracks and Signs

Credits 3. 3 Lecture Hours. Designed for ecologists, naturalists, and other parties who wish to have a deeper understanding of the behavior of terrestrial animals in terms of the habitats they frequent, what and where they feed, den and bedding locations, and other activities; designed for wildlife professionals who work in the field conducting animal surveys, observations, and capturing/handling wildlife or who are otherwise involved in teaching field skills. **Prerequisites:** Junior or senior classification; or approval of instructor.

RWFM 404 Aquatic Ecosystems

Credits 3. 3 Lecture Hours. Inland and coastal zone aquatic ecosystems, lower foodweb structure, functioning and influence on living resources; lakes, rivers, estuaries, open bay systems, factors impacting ecosystem health and fisheries; harmful algal blooms, reduced water inflows, eutrophication and hypoxia formation as they affect foodwebs, recruitment of commercially and recreationally important fisheries. **Prerequisite:** Junior or senior classification or approval of instructor.

RWFM 405 Urban Wildlife and Fisheries

Credits 3. 3 Lecture Hours. Urban wildlife and fisheries trains students to establish and maintain diverse, self-sustaining urban wildlife and fish populations at levels in harmony with ecological, social, and economic values of the human community and to develop optimal levels of public appreciation and use of urban wildlife and fish resources and associated habitats. **Prerequisites:** ECCB 205; junior or senior classification.

RWFM 406 Wildlife Habitat Management

Credits 3. 3 Lecture Hours. Designed to acquaint the student with major land use practices on lands that produce wildlife, how these influence wildlife production and alterations or manipulations of habitat used to achieve specific wildlife management goals. **Prerequisites:** Junior or senior classification, or approval of instructor.

RWFM 408 Techniques of Wildlife Management

Credits 3. 2 Lecture Hours. 3 Lab Hours. Techniques available to directly and indirectly manipulate wild animal populations to achieve balance between socioeconomic and aesthetic values. **Prerequisites:** Senior classification or approval of instructor.

RWFM 409 NATURE in the Classroom

Credits 3. 3 Lecture Hours. Integration of natural resources through conservation ecology programs, utilization of research techniques adaptable for classroom use; field trips to community facilities, gaming strategies and computer simulations. **Prerequisites:** Junior or senior classification or approval of instructor.

RWFM 410 Principles of Fisheries Techniques and Management

Credits 4. 3 Lecture Hours. 3 Lab Hours. Basic knowledge from ichthyology, biology of fishes and limnology related to applied aspects of freshwater and marine fishery science; management techniques applicable to streams, ponds, reservoirs, estuaries and the oceans. **Prerequisites:** BIOL 357, or grade of C or better in ECCB 311, ECCB 403, or RWFM 404, or approval of instructor.

RWFM 411 Ecosystem Management

Credits 4. 3 Lecture Hours. 3 Lab Hours. Concepts and practices relevant to the development of landscape/regional level ecosystem management plans including range, forest and other natural resources; an ecosystem management plan will be developed utilizing a strategic management/ coordinated resources approach to establish resource goals, ecosystem resource analysis and impact evaluation and implementation compatible with societal and individual concerns. **Prerequisites:** ECCB 205, senior classification or approval of instructor.

RWFM 415 Range Analysis and Management Planning

Credits 4. 3 Lecture Hours. 2 Lab Hours. Basic concepts and theories of range management systems. Resource inventory, analysis and management planning. **Prerequisites:** AGEC 105 or ECON 202, RWFM 314, RWFM 317; junior or senior classification or approval of instructor.

RWFM 419 Wildlife Restoration

Credits 3. 2 Lecture Hours. 3 Lab Hours. Study of the fundamentals of the restoration of animal populations and the resources they require; factors that control the distribution and abundances of animals in relation to restoration; and how restoration plans for wildlife are developed. **Prerequisite:** ECCB 205 or equivalent; junior or senior classification or approval of instructor; RWFM 406 and RWFM 407 and ECCB 320 preferred.

RWFM 420 Ecology and Society

Credits 3. 3 Lecture Hours. Study and compare human and natural ecosystems using diversity, interrelations, cycles, and energy as the conceptional organization; central themes are sustainability, stewardship and science. **Prerequisite:** Junior or senior classification.

RWFM 421 Game Bird Management

Credits 3. 2 Lecture Hours. 3 Lab Hours. Basic morphological, physiological and nutritional characteristics important to upland bird management, both game and non-game; history of upland bird habitat and management in the U.S., as well as current status of various groups of species; emphasis on population and habitat management techniques relevant to specific species; application of management principles to current, real-world management problems. **Prerequisites:** RWFM majors; ECCB 402 and RWFM 350, or approval of instructor.

RWFM 422 Large Mammal Management

Credits 3. 2 Lecture Hours. 3 Lab Hours. Management of various herbivorous large mammals, both game and non-game; development of knowledge on how to implement habitat and population management techniques to achieve management goals; history of modern wildlife management as it relates to the restoration and harvest of various species as game that once were imperiled; utilization of natural history information in the selection of the most the beneficial management techniques, and a survey of the techniques currently used in large mammal population management. **Prerequisite:** RWFM majors; ECCB 401 and RWFM 350.

RWFM 424 Wildlife Damage Management

Credits 3. 2 Lecture Hours. 3 Lab Hours. Exploration of the principles, philosophy, techniques, and application of wildlife damage management to solve negativistic human-wildlife interactions; exposure to animal capture, handling and sampling as well as human dimensions of wildlife damage management; hands-on project throughout the semester in real-world wildlife damage management situations; focus on preparation to pursue employment as a wildlife damage manager with public or private employers. **Prerequisite:** RWFM majors; ECCB 401 and RWFM 350.

RWFM 425 Carnivore Management

Credits 3. 2 Lecture Hours. 3 Lab Hours. Principles and practices of carnivore management; biology, ecology and management of various carnivorous wildlife species; application of the principles of trophic levels, carrying capacity and wildlife restoration to inform management plans; emphasis on current carnivore management scenarios that encompass both the biology and human-dimensions of carnivores; real-life examples to contextualize course learning. **Prerequisite:** RWFM majors; ECCB 401 and RWFM 350.

RWFM 436 Natural Resources Policy

Credits 3. 3 Lecture Hours. Natural resources and forest policy development in the United States and review of current issues in forest and related natural resource policy. **Prerequisite:** Junior or senior classification or approval of instructor.

RWFM 440 Wetland Delineation

Credits 3. 2 Lecture Hours. 2 Lab Hours. Application of the 1987 Wetland Delineation Manual in use by the Army Corps of Engineers (CORPS); field indicators of hydrophytic vegetation; hydric soils, wetland hydrology, methods for making jurisdictional determinations in non-disturbed and disturbed areas, recognition of problem wetlands and technical guidelines for wetlands. **Prerequisite:** Junior or senior classification.

RWFM 443 Aquaculture Production and Hatchery Management

Credits 3. 2 Lecture Hours. 2 Lab Hours. Scientific perspectives concerning major principles associated with fish production under controlled conditions; production techniques associated with prominent species produced via aquaculture throughout the world with emphasis on those cultured in the United States. **Prerequisite:** Junior or senior classification.

RWFM 444 Aquaculture Hatchery Management

Credits 3. 3 Lecture Hours. Study of finfish and shellfish hatchery requirements and operations, broodstock management, reproduction and hatchery techniques and application of those techniques in the field; management of hatchery systems for the production of seed stock. **Prerequisite:** Junior or senior classification or approval of instructor.

RWFM 445 Fish Health and Diseases

Credits 3. 3 Lecture Hours. Health disorders and diseases of finfish and shellfish including water quality issues and management, environmental endocrine disruptors, biosecurity and practical techniques used to isolate, identify and manage or mitigate diseases. **Prerequisite:** Junior or senior classification.

RWFM 446 Fish Physiology

Credits 3. 3 Lecture Hours. Physiology of fish focusing on the diverse range of functional adaptations that fish use to cope with various environmental and physiological states; bioenergetics, respiration, cardiovascular system, blood chemistry and function, muscle function and locomotion, gas exchange, buoyancy regulation, nitrogen metabolism and excretion, thermoregulation, reproduction, growth, osmoregulation, and immunity. **Prerequisite:** Junior or senior classification; ECCB 311.

RWFM 447 Aquatic Animal Nutrition, Diet Formulation and Feeding

Credits 3. 2 Lecture Hours. 2 Lab Hours. Review of scientific perspectives on major aspects of nutrition, diet formulation and feeding of aquatic species in aquaculture; major disease-causing organisms encountered in aquaculture and means of disease prevention and control. **Prerequisite:** Junior or senior classification.

RWFM 461 Community-Based Conservation

Credits 3. 3 Lecture Hours. Study of community-based conservation (CBC); definition, description, and analysis of the history, principles, critical actors, benefits, factors leading to successful initiatives, challenges in implementation and different models of community-based conservation. **Prerequisite:** Junior or senior classification.

RWFM 465 Managing Outdoor Enterprises

Credits 3. 3 Lecture Hours. Integration and synthesis of the skills learned throughout the outdoor enterprise management curriculum as well as presentations from industry representatives and content experts; application of various material from previous courses to managing a diverse array of outdoor enterprises. **Prerequisites:** Grade of C or better in RWFM 103; and junior or senior classification.

RWFM 470 Environmental Impact Assessment

Credits 3. 3 Lecture Hours. Evolution of natural resources regulatory policies and how this influences current procedures for environmental/natural resources assessment and management; demonstration of the environmental impact assessment procedures and policy issues associated with environmental impacts. **Prerequisite:** Junior or senior classification, or approval of instructor.

RWFM 480 Plant Identification and Undergraduate Range Management Exam

Credits 0 to 3. 0 to 3 Other Hours. Knowledge of plants morphology, identification and distribution for the profession of range management; knowledge of range management across the world; weekly tests to train on plant and range management knowledge. May be repeated for credit. **Prerequisites:** Junior or senior classification or approval of instructor.

RWFM 481 Senior Seminar

Credit 1. 1 Lecture Hour. Completion of professional e-portfolio, résumé and job application; exploration of job search, application, and interview; discipline competency exams; program evaluation. **Prerequisites:** Senior classification in ESSM or RWFM degree programs.

RWFM 484 Internship

Credits 0 to 9. 0 to 9 Other Hours. Practical experience working in a professional wildlife or fisheries facility. **Prerequisite:** Approval of department head.

RWFM 485 Directed Studies

Credits 1 to 3. 1 to 3 Other Hours. Individual study and research on selected problem approved by instructor and academic advisor. **Prerequisites:** Junior or senior classification; approval of department head.

RWFM 489 Special Topics in...

Credits 1 to 4. 1 to 4 Other Hours. Selected topics in an identified area of wildlife and fisheries sciences. May be repeated for credit. **Prerequisite:** Approval of department head.

RWFM 491 Research

Credits 0 to 6. 0 to 6 Other Hours. Laboratory and/or field research supervised by a faculty member in wildlife and fisheries sciences. Registration in multiple sections of this course are possible within a given semester provided the per semester credit hour limit is not exceeded. **Prerequisites:** Junior or senior classification; approval of instructor.

SCMT - Supply Chain Mgmt (SCMT)

SCMT 281 Supply Chain Management Professional Development

Credit 1. 1 Other Hour. Exposure to professional issues, contemporary supply chain and operations topics, potential supply chain career options, and supply chain management employers. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisites:** Admission to Mays Business School; intended SCMT major.

SCMT 300 Business Communications I

Credit 1. 1 Lecture Hour. Proper techniques for writing major-specific business communications; progress report, memorandum, letter, executive summary; verbal communications via phone call and person-to-person communications; critiques of personal and peer writing. **Prerequisite:** Grade of C or better in SCMT 364; concurrent enrollment in SCMT 361; junior or senior classification; SCMT majors.

SCMT 305 Forecasting and the Statistical Foundation of Business Analytics

Credits 3. 3 Lecture Hours. Selected topics in forecasting and the statistical foundation of business analytics; practical applications to supply chain management and other business functions. **Prerequisites:** BUSN 203 or STAT 211.

SCMT 309 Supply Chain Management Principles

Credits 3. 3 Lecture Hours. Integrated management of the make, buy and delivery processes in firms; emphasis on issues specific to the procurement, manufacturing, and logistics disciplines; requirements for operating in a global marketplace; includes cultural, functional and strategic aspects of global business. **Prerequisite:** ISTM 209; junior classification; University Studies Business Concentration students only.

SCMT 334 Purchasing Practices

Credits 3. 3 Lecture Hours. Operational practices to run a purchasing department; understanding the types of specifications; identifying and quantifying costs to make versus buy; identifying, soliciting, qualifying domestic and international suppliers; selecting suppliers; estimating the total cost of ownership; devising compensation agreements; understanding the legal framework; and assuring ethical practices. **Prerequisite:** SCMT 364 with a grade of C or better; admission to upper division in Mays Business School.

SCMT 335 Sourcing and Procurement

Credits 3. 3 Lecture Hours. Processes to identify and manage suppliers for goods and services to support operations; including sourcing, contracting, negotiations, buying procedures, cost and price analysis, vendor relations, auditing and inspection, supplier relations, and applications to information technology systems. **Prerequisite:** SCMT 364 with a grade of C or better; SCMT 340 and SCMT 361; or approval of instructor.

SCMT 336 Data Analytics with Optimization

Credits 3. 3 Lecture Hours. Application of quantitative decision-making techniques to management decision problems; focus on model development, solution and implementation of results; optimization. **Prerequisites:** SCMT 364; junior or senior classification; also taught at Galveston campus.

SCMT 340 Managing Logistics and Supply Chain Operations

Credits 3. 3 Lecture Hours. Integration of activities and processes needed to compete in a highly competitive global environment; application of methods and tools that generate competitive advantage, develop inventory models, conduct transportation analysis, evaluate strategic network configurations, and develop cohesive, competitive advantage generating strategies. **Prerequisite:** Grade of C or better in SCMT 364.

SCMT 345 Business Process Design

Credits 3. 3 Lecture Hours. Design, implementation and improvement of the processes by which a firm sources, makes, and delivers products and services to meet customer requirements; includes six-sigma, process flow charting, computer simulation, and other techniques to document, analyze, design and improve business processes. **Prerequisite:** SCMT 364 with a grade of C or better; SCMT 340 and SCMT 361; or approval of instructor.

SCMT 361 Operations Planning and Control

Credits 3. 3 Lecture Hours. Planning and controlling the conversion of materials, labor, capital, and information into goods and services for both manufacturing and service organizations; emphasis on managerial and technical aspects of planning and controlling operating systems. **Prerequisites:** Grade of C or better in SCMT 364 or INFO 364 or approval of instructor.

SCMT 364 Operations Management

Credits 3. 3 Lecture Hours. Concepts, issues and techniques used to plan, analyze, and control systems of production; operational problems in producing goods and services. **Prerequisite:** BUSN 203 or concurrent enrollment and admission to upper division in Mays Business School, Agribusiness, or Maritime Business Administration; also taught at Galveston campus.

SCMT 375 Supply Chain Security

Credits 3. 3 Lecture Hours. Security of global supply chains; selection of appropriate technologies utilized in securing global supply chains; planning responses to disaster events in relation to the delivery and receipt of goods and services; designing draft security policies for an organization's supply chain. **Prerequisite:** SCMT 364.

SCMT 380 Lean Business Systems

Credits 3. 3 Lecture Hours. Analysis of real world business challenges using an operational framework to identify and solve problems; provides a route map to sustain results; exploration of lean strategies such as root cause analysis, batch to pull processes, value stream mapping, level loading, line balancing. **Prerequisite:** Admission to upper division in Mays Business School.

SCMT 390 Blockchain and AI Business Transformation

Credits 3. 3 Lecture Hours. Transforming processes and business models through the application of advanced technologies; blockchain and Artificial Intelligence (AI); focus on underlying technologies, business process design, business case development and consulting; final project presentation of a new process or model and a supporting business case. **Prerequisite:** SCMT 364 or FINC 341; admission to upper-division in Mays Business School.

SCMT 455/ISTM 455 Cybersecurity Management

Credits 3. 3 Lecture Hours. Explores business, managerial and technological aspects of information and cybersecurity; analysis, design, implementation and management issues surrounding effective information security; includes risk management, business continuity planning, and security policy development. **Prerequisite:** ISTM 310 or SCMT 375. **Cross Listing:** ISTM 455/SCMT 455.

SCMT 465 Information Technology for Supply Chain Management

Credits 3. 3 Lecture Hours. Overview of information technology applications for planning and controlling the design, manufacture and distribution of goods and services; managerial and technical aspects of information technology for product design, shop floor, factory, enterprise and supply chain management. **Prerequisite:** SCMT 340 with a grade of C or better; SCMT 361; or approval of instructor.

SCMT 468 Enterprise Resource Planning

Credits 3. 3 Lecture Hours. Application of advanced information technology for integrating business functions through distributed databases; applications for planning, scheduling, purchasing and costing to multiple layers of the organization. **Prerequisite:** SCMT 364.

SCMT 469 Transportation Management Systems

Credits 3. 3 Lecture Hours. The discipline of transportation management; exploration of the transportation function as related to the different modes, role of government, carrier management, transportation economics and current trends in the field. **Prerequisite:** SCMT 364 and admission to upper division in Mays Business School.

SCMT 481 Seminar

Credit 1. 1 Other Hour. Exposure to professional issues, contemporary supply chain and operations topics, potential supply chain career options, and supply chain management employers. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisites:** Admission to upper division in Mays Business School; or approval of instructor.

SCMT 484 Supply Chain Management Internship

Credits 1 to 4. 1 to 4 Other Hours. A directed internship in an organization to provide students with a learning experience supervised by professionals in organizational settings appropriate to the student's professional objectives. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisite:** SCMT major and approval of academic advisor and instructor.

SCMT 485 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Directed study of selected problems in an area of supply chain management not covered in other courses. **Prerequisites:** Admission to upper division in Mays Business School and approval of academic advisor and instructor.

SCMT 489 Special Topics In...

Credits 1 to 4. 1 to 4 Other Hours. Selected topic in an identified field of supply chain management two times for credit. **Prerequisites:** Admission to upper division in Mays Business School and approval of academic advisor and instructor.

SCSC - Soil and Crop Sciences (SCSC)

SCSC 105 World Food and Fiber Crops

Credits 3. 2 Lecture Hours. 2 Lab Hours. (AGRI 1307, AGRI 1407) World Food and Fiber Crops. Plant relationships, structure and development; environmental factors affecting plants; technological aspects of agricultural practices; food production for an increasing population.

SCSC 201 American Agriculture

Credits 3. 3 Lecture Hours. American Indian farming; land settlement and Homestead Act; crops, and livestock; effects of wars; land grant universities; United States Department of Agriculture (USDA); great depression; dust bowl; farm equipment; irrigation; fertilization; pest controls; biotech and genetically modified organisms (GMOs); plant breeding; organic; precision farming; drones; cultural and social aspects of agriculture.

SCSC 205 Problem Solving in Plant and Soil Systems

Credits 3. 2 Lecture Hours. 2 Lab Hours. Problems in management of soils, crops, and natural resources; problem solving skills including collecting, interpreting, using and communicating scientific and nonscientific data.

SCSC 289 Special Topics In...

Credits 0 to 4. 0 to 4 Other Hours. Selected topics in an identified area of soil and crop sciences. May be repeated for credit.

SCSC 291 Research

Credits 1 to 3. 1 to 3 Lecture Hours. Research conducted under the direction of faculty member in agronomy. May be repeated 2 times for credit. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

SCSC 301 Soil Science

Credits 4. 3 Lecture Hours. 2 Lab Hours. Evaluation of the nature and properties of soils; explanation of the various soils, their components and roles in the environment using the scientific methods and technology. **Prerequisite:** Junior or senior classification, or approval of instructor.

SCSC 302 Recreational Turf

Credits 3. 3 Lecture Hours. Principles underlying construction and maintenance practices for turf facilities including athletic fields, golf courses, parks and home lawns; aesthetic, safety and economic aspects of turf varieties, soil conditions, plant protectants and maintenance equipment. **Prerequisite:** Biology or approval of instructor.

SCSC 304 Plant Breeding and Genetics

Credits 3. 3 Lecture Hours. 0 Lab Hours. Genetic improvement of crops by hybridization and selection; special breeding methods and techniques applicable to naturally self-pollinated, cross-pollinated and asexually reproduced plants. **Prerequisite:** SCSC 105, SCSC 205, or HORT 201, or approval of instructor.

SCSC 305 Professional Development in Agronomy

Credit 1. 2 Lab Hours. Development of soft skills required for a successful career in soil and crop sciences; includes a field trip to agricultural enterprises in Texas prior to the start of the summer session to interact with leadership from global agricultural companies and Texas A&M AgriLife researchers; enhancement of effective learning skills, job seeking and retention, and setting and achieving both near-term and long-term professional goals. **Prerequisites:** Junior or senior classification or approval of instructor.

SCSC 307 Crop Biology and Physiology

Credits 4. 3 Lecture Hours. 2 Lab Hours. Emphasis on seed biology, germination, development of cells and tissues, anatomy, and growth and development of crop plants; plant hormones and tropisms, membranes and membrane transport, water absorption and transport through plants, photosynthesis, respiration and carbohydrate metabolism, and flowering; environmental effects on crop adaptation, growth, development, and productivity. **Prerequisites:** SCSC 205, junior or senior classification, or approval of instructor.

SCSC 309 Water in Soils and Plants

Credits 3. 3 Lecture Hours. 0 Lab Hours. Fundamentals of plant water use, and water movement and storage in soils; evapotranspiration, plant water requirements and irrigation scheduling; issues impacting irrigation and water quality; techniques for measuring soil and plant water relations. **Prerequisites:** SCSC 301; junior or senior classification; knowledge of college-level algebra; or approval of instructor.

SCSC 310 Soil Morphology and Interpretations

Credits 3. 2 Lecture Hours. 3 Lab Hours. Field study of morphological features of soil profiles and the morphological characterization of soils concerning interpretation for soil use and management. **Prerequisites:** Junior or senior classification or approval of instructor.

SCSC 311 Principles of Crop Production

Credits 3. 3 Lecture Hours. Origin and development of major U.S. agronomic crops; crop and species adaptation; crop management factors such as cultivar selection, planting, pest control, plant nutrition, irrigation, harvesting; organic farming; conservation agriculture; bioenergy crops; influence of markets, government policies, and global economy on cropping strategies; provide an understanding of the major row and drill (agronomic) crops grown in the United States including barley, corn, cotton, grain sorghum, peanuts, rice, soybean and wheat. **Prerequisites:** SCSC 105 or SCSC 205, junior or senior classification, or approval of instructor.

SCSC 312 Professional Development in Turfgrass

Credit 1. 2 Lab Hours. Includes but not limited to fertilizer, pesticide, irrigation calculations; turfgrass, insect and weed identification and management, soils and rootzone construction; irrigation system operation and auditing; sprayer and spreader operation and calibration; builds upon and allows application of information obtained in SCSC 302; designed to better prepare those intending to compete in the GCSAA and STMA Collegiate Turf Bowl competitions. **Prerequisite:** SCSC 302 or registration therein.

SCSC 315 Hemp Production and Utilization

Credits 3. 3 Lecture Hours. Advanced topics in principles and practices of producing hemp and its utilization in industrial, nutritional and therapeutic activities. **Prerequisite:** Junior or senior classification.

SCSC 317 Environmental Field Soil Judging

Credits 2. 1 Lecture Hour. 3 Lab Hours. Evaluation, description and classification of soils in the field; assessment and interpretation of soil morphological, chemical and physical properties; compete in collegiate soil judging competitions. May be taken six times for credit. **Prerequisites:** Junior or senior classification or approval of instructor.

SCSC 330 Social and Ethical Aspects of International Cropping Systems

Credits 3. 3 Lecture Hours. 0 Lab Hours. Philosophical basis of ethical decisions; includes slavery, war, population growth, migration, farm workers, chemical inputs, genetically modified organisms, soil and water conservation and protection of wild species. **Prerequisite:** Junior or senior classification.

SCSC 401/FIVS 401 Forensic Soil Science

Credits 3. 2 Lecture Hours. 2 Lab Hours. Examination of soils biology, chemistry and physical attributes to solve crimes; soil and geologic characteristics associated with crime scene examination; physical, biological and chemical characteristics and use of trace evidence. **Prerequisite:** Grade of C or better in FIVS 282. **Cross Listing:** FIVS 401/SCSC 401.

SCSC 402 Crop Stress Management

Credits 4. 3 Lecture Hours. 2 Lab Hours. Identification, measurement, biology, physiology and management of crop stress; limitations of specific environments to crop productivity; morphological and physiological crop stress response mechanisms. **Prerequisites:** SCSC 307, junior or senior classification, or approval of instructor.

SCSC 405 Soil and Water Microbiology

Credits 3. 3 Lecture Hours. Roles of soil and water microorganisms in the sustainability and productivity of various ecosystems with specific emphasis on plant-microbial interactions, nutrient cycling, degradation of pesticides and other xenobiotics, generation of trace gases, and soil and water quality; hands-on laboratory experience with current techniques in soil and water microbiology. **Prerequisites:** Junior or senior classification, or approval of instructor.

SCSC 406 Soil and Water Microbiology Laboratory

Credit 1. 2 Lab Hours. Hands-on experience with current techniques for examining the types, numbers, activity and roles of soil and water microorganisms with specific application to the carbon, nitrogen and sulfur cycle; plant-microbial interactions; soil and water quality. **Prerequisites:** SCSC 405 or concurrent enrollment; junior or senior classification or approval of instructor.

SCSC 410 International Agricultural Systems

Credits 3. 3 Lecture Hours. Contrast modern agriculture systems with those in developing countries; emphasis on natural resources and technologies interacting with economic and social development on a global scale. **Prerequisite:** Junior or senior classification, or approval of instructor.

SCSC 411/GENE 411 Biotechnology for Crop Improvement

Credits 3. 3 Lecture Hours. Use of biotechnology to improve agricultural, horticultural and forest crops; techniques and methods used and case studies where biotechnology has been used to alter traits such as pathogen resistance, protein or oil consumption, ripening, fertility and wood properties. **Prerequisite:** BIOL 111 or equivalent, or approval of instructor. **Cross Listing:** GENE 411/SCSC 411.

SCSC 420 Brazilian Agriculture and Food Production Systems

Credits 3 to 6. 3 to 6 Lecture Hours. Comparison and study of Brazilian and U.S. agriculture and culture related to soil, water, and forest conservation and management in Brazil; tour and learn about Amazon River, rain forest, Brasilia, farm, ranch, and floral production systems, agricultural cooperatives and research, sugar and alcohol production, phosphate mining and production; visit points of interest. **Prerequisite:** Junior or senior classification or approval of instructor.

SCSC 421 International Agricultural Research Centers - Mexico

Credits 3. 3 Lecture Hours. International agricultural research; CIMMYT interaction; modern and underdeveloped tropical agricultural systems; introduction to Mexican culture; critical evaluation of complex and international agricultural issues and research programs. **Prerequisites:** Junior or senior classification and approval of instructor.

SCSC 422 Soil Fertility and Plant Nutrient Management

Credits 3. 3 Lecture Hours. Chemical and biological reactions in soils that influence nutrient availability to plants; environmental aspects associated with nutrient availability and fertilization, especially for nitrogen (N) and phosphorus (P). **Prerequisites:** SCSC 301, junior or senior classification, or approval of instructor.

SCSC 424 Soil Chemistry

Credits 3. 3 Lecture Hours. Chemistry of clay minerals, inorganic solid phases, and organic colloids in soil; mass transfer reactions in soils: absorption/desorption, precipitation/dissolution, gas/liquid phase exchange; principles of soil acidity and salinity; introduction to application of equilibrium concepts in soils. **Prerequisites:** SCSC 301 or approval of instructor; completion of introductory or fundamental chemistry is strongly encouraged.

SCSC 427 Sports Field Construction

Credits 4. 3 Lecture Hours. 3 Lab Hours. Development of knowledge, skills, and experiences for the design and construction of a turfgrass-based sports field; case studies and visits to model fields, guest lectures from sports field owners, designers, and construction company managers; hands-on construction of a small-scale sand-based sports field. **Prerequisites:** SCSC 309, junior or senior classification, or approval of instructor.

SCSC 428 Advanced Turf Ecology and Physiology

Credits 3. 3 Lecture Hours. Examination of how environmental stresses, genetics, and cultural management practices influence the growth, development, and physiology of turfgrasses; exploration of how turf communities function within urban landscapes; introduction to environmental, social, and political issues encountered when managing these areas.

SCSC 429 Turf Management Systems

Credits 4. 3 Lecture Hours. 2 Lab Hours. Development of turf management plans for large turfgrass sites including parks, golf courses and sports facilities; use of case studies to critically analyze turf management programs. **Prerequisite:** SCSC 428.

SCSC 430 Turfgrass Maintenance

Credits 3. 3 Lecture Hours. Effective leadership and management strategies, organizational structures, human resource management, employee training and motivational strategies, effective professional communication approaches with clientele, employees and within a leadership team within a turfgrass facility framework; emphases on ethics, professional development and life-long learning. **Prerequisite:** SCSC 429 or approval of instructor.

SCSC 432 Soil Fertility and Plant Nutrient Management Laboratory

Credit 1. 3 Lab Hours. Methods used in soil testing, fertilizer recommendations, chemical and physical properties of soils, and determination of specific characteristics of a collected and analyzed soil sample. **Prerequisites:** SCSC 301; SCSC 422 or registration therein, junior or senior classification, or approval of instructor.

SCSC 436 Industrial Hemp Bioproducts

Credits 3. 3 Lecture Hours. Examination of the relevance and scalability (DIY vs research vs commercial) of renewable, industrial hemp bioproducts within emerging bioeconomies, including biomass production and conversion platforms, potential biopolymer (biocomposite, phytochemical, platform molecule markets), environmental impacts and ecosystem services, and social, policy, and ethical considerations. **Prerequisites:** Junior or senior classification or approval of instructor.

SCSC 441 Advances in Agronomic Sciences

Credits 3. 3 Lecture Hours. Synthesis, integration and extension of agronomic and related concepts for understanding the functioning and management of agricultural cropping systems. **Prerequisite:** Senior classification or approval of instructor.

SCSC 444 Forage Ecology and Management

Credits 3. 3 Lecture Hours. Investigation of multidisciplinary approaches toward the development of integrated forage, livestock, and wildlife production systems that are economically feasible and environmentally sustainable. **Prerequisite:** Junior or senior classification or approval of instructor.

SCSC 446 Weed Management and Ecology

Credits 3. 2 Lecture Hours. 2 Lab Hours. Practical information related to weed management and ecology for various vegetative systems to include turf and agronomic crops; calibration of applicators, herbicide labels, mode of action of herbicides, herbicide-resistant weed management. **Prerequisites:** BIOL 111, BIOL 101 or BIOL 113, junior or senior classification.

SCSC 449 Weed Judging

Credit 1. 1 Lecture Hour. Comprehensive understanding of weed identification and management; practical, hands-on training; participation in the Southern Weed Science Society Weed Contest; expanding knowledge of forest, rangeland, agronomic, and turfgrass weeds. May be taken three times for credit. **Prerequisites:** SCSC 453; junior or senior classification or approval of instructor.

SCSC 453 Essentials for Weed Systematic Identification and Management in Agronomy

Credits 3. 3 Lecture Hours. Fundamental understanding and hands-on training on the basics of plant weed identification and management; relevant to agronomy, turf, horticulture and rangeland science and vegetation identification and management. **Prerequisite:** Junior or senior classification.

SCSC 455 Environmental Soil and Water Science

Credits 3. 3 Lecture Hours. Discussion of physical, chemical, and biological properties of soil and water and the impact on productivity and sustainability of various ecosystems; application of the knowledge of properties and soil processes to develop and evaluate strategies for protecting and/or improving soil and water quality. **Prerequisite:** SCSC 301 or approval of instructor.

SCSC 458 Watershed, Water and Soil Quality Management

Credits 3. 3 Lecture Hours. Land use impact on surface and ground water chemistry; legislation impacting water quality; surface and groundwater impairment and restoration. **Prerequisite:** CHEM 119 or equivalent or approval of instructor; junior or senior classification.

SCSC 481 Senior Seminar

Credits 2. 2 Lecture Hours. Capstone course bringing together student experiences, exams, and exercises necessary for completing and assessing curriculum program learning outcomes. **Prerequisite:** Senior classification.

SCSC 484 Internship

Credits 0 to 4. 0 to 4 Other Hours. Practical on-the-job experience in the student's area of specialization. **Prerequisites:** Junior or senior classification; approval of instructor; 2.0 or better GPR in major and overall.

SCSC 485 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. For advanced undergraduates to permit field or laboratory investigation or study of subject matter not included in established courses. **Prerequisite:** 10 hours of junior and senior agronomy or approval of instructor.

SCSC 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified area of agronomy. May be repeated for credit. **Prerequisite:** Approval of department head.

SCSC 491 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in agronomy. May be repeated 2 times for credit. Registration in multiple sections of this course are possible within a given semester provided that the per semester credit hour limit is not exceeded. **Prerequisites:** Junior or senior classification and approval of instructor.

SEFB - Special Ed Field Based (SEFB)

SEFB 315 Clinical Teaching I - Collaborative Practices in Education to Support Students with Disabilities

Credits 3. 2 Lecture Hours. 1 Other Hour. Field-based study of collaborative partnerships used in education to support students with disabilities; topics include best-practices in collaboration and effective co-teaching strategies; collaboration between professionals such as special educators, general educators, paraprofessionals, related service professionals, community agencies, and with families. **Prerequisites:** Grade of C or better in INST 210; admission to professional phase of program; or approval of instructor.

SEFB 325 Clinical Teaching II - Academic Data-Based Interventions

Credits 4. 3 Lecture Hours. 1 Other Hour. Field-based study of evidence-based academic interventions for students who are at-risk or who have disabilities; includes response to intervention (RTI)/multi-tier systems of supports (MTSS) strategies, data driven decision-making with assessments, data collection, selection of interventions, applying interventions, and progress monitoring used in school-based settings. **Prerequisites:** Grade of C or better in SEFB 315; SPED 325 or concurrent enrollment; admission to the professional phase of program.

SEFB 410 Clinical Teaching III - Specialized Instruction in High Support Needs

Credits 4. 3 Lecture Hours. 1 Other Hour. Overview of learning and behavioral characteristics of individuals with low-incidence disabilities such as intellectual disability, autism, physical disabilities, traumatic brain injury, sensory impairments, and multiple disabilities; research-based practices in assessment, instructional strategies, collaboration, and designing educational environments that facilitate active participation, self-advocacy, and independence. **Prerequisites:** Grade of C or better in SEFB 325 and SPED 325; SPED 410 or concurrent enrollment; admission to professional phase of program.

SEFB 420 Education and Employment Issues in Secondary Special Education

Credits 3. 2 Lecture Hours. 3 Other Hours. Field-based course involving psychological, social, physical and cognitive development of secondary-age students; career assessment; programmatic options within educational and employment settings; transition models from school to adult settings. **Prerequisites:** Admission to professional phase of program.

SEFB 425 Clinical Teaching IV

Credits 6. 24 Other Hours. Observation and participation in an accredited special education classroom; techniques of teaching special education and appropriate instructional strategies for students with exceptionalities. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisites:** Grade of C or better in SEFB 410 and SPED 410; admission to professional phase of program.

SEFB 430 Practicum in Applied Behavior Analysis

Credits 3. 9 Other Hours. University-supervised experience related to specializations in special education and behavior analysis. May be taken 8 times for credit. **Prerequisites:** Junior or senior classification; approval of instructor; approval of department head.

SENG - Safety Engineering (SENG)

SENG 310 Fundamentals of Safety Engineering

Credits 3. 3 Lecture Hours. Application of scientific and engineering principles in the selection and design of control systems related to chemical, physical and ergonomic exposures in the process and manufacturing industries; relationships of criteria, analysis and specifications for the assessment and control of occupational related illnesses.

SENG 312 System Safety Engineering

Credits 3. 3 Lecture Hours. Application of system safety analytical techniques to the design process; emphasis on the management of a system safety or product safety program; relationship with other disciplines such as reliability, maintainability, human factors and product liability applications. **Prerequisite:** Junior classification.

SENG 321 Safety Management Systems

Credits 3. 3 Lecture Hours. Concepts of design, operation and maintenance of optimally safe systems, risk management, economic impact, legislation, performance measurement and accident investigation and analysis; principles and practices in industrial hygiene engineering, fire protection engineering and introduction to systems safety engineering. **Prerequisite:** Junior classification.

SENG 422 Fire Protection Engineering - Facilities Design

Credits 3. 3 Lecture Hours. Design of facilities from a fire protection engineering viewpoint including fire detection and fire control systems; materials, equipment, exposures, occupancies and processes; both public and industrial occupancies studied to determine fire protection design specifications. **Prerequisite:** Approval of instructor.

SENG 430/CHEN 430 Risk Engineering

Credits 3. 3 Lecture Hours. Concepts of risk and risk assessment, including use of all available information to provide a foundation for risk-informed and cost-effective engineering practices; examples and exercises from a variety of engineering areas. **Prerequisite:** Junior or senior classification. **Cross Listing:** CHEN 430/SENG 430.

SENG 440 Material Safety in Semiconductor Manufacturing

Credits 3. 3 Lecture Hours. In-depth understanding of hazardous materials commonly used in semiconductor manufacturing processes; focus on the significance of hazardous materials handling and the safe way to do it; safe handling practices, storage requirements, emergency response procedures, and regulatory compliance specific to hazardous materials in semiconductor facilities; modeling and management techniques for different consequences (e.g., toxicity, fire, and explosion). **Prerequisites:** Junior or senior classification.

SENG 441 Process Safety in Semiconductor Manufacturing

Credits 3. 3 Lecture Hours. Comprehensive understanding of chemical process safety principles and practices specifically tailored to the semiconductor manufacturing industry; overview of how to identify and mitigate hazards associated with chemical processes, develop emergency response plans, and gain insights into safety management systems within semiconductor facilities. **Prerequisites:** Junior or senior classification.

SENG 442 Vapor Phase Techniques for Semiconductor Manufacturing

Credits 3. 3 Lecture Hours. Comprehensive understanding of physical vapor deposition (PVD) and chemical vapor deposition (CVD) techniques and their crucial roles in semiconductor manufacturing; understanding of the principles, processes, and applications of PVD and CVD, with a specific focus on mass transport, heat transport, chemistry for CVD, epitaxy, vapor phase exchange, and CVD reactor design; topics include how to distinguish between PVD and CVD methods, effectively choose the most suitable CVD techniques for specific industrial applications, perform calculations related to mass transport, analyze heat transfer mechanisms, anticipate chemical reactions within deposition processes, apply epitaxial growth principles, optimize vapor phase exchange mechanisms, and engineer custom CVD reactor systems tailored to industry requirements; various aspects of semiconductor manufacturing, research, and development; exploration of the efficiency of film deposition processes, exert control over film characteristics, and actively contribute to the continuous advancement of semiconductor technology. **Prerequisites:** Junior or senior classification.

SENG 455/CHEN 455 Process Safety Engineering

Credits 3. 3 Lecture Hours. Applications of engineering principles to process safety and hazards analysis, mitigation, and prevention, with special emphasis on the chemical process industries; includes source modeling for leakage rates, dispersion, analysis, relief valve sizing, fire and explosion damage analysis, hazards identification, risk analysis, accident investigations. **Prerequisites:** Grade of C or better in CHEN 322; senior classification; engineering majors. **Cross Listing:** CHEN 455/SENG 455.

SENG 460/CHEN 460 Quantitative Risk Analysis in Safety Engineering

Credits 3. 3 Lecture Hours. Fundamental concepts, techniques, and applications of risk analysis and risk-informed decision making for engineering students; practical uses of probabilistic methods are demonstrated in exercises and case studies from diverse engineering areas. **Prerequisite:** Senior or graduate classification. **Cross Listing:** CHEN 460/SENG 460.

SENG 485 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Permits students to develop special projects in industrial hygiene engineering, safety engineering or fire protection engineering. Project must be approved by department head.

SENG 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in industrial hygiene engineering, safety engineering or fire protection engineering of specific student interest. May be repeated for credit. **Prerequisite:** Approval of instructor.

SOCI - Sociology (SOCI)

SOCI 203 U.S.-Mexico Border

Credits 3. 3 Lecture Hours. Understanding of the U.S.-Mexico border from different theoretical perspectives, including structural violence, identity, power and demography.

SOCI 205 Introduction to Sociology

Credits 3. 3 Lecture Hours. (SOC1 1301) Introduction to Sociology. Sociological perspectives including concepts and methods; social class and social status, the family, minorities, crime, religion, power, urbanization and population; also taught at Galveston campus.

SOCI 206 Global Social Trends

Credits 3. 3 Lecture Hours. Long-term trends in world societies from ancient times to the present and to the foreseeable future; emphasis on contemporary international issues and problems, techniques of analysis and future projections.

SOCI 207/WGST 207 Introduction to Gender and Society

Credits 3. 3 Lecture Hours. Similarities and differences between females and males in a number of cultures throughout the world; sociological analysis of gender in relation to social structure. **Cross Listing:** WGST 207/SOCI 207.

SOCI 210 Sociology of Technology and Science

Credits 3. 3 Lecture Hours. Examination of technology and science from a variety of theoretical perspectives; process by which engineered products are influenced by social factors as well as how they in turn, impact society; exploration and critique of classic and contemporary theories of technological development.

SOCI 211 Sociology of Deviance

Credits 3. 3 Lecture Hours. Perspectives on non-normative behavior; theories of deviance.

SOCI 212 Sociology of Popular Culture

Credits 3. 3 Lecture Hours. Examination of the classic and contemporary social scientific definitions and theories of culture, and popular versus "high" or elite culture(s), various forms and arenas of popular culture, such as television, film, and music, institutions and popular culture, identity (race, class, gender and sexuality) and popular culture.

SOCI 213/WGST 213 Gender and Health

Credits 3. 3 Lecture Hours. An examination of social and historical context of health in the U.S., including inequities in health by gender, race, class and gendered issues in health professions. **Cross Listing:** WGST 213/SOCI 213.

SOCI 214 Social Problems

Credits 3. 3 Lecture Hours. Survey and exploration of causes and consequences of major social problems in American society such as poverty, unemployment, energy, alcohol, other drugs and sexual abuse.

SOCI 215/WGST 205 Introduction to Lesbian, Gay, Bisexual, Transgender, and Queer Studies

Credits 3. 3 Lecture Hours. Interdisciplinary survey of the histories of and theories regarding Lesbian, Gay, Bisexual, Transgender, Queer (LGBTQ +) identities and communities; the social construction of sexuality and gender; institutional ways in which homophobia, biphobia, and transphobia are systematically deployed; advocacy by and on behalf of LGBTQ+ individuals; evolution of desire and subjectivity. **Cross Listing:** WGST 205/SOCI 215.

SOCI 217 Introduction to Race and Ethnicity

Credits 3. 3 Lecture Hours. Introduction to the sociological examination of race and ethnicity in U.S. society; overview of theories and methods in the study of race and ethnicity, an understanding of how they function as individual and group-level identities, and organizing principles in social institutions.

SOCI 220 Methods of Social Research

Credits 3. 2 Lecture Hours. 2 Lab Hours. Relationships between sociological theory, research, qualitative evaluation of data; construction and use of analytical procedures and research techniques, and participant observation.

SOCI 229 Qualitative Methods

Credits 3. 3 Lecture Hours. Methodologies in social research with emphasis on qualitative dimensions of inquiry; topics include in-depth interviewing, observation, unobtrusive measures, analysis of documents, fieldwork issues, ethics, note-taking, preliminary data analysis, and an overview of writing research reports based on qualitative research.

SOCI 230 Classical Sociological Theory

Credits 3. 3 Lecture Hours. Role of theory in sociological study; the development of classical theoretical perspectives providing the foundation for contemporary theory.

SOCI 240 Tourism, Culture and Place

Credits 3. 3 Lecture Hours. Analysis of tourist encounters; marketing and displaying culture to tourists; implications of tourism for urban economies and landscapes; interactions between tourists and locals; Galveston campus.

SOCI 285 Directed Studies

Credits 0 to 3. 0 to 3 Other Hours. Special problems not covered by other courses. Course depends upon needs and interest of the student and upon the number of credit hours. **Prerequisite:** Sophomore classification in sociology.

SOCI 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified area of sociology. May be repeated for credit. **Prerequisite:** Approval of instructor; also taught at Galveston campus.

SOCI 291 Research

Credits 0 to 3. 0 to 3 Other Hours. Research conducted under the direction of a chosen faculty member in sociology. May be taken for a maximum of three hours total credit. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

SOCI 304 Criminology

Credits 3. 3 Lecture Hours. Criminal law and crime rates; explanations of criminal behavior; criminal careers, police, adult courts and prisons. **Prerequisite:** Junior or senior classification.

SOCI 311 Social Change

Credits 3. 3 Lecture Hours. Survey of major changes in American and Western society, the forces underlying change and tensions caused by social change. **Prerequisite:** Junior or senior classification or approval of instructor.

SOCI 312 Population and Society

Credits 3. 3 Lecture Hours. The causes and implications of major population trends; also taught at Galveston campus.

SOCI 315/WGST 315 The Marriage Institution

Credits 3. 3 Lecture Hours. Courtship, engagement, marriage, family formation, personal adjustment, conflict, financing and child rearing.

Cross Listing: WGST 315/SOCI 315.

SOCI 316/WGST 316 Sociology of Gender

Credits 3. 3 Lecture Hours. Sociological explanations of status differences between men and women; cross-cultural comparisons; gender role socialization, cultural stereotypes, discrimination; gender roles and status in the family, economy, religion, science, other social institutions; deviance, victimization and gender; recent social changes.

Cross Listing: WGST 316/SOCI 316.

SOCI 317/AFST 317 Racial and Ethnic Relations

Credits 3. 3 Lecture Hours. Status of racial and ethnic groups such as Native Americans, African Americans, Latino Americans, Asian Americans, European Americans, and other groups in the political, economic, legal and social systems of the United States. **Cross Listing:** AFST 317/SOCI 317.

SOCI 319/SPMT 319 Sociology of Sport

Credits 3. 3 Lecture Hours. Social institution of sport and its consequences for American society; social organization from play to professional sport; violence, discrimination, women in sport; socialization implications from participation in sports. **Prerequisite:** Junior or senior classification. **Cross Listing:** SPMT 319/SOCI 319.

SOCI 320 Demographic Methods

Credits 3. 3 Lecture Hours. Procedures and techniques of demographic analysis; examination of demographic data; calculation of rates; construction of life tables; population estimates and projections.

Prerequisite: Junior or senior classification or approval of instructor; also taught at Galveston campus.

SOCI 323/AFST 323 Sociology of African Americans

Credits 3. 3 Lecture Hours. Major elements of the Afro-American subculture in relation to white American society and its major social institutions. **Prerequisite:** SOCI 205. **Cross Listing:** AFST 323/SOCI 323.

SOCI 326/RELS 326 Sociology of Religion

Credits 3. 3 Lecture Hours. Institution of religion and religious-related behavior; relationship between dynamic and structural religion and contemporary society. **Prerequisite:** SOCI 205. **Cross Listing:** RELS 326/SOCI 326.

SOCI 328 Environmental Sociology

Credits 3. 3 Lecture Hours. A comprehensive overview of environmental sociology, including major sociological theories, concepts and policy issues affecting our understanding of environmental changes; emphasizes social factors that impact environmental quality.

Prerequisite: SOCI 205 or approval of instructor; also taught at Galveston campus.

SOCI 330 Sociology of Nutrition

Credits 3. 3 Lecture Hours. Social factors affecting the kind and amount of food consumed around the world; social consequences of nutritional status for family functioning and for international development.

SOCI 335 Sociology of Organizations

Credits 3. 3 Lecture Hours. How people act in organizations; structures in organizations; the relationship between organizations and their environments.

SOCI 337 International Migration

Credits 3. 3 Lecture Hours. Survey of theories and trends in international migration. **Prerequisite:** Junior or senior classification, or approval of instructor.

SOCI 338 Latino Immigration

Credits 3. 3 Lecture Hours. Theoretical and empirical examinations of the causes, processes, and impacts of Latin American immigration to the U.S.; Latino/a immigrant experience in the U.S.; effects of immigration on sending and receiving communities. **Prerequisite:** Junior or senior classification or approval of the instructor.

SOCI 376/MGMT 376 Entrepreneurial Perspectives

Credits 3. 3 Lecture Hours. Entrepreneurship as a career choice and its impact on society and economy; definitions of entrepreneurship; discovery of entrepreneurial opportunities and start-up funding; innovation and entrepreneurship theories for analyzing and predicting success of start-up and established entrepreneurial organizations.

Prerequisite: Admission to upper division in Mays Business School. **Cross Listing:** MGMT 376/SOCI 376.

SOCI 377 Entrepreneurial Thought Leaders Seminar

Credits 3. 3 Lecture Hours. Origins of entrepreneurial cognition and motivation; entrepreneurial thought leaders share lessons from real world experiences in non-profit, profit-making enterprise, government, public policy, and social mission domains; reflection on thought leaders experience in innovation and entrepreneurship; build exposure to entrepreneurial thinking, role modeling, mentoring, social capital.

SOCI 403 Sociology of Latinos

Credits 3. 3 Lecture Hours. Exploration of social characteristics and acculturation problems of Mexican Americans in the United States; styles of life and cultural variability, social mobility, the struggle for advancement and identity through social movements.

SOCI 404/RPTS 404 Sociology of the Community

Credits 3. 3 Lecture Hours. Organization of American communities examining the bases of community, types of communities and the changes faced by communities. **Prerequisite:** SOCI 205; SOCI-404 also taught at Galveston campus. **Cross Listing:** RPTS 404/SOCI 404.

SOCI 408 Death and Dying

Credits 3. 3 Lecture Hours. Exploration of interdisciplinary social issues surrounding death and dying: the interactions among professionals, families, and dying individuals; the development and functioning of death norms and institutions (e.g., hospitals, funeral homes, hospice, capital punishment); the critical analysis of social/cultural inequalities affecting when and how we die. **Prerequisite:** Junior or senior classification or approval of instructor.

SOCI 410/WGST 410 Reproduction, Birth and Power

Credits 3. 3 Lecture Hours. Examination of topics related to reproductive practices, experiences and ideologies and of the constructed and contested meanings surrounding womanhood, motherhood, sexuality, reproductive freedom and eugenics. **Prerequisites:** SOCI 205; junior or senior classification. **Cross Listing:** WGST 410/SOCI 410.

SOCI 411 Social Psychology

Credits 3. 3 Lecture Hours. Effects of social experience and groups on the development of personality, attitudes, values and behavior. **Prerequisite:** 3 hours of sociology or psychology.

SOCI 412 Political Sociology

Credits 3. 3 Lecture Hours. Survey of social bases of power; state formation in advanced industrial societies; origins of welfare state; interrelation of nationalism; culture and class formation. **Prerequisite:** Junior or senior classification or approval of instructor.

SOCI 413 Social Movements

Credits 3. 3 Lecture Hours. Survey of social movements; emphasis on social movement participation, emergence and outcomes; analysis of revolutions and movements in the developing world; theory and methods of social movement research. **Prerequisite:** Junior or senior classification or approval of instructor.

SOCI 415 Sociology of Education

Credits 3. 3 Lecture Hours. Relationship of social structure and change to education; social background and student performance; teachers and their careers; bureaucracy and change in education. **Prerequisite:** SOCI 205.

SOCI 419 Social Class in Contemporary Society

Credits 3. 3 Lecture Hours. Composition and consequences of social class structure; social class explanations for lifestyle patterns, educational and occupational achievements. **Prerequisite:** SOCI 205.

SOCI 420 Advanced Methods of Social Research

Credits 3. 2 Lecture Hours. 2 Lab Hours. Philosophy and methods of social research, including research design; methods of observation; questionnaires, interviews and other sources of social data; qualitative and quantitative techniques of inference, analysis and research report writing. **Prerequisite:** SOCI 220.

SOCI 421/WGST 421 Gender & Crime

Credits 3. 3 Lecture Hours. Gender & Crime. Gender disparities in contemporary patterns of crime, victimization and incarceration; key concepts, major theories and empirical research studies around gender and crime. **Prerequisite:** Grade of C or better in SOCI 207/WGST 207, SOCI 211, SOCI 304, SOCI 316/WGST 316, WGST 200, WGST 207/SOCI 207, or WGST 316/SOCI 316. **Cross Listing:** WGST 421/SOCI 421.

SOCI 422 Race, Ethnicity, Crime and Justice

Credits 3. 3 Lecture Hours. Racial/ethnic disparities in criminal offending and victimization, as well as different experiences with law enforcement, judicial, and correctional agencies. **Prerequisites:** SOCI 220 or equivalent. **Cross Listing:** AFST 422 and LMAS 422.

SOCI 425 Medical Sociology

Credits 3. 3 Lecture Hours. Organization, value systems and practice of medicine and the provision of health care in the U.S.; role of physicians, health occupations and patients; marginal and folk medicine. **Prerequisite:** SOCI 205.

SOCI 430 Contemporary Sociological Theory

Credits 3. 3 Lecture Hours. Basic ideas of contemporary sociological theory: structuralism, functionalism, conflict, symbolic interaction, exchange and their application to current research. **Prerequisite:** SOCI 230.

SOCI 432/MGMT 479 Technology Commercialization

Credits 3. 3 Lecture Hours. Examination of the process of introducing to the marketplace new products or services based upon scientific and technological innovations; practical skills for assessing the technology, identifying potential products and services, and quantifying market demand; focuses on value creation, financing, intellectual property law, regulatory, and socio-economic drivers. **Prerequisite:** Junior or senior classification or admission to upper division in Mays Business School; SOCI 376/MGMT 376 or MGMT 376/SOCI 376 and SOCI 476/MGMT 476 or MGMT 476/SOCI 476 recommended. **Cross Listing:** MGMT 479/SOCI 432.

SOCI 445 Sociology of Law

Credits 3. 3 Lecture Hours. Introduction to the sociology of law; the relation of law to general social control and to organizational dynamics.

SOCI 446 Sociology of War Crimes

Credits 3. 3 Lecture Hours. Sociological and cultural perspectives on war crimes; topics of responsibility, command responsibility, court-martial, and interrogation techniques; theories and concepts from forensic sociology applied to case studies. **Prerequisites:** Junior or senior classification.

SOCI 450 Social Entrepreneurship

Credits 3. 3 Lecture Hours. Applying business principles and practices to solve social, economic and environmental problems; social entrepreneurship concepts and issues in scaling social enterprise ventures including management tools, organization structures, funding sources, impact measurement; experience in opportunity recognition, designing, planning, pitching social mission ventures; build social capital with social enterprise founders. **Prerequisites:** Junior or senior classification. **Cross Listing:** MGMT 478 and PSAA 465.

SOCI 455/WGST 445 Queer Theory

Credits 3. 3 Lecture Hours. Examines origins of theories of gender and sexual diversity and their intersections with feminist theories; considers foundational and contemporary texts that address queer theory. **Prerequisites:** 6 hours in Women's and Gender Studies; senior classification or approval of instructor. **Cross Listing:** WGST 445/ SOCI 455.

SOCI 463 Gender in Asia

Credits 3. 3 Lecture Hours. Gender dynamics in Asia; changes in gender roles; women's movements; women and the economy; women and politics; men's and women's private lives. **Prerequisite:** Junior or senior classification or approval of instructor. **Cross Listing:** ASIA 463 and WGST 463.

SOCI 476/MGMT 476 Entrepreneurship Practice

Credits 3. 3 Lecture Hours. Practical skills for creating new businesses; evaluating, planning and operational strategy, including assessing the technology; product and service markets, value creation model; financing strategies; legal, regulatory, socio-economic drivers, risks; leadership to develop management team, advisory board; go-to-market strategy; develop own entrepreneurial opportunities or those of faculty and entrepreneurs. **Cross Listing:** MGMT 476/SOCI 476.

SOCI 478 Professional Development in Sociology I

Credit 1. 1 Lecture Hour. Career fields available to sociology majors, including the nature of the work, professional expectations, and the credentials for entry in the fields. **Prerequisite:** Sociology major; junior or senior classification.

SOCI 479 Professional Development in Sociology II

Credits 2. 2 Lecture Hours. Preparation for careers in sociology-related professionals by in-depth research of prospective career fields, development of oral, written, and media skills, formation of professional networks, and training in professional ethics, cultural diversity, and leadership. **Prerequisite:** Sociology major; junior or senior classification.

SOCI 484 Field Practicum

Credits 0 to 4. 0 to 4 Other Hours. Field Experiences. Participation in an approved agency. Field experience will be supervised by selected agency personnel and appropriate faculty. Experiences and requirements will vary slightly according to placement and student interests. **Prerequisites:** Major in sociology; 12 hours of sociology; approval of undergraduate advisor; also taught at Galveston campus.

SOCI 485 Directed Studies

Credits 0 to 3. 0 to 3 Other Hours. Special problems not covered by other courses. Course depends upon needs and interest of the student and upon the number of credit hours. **Prerequisite:** Senior classification in sociology.

SOCI 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of sociology. May be repeated for credit. **Prerequisite:** Approval of instructor.

SOCI 491 Research

Credits 0 to 3. 0 to 3 Other Hours. Research conducted under the direction of a chosen faculty member in sociology. May be taken four times for credit. **Prerequisites:** Junior or senior classification and approval of instructor.

SOMS - Schl of Military Sciences (SOMS)

SOMS 111 Principles of Academic and Personal Development

Credits 0-1. 0-1 Lecture Hours. Identification of personal goals and learning skills promoting academic and career success; development of personal leadership strengths, styles, motivation and values; personal development planning for self-improvement. **Prerequisite:** Freshman classification or approval of instructor.

SOMS 180 Survey of Performance Based Training Methods

Credits 0-1. 0-1 Lecture Hours. Introduction to performance oriented training methods and techniques; key concepts and generalizations of training and identification of training needs; study of representative theories of workplace training, performance evaluation, and experiential training techniques. **Prerequisite:** Freshman classification or approval of instructor.

SOMS 181 Developing and Instructing Others

Credits 0-1. 0-1 Lecture Hours. Introduction to leadership, mentoring and instructing others in the specific context of military-style training; survey of basic military performance counseling skills; introduction to subordinate instruction and evaluation techniques. **Prerequisite:** Freshman classification or approval of instructor.

SOMS 280 Fundamentals of Peer Leadership

Credits 0-1. 0-1 Lecture Hours. Introduction to theories of peer leadership when applied to a specific context; fundamentals and techniques of small group communication; performance evaluation; survey of basic supervisory skills. **Prerequisite:** Sophomore classification or approval of instructor.

SOMS 281 Fundamentals of Intentional Leadership

Credits 0-1. 0-1 Lecture Hours. Exposure to the fundamentals of intentional leadership, deliberate practice, planning and leadership assessment; development of initial personal leadership development plans; alignment of personal and organizational values, vision, mission, purpose and goals toward desired outcomes. **Prerequisites:** Grade of C or better in SOMS 280 or approval of department head or director.

SOMS 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of leadership theory and practice. May be repeated for credit. **Prerequisites:** Freshman or sophomore classification; approval of instructor.

SOMS 380 Workshop in Leadership Education

Credits 0-1. 0-1 Lecture Hours. The study of leadership theory, intra group relationships, assessment tools for skills development, and techniques for achieving group goals. **Prerequisite:** Junior classification or approval of instructor.

SOMS 381 Workshop in Leadership Education II

Credits 0-1. 0-1 Lecture Hours. Continuation of SOMS 380. Fundamentals of small group dynamics; interpersonal communication; application of selected leadership theories; interpretation of individual assessments to include personality traits, values, and signature strengths. **Prerequisites:** SOMS 380; junior or senior classification.

SOMS 481 Seminar in Executive Leadership

Credits 0-1. 0-1 Other Hours. The study of contemporary leadership issues, organizational effectiveness, problem solving, and decision making. **Prerequisite:** Senior classification or approval of instructor.

SOMS 482 Seminar in Executive Leadership II

Credits 0-1. 0-1 Other Hours. Continuation of SOMS 481. Discussion of ethical dilemmas in leadership roles; ethical decision-making; personal accountability in organizational settings. **Prerequisite:** SOMS 481 or approval of instructor.

SOMS 485 Directed Studies

Credits 0 to 4. 0 to 4 Lecture Hours. Individual supervision of special readings or assigned projects to promote independent study; program enrichment for capable students; written and oral reports required. **Prerequisite:** Approval of instructor.

SOMS 486 Seminar in Executive Organizational Leadership

Credits 3. 3 Other Hours. Examination of the leadership demands of executive leaders in organizations; includes roles and responsibilities in executive leadership, creating organizational culture and influencing organizational norms, defining desirable outcomes and results and developing others in a leadership team; the practice of communicating vision and purpose and intentionality toward continuous development as a leader. **Prerequisite:** Senior classification or approval of instructor.

SOMS 487 Seminar in Ethical Organizational Leadership

Credits 3. 3 Other Hours. Examination of the ethical demands of executive leaders in organizations; includes ethical decision-making in complex situations, ethical philosophies, trust and developing ethical competencies in others; practice making ethical decisions in complex situations and conclude with a culminating exercise for designing, developing and enforcing organizational ethical norms. **Prerequisite:** Senior classification or approval of instructor.

SOMS 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of leadership theory and practice. May be repeated for credit. **Prerequisites:** Junior or senior classification; approval of instructor.

SPAN - Spanish (SPAN)

SPAN 101 Beginning Spanish I

Credits 4. 4 Lecture Hours. (SPAN 1411) Beginning Spanish I. Elementary language study with oral, written and reading practice; active use of the language in conversation and culture-based projects at the novice high level as defined by American Council on the Teaching of Foreign Languages; intended for those with no prior knowledge of Spanish. **Prerequisite:** Prior knowledge of Spanish requires the Spanish Placement Test before enrolling for the first time in a college Spanish course; also taught at Galveston campus.

SPAN 102 Beginning Spanish II

Credits 4. 4 Lecture Hours. (SPAN 1412) Beginning Spanish II. Continuation of SPAN 101. Active use of the language in conversation, writing, reading, and culture-based projects at the intermediate low level as defined by the American Council on the Teaching of Foreign Languages. **Prerequisite:** SPAN 101 with a grade of C or better or placement by exam; students with prior knowledge of Spanish are required to take the Spanish Placement Test before enrolling for the first time in a college Spanish course; also taught at Galveston campus.

SPAN 112 Intensive Beginning Spanish

Credits 8. 8 Lecture Hours. Accelerated study of Spanish with oral, written and reading practice; active use of the language in conversation and culture-based projects at the novice high level as defined by American Council on the Teaching of Foreign Languages; intended for those with no prior knowledge of Spanish; equivalent to SPAN 101 and SPAN 102. **Prerequisite:** Prior knowledge of Spanish requires the Spanish Placement Test before enrolling for the first time in a college Spanish course.

SPAN 201 Intermediate Spanish I

Credits 3. 3 Lecture Hours. (SPAN 2311) Intermediate Spanish I. Active use of the language in conversation, writing, reading and projects at the mid intermediate level as defined by the American Council on the Teaching of Foreign Languages. Only one of the following will satisfy the requirements for a degree: SPAN 201, SPAN 208, or SPAN 221. **Prerequisite:** SPAN 102 with a grade of C or better or placement by exam; students with prior knowledge of Spanish are required to take the Spanish Placement Test before enrolling for the first time in a college Spanish course.

SPAN 202 Intermediate Spanish II

Credits 3. 3 Lecture Hours. (SPAN 2312) Intermediate Spanish II. Continuation of SPAN 201. Active use of the language in conversation, writing, reading and projects at the high intermediate level as defined by the American Council on the Teaching of Foreign Languages. Only one of the following will satisfy the requirements for a degree: SPAN 202, SPAN 218, or SPAN 222. **Prerequisite:** SPAN 201 with a grade of C or better or placement by exam; students with prior knowledge of Spanish are required to take the Spanish Placement Test before enrolling for the first time in a college Spanish course.

SPAN 203 Intermediate Spanish for Heritage Speakers

Credits 3. 3 Lecture Hours. (SPAN 2313) Intermediate Spanish for Heritage Speakers. Focus on developing speaking, reading and writing abilities in a cultural context centered on Spanish-speaking communities in the U.S.; intended for those who understand casual spoken Spanish and have some functional communication abilities in the language because of family background or sociocultural experience. **Prerequisites:** SPAN 201 with a grade of C or better or placement by exam; students with prior knowledge of Spanish are required to take the Spanish Placement Test before enrolling for the first time in a college Spanish course.

SPAN 208 Spanish for Health Professionals I

Credits 3. 3 Lecture Hours. First half of a two-semester sequence in Spanish, at the mid intermediate level as defined by the American Council on the Teaching of Foreign Language; for those interested in careers in the health professions; presentation and practice of the most important basic communication functions in patient-provider interaction. Only one of the following will satisfy the requirements for a degree: SPAN 201, SPAN 208, or SPAN 221. **Prerequisites:** SPAN 102 with a grade of C or better or placement by exam; students with prior knowledge of Spanish are required to take the Spanish Placement Test before enrolling for the first time in a college Spanish course.

SPAN 218 Spanish for Health Professionals II

Credits 3. 3 Lecture Hours. Second half of a two-semester course sequence in Spanish at the high intermediate as defined by the American Council on the Teaching of Foreign Languages; for those interested in careers in the health professions; presentation and practice of the most important basic communication functions in patient-provider interaction. Only one of the following will satisfy the requirements for a degree: SPAN 202, SPAN 218, or SPAN 222. **Prerequisite:** SPAN 201, SPAN 208, placement by exam, or approval of instructor; students with prior knowledge of Spanish are required to take the Spanish Placement Test before enrolling for the first time in a college Spanish course.

SPAN 221 Field Studies Abroad I

Credits 1 to 6. 1 to 6 Lecture Hours. Active use of the language in conversation, writing, reading and projects at the mid intermediate level, as defined by American Council on the Teaching of Foreign Languages, in a Spanish-speaking country; participation in academic and cultural activities of a host university or study abroad institute/center. Only one of the following will satisfy the requirements for a degree: SPAN 201, SPAN 208, or SPAN 221. **Prerequisite:** SPAN 102 with a grade of B or better, placement by exam, or approval of instructor; students with prior knowledge of Spanish are required to take the Spanish Placement Test before enrolling for the first time in a college Spanish course.

SPAN 222 Field Studies Abroad II

Credits 1 to 6. 1 to 6 Lecture Hours. Active use of the language in conversation, writing, reading and projects at the high intermediate level, as defined by American Council on the Teaching of Foreign Languages, in a Spanish-speaking country; participation in academic and cultural activities of a host university or study abroad institute/center. Only one of the following will satisfy the requirements for a degree: SPAN 202, SPAN 218, or SPAN 222. **Prerequisite:** SPAN 102 with a grade of B or better, placement by exam, or approval of instructor; students with prior knowledge of Spanish are required to take the Spanish Placement Test before enrolling for the first time in a college Spanish course.

SPAN 285 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Individual supervision of readings or assigned projects in Spanish, selected for each student individually. **Prerequisite:** Approval of instructor and department head.

SPAN 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of Spanish. May be repeated for credit. **Prerequisite:** Approval of instructor.

SPAN 301 Oral Expression

Credits 3. 3 Lecture Hours. Development of oral skills in Spanish through pronunciation practice, discussion of current events, skits, interviews, conversations, role play, impromptu debates, rhetoric, public speaking and formal presentations. **Prerequisites:** SPAN 202, SPAN 203, SPAN 218, SPAN 222, placement by exam, or approval of instructor; junior or senior classification or approval of instructor.

SPAN 302 Advanced Grammar

Credits 3. 3 Lecture Hours. Study and practice of Spanish language structures; development of metalinguistic awareness and appropriate usage in socio-pragmatic context. Only one of the following will satisfy the requirements for a degree: SPAN 302 or SPAN 304. **Prerequisites:** SPAN 202, SPAN 203, SPAN 218, or SPAN 222; or placement by exam; junior or senior classification or approval of instructor.

SPAN 303 Spanish Composition

Credits 3. 3 Lecture Hours. Development of writing skills in Spanish; structural analysis of representative texts; drafting, revision and rewriting of short compositions and term papers. **Prerequisites:** SPAN 202, SPAN 203, SPAN 218, or SPAN 222; or placement by exam; junior or senior classification or approval of instructor.

SPAN 304 Advanced Grammar for Heritage Speakers

Credits 3. 3 Lecture Hours. Continuation of SPAN 203; study and practice of Spanish centered on grammatical features of particular concern to heritage speakers in a cultural context focused on Hispanics in the U.S. Only one of the following will satisfy the requirements for a degree: SPAN 302 or SPAN 304. **Prerequisites:** SPAN 202, SPAN 203, SPAN 218 or SPAN 222; or placement by exam or approval of instructor; junior or senior classification or approval of instructor.

SPAN 305 Spanish for Legal Professions

Credits 3. 3 Lecture Hours. Study of legal concepts, legal terminology, grammar and expressions; focus on oral and written communication skills and exposure to cross-cultural approaches to interactions with persons of Hispanic origin in legal professional settings. **Prerequisites:** Grade of C or better in three credits of 300 or 400-level Spanish courses or approval of instructor.

SPAN 306 Business Spanish

Credits 3. 3 Lecture Hours. Presentation and practice of commercial language, vocabulary, customs and cultural environment of the Spanish-speaking business world and related fields; development of cultural awareness for conducting business with Spanish-speaking countries and U.S. Hispanic communities. **Prerequisite:** 3 credits of 300-level Spanish courses or approval of instructor.

SPAN 307 Spanish for the Sciences

Credits 3. 3 Lecture Hours. Development of written and oral scientific communication in Spanish, including listening, speaking, reading and writing, with a focus on general and specialized scientific discourse; field-specific vocabulary and review of structures necessary for academic registers. **Prerequisites:** 3 credits of 300-level Spanish courses or approval of instructor.

SPAN 311 Hispanic Culture and Civilization to the 18th Century

Credits 3. 3 Lecture Hours. Survey of the Hispanic world with emphasis on its history and cultural patterns from pre-Roman times to the 18th century; description and analysis of artistic, historical, literary, political topics. Taught in Spanish. **Prerequisite:** SPAN 202, 203, 222 or approval of instructor.

SPAN 312 Hispanic Culture and Civilization: 18th Century to Present

Credits 3. 3 Lecture Hours. Overview of the Hispanic world, including the United States, from independence in the Americas to present; description and analysis of artistic, historical, literary, political, sociolinguistic topics. Taught in Spanish. **Prerequisite:** SPAN 202, SPAN 203, SPAN 222 or approval of instructor.

SPAN 318 Oral Communication for Health Professionals

Credits 3. 3 Lecture Hours. Development of advanced fluency in oral communication skills in Spanish within the context of the medical professions through discussion of health issues pertaining to the Latino/Hispanic community; field trips, service learning, volunteering, interviews, impromptu speaking and formal presentations. **Prerequisite:** SPAN 218, 3 credits of 300-level Spanish, or approval of instructor.

SPAN 319/JOUR 319 Bilingual Reporting

Credits 3. 3 Lecture Hours. Journalistic techniques and skills used to report in Spanish and/or for Spanish-language media; examination of the unique set of challenges facing LatinX communities in the United States, Latin American, and Hispanic countries abroad; integration of newsgathering, writing, editing, research skills, multimedia podcasting. **Prerequisites:** Junior or senior classification; SPAN 302 or approval of instructor. **Cross Listing:** JOUR 319/SPAN 319.

SPAN 320 Introduction to Hispanic Literature

Credits 3. 3 Lecture Hours. Survey of literature from the Spanish-speaking world; emphasis on the language and techniques of literary analysis as applied to examples of poetry, narrative fiction, theater and essay. **Prerequisite:** 3 credits of 300-level Spanish courses or approval of instructor.

SPAN 331 Spanish Literature to 1700

Credits 3. 3 Lecture Hours. Origins and evolution of Spanish literature from the Medieval to the Golden Age traditions; epic, drama, novel, picaresque and satire as reflected in works by Berceo, Cervantes, Garcilaso de la Vega, Lope de Vega, Calderón de la Barca and others; conducted in Spanish. **Prerequisites:** SPAN 202, SPAN 203, SPAN 222 or approval of instructor.

SPAN 332 Spanish Literature from 1700 to 1936

Credits 3. 3 Lecture Hours. Representative works of Spanish Neoclassicism, Romanticism, realism, naturalism, modernism, and Avant-Garde movements; overview of historical background, cultural and philosophical tendencies; socio-political movements in modern Spain until the Civil War; conducted in Spanish. **Prerequisites:** SPAN 202, SPAN 203, SPAN 222 or approval of instructor.

SPAN 341 Spanish-American Literature from 1492 to 1821

Credits 3. 3 Lecture Hours. Themes, styles and authors from the meeting of Old and New Worlds through the final days of the Colony; overview of cultural and historical background; conducted in Spanish. **Prerequisites:** SPAN 202, SPAN 203, SPAN 222 or approval of instructor.

SPAN 342 Spanish-American Literature from 1821 to 1935

Credits 3. 3 Lecture Hours. Themes, styles and authors from Independence to Modernity; overview of cultural and historical background; conducted in Spanish. **Prerequisites:** SPAN 202, SPAN 203, SPAN 222 or approval of instructor.

SPAN 350 Spanish Phonetics and Phonology

Credits 3. 3 Lecture Hours. Sound system of Spanish with special reference to pronunciation and contrast with sounds of American English; phonological inventory and phonetic variation in Latin American and Peninsular varieties. **Prerequisite:** 3 credits of 300-level Spanish courses or approval of instructor.

SPAN 352 Hispanic Linguistics

Credits 3. 3 Lecture Hours. Study of Hispanic linguistics, including phonetics and phonology, morphology, syntax, change and variation.

Prerequisite: 3 credits of 300-level Spanish courses or approval of instructor.

SPAN 403 Advanced Writing in Spanish

Credits 3. 3 Lecture Hours. Building on established skills, practice in and reflection on writing in professional, public, academic, and literary genres; evaluation of a variety of models and development of abilities in audience analysis, critical research, review and revision. **Prerequisites:** SPAN 303 and 3 additional SPAN credits at the 400-level, or approval of instructor.

SPAN 407 Spanish-English Translation

Credits 3. 3 Lecture Hours. Foundations of translation methodology, strategies and practice; rendering of literary and non-literary texts; ethics of translation; emphasis on translation into the first language.

Prerequisite: 6 credits of upper division SPAN with a grade of B or better or approval of instructor.

SPAN 410 Hispanic Film

Credits 3. 3 Lecture Hours. Examination of major works and directors of contemporary Hispanic film; interpretation of culture through film; relationship of literature and film; introduction to vocabulary of film criticism in Spanish. **Prerequisites:** 6 credits of 300-level Spanish courses; junior or senior classification or approval of instructor.

SPAN 411 Contemporary Hispanic Society and Culture

Credits 3. 3 Lecture Hours. Examination of cultural, economic, and political aspects central to 20th and 21st century Hispanic societies.

Prerequisites: At least 6 credits of 300-level Spanish courses; junior or senior classification or approval of instructor.

SPAN 412 U.S. Hispanic Writers

Credits 3. 3 Lecture Hours. Analysis of contemporary literature by U.S. Latino/a authors; discussion of prevalent themes including immigration, language, race, gender, identity. **Prerequisites:** At least 6 credits of 300-level Spanish courses; junior or senior classification or approval of instructor.

SPAN 413 Hispanic Culture through Art

Credits 3. 3 Lecture Hours. Examination of the works of a major artist and/or artistic movement as a vehicle for intensive analysis of elements of Hispanic culture. **Prerequisites:** At least 6 credits of 300-level Spanish courses; junior or senior classification or approval of instructor.

SPAN 414 Mexican Cinema and Culture

Credits 3. 3 Lecture Hours. Analysis of Mexican films from acclaimed actors, directors and time periods in order to understand the historical, social and political conditions; aesthetic, social, cultural and political analysis surrounding the production of representative films; taught in Spanish. **Prerequisites:** 6 credits of 300-level Spanish courses; junior or senior classification, or approval of instructor.

SPAN 417 Advanced Spanish-English Translation

Credits 3. 3 Lecture Hours. Expansion of translation practice and development of lexical and stylistic competence in specialized fields, including commercial, legal, medical, technical and scientific; mandatory service learning component included. **Prerequisite:** SPAN 407 with a grade of B or better or approval of instructor.

SPAN 421 Latin American Poetry and Music

Credits 3. 3 Lecture Hours. Study of contemporary Latin American poetry and music; analysis of language, rhythms and styles from 1900 to the present. **Prerequisites:** 6 credits of 300-level Spanish courses; junior or senior classification or approval of instructor.

SPAN 423 Soccer in the Hispanic World

Credits 3. 3 Lecture Hours. Overall perspective on the sport; analysis of the interaction of soccer, arts and society; comprehensive sociological and aesthetic view of the game in the Spanish-speaking world; soccer as a metaphor for contemporary world; taught in Spanish. **Prerequisites:** 6 credits of 300-level Spanish courses; junior or senior classification, or approval of instructor.

SPAN 445 Cervantes

Credits 3. 3 Lecture Hours. Analysis of Cervantes' life, cultural milieu and works; emphasis on Don Quixote, its significance in Spanish literature and in the development of the modern novel; conducted in Spanish.

Prerequisites: At least 6 credits of 300-level Spanish courses; junior or senior classification or approval of instructor.

SPAN 450 Contemporary Spanish and Spanish-American Literature

Credits 3. 3 Lecture Hours. Representative works of authors from both sides of the Atlantic; study of similarities and differences in themes, movements, social and aesthetic concerns among Spanish and Spanish American writers. **Prerequisites:** 6 credits of 300-level Spanish courses; junior or senior classification or approval of instructor.

SPAN 452 Hispanic Sociolinguistics

Credits 3. 3 Lecture Hours. Regional and social varieties of Spanish; variation in situational contexts (register, style, and modality); theoretical foundations of sociolinguistic variation. **Prerequisites:** 6 credits of 300-level Spanish courses; junior or senior classification or approval of instructor.

SPAN 460 Topics in Hispanic Literature

Credits 3. 3 Lecture Hours. Exploration of a significant topic, author, movement, genre or period in Hispanic literature. May be taken three times for credit when topics vary. **Prerequisite:** 6 credits of 300-level Spanish courses; junior or senior classification or approval of instructor.

SPAN 461 Topics in Hispanic Culture

Credits 3. 3 Lecture Hours. Exploration of significant socio-cultural issues in Hispanic society and their influence on cultural and artistic production. May be taken three times for credit when topics vary. **Prerequisites:** 6 credits of 300-level Spanish courses; junior or senior classification or approval of instructor.

SPAN 462 Topics in Hispanic Linguistics

Credits 3. 3 Lecture Hours. Exploration of significant topics in Hispanic linguistics from different theoretical and applied perspectives. May be taken three times when topics vary. **Prerequisites:** 6 credits of 300-level Spanish courses; junior or senior classification or approval of instructor.

SPAN 483 Community Impact through Service Learning in Spanish

Credits 0 to 4. 0 to 4 Other Hours. Directed service-learning experience in a context where Spanish is necessary to deliver services to underserved populations in the U.S. or abroad. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisites:** Majors and Hispanic Studies for Community Engagement minors only; approval of undergraduate studies director; junior or senior classification.

SPAN 484 Internship

Credits 0 to 3. 0 to 3 Other Hours. Directed internship in a Spanish-speaking professional environment to provide students with training or applied research experience appropriate to career objectives. Must be taken on a satisfactory/unsatisfactory basis. May be taken three times for credit. **Prerequisites:** SPAN majors; junior or senior classification and approval of instructor.

SPAN 485 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Individual supervision of readings or assigned projects selected for each student individually; written and oral reports. **Prerequisite:** Approval of instructor and department head.

SPAN 489 Special Topics in...

Credits 3. 3 Lecture Hours. Selected topics in an identified area of Spanish. May be repeated for credit. **Prerequisite:** 6 credits of 300-level Spanish; junior or senior classification.

SPAN 491 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in Hispanic Studies. May be repeated three times for credit. **Prerequisites:** SPAN majors; junior or senior classification and approval of instructor.

SPED - Special Education (SPED)

SPED 291 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in special education. May be repeated 2 times for credit. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

SPED 302 Planning and Teaching with Explicit Instruction

Credits 3. 3 Lecture Hours. Familiarizes pre-service teachers with research associated with effective teaching; designing and implementing of instruction for students including those with mild to moderate disabilities; designing and managing environments and materials. **Prerequisites:** Grade of C or better in INST 210; or approval of instructor.

SPED 303 Characteristics and Educational Considerations of Disabilities

Credits 3. 3 Lecture Hours. Advanced instruction in the history, concepts, perspectives, and characteristics of individuals with exceptionalities; examines the history of discrimination against people with disabilities; exploration of each of the eligibility categories under the Individuals with Disabilities Education Act (IDEA) and corresponding characteristics; emphasis on culturally responsive communication and support. **Prerequisites:** Grade of C or better in INST 210 or approval of instructor.

SPED 310 Instructional Strategies for Students with Disabilities

Credits 3. 3 Lecture Hours. Research-based strategies and techniques in teaching students who are at-risk academically or students with disabilities in a variety of general and special education settings; addresses teaching of academics, teacher strategies for engagement and incorporating the use of technology. **Prerequisite:** Admission to professional phase of program.

SPED 312 Effective Reading Instruction for Students with Diverse Abilities

Credits 3. 3 Lecture Hours. Information and competencies in research-based reading instruction for students who have disabilities, are struggling readers, and are bilingual/multilingual; includes reading assessment, dyslexia and effective instruction in phonemic awareness, phonics, reading fluency, vocabulary and comprehension, Response to Intervention (RTI) strategies, and data driven decision-making. **Prerequisite:** Admission to professional phase of program.

SPED 314 Effective Mathematics Strategies for Students with Disabilities

Credits 3. 3 Lecture Hours. Information and competencies through instruction in effective mathematics instruction for students P-12 with academic learning problems and/or disabilities; effective instruction design and teaching techniques, implementation of research-based methods relevant for active authentic learning; considers state and national standards related to teaching and learning mathematics. **Prerequisites:** Admission to the professional phase of the special education program; junior or senior classification.

SPED 316 Classroom Management and Behavioral Interventions - Tier 1 and 2 Supports

Credits 3. 3 Lecture Hours. Application of effective classroom management strategies, including evidence-based models of classroom discipline, proactive strategies to prevent misbehavior, effective responses to problem behaviors, and ethically appropriate discipline procedures for students with disabilities. **Prerequisites:** Grade of C or better in INST 210 or approval of instructor; admission to professional phase of program.

SPED 321 Assessment of Students with Disabilities

Credits 3. 3 Lecture Hours. Instruction in formal and informal assessment techniques used with students with disabilities, including interpreting and communicating scores; topics include the response to intervention (RTI) process; selecting assessments; describing assessments; using assessments to inform the development of Individualized Educational Programs (IEPs); and designing assessment for progress monitoring; development of knowledge and skills to be able to individually assess students with disabilities, and to understand and make data-based decisions using other measures as applicable. **Prerequisites:** Grade of C or better in INST 210; or approval of instructor; admission to professional phase of program.

SPED 325 Professional Skills and Dispositions I

Credit 1. 1 Lecture Hour. Study and development of skills focusing on collaboration, instruction, classroom management and professionalism in P-12 schools; Texas Education Agency (TEA) requirements and certification process monitored. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisites:** Grade of C or better in SEFB 315; SEFB 325 or concurrent enrollment; admission to the professional phase of program.

SPED 326 Classroom Management and Behavior Interventions: Tier 3 Supporting and Managing Intensive Behavior

Credits 3. 3 Lecture Hours. Exploration and application of strategies to support students who engage in behaviors requiring intensive, individualized supports; communication of policies related to behavior management and supporting students with exceptionalities; conducting and analyzing data from a functional behavioral assessment (FBA); writing and implementing a behavior intervention plan (BIP) based on synthesized data; topics include legal and ethical guidelines, components of FBAs and BIPs, data collection, teaching replacement behaviors, and collaboration with other professionals. **Prerequisites:** Grade of C or better in SPED 316 or approval of instructor; admission to professional phase of program.

SPED 410 Professional Skills and Dispositions II

Credit 1. 1 Lecture Hour. Study and development of skills focusing on collaboration, instruction, classroom management and professionalism in P-12 schools; Texas Education Agency (TEA) requirements and certification process monitored. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisites:** Grade of C or better in SEFB 320 and SPED 320; SEFB 410 or concurrent enrollment; admission to professional phase of program.

SPED 411 Assessment in Action: Writing and Implementing Individualized Education Programs

Credits 3. 3 Lecture Hours. Application of assessment scores and stakeholder input to create individualized education programs (IEPs); exploration of the evaluation process and the development of individualized family service plans (IFSPs) and transition plans; development of an IEP based on a real case or case study; topics include translating assessment data, writing present levels and goals, selecting appropriate services, accommodations, and modifications, and participating in an Admission, Review, and Dismissal (ARD) meetings. **Prerequisites:** Grade of C or better in SPED 321; or approval of instructor; admission to professional phase of program.

SPED 412 Adapting the General Curriculum

Credits 3. 3 Lecture Hours. Methods of academic instruction in core content areas for learners with extensive support needs, emphasis on evidence-based practices, linking instruction to state-standards, age appropriate instruction, application of systematic instruction and response prompting, data-based decision making, building learners communicative competence, and generalization of skills. **Prerequisites:** Grade of C or better in INST 210 or approval of instructor; admission to professional phase of program.

SPED 414 Methods and Issues in Low-Incidence Disabilities

Credits 3. 3 Lecture Hours. Overview of learning and behavioral characteristics of individuals with low-incidence disabilities such as intellectual disability, autism, physical disabilities, traumatic brain injury, sensory impairments, and multiple disabilities; research-based practices in assessment and education and designing educational environments that facilitate active participation, self-advocacy and independence. **Prerequisites:** Admission to professional phase of program.

SPED 418 Transition Planning and Preparation for Students with Disabilities

Credits 3. 3 Lecture Hours. Overview of the psychological, social, physical and cognitive development of students with disabilities; career assessment; programmatic options within educational and employment settings; transition models from school to adult settings. **Prerequisites:** Grade of C or better in INST 210 or approval of instructor; admission to professional phase of program.

SPED 442 Teaching Students with Emotional Disturbances and Behavior Disorders

Credits 3. 3 Lecture Hours. Research-based techniques and materials used in the instruction of students who have emotional and behavioral disorders across a variety of classroom and other educational environments; includes identification and assessment issues, placements, family involvement, and historical and legal issues. **Prerequisites:** Admission to professional phase of program.

SPED 491 Research

Credits 0 to 4. 0 to 4 Lecture Hours. Research conducted under the direction of faculty member in special education. May be repeated 2 times for credit. **Prerequisites:** Junior or senior classification and approval of instructor.

SPEN - Space Engineering (SPEN)

SPEN 201 Introduction to Space Engineering

Credits 3. 3 Lecture Hours. Broad overview and foundational knowledge of the key topics in Space Engineering; historical perspective on space exploration and the engineering advancements that have enabled deep space and planetary science missions, as well as human spaceflight and the commercial satellite industry; focuses on the unique characteristics of the space environment, which presents numerous challenges that drive the design of spacecraft systems; exploration of evolution of spacecraft system technology including power, communications, thermal control, life support, navigation, guidance, control and propulsion systems; emphasis on orbital mechanics, robotics, space architecture, and bioastronautics; topics include remote sensing, deep space propulsion, planetary defense, satellites, and end-to-end mission operations. **Prerequisites:** Grade of C or better in ENGR 102 and PHYS 206; grade of C or better in ENGR 216/PHYS 216 or PHYS 216/ENGR 216; grade of C or better in MATH 251 or MATH 253, or concurrent enrollment; Space Engineering majors.

SPEN 223 Fundamentals of Thermodynamics, Heat Transfer, and Fluid Mechanics for Space Engineering I

Credits 3. 3 Lecture Hours. Fundamentals of thermodynamics, heat transfer and fluid mechanics applied to space systems; concepts of energy, entropy, properties of liquids, vapors and mixtures; heat capacity of solids, liquids, vapors; heat conduction and radiation; fluid flows of relevance to habitats, biosystems, propulsion systems and atmospheres. **Prerequisites:** Grade of C or better in ENGR 102, PHYS 206, and SPEN 201; grade of C or better in ENGR 216/PHYS 216 or PHYS 216/ENGR 216; grade of C or better in MATH 251 or MATH 253, or concurrent enrollment; Space Engineering majors.

SPEN 324 Fundamentals of Thermodynamics, Heat Transfer, and Fluid Mechanics for Space Engineering II

Credits 3. 3 Lecture Hours. Continuation of SPEN 223; fundamentals of thermodynamics, heat transfer and fluid mechanics applied to space systems; concepts of energy, entropy, properties of liquids, vapors and mixtures; heat capacity of solids, liquids, vapors; heat conduction and radiation; fluid flows of relevance to habitats, biosystems, propulsion systems and atmospheres. **Prerequisites:** Grade of C or better in ENGR 102, PHYS 206, SPEN 201, and SPEN 223; grade of C or better in ENGR 216/PHYS 216 or PHYS 216/ENGR 216; grade of C or better in MATH 251 or MATH 253, or concurrent enrollment; Space Engineering majors.

SPEN 354 Materials Science for Space Engineering

Credits 3. 3 Lecture Hours. Study of the relationship between aerospace engineering material properties and microstructure; mechanical and thermal properties; environmental degradation; mechanical failure. **Prerequisites:** Grade of C or better in AERO 304.

SPEN 401 Space Design Principles

Credits 3. 3 Lecture Hours. Study of systems engineering; project lifecycle; stakeholder, concept of operations (CONOPS) and requirements definition; cost assessment; risk management; trade studies; decomposition and design of a space system; engineering ethics; technical communication. **Prerequisites:** Grade of C or better in AERO 307, SPEN 324, SPEN 354, and AERO 423.

SPEN 402 Space System Design

Credits 2. 2 Lecture Hours. Focuses on the design and analysis of a constellation of imaging satellites to develop 3D models of ground targets; emphasis on refinement of last semester's design and verification via the detailed simulation and optimization of the system's operations; project presented at the Engineering Project Showcase competition and the final capstone design review presentation. **Prerequisites:** Grade of C or better in AERO 307, SPEN 324, SPEN 354, AERO 423, and SPEN 401.

SPEN 437 Space Communications

Credits 3. 3 Lecture Hours. Basics of space communications systems; focuses on radio frequency communications systems and optical communications systems; topics include signals, modulations, source and channel coding, link performance, antennas and antenna arrays, transceivers, multiple access, communication networks, and advanced communications systems. **Prerequisites:** Grade of C or better in SPEN 201 and ECEN 314.

SPEN 439 Principles of Positioning, Navigation, and Timing

Credits 3. 3 Lecture Hours. Reference frames and transformations; Inertial Navigation Systems (INS) Global Navigation Satellite Systems (GNSS); timing sources and errors; applied Kalman filtering tools for GNSS/INS integration; image based navigation; spacecraft attitude sensors and algorithms; statistical signal processing methods for vehicle positioning system. **Prerequisites:** Grade of C or better in AERO 221, AERO 310, and AERO 423.

SPEN 441 Foundations of Space Autonomy

Credits 3. 3 Lecture Hours. Mathematical and computational foundations of aerospace systems autonomy; basic concepts to undertake the study of aerospace autonomous and intelligent systems (data structures, algorithms, probability theory, and optimization); classical artificial intelligence topics include search, constraint satisfaction, and logical and probabilistic reasoning; applications include planetary rovers and satellite swarms. **Prerequisites:** Grade of C or better in SPEN 401 or AERO 401, or concurrent enrollment.

SPEN 489 Special Topics in...

Credits 1 to 4. 1 to 4 Other Hours. Selected topics in an identified field of space engineering. May be repeated for credit. **Prerequisites:** Junior or senior classification, or approval of instructor.

SPMT - Sport Management (SPMT)

SPMT 217 Foundations of Sport Management

Credits 3. 3 Lecture Hours. History, principles, and objectives of the sport management profession; an overview of the structure of the sport industry; introduction to the scope and variety of career opportunities in sport.

SPMT 220 Olympic Studies

Credits 3. 3 Lecture Hours. History of the Olympic Games and their development over time; analyze, compare and contrast the relationship between the Olympics, cultures and societies; examination of central problems, accomplishments and collaborations revolving around the Olympics from a variety of viewpoints.

SPMT 225 Practical Skills for Sport Professionals

Credits 3. 3 Lecture Hours. Introduction to the writing, communication and technical skills required to succeed in the sport industry; segmented into units based on different professions within the sport industry such as journalism, marketing, technology, public relations, organizational communication and law.

SPMT 230 Introduction to Leadership in Sport Organizations

Credits 3. 3 Lecture Hours. Attainment and application of leaderships skills in the sports setting; analysis of sports leaders and their styles; ethics in sport leaders; preparation to work in youth sports institutions; youth community agencies and sport related non-profit agencies.

SPMT 260 Overview of Practices in Sport

Credits 2. 2 Lecture Hours. History, principles, and objectives of the sport management profession; an overview of the structure of the sport industry; introduction to sport management practices and career opportunities in sport. **Prerequisite:** Concurrent enrollment in SPMT 270.

SPMT 262 Human Capital Management in Sport

Credits 3. 3 Lecture Hours. Dynamic issues of individual and organizational change; overview of human resources, relational and conflict management, and leadership principles. **Prerequisite:** Grade of C or better in SPMT 260; concurrent enrollment in SPMT 272.

SPMT 265 Professional Communication for the Sport Industry

Credits 4. 4 Lecture Hours. Application of the writing, communication and technical skills required to succeed in the sport industry; utilizing various communication types including oral, written, digital and listening from a global perspective. **Prerequisites:** Grade of C or better in ENGL 103 or ENGL 104; grade of C or better in COMM 203, SPMT 260, SPMT 262, SPMT 270, and SPMT 272, or concurrent enrollment.

SPMT 270 Sport Marketing

Credits 2. 2 Lecture Hours. Broad and contemporary overview of the sport marketing field; differentiating the field of sport and entertainment marketing with the practices and applications of mainstream marketing. **Prerequisite:** Concurrent enrollment in SPMT 260.

SPMT 272 Sport Marketing Issues

Credits 2. 2 Lecture Hours. Recognition of current issues within the sport marketing field while gaining transferable skills necessary for the sport industry. **Prerequisite:** Grade of C or better in SPMT 270; concurrent enrollment in SPMT 262.

SPMT 285 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Work on a specified topic with the intent of promoting independent reading, research and study; supplement existing course offerings or subjects not presently covered. May be repeated for credit. **Prerequisites:** Freshman or sophomore classification; approval of instructor.

SPMT 289 Special Topics in...

Credits 0 to 4. 0 to 4 Lecture Hours. Selected topics in an identified area of sport management. May be repeated for credit.

SPMT 291 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of a faculty member in sport management. May be repeated 4 times for credit. **Prerequisites:** Freshman or sophomore classification; approval of instructor.

SPMT 295 Introduction to the Culminating Experience

Credit 1. 1 Lecture Hour. Orientation, observations and experiences in preparation for the Culminating Experience. **Prerequisite:** Grade of C or better in SPMT 260 and SPMT 270; grade of C or better in SPMT 265 or concurrent enrollment.

SPMT 304 Sport Psychology Management and Practice

Credits 3. 3 Lecture Hours. The relationship of psychology to sport and exercise; topics include history, application of learning principles, social psychology, personality variables, psychological assessment, youth sport, and diversity issues in sport and exercise. **Prerequisite:** Junior classification.

SPMT 316 Sales Strategies in Sport Organizations

Credits 3. 3 Lecture Hours. Preparation for the sport business workforce via the sales outlet; emphasis on developing skills for success in sport sales. **Prerequisites:** Grade of C or better in SPMT 217; junior or senior classification.

SPMT 319/SOCI 319 Sociology of Sport

Credits 3. 3 Lecture Hours. Social institution of sport and its consequences for American society; social organization from play to professional sport; violence, discrimination, women in sport; socialization implications from participation in sports. **Prerequisite:** Junior or senior classification. **Cross Listing:** SOCI 319/SPMT 319.

SPMT 321 Risk Management in Sport Organizations

Credits 3. 3 Lecture Hours. Legal principles and rules of law affecting the administration and operation of health, human performance, recreation and sports programs, resources, areas and facilities; risk management and legal concepts applied to contracts, human rights, constitutional issues, supervision of recreation activities and torts. **Prerequisites:** Junior or senior classification; or approval of instructor.

SPMT 330 Application of Leadership Skills in Sport Organizations

Credits 3. 3 Lecture Hours. Development and application of leadership vision to sport organizations; development of leadership skills that create collaborative and management of groups in sports organizations.

SPMT 333 Sport Management

Credits 3. 3 Lecture Hours. Introduction to techniques for proper management of programs in physical activities and athletics including the basic physical education instructional program, intercollegiate and interscholastic athletics, intramural and club programs, and alternative athletic programs such as health clubs, corporate fitness centers and YMCA/YWCAs. **Prerequisites:** Junior or senior classification; admission to professional phase of program.

SPMT 336 Diversity in Sport Organizations

Credits 3. 3 Lecture Hours. Examine an encompassing perspective of diversity within North American and international sport organizations. **Prerequisite:** Junior or senior classification; also taught at Galveston campus.

SPMT 337 International Sport Business

Credits 3. 3 Lecture Hours. The magnitude of global expansion and development of sport familiarity with major firms and organizations on the global scene, major issues in global sports; emphasis on business opportunities available internationally; underlying thesis focuses on the contrasts from the U.S. sport industry to foreign markets. **Prerequisite:** Junior or senior classification; also taught at Galveston campus.

SPMT 340 Sport Governance

Credits 3. 3 Lecture Hours. Governance and policy development in sport management; managerial activities related to governance, strategic management, ethics in sport, governance and policy development in specific sport contexts. **Prerequisite:** Junior or senior classification.

SPMT 360 Organizational Issues in Sport

Credits 3. 3 Lecture Hours. Gain knowledge and experience in organizational structure, organizational behavior, global issues, human resources, strategic and operational planning, data information systems, evaluation and assessment. **Prerequisite:** Grade of C or better in SPMT 260, SPMT 262, SPMT 265, SPMT 270, SPMT 272, and SPMT 295.

SPMT 362 Sport Leadership

Credits 3. 3 Lecture Hours. Attainment and application of leadership skills in the sport setting; concepts related to negotiations and change management; ethics and legal issues in sport. **Prerequisite:** Grade of C or better in SPMT 260, SPMT 262, SPMT 265, SPMT 270, SPMT 272, and SPMT 295.

SPMT 364 Financial Management in Sport

Credits 3. 3 Lecture Hours. Financial theories and practical application as they impact sport revenues and expenditures; familiarization with current issues and trends in financing sport organizations. **Prerequisite:** Grade of C or better in SPMT 260, SPMT 262, SPMT 265, SPMT 270, SPMT 272, and SPMT 295.

SPMT 366 Sport Facility and Event Management

Credits 3. 3 Lecture Hours. Orientation into the design, operations and functions related to cost-effectively managing recreational facilities and events; address key elements of program management, conflict management, group dynamics and customer service. **Prerequisite:** Grade of C or better in SPMT 260, SPMT 262, SPMT 265, SPMT 270, SPMT 272, and SPMT 295.

SPMT 370 Fan Behavior in Sport

Credits 3. 3 Lecture Hours. Communication with current and potential consumers; importance of identifying and understanding consumers when planning, creating, and performing marketing activities. **Prerequisites:** Grade of C or better in SPMT 260, SPMT 262, SPMT 265, SPMT 270, SPMT 272, and SPMT 295; junior or senior classification.

SPMT 372 Sales Strategies in Sport Organizations

Credits 3. 3 Lecture Hours. Preparation for the sport business workforce via the sales outlet with emphasis placed on students developing skills necessary for success in sport sales. **Prerequisite:** Grade of C or better in SPMT 260, SPMT 262, SPMT 265, SPMT 270, SPMT 272, and SPMT 295.

SPMT 374 Strategic Sport Marketing

Credits 3. 3 Lecture Hours. Managing customers to maximize long-term company profits focused on managing at the strategic level by targeting, acquiring, retaining and growing customers. **Prerequisite:** Grade of C or better in SPMT 260, SPMT 262, SPMT 265, SPMT 270, SPMT 272, and SPMT 295.

SPMT 401 Undergraduate Research Methods for Sport Organizations

Credits 3. 3 Lecture Hours. Methodology and application of social science research in sport organizations for undergraduates, including the research process, research designs, sampling procedures, measurement, survey research, hypothesis testing, descriptive analyses and the research presentation. **Prerequisites:** Grade of C or better in SPMT 295 and SPMT 481 (Seminar for Undergraduate Research).

SPMT 402 Pre-Internship Field Experiences

Credit 1. 2 Lab Hours. Orientation, observations and experiences in preparation for professional internships. **Prerequisites:** Senior classification; approved acceptance to field experience.

SPMT 412 Managing Sport Events

Credits 3. 3 Lecture Hours. Examination of principles involved in planning and managing sport events. **Prerequisites:** Junior or senior classification or approval of instructor.

SPMT 420 Sports Facility Planning

Credits 3. 3 Lecture Hours. Examination of the principles involved in planning and managing sports and recreational facilities. **Prerequisites:** Junior or senior classification; admission to professional phase of program or approval of instructor for non-sport management majors.

SPMT 421 Legal Aspects of Sport

Credits 3. 3 Lecture Hours. Explores the relationship between sport and law, and the fundamentals of law used by sport managers, including contract law, tort law, Constitutional issues, employment and discrimination law, the effect of state and federal statutes on recreational activities and sport, and current legal issues in sports. **Prerequisites:** Junior or senior classification; admission to professional phase of program or approval of instructor for non-sport management majors.

SPMT 422 Financing Sport Operations

Credits 3. 3 Lecture Hours. Study of financial theories and practical application as they impact sport revenues and expenditures; familiarization with current issues and trends in financing sport organizations. **Prerequisites:** Junior or senior classification; admission to professional phase of program.

SPMT 423 Marketing Aspects of Sport

Credits 3. 3 Lecture Hours. Investigation of the rapidly developing sports industry from a marketing perspective; familiarization of marketing terms and tools needed in the sports industry; introduction to the various aspects of marketing that make up the marketing plan. **Prerequisites:** Junior or senior classification; admission to professional phase of program.

SPMT 450 Professional Practice in Sport Management

Credits 1 to 7. 1 to 7 Other Hours. Information, perspectives and skills to promote the management of sports in the community, school, workplace and sport business settings; boundary-crossing partnerships across sport disciplines; the role of collaborative efforts to improve the needs of the sport community. May be taken four times for credit. **Prerequisite:** Admission to professional phase of program; senior classification.

SPMT 455 Research and Writing Culminating Experience

Credits 0 to 6. 0 to 6 Other Hours. Facilitation of culminating experience research project implementation, which includes conducting research and disseminating results in the form of a research paper and presentation. **Prerequisites:** Grade of C or better in SPMT 481 (Seminar for Undergraduate Research).

SPMT 460 Sport Business Planning

Credits 3. 3 Lecture Hours. Development of a sport business plan; planning, assessing and delivery of all components of a business plan for a sport organization. **Prerequisites:** Grade of C or better in SPMT 360, SPMT 362, SPMT 364, SPMT 366, SPMT 370, SPMT 372, and SPMT 374.

SPMT 462 Leadership Application in Sport

Credits 3. 3 Lecture Hours. Development and application of leadership vision to sport organizations; development of leadership skills that create collaborative management of groups in sports organizations. **Prerequisites:** Grade of C or better in SPMT 360, SPMT 362, SPMT 364, SPMT 366, SPMT 370, SPMT 372, and SPMT 374.

SPMT 470 Application of Marketing Strategies in Sport

Credits 3. 3 Lecture Hours. Examination of the application of marketing principles to the general sport enterprise; creation of sport marketing plans, evaluation of effective methods and practices relevant to sport marketing. **Prerequisites:** Grade of C or better in SPMT 360, SPMT 362, SPMT 364, SPMT 366, SPMT 370, SPMT 372, and SPMT 374.

SPMT 472 Data Analysis and Problem Solving in Sport

Credits 3. 3 Lecture Hours. Acquire market analysis and problem solving skills; understanding of rigorous marketing research methods; learn techniques to create marketing campaigns. **Prerequisites:** Grade of C or better in SPMT 360, SPMT 362, SPMT 364, SPMT 366, SPMT 370, SPMT 372, and SPMT 374.

SPMT 481 Seminar

Credit 1. 1 Lecture Hour. A variety of topical seminars in communicating contemporary and historical sport management subjects designed to complement the curriculum in sport management. May be taken three times for credit. **Prerequisite:** Admission to the professional phase of the sport management program; junior or senior classification; or approval of instructor.

SPMT 482 Professional Writing Seminar

Credit 1. 1 Lecture Hour. Acquaint students with a primary means of communicating contemporary research in sport management; extensive readings, intensive writings and an oral presentation designed to complement the curriculum in sport management by introducing the application of sport management research to organizational decision making. May be taken two times for credit. **Prerequisites:** Admission to professional phase of program or approval of instructor; junior or senior classification.

SPMT 483 Practicum in Sport Management

Credits 0 to 3. 0 to 3 Other Hours. Participation and study in sport management and administration; acquisition and practice of professional and/or clinical skills in sport management. May be taken up to 12 hours for credit. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisites:** Admission to professional phase of program; approval of instructor; junior or senior classification.

SPMT 484 Internship in Sport Management

Credits 0 to 12. 0 to 12 Other Hours. Supervised internship with sport management organizations; acquisition and practice of professional and/or clinical skills in sport management. **Prerequisites:** SPMT 402; completion of all coursework.

SPMT 485 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Special problems in sport management assigned to individual students or to groups. May be repeated for credit. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisites:** Junior or senior classification; approval of instructor.

SPMT 489 Special Topics in...

Credits 0 to 4. 0 to 4 Lecture Hours. Selected topics in an identified area of sport management. May be repeated for credit.

SPMT 491 Research

Credits 0 to 6. 0 to 6 Other Hours. Research conducted under the direction of a faculty member in sport management. May be repeated 4 times for credit. **Prerequisites:** SPMT 481; junior or senior classification; approval of instructor.

STAT - Statistics (STAT)

STAT 182 Foundations of Statistics

Credit 1. 1 Lecture Hour. Elementary topics in statistics; data collection; design of experiments; confidence intervals, hypothesis testing; ethics in statistics; the role of statistics in industry, the health profession and the sciences. **Prerequisite:** Statistics majors only.

STAT 201 Elementary Statistical Inference

Credits 3. 3 Lecture Hours. (MATH 1342, 1442) Elementary Statistical Inference. Data collection, tabulation and presentation; elementary description of the tools of statistical inference; probability, sampling and hypothesis testing; applications of statistical techniques to practical problems. Only one of the following will satisfy the requirements for a degree: STAT 201 or BUSN 203; STAT 301, STAT 302, STAT 303.

STAT 205 Bioinformatics Cornerstone

Credit 1. 1 Lecture Hour. Exploration of reading, writing, and analyzing various biological, genetic, and medical topics, with a focus on learning how to think and write like a bioinformatician; strengthening critical reading comprehension and technical writing skills; writing synopses of research findings to lay audiences. **Prerequisites:** BIOL 112 and STAT 211; CSCE 110 or CSCE 111.

STAT 211 Principles of Statistics I

Credits 3. 3 Lecture Hours. Introduction to probability and probability distributions; sampling and descriptive measures; inference and hypothesis testing; linear regression, analysis of variance. **Prerequisite:** MATH 148, MATH 152, or MATH 172; also taught at Galveston and Qatar campuses.

STAT 212 Principles of Statistics II

Credits 3. 3 Lecture Hours. Design of experiments, model building, multiple regression, nonparametric techniques and contingency tables. **Prerequisite:** STAT 211.

STAT 301 Introduction to Biometry

Credits 3. 3 Lecture Hours. Intended for students in animal sciences. Introduces fundamental concepts of biometry including measures of location and variation, probability, tests of significance, regression, correlation and analysis of variance which are used in advanced courses and are being widely applied to animal-oriented industry. Only one of the following will satisfy the requirements for a degree: STAT 201 or BUSN 203; STAT 301, STAT 302, STAT 303. **Prerequisite:** MATH 168 or equivalent; junior or senior classification.

STAT 302 Statistical Methods

Credits 3. 3 Lecture Hours. Intended for undergraduates in the biological sciences. Introduction to concepts of random sampling and statistical inference; estimation and testing hypotheses of means and variances; analysis of variance; regression analysis; chi-square tests. Only one of the following will satisfy the requirements for a degree: STAT 201 or BUSN 203; STAT 301, STAT 302, STAT 303. **Prerequisite:** MATH 168 or equivalent; junior or senior classification.

STAT 303 Statistical Methods

Credits 3. 3 Lecture Hours. Intended for undergraduates in the social sciences. Introduction to concepts of random sampling and statistical inference, estimation and testing hypotheses of means and variances, analysis of variance, regression analysis, chi-square tests. Only one of the following will satisfy the requirements for a degree: STAT 201 or BUSN 203; STAT 301, STAT 302, STAT 303. **Prerequisite:** MATH 168 or equivalent; junior or senior classification; also taught at Galveston campus.

STAT 307 Sample Survey Techniques

Credits 3. 3 Lecture Hours. Concepts of population and sample; the organization of a sample survey; questionnaire design. Basic survey designs and computation of estimates and variances. **Prerequisite:** STAT 301 or STAT 302 or STAT 303 or BUSN 203.

STAT 312 Statistics for Biology

Credits 3. 3 Lecture Hours. Statistical learning methods for biological applications including the topics on generative models for count data, clustering, dimension reduction, hypothesis testing, classification and regression, experimental design and software tools in R to visualize and analyze biological data. **Prerequisite:** MATH 147 or MATH 142, or equivalent; STAT 201 or MATH 148, or equivalents.

STAT 315 Computational Data Science

Credits 3. 3 Lecture Hours. Computational practice of data science through a sequence of interactive modules that provides an integrated hands-on approach to its methods, tools, applications and supporting technologies including high performance and cloud computing platforms. **Prerequisites:** Grade of C or better in ENGR 102, CSCE 110, CSCE 111, or CSCE 206; grade of C or better in MATH 251, MATH 253, or STAT 211; junior or senior classification. **Cross Listing:** CSCE 305 and ECEN 360.

STAT 335/CSCE 320 Principles of Data Science

Credits 3. 3 Lecture Hours. Theoretical foundations, algorithms and methods of deriving valuable insights from data; includes foundations in managing and analyzing data at scale, e.g. big data; data mining techniques and algorithms; exploratory data analysis; statistical methods and models; data visualization. **Prerequisites:** STAT 211 or ECEN 303; STAT 212 or CSCE 222/ECEN 222; MATH 304. **Cross Listing:** CSCE 320/STAT 335.

STAT 404 Statistical Computing

Credits 3. 3 Lecture Hours. Statistical programming in R; random number generation; design of simulation studies; interactive and dynamic statistical graphics; parallel computing in statistics; statistical and machine learning algorithms. **Prerequisites:** STAT 212; junior or senior classification.

STAT 406 Design and Analysis of Experiments

Credits 3. 3 Lecture Hours. Design fundamentals; completely randomized designs; blocking; factorial, nested, nested-factorial designs; incomplete designs; fractional factorial designs; confounding; general mixed factorials; split plot; analysis of covariance; crossover designs; power analysis, sample size determination. **Prerequisite:** STAT 212; STAT 408.

STAT 407 Principles of Sample Surveys

Credits 3. 3 Lecture Hours. Principles of sample surveys and survey design; techniques for variance reduction; simple, stratified and multi-stage sampling; ratio and regression estimates; post-stratification; equal and unequal probability sampling. **Prerequisite:** STAT 212.

STAT 408 Introduction to Linear Models

Credits 3. 3 Lecture Hours. Introduction to the formulation of linear models and the estimation of the parameters of such models, with primary emphasis on least squares. Application to multiple regression and curve fitting. **Prerequisites:** STAT 212; MATH 304 or MATH 323.

STAT 414 Mathematical Statistics I

Credits 3. 3 Lecture Hours. Mathematical theory of statistics; probability, random variables and their distributions, transformations of random variables, expectations and variance, generating functions, sampling distributions and basic limit theorems. **Prerequisite:** MATH 221, MATH 251 or MATH 253.

STAT 415 Mathematical Statistics II

Credits 3. 3 Lecture Hours. Continuation of the mathematical theory of statistics, including principles for statistical inference, formulation of statistical models, reduction of data, point estimation, confidence intervals, hypothesis testing and Bayesian inference. **Prerequisite:** STAT 414 or MATH 411.

STAT 421 Machine Learning

Credits 3. 3 Lecture Hours. Theoretical foundations of machine learning, pattern recognition and generating predictive models and classifiers from data; includes methods for supervised and unsupervised learning (decision trees, linear discriminants, neural networks, Gaussian models, non-parametric models, clustering, dimensionality reduction, deep learning), optimization procedures and statistical inference. **Prerequisite:** Grade of C or better in MATH 304, MATH 311, or MATH 323; Grade of C or better in STAT 211, and STAT 404 or CSCE 221, or ECEN 303, and CSCE 121 or CSCE 120. **Cross Listing:** CSCE 421 and ECEN 427.

STAT 424/MATH 424 Probability and Computing

Credits 3. 3 Lecture Hours. Applications of modern probability in data science, with an emphasis on randomization and the role of probabilistic techniques in computing; discrete random variables and expectation; deviation inequalities and applications to randomized algorithms; probabilistic methods and satisfiability; Monte Carlo method; sample complexity; combinatorial dimension. **Prerequisites:** MATH 304, MATH 309, MATH 311, or MATH 323; MATH 411 or STAT 414. **Cross Listing:** MATH 424/STAT 424.

STAT 426 Methods in Time Series Analysis

Credits 3. 3 Lecture Hours. Autocorrelation and spectral characteristics of univariate, autoregressive and moving average models; identification, estimation and forecasting. **Prerequisites:** STAT 408; STAT 414.

STAT 436 Multivariate Analysis and Statistical Learning

Credits 3. 3 Lecture Hours. Matrix algebra; random vectors; multivariate distributions; copulas; multivariate generalizations of classical testing; principle component analysis; discriminant analysis; clustering; multidimensional scaling; factor analysis; canonical analysis.

Prerequisites: MATH 304 or MATH 323; STAT 212; STAT 415 or equivalent.

STAT 438 Bayesian Statistics

Credits 3. 3 Lecture Hours. Analysis of scalar and vector-valued parameters; Bayesian linear models; Monte Carlo computational methods; prior elicitation; hypothesis testing and model selection; hierarchical models; selected advanced models; use of statistical packages such as WinBUGS, R or MATLAB. **Prerequisites:** MATH 221; STAT 408 or equivalent.

STAT 445 Applied Biostatistics and Data Analysis

Credits 3. 3 Lecture Hours. Applications of regression methods in biostatistics; correlated data analysis; survival analysis; missing data techniques; use of the R programming language. **Prerequisites:** STAT 212; STAT 408.

STAT 446 Statistical Bioinformatics

Credits 3. 3 Lecture Hours. Analysis of high-dimensional genomic and proteomic data using R; sequence analysis; genome-wide association studies; proteomics; array-based technologies; classification techniques. **Prerequisites:** STAT 212.

STAT 447 Machine Learning for Computational Biology

Credits 3. 3 Lecture Hours. Machine learning and statistical learning for bioinformatics techniques and tools, with application to biological, genetic/genomic, and medical case studies. **Prerequisites:** STAT 315; GENE 301 or GENE 302; senior classification.

STAT 459 Categorical Data Analysis

Credits 3. 3 Lecture Hours. Techniques for the analysis of categorical data; contingency table analysis; logistic regression; Poisson regression; loglinear models; analysis of ordinal data; use of computer software such as SAS or R. **Prerequisite:** STAT 212; STAT 408 or equivalent.

STAT 482 Statistics Capstone

Credits 3. 3 Lecture Hours. Integration of statistical models, design, sampling, graphics and computing for the analysis of real problems; planning, drafting, revising and editing reports; ethics; principles of collaboration and communication. **Prerequisites:** STAT 404; STAT 408 and senior classification.

STAT 483 Interdisciplinary Data Analytics Practicum

Credits 3. 3 Lecture Hours. . Application of data analytic methods and technologies in domain-based problems with real-world data; use of relevant machine learning platforms and open source tools; organization of project activities to meet goals; written and oral communication skills and methods for effective collaboration in teams with members drawn from varied technical disciplines. **Prerequisite:** STAT 404, ISTM 313, ISTM 315, PETE 404, GEOP 361, CSCE 310, or CSCE 314; STAT 408, SCMT 305, ECEN 360, STAT 315, CSCE 305, GEOL 360, CSCE 305, CSCE 320/STAT 335, or STAT335; STAT 436, STAT 421, CSCE 421, ISTM 360, or PETE 419.

STAT 484 Internship

Credits 0 to 3. 0 to 3 Other Hours. Directed internship in an organization to provide on-the-job training and applied research experience with professionals in settings appropriate to statistics and student professional interest. **Prerequisites:** Major in statistics; 12 completed hours of statistics; 2.5 cumulative GPA; 2.5 GPA in statistics courses; approval of statistics undergraduate advisor.

STAT 485 Directed Studies

Credits 1 to 6. 1 to 6 Other Hours. Special problems in statistics not covered by another course in the curriculum. Work may be in either theory or methodology. **Prerequisite:** Approval of instructor.

STAT 486 Bioinformatics Capstone

Credits 3. 3 Lecture Hours. Integration of experimental design, computational algorithm, statistical methods for the analysis of high-throughput genomic data; planning, drafting, revising, and editing reports; principles of collaboration and communication. **Prerequisites:** STAT 408 or STAT 446; senior classification.

STAT 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of statistics. May be repeated for credit. **Prerequisite:** Junior or senior classification or approval of department head.

STAT 491 Research

Credits 0 to 4. 0 to 4 Lecture Hours. 0 to 4 Lab Hours. Research conducted under the direction of faculty members in statistics. May be taken four times for credit. Registration in multiple sections of this course is possible within a given semester provided that the per semester credit hour limit is not exceeded. **Prerequisite:** Junior or senior classification or approval of instructor.

TCMG - Technology Management (TCMG)

TCMG 476 Technical Network Capstone

Credits 4. 3 Lecture Hours. 3 Lab Hours. Development of knowledge and skills towards the application of technical network management in public education and corporate training settings; focus on practices, techniques and tools for managers of technical networks. **Prerequisites:** TCMG 303 or TCMG 304 with a grade of C or better; junior or senior classification.

TCMG 484 Professional Internship

Credits 6. 6 Other Hours. Directed internship in an organization to provide students with a learning experience supervised by professionals in organizational settings appropriate to the student's professional objectives; must be in good standing with the University. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisites:** EHRD 481 and EHRD 490 with a grade of C or better; approval of instructor.

TCMG 485 Directed Studies

Credits 0 to 12. 0 to 12 Other Hours. Directed readings or research problems in industrial technology. **Prerequisites:** Junior or senior classification; approval of directed studies application.

TCMG 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified area of industrial technology. May be repeated for credit. **Prerequisite:** Approval of instructor.

TCMG 491 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in technology management. **Prerequisites:** Junior or senior classification; approval of instructor.

TEED - Teacher Education (TEED)

TEED 425 Supervised Clinical Teaching

Credits 12. 36 Other Hours. Culmination of teacher education program; integration and application of knowledge and skills learned from program of study while clinical teaching in accredited schools with university supervision. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisites:** Admission and retention in teacher education program; successful completion of all coursework; senior classification.

TEFB - Teacher Ed Field Based (TEFB)

TEFB 273 Introduction to Culture, Community, Society and Schools

Credits 3. 2 Lecture Hours. 3 Other Hours. (EDUC 1301) Introduction to Culture, Community, Society and Schools. Field-based course that introduces the culture of schooling and classrooms for analysis within the lens of language, gender, racial, socio-economic, ethnic and academic diversity; the family as a partner in education and educational equality discussed.

TEFB 322 Teaching and Schooling in Modern Society

Credits 3. 2 Lecture Hours. 3 Lab Hours. Development, structure, management and finance of secondary schools; historical, philosophical, ethical and moral dimensions of teaching; role of school in a democratic society; teaching as a profession. **Prerequisites:** Junior or senior classification; admission to educator preparation program.

TEFB 324 Teaching Skills II

Credits 3. 2 Lecture Hours. 2 Lab Hours. Study and development of teaching skills necessary for applying instructional strategies; teaching general strategies, assessing student learning, and analyzing and synthesizing multiple source data; emphasis given to adolescent development and cultures and to teacher and child cultures. **Prerequisites:** Grade of C or better in TEFB 322; junior or senior classification.

TEFB 371 Dynamics and Management in Multicultural/Inclusionary Learning Environments

Credits 3. 2 Lecture Hours. 4 Lab Hours. Field-based course focusing on communication, methodology and management perspectives that lead to democratic classrooms; organizational structures that focus on transformative, inclusionary learning; interventions for students with disabilities; analysis of systemic conditions placing children from diverse backgrounds and representing diverse abilities in positions of "risk" for incomplete success in school. **Prerequisite:** Admission to teacher education; junior or senior classification; concurrent enrollment in EDCI 354.

TEFB 401 Language Arts in the Middle and Senior School

Credits 3. 2 Lecture Hours. 6 Lab Hours. Methodology of teaching language arts-related content with specific reference to language, literature, journalism, drama and speech interactions among these areas; development of oral competence; coordination with other subjects. Phase IV, Practicum I. **Prerequisites:** Completion of Phases I, II and III of the secondary program; admission to teacher education; enrollment in language arts-related teaching field.

TEFB 404 Social Studies in the Middle and Senior High School

Credits 3. 2 Lecture Hours. 6 Lab Hours. Features of social studies instruction in grades 6-12; approaches, methods and instructional materials. Phase IV, Practicum I. **Prerequisites:** Completion of Phases I, II and III of the secondary program; admission to teacher education; enrollment in history and/or social science teaching field.

TEFB 406 Science in the Middle and Secondary School

Credits 3. 2 Lecture Hours. 6 Lab Hours. Methods course for the prospective secondary teacher in the physical and biological sciences; implementation of contemporary curricula. Phase IV, Practicum I. **Prerequisites:** SEED minor; admission to educator preparation program; grade of C or better in TEFB 324.

TEFB 407 Mathematics in the Middle and Senior School

Credits 3. 2 Lecture Hours. 6 Lab Hours. Design and teach selected topics from middle and secondary school mathematics. Content, materials and methodology. **Prerequisites:** SEED minor; admission to educator preparation program; grade of C or better in TEFB 324.

TEFB 410 Social Studies and the Humanities in the Elementary School

Credits 3. 2 Lecture Hours. 6 Lab Hours. Recent trends, issues and procedures related to curriculum development and instruction in the social studies and humanities; integration of content, planning, design of appropriate teaching/learning experiences and evaluation; preparation of prototype materials. **Prerequisite:** Admission to teacher education; junior or senior classification; concurrent enrollment in RDNG 467, TEFB 412, and TEFB 413.

TEFB 412 Mathematics in the Elementary School

Credits 3. 2 Lecture Hours. 6 Lab Hours. Introduction to understanding of modern mathematics; integration of content, history and application of discovering techniques using problem solving approach; developing an understanding of four fundamental procedures—structure, measurement, sets, fractions—and communication of important mathematical concepts to elementary children. **Prerequisites:** Admission to educator preparation program; concurrent enrollment in RDNG 467, TEFB 410 and TEFB 413.

TEFB 413 Science in the Elementary School

Credits 3. 2 Lecture Hours. 6 Lab Hours. Designed to help elementary teachers understand basic concepts of science and scientific methods; content relates to natural phenomena involving physical, chemical and biological processes; elementary students appreciation and interest in science. **Prerequisites:** Admission to educator preparation program; concurrent enrollment required in RDNG 467, TEFB 410 and TEFB 412.

TEFB 426 Supervised Clinical Teaching

Credits 6. 24 Other Hours. Culmination of teacher education program; integration and application of knowledge and skills learned from program of study while clinical teaching in accredited schools with university supervision. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisite:** Admission and retention in teacher education program; successful completion of all coursework; senior classification.

TEFB 429 Supervised Clinical Teaching

Credits 9. 36 Other Hours. Culmination of teacher education program; integration and application of knowledge and skills learned from program of study while clinical teaching in accredited schools with university supervision. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisites:** Admission and retention in teacher education program; successful completion of all coursework; senior classification.

THEA - Theatre (THEA)

THEA 103 Introduction to Devised Theatre

Credits 3. 3 Lecture Hours. Overview of approaches to devising performance and collective creation in the US and around the world; fundamentals of theatrical production.

THEA 110 Acting I: Fundamentals

Credits 3. 2 Lecture Hours. 4 Lab Hours. (DRAM 1351) Acting I: Fundamentals. A Stanislavsky-based approach to the fundamentals of acting, which may include sensory exercises, relaxation, concentration, imagination, improvisation, character analysis and scene work.

THEA 112 Introduction to Stagecraft

Credits 3. 2 Lecture Hours. 2 Lab Hours. Foundations of theatrical production and collaboration; introduction to theatre technology including scenic construction, drafting, carpentry, lighting, and rigging; scene shop and stage safety, use of equipment including hand tools and power tools.

THEA 200 Introduction to World Theatre

Credits 3. 3 Lecture Hours. (THEA 200) Introduction to World Theatre. Non-Western theatre, its origins and continuing influence on society and Western theater; emphasis on the theaters of India, China, Japan, Africa, the Caribbean and Latin America; also taught at Galveston campus.

THEA 210 Physical Acting

Credits 3. 2 Lecture Hours. 4 Lab Hours. Principles of physical acting and physical training of the actor; exploration of the materiality of the body onstage; topics include introductions to biomechanics, Viewpoints, Suzuki, Jacques Lecoq, Jerzy Grotowski, and others.

THEA 220 Decentering the Text

Credits 3. 3 Lecture Hours. Modes of authorship in theatre; introduction to script analysis techniques; approaches to collective creation, verbatim theatre, and postdramatic theatre-making.

THEA 245 Introduction to Theatrical Design

Credits 3. 3 Lecture Hours. Elements and principles of design for the theatre; role of the designer within the production team, theoretical and practical applications in the visual interpretation of plays.

THEA 250 Stage Makeup

Credits 3. 2 Lecture Hours. 4 Lab Hours. Design of makeup for the stage; practical makeup application techniques and media; hygiene and safety considerations; characterization through makeup.

THEA 255 Costume Technology

Credits 3. 2 Lecture Hours. 4 Lab Hours. Survey of the costume process from concept to realization; hand and machine sewing techniques; basic patterning and fitting methods; and craft techniques; participation in PVFA productions required.

THEA 281 History of the Theatre II

Credits 3. 3 Lecture Hours. (DRAM 2362) History of the Theatre II. Survey of the history of western theatre from the closing of the theaters in England in 1642 to the present; consideration of cross-cultural exchange and the influence of global performance practices on theatre in Europe and the United States; also taught at Galveston campus.

THEA 289 Special Topics in...

Credits 3. 3 Other Hours. Selected topics in theatre. May be repeated for credit. **Prerequisite:** Approval of instructor.

THEA 300 Dramaturgy

Credits 3. 3 Lecture Hours. Exploration of literary, production and theoretical dramaturgy in a classroom setting; script analysis, theatre criticism, theories of theatre, research techniques and dramaturgy in the production process, advancing thought about the art form in all its complexity; research methods for theatre. **Prerequisites:** Junior or senior classification.

THEA 304 Devised Theatre Studio

Credits 3. 1 Lecture Hour. 5 Lab Hours. Advanced theory and practice of conceiving, developing, rehearsing, and staging live and mediated devised theatrical performance; investigation of structures for collaborative creation; advanced techniques and skills for devising theatre; discussion and critical analysis of devised theatre. May be repeated two times for credit. **Prerequisites:** Grade of C or better in PERF 303.

THEA 307 Stage Management

Credits 3. 3 Lecture Hours. Role of the stage manager in a collaborative theatre-making process; communication, leadership, and organization skills; stage safety; practical application throughout preproduction, rehearsal, and performance phases; creation and use of promptbooks. **Prerequisites:** Grade of C or better in PVFA 111.

THEA 310 Strategies for Equitable Acting

Credits 3. 2 Lecture Hours. 4 Lab Hours. Advanced approaches to acting; care and respect in acting; strategies for sensitive representation of characters from varied backgrounds, cultures, and experiences; strategies for fostering inclusive and equitable rehearsal spaces. **Prerequisites:** Grade of C or better in PVFA 111.

THEA 320 Directing Live Performance

Credits 3. 2 Lecture Hours. 4 Lab Hours. Composition for the stage; theatre forms and styles; director's function and responsibility in producing plays and as a collaborator; script analysis; directing laboratory scenes. **Prerequisites:** Grade of C or better in PVFA 111 and THEA 220.

THEA 342 Applied Theatre

Credits 3. 3 Lecture Hours. Use of theatrical approaches to address issues facing diverse communities; topics may include theatre as therapy, theatre for development, creative drama, and other forms of theatrical community engagement. **Prerequisites:** Grade of C or better in PVFA 111.

THEA 345 Environmental Scenography

Credits 3. 2 Lecture Hours. 4 Lab Hours. Principles and applications of scenic design in diverse performance genres; conception, design and construction of physical environments; exploration of site-specific design, and scenic design beyond the stage. **Prerequisites:** Grade of C or better in THEA 245.

THEA 355 Creative Costuming

Credits 3. 2 Lecture Hours. 4 Lab Hours. Overview of the art of dress for performance; aesthetic, cultural, and historical considerations of the body and dress; characterization through costume; methods of design and rendering costumes. **Prerequisites:** Grade of C or better in THEA 245.

THEA 360 Art of Light

Credits 3. 2 Lecture Hours. 4 Lab Hours. The theatrical use of light on stage and beyond; color theory and color media; stage lighting theory and technique; operation and maintenance of lighting equipment; sculpting and storytelling with light; principles of projection design. **Prerequisites:** Grade of C or better in THEA 245.

THEA 370 Producing Theatre

Credits 3. 3 Lecture Hours. Overview of the business of theatre; principles of operating a theatrical venue and managing a theatre company; principles of budgeting, marketing, and personnel management; principles of presenting and season design; grants and fundraising; government and community relations.

THEA 379 Voice for the Stage

Credits 3. 3 Lecture Hours. Use of the voice as a creative instrument in performance; principles of breathing, musicality, vocal placement, and resonance; relationship between voice and body; sensitive approaches to vocal characterization. **Prerequisites:** Grade of C or better in PVFA 111.

THEA 386/MUSC 386 Evolution of the American Musical

Credits 3. 3 Lecture Hours. Examination of the American musical from its heterogeneous origins to a thriving and diverse expression of the human condition; analysis and critical discourse on the development of the American musical through text, audio and visual recordings.

Prerequisites: Junior or senior classification or approval of instructor.

Cross Listing: MUSC 386/THEA 386.

THEA 390 Theatre Practicum - Performance

Credits 0 to 4. 0 to 4 Other Hours. Participation as a performer in a departmental theatre production under the supervision of theatre arts faculty; audition or application may be required. May be taken 7 times for credit. **Prerequisites:** Junior or senior classification, or approval of instructor.

THEA 392 Theatre Practicum - Design

Credits 0 to 4. 0 to 4 Other Hours. Participation in the design team for a departmental theatre production under the supervision of theatre arts faculty; audition or application may be required. **Prerequisites:** Junior or senior classification, or approval of instructor.

THEA 401 Theatre Pedagogy

Credits 3. 3 Lecture Hours. Theory and practice of theatre pedagogy; foundational skills for teaching acting, theatrical production, and design to varied populations; introduction to equitable and inclusive teaching methods, lesson planning, instructional communication, and learning styles in theatre education. **Prerequisites:** Grade of C or better in PVFA 111.

THEA 410 Advanced Problems in Acting

Credits 3. 2 Lecture Hours. 4 Lab Hours. Investigation of advanced dramatic problems using acting, voice, movement, and style techniques; writing, development and performance of an autobiographical monologue; includes audition preparation and rehearsal techniques.

Prerequisites: Grade of C or better in THEA 210 or THEA 310 and approval of instructor.

THEA 435 Technology for Designers

Credits 3. 3 Lecture Hours. Fundamentals of design software including sound editing, video editing, and rendering for theatre; multi-media installation. **Prerequisites:** Grade of C or better in THEA 245; junior or senior classification, or approval of instructor.

THEA 441 Capstone Seminar in Theatre

Credits 3. 1 Lecture Hour. 5 Lab Hours. Capstone senior project on an individually-chosen research topic, presentation of a performance or interdisciplinary project; major writing and oral communication components. **Prerequisites:** Theatre major; completion of all Theatre coursework or taken concurrently with this course; approval of instructor, advisor and program director.

THEA 482 Topics in American Theatre and Performance

Credits 3. 3 Lecture Hours. Exploration of significant issues in American theatre and performance; emphasis on the aesthetic, social, and cultural issues affecting theatre and performance. May be taken two times for credit. **Prerequisites:** Junior or senior classification.

THEA 489 Special Topics in...

Credits 1 to 4. 1 to 4 Other Hours. Selected topics in theatre. May be repeated for credit. **Prerequisite:** Approval of instructor.

UGST - Undergraduate Studies (UGST)

UGST 001

Credits 0.

UGST 181 First Year Seminar

Credits 0 to 3. 0 to 3 Lecture Hours. Seminar on various contemporary topics; introduction to high quality college instruction and research; focus on writing, speaking, discussion and research; open to all majors; restricted to first-time-in-college students and limited in size to provide small class experience; also taught at Qatar campus. May be taken two times for credit.

UGST 182 Topics in Undergraduate Studies

Credits 0 to 3. 0 to 3 Lecture Hours. Selected interdisciplinary topics related to specific programs as identified by the office of undergraduate studies; for students in approved first year programs. May be taken two times for credit. **Prerequisite:** Freshman classification or approval of instructor; also taught at Qatar campus.

UGST 285 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Directed individual study on selected topics in undergraduate studies. May be taken six times for credit.

UGST 311 UScholar Exploration Series

Credits 0-1. 0-1 Lecture Hours. Selection from a variety of discussion topics designed to foster student-faculty interaction, intellectual and cultural enrichment, inter-and cross-disciplinary connections, and the development of interest and knowledge of issues outside of a student's degree area. May be taken six times for credit. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisites:** Junior or senior classification or approval of instructor; admitted to University Scholar program.

UGST 405 Thesis Writing

Credits 0-1. 0-1 Lecture Hours. Accessing information, searching scholarly literature, and oral or poster presentation of scholarly work and formal research thesis. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisites:** Junior or senior classification; admission to the Undergraduate Research Scholars thesis program.

UGST 484 Internship

Credits 0 to 3. 0 to 3 Other Hours. Directed internship in a community, public or private organization to provide students with on-the-job training and/or applied research experience appropriate to career objectives. May be taken three times for credit. **Prerequisites:** Junior or senior classification and approval of instructor.

UGST 485 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Directed individual study on selected topics in undergraduate studies. May be taken six times for credit.

UGST 491 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of a faculty member in undergraduate studies. May be taken three times for credit. **Prerequisites:** Junior or senior classification and approval of instructor.

UGST 492 Cooperative Education in Public Policy

Credits 0 to 6. 0 to 6 Other Hours. Educational work assignment in public policy setting related to student's career interest and course of study; supervision of the student will be by the cooperating employer and the instructor; reports, approved by course instructor, will be required. May be taken two times for credit. **Prerequisites:** Junior or senior classification; approval of Policy Internship Programs Staff.

UGST 497 Capstone

Credits 0 to 6. 0 to 6 Other Hours. Demonstrating mastery of discipline as applied to an original problem through an independent, mentored project; public presentation of work. May be taken two times for credit. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisites:** Junior or senior classification; admitted to Undergraduate Service Scholars program.

URPN - Urban & Reg Planning (URPN)

URPN 201 The Evolving City

Credits 3. 3 Lecture Hours. Introduction to the history of contemporary urban and regional planning and how the evolving forms of cities and regions pose opportunities and/or challenges for planners; understanding key social, economic, political and technological forces that shape city form and function and its ramification for urban and regional planning.

URPN 202 Building Better Cities

Credits 3. 3 Lecture Hours. Determinants of land use patterns; classification of uses; idealized conceptual alternatives; location and size criteria; mapping; comprehensive planning process, relationship to circulation planning.

URPN 203 Smart Cities - Bit, Bots and Beyond

Credits 3. 3 Lecture Hours. Historic perspectives of technological innovation and urbanization; smart-city solutions to tackle the world's challenges in transportation, climate change, aging population, governance, economic growth, and social inclusion; challenges and promises of disruptive technologies; future proof policies and strategies.

URPN 204 Introduction to U.S. Health System

Credits 3. 3 Lecture Hours. Examination of historical evolution, current state and potential future of U.S. health system; health costs, quality, access; delivery settings, health care workforce, role of government, system performance.

URPN 210 Urban Analytical Methods I

Credits 3. 3 Lecture Hours. Study of various analytical techniques used in urban and regional decision making; quantitative approaches to analyze and manipulate data; utilization of statistical packages for data, analysis and communication to enhance urban planning modeling. **Prerequisite:** URPN majors only or approval of instructor.

URPN 220 Digital Communication I

Credits 3. 3 Lecture Hours. Applications of computer graphics, rendering, and visualization software in urban design, landscape architecture, and environmental analysis; introduction to basic concepts and principles of graphic composition; rendering, visualization, and linkages to landscape-referenced data. **Prerequisite:** Landscape Architecture and Urban Planning majors only or approval of instructor.

URPN 240 More Than Monuments: Preservation as Social Justice

Credits 3. 3 Lecture Hours. Exploration of the ways designers', planners', and preservationists' expertise, combined with historical inquiry and citizen engagement, have fostered social and restorative justice.

URPN 291 Research

Credits 1 to 4. 1 to 4 Other Hours. Research conducted under the direction of faculty member in landscape architecture and urban planning. May be taken 2 times for credit. **Prerequisites:** Freshman or sophomore classification.

URPN 302 Planning Law

Credits 3. 3 Lecture Hours. Familiarization with the fundamental principles of planning law and legislation; legal foundation for the urban planning process; alternative methods of plan implementation; emphasis on legal issues as they impact land use planning and development at the municipal level of government; participation in mock advocacy trials and public hearings. **Prerequisites:** URPN 301; URPN majors only.

URPN 310 Urban Analytical Methods II

Credits 3. 3 Lecture Hours. Focuses on research conducted by planners, sociologists, anthropologists, political scientists and a variety of applied social scientists; examines variety of procedures employed when conducting research in urban areas; furthers understanding and knowledge of statistical methods employed in social research and elements of geographical analysis. **Prerequisite:** Upper division College of Architecture; URPN 210 or approval of instructor, URPN majors only.

URPN 320 Digital Communication II

Credits 3. 3 Lecture Hours. Advanced applications of computer graphics, rendering, and visualization software in urban design, landscape architecture, and environmental analysis; introduction to basic concepts and principles of graphic composition, rendering, visualization, and linkages to landscape-referenced data. **Prerequisites:** URPN 220; department majors only.

URPN 325 Introduction to GIS in Urban and Regional Planning

Credits 3. 2 Lecture Hours. 3 Lab Hours. Provides an understanding of GIS fundamentals; basic concepts, principles and functions; essential skills for applying GIS in various fields such as urban planning, landscape architecture, land development, environmental studies, transportation and hazard management; based on learning through class projects.

Prerequisite: Upper division College of Architecture; department majors only or approval of instructor.

URPN 326 Advanced GIS in Urban and Regional Planning

Credits 3. 3 Lecture Hours. Advanced instruction in applications of spatial tools for urban planning, landscape architecture, land development, hazard management, and related problems; GIS applications through review of literature and practice; data quality, uncertainty, the integration of GPS, remote sensing and information technology within the context of urban and regional planning.

Prerequisite: URPN 325 or approval of instructor; department majors only.

URPN 330 Land Development I

Credits 3. 3 Lecture Hours. Interface between the physical and financial dimensions in design and development to achieve building and project economies; creating a physical product and a financial venture that are responsive to social and environmental concerns and to market economy and finance. **Prerequisite:** Department majors only or approval of instructor.

URPN 331 Public and Private Infrastructure Funding

Credits 3. 3 Lecture Hours. An introduction to issues of financing public and public-private development project; exploring the difference between raising revenue, including the trade offs associated with establishing a sustainable tax base, and raising capital through capital markets; illustration of the range of decisions with financing public and public-private partnerships. **Prerequisite:** Upper division College of Architecture; URPN majors only.

URPN 340 Housing and Community

Credits 3. 3 Lecture Hours. Housing, its development, planning, marketing, designing, financing and production; social and design history and contemporary issues of American housing development, urban renewal, neighborhood structure and community facilities. **Prerequisite:** Department majors and minors only or approval of instructor.

URPN 360 Issues in Environmental Quality

Credits 3. 3 Lecture Hours. Issues in environmental quality; focus on stormwater and ecosystem qualities influenced by land development; design and planning principles and techniques (e.g. low impact development) for sustainable stormwater management in urban and suburban watersheds. **Prerequisite:** Junior or senior classification or approval of instructor.

URPN 361 Urban Issues

Credits 3. 3 Lecture Hours. Issues pertaining to the evolution and development of cities and urban regions; examines the socio-economic, cultural and physical development of urban areas; addresses contemporary problems such as racial tension, unemployment and poverty, housing, pollution and environmental sustainability, traffic and congestion, land use, crime, public health, and other quality of life issues.

Prerequisite: Junior or senior classification or approval of instructor.

URPN 369 Transportation and Urban Form

Credits 3. 3 Lecture Hours. Examination of the interrelated nature of transportation, land use and urban design; familiarization with the role of transportation in contemporary society; understanding the interrelationships between transportation and urban form at both the regional and community levels. **Prerequisite:** Junior or senior classification or approval of instructor.

URPN 370 Health Systems Planning

Credits 3. 3 Lecture Hours. Introduction to planning in the health care system at both institutional and community levels. **Prerequisite:** Junior or senior classification or approval of instructor.

URPN 371 Environmental Health Planning and Policy

Credits 3. 3 Lecture Hours. Philosophical and historical relationships of human-environment-disease; environmental health domains and associated planning and policy organizations and initiative for monitoring, intervention, and prevention; interdisciplinary approaches for risk analysis of environmental health. **Prerequisite:** Junior or senior classification or approval of instructor.

URPN 372 Environmental Health Planning and Policy II

Credits 3. 3 Lecture Hours. Exploration of interdisciplinary perspectives to understand the relationship between urban planning and public health, with a focus on health planning and policy issues in the United States. **Prerequisites:** Junior or senior classification or approval of instructor.

URPN 401 Policy Implementation

Credits 3. 3 Lecture Hours. Techniques of implementing major urban development programs and plans; capital improvements programming and budgeting; overview of regulatory measures including zoning and subdivision regulations; public involvement process; and fiscal planning. **Prerequisite:** URPN majors only.

URPN 409 Urban Design Studio

Credits 5. 2 Lecture Hours. 9 Lab Hours. Design studio focused on urban design as a human-centered participatory practice; consideration of a project derived through community engagement; interdisciplinary service learning combining methodologies of architecture, landscape architecture and urban design. **Prerequisites:** Junior or senior classification; admission to upper level in BED or URPN-BS; URPN 220, URPN 320, URPN 325, URPN 483, concurrent enrollment in URPN 419.

URPN 420 Principles of Urban Design

Credits 3. 3 Lecture Hours. Theories and fundamental components of urban design including historical trends, case studies, land use arrangement, transportation options, open space networks, urban form, aesthetics and planning policies; application of the history and theory behind differing urban designs to practical projects. **Prerequisites:** LAND 101, URPN 201, URPN 202, and URPN 210.

URPN 440 Urban and Regional Economic Development

Credits 3. 3 Lecture Hours. Examines economic development processes in urban and regional planning; issues explored include theoretical, the economic development planning process, ethics, location factors, intergovernmental relations, budgeting, and private sector revenue generation. **Prerequisite:** URPN majors only or approval of instructor.

URPN 450 Emergency Management Principles and Practices

Credits 3. 3 Lecture Hours. Introduction to the fundamental principles of emergency management. **Prerequisite:** Upper division College of Architecture or approval of instructor.

URPN 451 Hazard and Vulnerability Analysis for Planners

Credits 3. 3 Lecture Hours. Tools and techniques used by city planners and emergency managers to determine their jurisdictions' hazard risk and social vulnerability to disaster impacts. **Prerequisite:** Junior or senior classification, URPN 450 or approval of instructor.

URPN 460 Sustainable Communities

Credits 3. 3 Lecture Hours. Focuses on sustainable community with applications in public policy/design including societal organization, disciplinary bound design and policy, and empowered approaches to design, social ecology and public policy; reading and review of relevant literature on sustainability, complemented with exercises to illustrate underlying principles. **Prerequisite:** Department majors and minors only or approval of instructor.

URPN 467 Land and Property Aspects of Sustainable Development

Credits 3. 3 Lecture Hours. Sustainability perspectives about values, rights, property and what constitutes an optimum human environment; sustainability principles and case studies emphasizing on-the ground, incentive-based land development that balances economic growth with environmental quality. **Prerequisites:** Upper division College of Architecture.

URPN 469 Urban Infrastructure

Credits 3. 3 Lecture Hours. Foundation of planning and managing infrastructure and public services; utilization of life-cycle method of infrastructure planning and delivery, research theory and tools to perform basic infrastructure planning. **Prerequisite:** URPN majors only or approval of instructor.

URPN 470 Health Systems Planning and Policy

Credits 3. 3 Lecture Hours. Analyzes health needs at community, regional and national levels; organization and supply of health services at community, regional and national levels; medical technology and its impact on health needs and system organization; medical care financing and its effects on health need and system organization; health planning for natural and human-made disasters; and service-learning for applying planning theories and methods. **Prerequisite:** Junior or senior classification or approval of instructor.

URPN 471 Planning Healthier Communities

Credits 3. 3 Lecture Hours. Planning for the creation of healthier cities/communities; emphasis on the impact of global paradigmatic shifts regarding community health, stakeholder participation, coalition building, leadership, visioning the planning process, and the need for more systemic and process orientation in community building. **Prerequisite:** Junior or senior classification or approval of instructor.

URPN 481 Seminar

Credits 3. 3 Lecture Hours. Seminar discussion of current topics in urban planning. **Prerequisite:** Senior classification.

URPN 483 Studio in Urban and Regional Science

Credits 1 to 6. 1 to 6 Lecture Hours. Studio introduces the confluence of ecological, environmental, economic, social, cultural, and political forces impacting the planning, design, and development of complex urban environments; site planning, design process, sustainability. **Prerequisite:** URPN majors only or approval of instructor.

URPN 484 Internship

Credits 3. 3 Other Hours. Practical experience in an office of design allied professionals; 12 week internship with a minimum of 480 hours; continuous employment; departmental pre-approval through the department internship coordinator required. May not be repeated for credit. **Prerequisites:** URPN majors only or approval of internship coordinator.

URPN 485 Directed Studies

Credits 1 to 5. 1 to 5 Other Hours. Individual instruction in selected aspects of urban planning not adequately covered in other courses. May be taken 3 times for credit. **Prerequisite:** Upper level classification.

URPN 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified field of urban studies. May be repeated for credit.

URPN 491 Research

Credits 1 to 4. 1 to 4 Other Hours. Research conducted under the direction of faculty member in landscape architecture and urban planning. May be taken 2 times for credit. **Prerequisites:** Junior or senior classification.

URPN 493 Urban and Regional Studies Capstone Course

Credits 5. 5 Lecture Hours. Syntheses and application of skills and knowledge gained through coursework applied to the development of creative solutions to real-world projects. **Prerequisites:** URPN 310, URPN 331, URPN 410, URPN 469; LAND 494; senior classification; URPN majors only.

URPN 494 Internship

Credits 6. 6 Other Hours. Practical experience in public, private, non-profit and for profit organizations of design allied professionals; 18 week internship with a minimum of 720 hours; continuous employment; departmental pre-approval through the department internship coordinator required. May not be repeated for credit. **Prerequisites:** Upper level classification and approval of internship coordinator.

VIBS - Vet Integrative Biosci (VIBS)

VIBS 102 Scientific Notations on Neuroscience Overview

Credit 1. 1 Lecture Hour. Survey of neuroscience on the basic neuroscience core ideas and neurological disorders; includes in-class scientific writing practice. **Prerequisite:** NRSC-TPC majors only; concurrent enrollment in VIBS 101 or NRSC 101.

VIBS 111 Biodefense, Biosecurity and Bioterrorism

Credit 1. 1 Lecture Hour. Concepts presented in all aspects of bioterrorism, local state and federal agencies, definition of all levels of bioagents, detection methods, bioagent dissemination, genetic modification of bioagents, vaccination strategies, health system preparedness. **Prerequisites:** Freshman or sophomore classification; or approval of instructor.

VIBS 201/NRSC 201 History of Neuroscience

Credit 1. 1 Lecture Hour. Wide spectrum of neuroscience discovery beginning at the turn of the 20th Century; emphasis on key discoveries and their rationale, experimental design, experimental methods, major findings and interpretation of results. **Prerequisites:** Sophomore classification. **Cross Listing:** NRSC 201/VIBS 201.

VIBS 204 Fundamentals of Food Toxicology and Safety

Credits 3. 3 Lecture Hours. Toxicity and safety of various foods and food additives, ingredients and contaminants; occurrence, control and prevention of food transmitted diseases. **Prerequisite:** Sophomore classification and CHEM 101.

VIBS 210 Twenty-first Century Global One Health

Credit 1. 1 Lecture Hour. In depth presentation of concepts of surveillance, epidemiology and resistance, tropical medicine and One Health, climate change and One Health, conservation medicine and One Health and protection science policy and One Health. **Prerequisites:** BIMS 110, VIBS 111, or equivalent; freshman or sophomore classification.

VIBS 211 Twenty-first Century Biological Threats

Credit 1. 1 Lecture Hour. In depth presentation of different forms of bioterrorism, agroterrorism, sociological perspectives, surveillance, dual use research, advanced vaccine development, global health security and career opportunities. **Prerequisites:** BIMS 101; BIMS 110, VIBS 111, or equivalent; freshman or sophomore classification.

VIBS 222 Great Poisonings of the World

Credits 3. 3 Lecture Hours. Exploration of the effect of intentional and accidental man-made and natural poisonings on humans and the environment and their impact on public policy. **Prerequisite:** Freshman or sophomore classification.

VIBS 243 Introductory Mammalian Histology

Credits 2. 1 Lecture Hour. 2 Lab Hours. Biological aspects of the human body by integrating histology and anatomy and physiology; emphasis on the transition of cell and tissue organization to organ systems that comprise mammalian organisms; builds upon concepts introduced in lower-level biology and builds a foundation to succeed in upper-level histology, anatomy and physiology.

VIBS 277 Essential Neuroscience - From Molecules to Nervous Systems

Credits 3. 3 Lecture Hours. Neuroscience from the molecular to system levels; fundamental principles and knowledge of neuroscience; current research information on neuroscience. **Prerequisites:** Sophomore classification and approval of instructor.

VIBS 285 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Directed studies in specific problem areas of veterinary anatomy and public health. **Prerequisites:** Freshman or sophomore classification and approval of department head.

VIBS 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified area of veterinary anatomy or topics not covered in other courses. May be repeated for credit. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

VIBS 305 Biomedical Anatomy

Credits 4. 2 Lecture Hours. 4 Lab Hours. Comprehensive mammalian gross anatomy, using the dog and goat as model species; and introducing horse, cat, and ox structures where appropriate; includes laboratory dissection, prepared specimen examination, anatomical nomenclature, and the application of anatomy to clinical situations; general basic physiology will be presented to relate structure to function. **Prerequisites:** Grade of C or better in BIOL 112 and CHEM 228; junior or senior classification or approval of instructor.

VIBS 310 Biomedical Writing

Credit 1. 1 Lecture Hour. Mechanisms by which knowledge is shared among researchers, clinicians and other science professionals, then disseminated to the general public; an assortment of written assignments to develop writing skills specific for communicating scientific concepts to a variety of audiences. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisite:** Grade of C or better in BIOL 112, CHEM 228, PHYS 202 and MATH 142 or 151; junior or senior classification.

VIBS 311 Biomedical Explorations through Narrative

Credit 1. 1 Lecture Hour. Familiarization with the writing style required for biomedical and health science; instruction in writing styles and appropriate techniques to increase and strengthen writing abilities. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisite:** Grade of C or better in BIOL 112, CHEM 228, PHYS 202 and MATH 142 or 151; junior or senior classification.

VIBS 343 Histology

Credits 4. 3 Lecture Hours. 3 Lab Hours. Normal tissues of vertebrates including histogenesis of some; histogenesis and organography of mammalian tissues. **Prerequisites:** BIOL 112; CHEM 228; junior or senior classification; BIMS major with a minimum overall 2.5 Texas A&M GPA.

VIBS 401/NRSC 401 Developmental Neurotoxicology

Credits 3. 3 Lecture Hours. Effects of exposure to toxic substances on the developing nervous system; content to include mechanisms of toxicity of substances potentially devastating to the developing nervous system including lead, mercury and other heavy metals, alcohol, nicotine (smoking), pesticides, flame retardants, and others. **Prerequisites:** Grade of C or better in CHEM 258 or CHEM 228; junior or senior classification; VIBS 277 or NRSC 277 recommended. **Cross Listing:** NRSC 401/VIBS 401.

VIBS 402/BIMS 402 Anatomy

Credits 4. 2 Lecture Hours. 6 Lab Hours. Clinical and functional anatomy focused on pre-professional training; includes anatomy of all major body systems. **Prerequisites:** Grade of C or better in BIOL 112 and CHEM 258; junior or senior classification; minimum GPA 2.75; or approval on instructor. **Cross Listing:** BIMS 402/VIBS 402.

VIBS 407/NRSC 407 Core Ideas in Neuroscience

Credits 2. 2 Lecture Hours. General overview of selected core ideas across the full spectrum of neuroscience. **Prerequisite:** Junior or senior classification; background in science courses recommended. **Cross Listing:** NRSC 407/VIBS 407.

VIBS 408 Neuroscience and Religion

Credits 3. 3 Lecture Hours. Emphasis on the biology of the human mind in the context of religious implications. **Prerequisites:** Junior or senior classification; concurrent enrollment in NRSC 407/VIBS 407 or VIBS 407/NRSC 407.

VIBS 411 Tumor Cell Biology and Carcinogenesis

Credits 3. 3 Lecture Hours. Principles of tumor biology; role of gene-environment interactions; molecular mechanisms regulating cancer initiation and progression; therapeutic treatment of cancer. **Prerequisites:** BIMS 320/GENE 320 or equivalent; junior or senior classification.

VIBS 413 Introduction to Epidemiology

Credits 3. 3 Lecture Hours. Study and measurement of disease and health in populations; examples from literature and current events; emphasizes concepts and appreciation for epidemiologic approaches and applications in life. **Prerequisite:** Junior or senior classification.

VIBS 420 Computer Applications in Public Health Research

Credits 3. 2 Lecture Hours. 3 Lab Hours. Introduction to the use of computers for public health research applications, including word processing, spreadsheets, data base management and telecommunications. **Prerequisites:** Senior classification or approval of instructor; BIMS major with a minimum overall 2.5 Texas A&M GPA.

VIBS 422 Endocrine Toxicology

Credits 4. 4 Lecture Hours. Impacts of endocrine toxicology on endocrine system; prevalence, environmental and occupational use and disposal of environmental endocrine disrupting chemicals (EDCs); structure, toxicokinetics and mechanism of action of EDCs; effects of EDCs on the development and function, disorders and diseases of the endocrine and reproductive organs. **Prerequisites:** Senior classification; approval of instructor.

VIBS 424/VTPP 424 Biomedical Neuroendocrinology and Endocrine Disorders

Credits 3. 3 Lecture Hours. Neuroendocrine (hypothalamus-pituitary) control of puberty, menstruation, ovulation, pregnancy, labor, lactation, female reproductive cycles, male reproductive functions, thyroid and parathyroid, adrenal and kidney, diabetes, obesity, sleep, memory, learning and aging and their endocrine disorders; overview on biosynthesis, transport and signaling of peptide and neuropeptide hormones, steroids and prostaglandins. **Prerequisites:** Honors, junior or senior classification, or approval of instructor. **Cross Listing:** VTPP 424/VIBS 424.

VIBS 426/ENTO 426 Methods in Vector-Borne Disease Ecology

Credits 3. 1 Lecture Hour. 5 Lab Hours. Methodological understanding of how vector-borne diseases are studied in the field and laboratory; hands-on exploration of the ecology disease systems in a one health framework; concepts of design, execution and presentation of research projects; outdoor field work and bio-safety level 2 laboratory. **Prerequisites:** Junior or senior classification and approval of instructor. **Cross Listing:** ENTO 426/VIBS 426.

VIBS 443 Biology of Mammalian Cells and Tissues

Credits 4. 3 Lecture Hours. 3 Lab Hours. Molecular phenomena placed in context with tissues, organs and organ systems; cell and tissue structures visualized by light microscopy and electron micrographs for functional relationships; clinical correlations reveal relevance of histology in specific disease states; conceptual thinking exercises facilitate problem solving skills. **Prerequisites:** Junior or senior classification in life sciences and interest in health related careers.

VIBS 445 Learning and Applying Peer Teaching Principles in Biomedical Anatomy

Credits 3. 2 Lecture Hours. 4 Lab Hours. Application of peer teaching techniques in an undergraduate lab course; discussion of current pedagogical theories and practices; focus on using effective communication in the classroom; development of personal teaching philosophy, assessments and learner-centered engagement strategies. **Prerequisite:** Grade of B or better in VIBS 305 and approval of instructor.

VIBS 446 Functional Anatomy of Domestic Animals

Credits 4. 3 Lecture Hours. 4 Lab Hours. Comprehensive mammalian gross anatomy, includes dog, cat, ruminant, and equine species. **Prerequisites:** Grade of C or better in BIOL 112 and CHEM 228; junior or senior classification; minimum GPA 2.75 or higher; or approval of instructor.

VIBS 447 Neurophysiology of Music

Credits 2. 2 Lecture Hours. Exploration of the heritability and genetics of musical talent, the physiology and physics of hearing, and the neurophysiology of processing sound using primarily German and Austrian compositions. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisite:** Junior or senior classification.

VIBS 450 Mammalian Functional Neuroanatomy

Credits 4. 3 Lecture Hours. 2 Lab Hours. Functional morphology of the domestic animal and human brain using gross specimens, microscopic sections, interactive computer-, DVD- and video-assisted instructional programs supplemented with clinical case studies. **Prerequisites:** Junior or senior classification; BIMS, biology, biochemistry, or psychology majors, or neuroscience minors with overall 3.5 Texas A&M GPA; or approval of instructor.

VIBS 456 Science in Cinema and Society

Credits 3. 3 Lecture Hours. Examination of the role science depicted in popular culture plays in shaping basic science literacy. **Prerequisites:** VIBS 310; majors only; junior or senior classification; approval of instructor.

VIBS 485 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Directed individual study of a selected problem in veterinary anatomy (with emphasis on neuroscience, cell biology, reproduction, developmental biology, marine mammal anatomy) approved by instructor or selected problems in veterinary public health (with emphasis on food safety, toxicology, epidemiology, informatics, zoonoses). **Prerequisites:** Junior or senior classification and approval of instructor.

VIBS 489 Special Topics in...

Credits 1 to 4. 0 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified area of veterinary anatomy (with emphasis on neuroscience, cell biology, genetics, reproduction, developmental biology, marine mammal anatomy) or selected topics in veterinary public health, epidemiology, zoonoses, food hygiene, food toxicology and mycotoxicology. May be repeated for credit. **Prerequisites:** Junior or senior classification and approval of instructor; BIMS major with a minimum overall 2.5 Texas A&M GPA.

VIBS 491 Research

Credits 1 to 4. 1 to 4 Other Hours. Research conducted under the direction of faculty member in veterinary integrative biosciences. May be taken four times for credit. **Prerequisites:** Junior or senior classification in Biomedical Sciences or approval of instructor; grade of C or better in VIBS 310 or VIBS 311.

VIST - Visual Studies (VIST)

VIST 101/FILM 101 Introduction to Visual Studies

Credits 3. 3 Lecture Hours. Survey of topics in the interdisciplinary field of visual studies, including forms of art, media, and architecture, and visual culture in global and intercultural contexts; application of visual studies methods and techniques to art, media, and architecture; analysis of the visual in contemporary culture; in-class visual studies exercises and discussions. **Cross Listing:** FILM 101/VIST 101.

VIST 105 Principles of Design I

Credits 3. 1 Lecture Hour. 7 Lab Hours. Principles and theory of design and visual communication; elements and organizational structure of the visual language; sign, symbol and meaning; visual perception; problem solving and the creative process; introduction to color theory; emphasis on two-dimensional design. **Prerequisite:** Lower division in Visualization.

VIST 106 Principles of Design II

Credits 3. 1 Lecture Hour. 7 Lab Hours. Fundamentals of spatial design; theory of form; transformations, additive/subtractive techniques as process; 3D composition; traditional modeling and construction techniques; formal visual analysis and critique. **Prerequisite:** Grade of C or better in VIST 105.

VIST 110 Design Innovation

Credits 3. 2 Lecture Hours. 2 Lab Hours. Introduction to fundamental design issues, processes, and theories relevant to design resolution and the creation of new ideas for innovative design products and services by keeping users' needs at the center of the development process; overview of design research, prototyping, evaluation, and communication techniques to generate valuable insights for design innovation.

VIST 131 First Year Seminar

Credit 1. 1 Other Hour. Seminar on contemporary topics related to Visualization; introduction to college instruction and experiences; focus on writing, exploration, discussion and research. **Prerequisite:** Lower division in Visualization.

VIST 170 Introduction to Visualization Computing Environments

Credit 1. 2 Lab Hours. Procedures, practices and environments useful for visual problem solving using programmatic languages; setup and use of the computing environment; useful system tools and commands; basic programming concepts and constructs. **Prerequisite:** Lower division in Visualization.

VIST 172 Foundations of Visual Computing

Credits 3. 2 Lecture Hours. 2 Lab Hours. Introduction to computer programming and mathematical concepts needed for developing solutions to visual computing problems; includes a graduated series of hands-on programming assignments; introduction to scripting in a professional animation package and emphasis on problem solving and debugging. **Prerequisite:** Lower division in Visualization.

VIST 173 Foundations of Visual Computing II

Credits 3. 2 Lecture Hours. 2 Lab Hours. Continuation of the introduction to programming and mathematical concepts underlying visual computing, with emphases on object-oriented programming and interaction; includes a graduated series of hands-on programming assignments; introduction to scripting in a 3D animation and visual effects package. **Prerequisites:** Grade of C or better in VIST 172.

VIST 201 Writing for Design

Credit 1. 2 Lab Hours. Writing as a discipline for the development, conceptualization, critique and presentation of visual works; emphasis on portfolio and narrative development. **Prerequisite:** Major in visualization.

VIST 205 Principles of Design III

Credits 3. 1 Lecture Hour. 7 Lab Hours. Introduction to the creative processes, workflows and methodologies used in the field of visualization including interactive design, game design and development and animation. **Prerequisite:** ARTS 115; VIST 106; VIST 283.

VIST 206 Visual Studies Studio I

Credits 3. 1 Lecture Hour. 5 Lab Hours. Theory and practice of visual communication methodologies and processes used in interactive media, game design and development, or animation; visual storytelling. **Prerequisite:** Grade of C or better in VIST 275.

VIST 210 Time and Interaction

Credits 3. 2 Lecture Hours. 2 Lab Hours. Introduction to the history and practice of designing narrative media exploring principles and aesthetics of linear and non-linear interactive media.

VIST 215 Look Development I

Credits 3. 2 Lecture Hours. 4 Lab Hours. Introduction to look development for 3D environments; principles of light transport and material properties; physically-based shading; digital image foundations; texture and shader authoring; adding visual detail through texture data; proceduralism and image-based capture; accurate digital recreation of an asset based on real source material; industry and platform requirements. **Prerequisites:** Grade C or better in VIST 206.

VIST 216/DCED 216 Performance Documentation and Editing

Credits 3. 3 Lecture Hours. Exploration of the technical and artistic skills required for filming and documenting performance; fundamental techniques of camera movement and frame composition; hands-on experience learning and operating various cameras, movement apparatuses and camera rigs, lighting equipment, and professional editing programs to produce archival and promotional documentation of live performances. **Cross Listing:** DCED 216/VIST 216.

VIST 225 Virtual Production Techniques

Credits 3. 2 Lecture Hours. 2 Lab Hours. Introduction to the virtual production techniques utilized in various fields of visualization; topics include live action cinematography, real time engine, direct modeling, and animation digital content creation; procedural digital content creation; animation sequencing and virtual camera control in a real-time engine. **Prerequisites:** Lower division in Visualization, or approval of instructor.

VIST 235 Theory and Practice in Visualization

Credits 2. 1 Lecture Hour. 2 Lab Hours. Professional material development, media theory and trends, copyright law and common business practices; professional practice in pursuit of career paths for creative fields in Visualization. **Prerequisite:** Grade of C or better in VIST 275.

VIST 270 Computing for Visualization I

Credits 4. 3 Lecture Hours. 2 Lab Hours. Theory and practice of visual computer based problem solving; system tools; scripting; software design principles and practice; basics of interactive programming and interface design; development concepts and principles useful in digital art and visualization production. **Prerequisite:** MATH 151 and upper division in Visualization.

VIST 272 Visual Computing

Credits 3. 2 Lecture Hours. 2 Lab Hours. Emphasis on the procedural and mathematical principles underlying computer programming for visual display and interaction; basics of digital image processing, parametric and implicit shape description, and applied linear algebra; includes an introduction to scripting in a 3D gaming package. **Prerequisite:** Grade of C or better in VIST 173.

VIST 275 Production Techniques

Credits 3. 2 Lecture Hours. 4 Lab Hours. Introduction to the asset-creation techniques utilized in various fields of visualization; topics include game development, visual effects, interactive media, animation, and fabrication; interdisciplinary principles shared by diverse production pipelines, with a focus on 3D visualization. **Prerequisite:** Grade of C or better in VIST 106.

VIST 282 2D Visualization Techniques

Credit 1. 2 Lab Hours. Introduction to software used in the visual arts including 2D raster and vector images for motion graphics, animation, illustration and design. Specific course content will vary based upon curriculum requirements. May be taken for credit up to two hours. **Prerequisite:** Major in visualization or minor in art.

VIST 283 3D Visualization Techniques

Credit 1. 2 Lab Hours. Introduction to software used in the visual arts including 3D modeling, gaming and animation; applicable to 3D printing and rendering. Specific course content will vary based upon curriculum requirements. May be taken for credit up to two hours. **Prerequisite:** Major in visualization.

VIST 284 Visualization Techniques

Credit 1. 2 Lab Hours. Introduction to software used in the visual arts for technical manipulation of content, including film editing, gaming, Augment Reality (AR)/Virtual Reality (VR), or Audio. Specific course content will vary based upon curriculum requirements. May be repeated two times for credit. **Prerequisite:** Major in visualization, minor in art, or minor in game design and development.

VIST 289 Special Topics in...

Credits 1 to 4. 1 to 4 Other Hours. Selected topics in an identified area of visualization. May be repeated for credit. **Prerequisite:** Approval of instructor.

VIST 301 Field Studies in Design Innovation

Credits 1 to 6. 0 Lecture Hours. 1 to 6 Other Hours. Design innovation in international and domestic environments away from the Texas A&M University campus; emphasis on the cultural, social, economic, geographical, climatic and technological factors influencing design solutions for human needs. May be taken two times for credit.

Prerequisite: Junior or senior classification; approval of assistant dean for international programs and initiatives.

VIST 305 Visual Studies Studio II

Credits 3. 1 Lecture Hour. 5 Lab Hours. Theory and practice of visual communication employing digital and conventional media; development of artistic concepts, proposal development and related implementation techniques; introduction to digital painting, 3D modeling, animatics and post production. **Prerequisites:** Grade of C or better in VIST 206.

VIST 310 Photography for Visualization

Credits 3. 2 Lecture Hours. 3 Lab Hours. Advanced aesthetic and thematic control of the digital image; exposure refinement; advanced lighting techniques and digital compositing; digital work-flow; image conversion and control; color management; digital forensics; printing technology, processes and presentation. **Prerequisites:** Upper division in Visualization.

VIST 311 Field Studies in Design Communication

Credits 3. 2 Lecture Hours. 4 Lab Hours. Art and design communication in international and domestic environments away from the Texas A&M University campus; emphasis on the tools, methods, and techniques for design communication. May be taken two times for credit. **Prerequisites:** Junior or senior classification; approval of Associate Dean for Academic Affairs.

VIST 325 Pre-Visualization and Storyboarding for Virtual Production

Credits 3. 2 Lecture Hours. 2 Lab Hours. Advanced three-dimensional computer animation; merging storytelling and visual communication; story development; expressive character design; acting; speech animation; choreography; stage lighting; storyboards; soundtracks; story reels; production efficiency, and quick iterative refinement. **Prerequisites:** Grade C or better in VIST 305 or VIST 372, or approval of instructor.

VIST 327 Virtual Cinematography and Lighting

Credits 3. 2 Lecture Hours. 2 Lab Hours. Principles and practical application of lighting and cinematography in the virtual production environment; building on the principles of visual communication; exploration of lighting, composition, and camera movement utilized for the achievement of desired presentation goals. **Prerequisites:** Grade of C or better in VIST 225; junior or senior classification.

VIST 331 Field Studies in Design Philosophy

Credits 3. 2 Lecture Hours. 4 Lab Hours. Art and performance experience in international and domestic environments away from the Texas A&M University campus; emphasis on the historical, philosophical, scientific, cultural, social, technical, and economic factors that influence art and performance. May be taken two times for credit. **Prerequisite:** Junior and senior classification; approval of associate dean of academic affairs.

VIST 333/FILM 333 Story for the Screen

Credits 3. 3 Lecture Hours. Exploration of the internal structure of stories; exploration of stories through emotion and action beats; narrative scripts in the visually kinetic language through which live-action and animated films and narratively-driven video games perform stories. **Prerequisites:** Junior or senior classification. **Cross Listing:** FILM 333/VIST 333.

VIST 339 Research Techniques in Visualization

Credits 3. 3 Lecture Hours. Research techniques used in visualization and creative fields; qualitative and quantitative methods, formulating research questions; determining appropriate methods, research planning and designing, data collection, testing and assessment; data analysis and interpretation. **Prerequisites:** Grade of C or better in VIST 206.

VIST 354 Principles of Multimedia Design

Credits 3. 2 Lecture Hours. 3 Lab Hours. Application and design of web and mobile platforms to create interactive products; planning, design, and development of intuitive user interfaces; focus on user-centered design, interaction principles, and standards-based technologies. **Prerequisite:** Grade of C or better in VIST 272 or ARTS 303.

VIST 357 Interaction Design

Credits 3. 2 Lecture Hours. 2 Lab Hours. Concepts, theories and methods in interaction design and interaction; dimensions of interaction design; data gathering methods and evaluation; task analysis; aesthetics and the sensory experience; prototyping, and workflow. **Prerequisite:** Upper division in Visualization.

VIST 370 Interactive Virtual Environments

Credits 3. 2 Lecture Hours. 2 Lab Hours. Languages and techniques useful for the creation of real time virtual environments; definition of formal scene description structures; modeling and transformation techniques; simulation techniques; behaviors and message passing; user interaction and animation; multiuser environments; creating virtual interfaces; scripting techniques. **Prerequisite:** Grade of C or better in VIST 272 or approval of instructor.

VIST 371 Artificial Intelligence in Interaction Design

Credits 3. 2 Lecture Hours. 2 Lab Hours. Addresses challenges and methodologies of designing interactions for artificial intelligence (AI) systems including user-centered design approaches; exploration of how AI transforms the way people interact with technology; work through the design of responsive, intuitive, and ethical AI interfaces; includes a combination of theory, practical design exercises, and project-based learning. **Prerequisites:** PVFA 201; PVFA 301 or concurrent enrollment; junior or senior classification or approval of instructor.

VIST 372 Creating Digital Environments

Credits 3. 2 Lecture Hours. 2 Lab Hours. Terminology, principles and practices in the creation of 3D models; mathematical principles of geometrical modeling theory and application of modeling techniques; boolean operations; parametric modeling; modeling; particle systems; L-Systems; nurbs and/or grammar based techniques; lighting setup and control. **Prerequisite:** Grade of C or better in VIST 271.

VIST 374 Multimedia Design and Development

Credits 3. 2 Lecture Hours. 4 Lab Hours. Concepts and techniques for integrating multimedia with user control and interactivity; production of computer presentations and interactive mobile devices; computer animation, graphics, production and use of digital images; scripting techniques; projects for stand-alone computers and mobile devices. **Prerequisite:** Junior or senior classification or approval of instructor and undergraduate program coordinator.

VIST 375 Foundations of Visualization

Credits 3. 3 Lecture Hours. Visualization concepts, techniques and applications; major topic areas include cultural context, application areas, visual perception, the digital image, visual language, coordinate systems, geometric representation, modeling animation, image synthesis, image composing, ethics and the future of visualization. **Prerequisites:** Grade of C or better in VIST 271.

VIST 386 Game Design I

Credits 3. 2 Lecture Hours. 2 Lab Hours. Game design, emphasis on mechanics, game play and interface design; history of game design, review of selected games; analysis of rules of play and iterative development of table-top games. **Prerequisites:** Junior or senior classification; or minor in Game Design and Development.

VIST 401 World-Building in Games

Credits 3. 2 Lecture Hours. 2 Lab Hours. Emphasis on creating and articulating a compelling setting for a table-top or computer game, and using world-building as a fundamental tool for creating games, structural analysis of ludic narratives and settings, understanding concepts like the chronotope and psychogeography and applying them to game design, and on making equitable and inclusive representations of other cultures. **Prerequisites:** Grade of C or better in VIST 386.

VIST 405 Visual Studies Studio III

Credits 3. 1 Lecture Hour. 5 Lab Hours. Theory and practice in the art and science of the visual image; scientific and mathematical principles as process; information theory and sensorial design; interactivity and user integration; integration of real and virtual environments including lighting design and material definition. **Prerequisites:** Grade of C or better in VIST 305, and VIST 301 or VIST 494.

VIST 406 Visual Studies Studio IV

Credits 3. 1 Lecture Hour. 5 Lab Hours. Theory and practice in the development of the digital image; non-traditional modeling methods; camera control and animation techniques; special effects; creative lighting methods; non-photorealistic rendering; integration of traditional and digital media in the creation of visual works. **Prerequisites:** Grade of C or better in VIST 305, and CARC 301 or VIST 494.

VIST 408/GLST 408 Techne, Technology, and the Visual Arts

Credits 3. 3 Lecture Hours. Examination of the tension between techne, art, and technology through an exploration of influential theoretical texts; analysis of major challenging works of visual art, ancient and contemporary, analog and digital, human and non-human; investigation of visual art and technology in a global context. **Prerequisites:** Junior or senior classification or approval of instructor. **Cross Listing:** GLST 408/ VIST 408.

VIST 409 Capstone Studio

Credits 3. 1 Lecture Hour. 5 Lab Hours. Completion of the proposed capstone project; integration of core methodologies, concept development, drawing and design, art history, aesthetics, research, methodology and processes, scripting and programming and digital communication; required peer reviewed publication or other appropriate venue. May be taken two times for credit. **Prerequisites:** Grade of C or better in VIST 305 and VIST 339.

VIST 415 Look Development II

Credits 3. 1 Lecture Hour. 4 Lab Hours. Advanced look development for photorealistic 3D assets and worlds; professional practices focused on efficiency and quality; managing project scale and complexity; procedural geometry-like hair, vegetation, and debris; procedural texture patterning; art and design principles for look development; integrating assets into larger creative projects using concept art and direction. **Prerequisite:** Grade C or better in VIST 215.

VIST 419 Motion Capture Animation

Credits 3. 2 Lecture Hours. 2 Lab Hours. Overview of motion capture technology, history, and techniques; application of motion-captured data to animate digital characters and props, including capture, cleaning and retargeting data for use. **Prerequisites:** Grade of C or better in VIST 305 or approval of instructor.

VIST 420 Business for Creatives

Credits 3. 3 Lecture Hours. Exploration of the essentials of entrepreneurship for creatives, from freelancing to small business ownership; hands-on development of business and financial plans, creating pitch decks, and gaining the knowledge needed to launch successful creative ventures while cultivating an entrepreneurial mindset. **Prerequisite:** Junior or senior classification, or approval of instructor.

VIST 425 Art Direction for Virtual Production

Credits 3. 2 Lecture Hours. 2 Lab Hours. Development of complementary skill sets specialized for the design of real-time environments design, real-time characters, and real-time props used in projects integrating physical and virtual sets for visual storytelling, and/or live performances and broadcast events; may include lighting studies cinematography, photogrammetry, performance capture and other uses of virtual production tools to help achieve the goals of a virtual art department. **Prerequisites:** Grade C or better in VIST 172 or VIST 225; junior or senior classification.

VIST 428 Advanced Game Design

Credits 3. 2 Lecture Hours. 2 Lab Hours. Emphasis on the application of game mechanics for different genres of games; development of mechanics for mobile, VR, PC, and console games; prototyping while also deeply engaging in the subject from an analytical perspective.

Prerequisites: Grade C or better in VIST 386, or approval of instructor.

VIST 429 On Set Virtual Production

Credits 3. 1 Lecture Hour. 4 Lab Hours. Development of advanced visual storytelling and visual communication projects utilizing virtual production technologies on a soundstage; emphasis on production efficiency on team-based collaborative projects with successive refinement of aesthetic intent; may include story development, expressive performance choreography, design and integrated use of virtual and practical sets and props, stage lighting, and sound; projects may be oriented toward live performance, live broadcast, or commercial production utilizing a combination of in-camera visual effects and post-processing and editing.

Prerequisites: Grade C or better in VIST 225, VIST 325, VIST 425, or approval of the instructor.

VIST 432 Applied Perception

Credits 3. 3 Lecture Hours. Topics in perceptual science useful for Visualization; cognitive, neural and evolutionary processes that undergird perceptual systems; perceptual factors that influence design decision.

Prerequisite: Upper division in Visualization.

VIST 439 Capstone Proposal Development

Credit 1. 2 Lab Hours. Individual proposal development for capstone studio; demonstration of ideation and concept development, drawing and design, art history, aesthetics, research, methodology and processes, scripting or programming and digital communication. **Prerequisites:** Grade of C or better in VIST 339.

VIST 441 Scientific and Technological Developments in Visual Arts

Credits 3. 3 Lecture Hours. Advanced level course focusing on the relationship between art, science and technology; visual arts before the digital revolution; the development of computer graphic arts.

Prerequisite: Upper division in Visualization.

VIST 442 Digital Characters - Art, Technology, Uses and Meaning

Credits 3. 2 Lecture Hours. 2 Lab Hours. Examination of the art and technology employed in the creation of digital characters; exploration of the reasons for, and impact of, their use in popular media and science; digital character creation techniques; estimating performance requirements; visual examples and written work used to illustrate topics and application areas. **Prerequisites:** Grade of C or better in VIST 206 and ARTS 349.

VIST 443 Algorithmic Design

Credits 3. 2 Lecture Hours. 2 Lab Hours. Best practices for the procedural generation of geometry, visual effects, and dynamics; process of creating geometry procedurally, how to create simple dynamic effects such as cloth and destruction simulations, and the fundamentals of creating visual effects such as explosions, smoke, and other fluids. **Prerequisites:** Grade C or better in VIST 272; junior or senior classification.

VIST 465 Video and Time Based Media

Credits 3. 2 Lecture Hours. 4 Lab Hours. Exploration of perception, vision and self-expression through video, film, and other time-based media; emphasis on language, theories, disciplines, and procedures used to plan and produce time-based works; exposure to the history of film and video and the social and conceptual influences on the medium. **Prerequisites:** Junior or senior classification.

VIST 470 Digital Rendering

Credits 3. 2 Lecture Hours. 2 Lab Hours. Creation of photorealistic images; rendering techniques and control; perceptual and physical principles related to creating realistic images; lighting and environmental effects; properties of materials; rendering models and techniques for adding visual detail; shading languages. **Prerequisites:** Grade of C or better in VIST 272; junior or senior classification.

VIST 472 Digital Compositing

Credits 3. 3 Lecture Hours. History, mathematical foundations, techniques and applications used in combining two dimensional images for film, video and multimedia; includes theoretical foundations of the digital image, color spaces and corrections, matte techniques, keying, rotoscoping, camera and object tracking, stereo compositing and process workflow. **Prerequisite:** Grade of C or better in VIST 272.

VIST 474 Designing for the Web

Credits 3. 2 Lecture Hours. 4 Lab Hours. Principles of web page and site creation; elements of visual design; typography for the web; web technologies; controlling the page real estate through cascading style sheets (CSS); imaging for the web; creation and use of color and graphics; web standards; building complete web sites. **Prerequisite:** Upper division in Visualization or minor in Graphic Design.

VIST 475 Character Animation

Credits 3. 2 Lecture Hours. 2 Lab Hours. Emphasis on the theoretical and practical approaches to 3D character animation; exploration of the 3D animation production pipeline; topics include the Twelve Principles of Animation, analysis of character animation in various media, and introduction to techniques and processes of implementing character animation into a game engine. **Prerequisites:** Grade C or better in VIST 206; junior or senior classification.

VIST 476/CSCE 447 Data Visualization

Credits 3. 3 Lecture Hours. Visual representation and design of data and information; 3D visualization, infographics, data narratives, principles of visual data encoding and interaction techniques. **Prerequisite:** Grade of C or better in VIST 272, or CSCE 221, or CSCE 441. **Cross Listing:** CSCE 447/VIST 476.

VIST 477/CSCE 446 Virtual Reality

Credits 3. 2 Lecture Hours. 2 Lab Hours. Theory and practice of virtual reality; interactive 3D virtual environments; input/output devices, 3D interaction techniques, augmented reality, role of realism in VR, navigation techniques, design guidelines and evaluation methods. **Prerequisite:** Grade of C or better in VIST 272, CSCE 221, or CSCE 441. **Cross Listing:** CSCE 446/VIST 477.

VIST 480 Game Level Design

Credits 3. 2 Lecture Hours. 2 Lab Hours. Game level design, the art of creating the game level context; game 2D & 3D spaces, spatial challenges; flow of game spaces and pacing; players engagement and communication through environment art; storytelling and rewards in game spaces. **Prerequisites:** Grade of C or better in VIST 386 or approval of instructor; junior or senior classification.

VIST 484 Summer Internship

Credits 3 to 6. 3 to 6 Other Hours. Practical experience in a visualization related company; equivalent of 240 hours over at least 5 weeks; departmental pre-approval through the departmental internship coordinator required; post evaluation conducted following the internship. May be taken two times for credit. **Prerequisites:** Upper division in Visualization and approval of visualization intern coordinator.

VIST 485 Directed Studies

Credits 1 to 6. 1 to 6 Other Hours. Special problems in visual studies. May be repeated for up to 9 credit hours. **Prerequisite:** Approval of instructor and undergraduate program coordinator.

VIST 487/CSCE 443 Game Development

Credits 3. 2 Lecture Hours. 2 Lab Hours. Aesthetic and technical aspects of computer game development, including game mechanics, story development, content creation and game programming; includes game design, interface design, 3D modeling and animation, graphics algorithms, shader programming and artificial intelligence; group project includes the design and development of a game from start to finish. **Prerequisites:** Grade of C or better in VIST 386 or CSCE 441, or approval of instructor. **Cross Listing:** CSCE 443/VIST 487.

VIST 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified field of visual studies. May be repeated for up to 9 credit hours. **Prerequisite:** Approval of instructor and undergraduate program coordinator.

VIST 491 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty members in visualization; emphasis on visual studies. May be repeated 2 times for credit. **Prerequisites:** Upper division in Visualization; approval of instructor and undergraduate program coordinator.

VIST 494 Internship

Credits 3 to 6. 3 to 6 Other Hours. Practical experience in a visualization related company; equivalent of 480-600 hours over at least 12-15 weeks; departmental pre-approval through the departmental internship coordinator required; post evaluation conducted following the internship. May be taken two times for credit. **Prerequisites:** Upper division in Visualization and approval of Visualization intern coordinator.

VLCS - Vet Large Animal Clin Sc (VLCS)

VLCS 422 Equine Disease and Epidemiology

Credits 3. 3 Lecture Hours. Principles and methods of epidemiology applied to equine health and prevention and control of selected equine infectious diseases. **Prerequisite:** Enrollment in equine certificate and junior or senior classification, or approval of instructor.

VLCS 485 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Directed individual study of selected problems in biomedical sciences approved by instructor. May be repeated for credit. **Prerequisites:** Senior classification in biomedical science and approval of department head.

VLCS 491 Research

Credits 1 to 4. 1 to 4 Other Hours. Research conducted under the direction of faculty member in large animal clinical services. May be taken three times for credit. **Prerequisites:** Junior or senior classification in biomedical sciences; approval of instructor.

VSCS - Vet Small Animal Clin Sc (VSCS)

VSCS 485 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Directed individual study of a selected problem in biomedical sciences approved by instructor. May be repeated for credit. **Prerequisites:** Junior or senior classification and approval of department head and instructor.

VSCS 491 Research

Credits 1 to 4. 1 to 4 Other Hours. Research conducted under guidance of the Small Animal Clinical Sciences faculty. May be taken three times for credit. **Prerequisites:** Junior or senior classification in Biomedical Sciences; approval of instructor.

VTPB - Veterinary Pathobiology (VTPB)

VTPB 212 Genetics in the News

Credits 3. 3 Lecture Hours. Use of contemporary news articles from the popular press to delve into the science of genetics and genomics and their methodologies to gain a deeper understanding of how data is analyzed and interpreted leading to news headlines. **Prerequisites:** Sophomore classification or approval of instructor; high school or college course in biology recommended.

VTPB 221 Great Diseases of the World

Credits 3. 3 Lecture Hours. Great infectious and parasitic diseases; introduction to the major diseases affecting humans and other mammals including plague, tuberculosis, AIDS and malaria. **Prerequisite:** Freshman or sophomore classification.

VTPB 285 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Directed individual study of selected problems in microbiology, parasitology, immunology, genetics or pathology as approved by instructor. **Prerequisites:** Approval of department head; freshman or sophomore classification.

VTPB 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of veterinary pathobiology. May be repeated for credit. **Prerequisite:** Freshman classification.

VTPB 301/RWFM 309 Wildlife Diseases

Credits 3. 3 Lecture Hours. Basic mechanisms of diseases as they occur in wildlife populations; interplay of habitat requirements, individual physiological requirements and disease producing mechanisms of varied wildlife species. **Prerequisite:** Junior classification or approval of department head. **Cross Listing:** RWFM 309/VTPB 301.

VTPB 303 Medical Communication in the International Community

Credits 3. 3 Lecture Hours. To develop an awareness that there is a culture associated with the practice of veterinary and human medicine in other countries. **Prerequisite:** Junior or senior classification.

VTPB 334 Poultry Diseases

Credits 4. 3 Lecture Hours. 2 Lab Hours. Poultry sanitation and diseases. Prevention and control of environmental, nutritional, parasitic and contagious diseases. **Prerequisites:** BIOL 107 or BIOL 111; junior or senior classification.

VTPB 405 Biomedical Microbiology

Credits 4. 3 Lecture Hours. 2 Lab Hours. Fundamentals of bacteriology, mycology, virology, infectious diseases, immunology and identification of pathogenic microorganisms. **Prerequisites:** Grade of C or better in BIOL 112 and CHEM 228; grade of C or better in MATH 142, MATH 147, MATH 151, or MATH 171; grade of C or better in PHYS 202; junior or senior classification.

VTPB 407 Advanced Veterinary Microbiology Laboratory

Credits 1 to 3. 1 to 4 Lab Hours. Modular course (one credit per module) that covers immunological and molecular techniques used with bacteria, parasites and viruses in animals for diagnostic and identification purposes. **Prerequisites:** VTPB 405, VTPB 409 and VTPB 438 or concurrent enrollment; junior or senior classification.

VTPB 408 Clinical Microbiology

Credits 3. 3 Lecture Hours. Conceptual basis for understanding pathogenic microorganisms and the mechanisms by which they cause disease in the human body; operates in an integrated manner with the spectrum of microorganisms including viruses, bacteria, fungi and parasites, describing the factors common to all infectious diseases; molecular biology, pathology and immunology explain the mechanisms for spread, immune response and recovery. **Prerequisites:** VTPB 405 or BIOL 456 and VTPB 409 or BIOL 454.

VTPB 409 Introduction to Immunology

Credits 3. 3 Lecture Hours. Diverse concepts relative to immunologic mechanisms inherent to domestic and laboratory animals. **Prerequisite:** Advanced classification.

VTPB 410 Cell Mechanisms of Disease

Credits 3. 3 Lecture Hours. Mechanisms, morphologic manifestations and clinical signs of disease processes at the cellular level. **Prerequisites:** CHEM 227 and CHEM 228, or equivalent; junior or senior classification; biomedical sciences major, biomedical engineering major or related field.

VTPB 411 One Health and Tropical Ecology

Credits 3. 2 Lecture Hours. 2 Lab Hours. Traditional lectures, guest lectures, field excursions, field laboratories, discussions, readings, student oral presentations and case studies; form and function of healthy ecosystems, various forms of ecosystem perturbation and how perturbations influence ecosystem, animal, and human health.

VTPB 415 Immunogenetics and Comparative Immunology

Credits 3. 3 Lecture Hours. Genetic mechanisms used to diversify immune receptors; immunoglobulins, T cell receptors, major histocompatibility complex, natural killer cell receptors, toll-like receptors and many others; selected comparative and veterinary examples of different immune recognition systems; evolution of the immune system. **Prerequisites:** Junior or senior classification, GENE 320/BIMS 320 and VTPB 409 or approval of instructor.

VTPB 421 Infectious Diseases of Humans and Animals

Credits 3. 3 Lecture Hours. Pathogenesis of selected bacterial pathogens of humans and animals; bacterial virulence factors, host immune responses; current concepts of extracellular, facultative intracellular and obligate intracellular bacterial diseases. **Prerequisites:** Junior or senior classification.

VTPB 425 Biomedical Microbiology

Credits 3. 3 Lecture Hours. Fundamentals of microbiology: bacteriology, mycology, virology, infectious diseases, immunology and identification of pathogenic microorganisms; specific emphasis on infectious diseases of humans and animals. **Prerequisites:** Grade of C or better in BIOL 112, CHEM 258, and PHYS 202; grade of C or better in MATH 142, MATH 147, MATH 151, or MATH 171; junior classification in Biomedical Sciences; may have concurrent enrollment with VTPB 426.

VTPB 426 Biomedical Microbiology Laboratory

Credit 1. 2 Lab Hours. Fundamentals of microbiology: mycology, virology, infectious diseases, immunology and identification of pathogenic microorganisms. Emphasis on infectious diseases of humans and animals. **Prerequisites:** Junior classification in BIMS; may be taken concurrently with VTPB 425.

VTPB 438 Biomedical Virology

Credits 3. 3 Lecture Hours. Fundamental study of nature and characteristics of human and animal viruses; classification, morphology, chemical structure, ability to cause disease and nature of resulting disease. **Prerequisite:** 3 hours of microbiology or approval of instructor.

VTPB 460 Mammalian Cell Pathobiology

Credits 3. 3 Lecture Hours. Cell signaling and organelle perspective of pathogenesis, mechanisms leading to a disease state; fundamental understanding of structural and functional properties of mammalian cells; molecular and cellular mechanisms underlying health-disease transitions. **Prerequisites:** BIOL 111 and BIOL 112, junior or senior classification or approval of instructor.

VTPB 485 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Directed individual study of selected problems in microbiology, parasitology, immunology, genetics or pathology as approved by instructor. **Prerequisites:** Approval of department head; junior or senior classification.

VTPB 487 Biomedical Parasitology

Credits 4. 3 Lecture Hours. 2 Lab Hours. Helminth and protozoan parasites of medical and veterinary importance; life cycles, morphology, taxonomic classification, economic and public health aspects and current topics in parasitic diseases. **Prerequisites:** BIOL 107 or BIOL 111; junior classification or approval of instructor.

VTPB 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified area of microbiology, pathology, genetics, immunology, parasitology, or physiological chemistry. May be repeated for credit. **Prerequisites:** Junior or senior classification and approval of department head.

VTPB 491 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in biomedical sciences. May be taken up to 9 hours for credit. **Prerequisites:** Junior or senior classification, or approval of instructor.

VTPP - Vet Physiology & Pharm (VTPP)

VTPP 123 Foundations of Physiology

Credits 3. 3 Lecture Hours. Introduction to fundamental concepts in physiology and the practice of physiology research through exploration of mathematical models used in physiology research; emphasis on prediction of complex adaptive behavior in health and disease from elementary math, physics, chemistry and biology. **Prerequisite:** Freshman or sophomore classification or approval of instructor.

VTPP 207 Methodologies of Physiology Education Research

Credits 3. 3 Lecture Hours. Creation and practice of physiology education research through quantitative, qualitative and mixed-methodology approaches; preliminary development of team-based research projects; emphasis on production and formal presentation of basic research using human subjects in a variety of physiology education topics.

VTPP 208 Analysis and Evaluation of Physiology Education

Credits 3. 3 Lecture Hours. Analysis and evaluation of research in physiology education; design of proper analytical techniques in quantitative, qualitative and mixed-methods analyses; emphasis on production of publishable applied research in physiology. **Prerequisite:** VTPP 207 or approval of instructor.

VTPP 223 Design of Experiments for Physiology Research

Credits 3. 2 Lecture Hours. 2 Lab Hours. Team or group formulation and refinement of novel hypotheses and design of controlled in vitro experiments; emphasis on production of publishable research in physiology. **Prerequisite:** VTPP 123 or approval of instructor.

VTPP 224 In Vitro Experimentation in Physiology Research

Credits 3. 2 Lecture Hours. 2 Lab Hours. Team or group collection, analysis and interpretation of data from in vitro experiments; emphasis on production of publishable research in physiology. **Prerequisite:** VTPP 223 or approval of instructor.

VTPP 234 Design of Models for Physiology Research

Credits 3. 3 Lecture Hours. Team or group design of novel models of physiological systems to predict homeostatic behavior arising from the interaction of subsystems; mastering bioinformatics toolboxes to process NextGen-omics data; emphasis on production and formal presentation of basic research in physiology.

VTPP 235 Analysis and Validation of Models for Physiology Research

Credits 3. 3 Lecture Hours. Team or group analysis and validation of models of physiological systems to explain disease states and design potential clinical interventions; analysis of NextGen-omics data; emphasis on production of publishable applied research in physiology. **Prerequisite:** VTPP 234 or approval of instructor.

VTPP 281 Seminar

Credits 4. 4 Other Hours. Exposure to scientists from a variety of biomedical disciplines through attendance at seminars followed by review and discussion of current scientific work in physiology and related subjects, and subsequent student seminar presentations. **Prerequisites:** Freshman or sophomore classification; approval of instructor.

VTPP 285 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Course for freshman and sophomore students who desire additional laboratory work in physiology to supplement required courses. **Prerequisites:** Freshman or sophomore classification; approval of department head.

VTPP 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified area of veterinary physiology and pharmacology. May be repeated for credit.

VTPP 291 Research

Credits 0 to 4. 0 to 4 Other Hours. Laboratory and/or field research supervised by a faculty member. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisites:** Freshman or sophomore classification; approval of instructor.

VTPP 323 Physiology of Domestic Animals

Credits 3. 3 Lecture Hours. Physiology essential to the understanding of life processes; for animal science, wildlife, agriculture and related fields. **Prerequisite:** BIOL 111 or equivalent; junior or senior classification.

VTPP 330 Biomedical Toxicology

Credits 3. 3 Lecture Hours. Understanding basic toxicologic concepts related to exposure, absorption and elimination of toxic compounds as well as mechanisms of action of toxicants and how they affect the body's organ systems; integration of toxicology with pharmacology and physiology to further understand how various toxicants impact on the body. **Prerequisites:** VIBS 222 or BIOL 319 or approval of instructor; junior or senior classification.

VTPP 401/BMEN 400 History of Human and Veterinary Medicine in Europe

Credits 4. 4 Lecture Hours. Addresses the major developments in human and veterinary medicine in Europe from the Middle Ages to the present; explores key events and figures in medical history and analyzes issues of current biomedical concern in a historical context; for example, animal rights, ethics of humane experimentation, euthanasia. **Prerequisites:** Admitted to major degree sequence in biomedical engineering; VTPP 434. **Cross Listing:** BMEN 400/VTPP 401.

VTPP 404 Food Toxicology and Safety

Credits 3. 3 Lecture Hours. Toxicity and safety of various foods and food additives, ingredients, and contaminants; occurrence, control and prevention of food transmitted diseases. **Prerequisite:** Junior or senior classification.

VTPP 405 Systemic Veterinary Physiology

Credits 3. 3 Lecture Hours. Aspects of cellular physiology, physiology of excitable membranes, physiology of body fluids, neurophysiology, and the physiology of smooth, cardiac and skeletal muscle; basic understanding of mammalian physiology essential as a framework for advanced studies. **Prerequisites:** BIMS 320/GENE 320; junior or senior classification; or approval of instructor; proper English composition and communication.

VTPP 420 Applied Pharmacology

Credits 2. 2 Lecture Hours. Modern themes about therapeutic drugs in animals and people including drug discovery and development, clinical use of drugs and drug regulation. **Prerequisites:** Grade of C or better in BICH 410, BIOL 320, VTPP 423, VTPP 434, or approval of instructor.

VTPP 423 Applied Biomedical Physiology I

Credits 4. 3 Lecture Hours. 2 Lab Hours. Human physiological principles, review of cellular physiology, and development of an understanding of the nervous system and muscle, cardiovascular, and renal physiology; clinical applications related to organ systems. **Prerequisites:** Grade of C or better in PHYS 202 and CHEM 228; junior classification.

VTPP 424/VIBS 424 Biomedical Neuroendocrinology and Endocrine Disorders

Credits 3. 3 Lecture Hours. Neuroendocrine (hypothalamus-pituitary) control of puberty, menstruation, ovulation, pregnancy, labor, lactation, female reproductive cycles, male reproductive functions, thyroid and parathyroid, adrenal and kidney, diabetes, obesity, sleep, memory, learning and aging and their endocrine disorders; overview on biosynthesis, transport and signaling of peptide and neuropeptide hormones, steroids and prostaglandins. **Prerequisites:** Honors, junior or senior classification, or approval of instructor. **Cross Listing:** VIBS 424/VTPP 424.

VTPP 425 Pharmacology

Credits 3. 3 Lecture Hours. Introduction to pharmacokinetics and pharmacodynamics; survey of major pharmaceutical classes; uses, mechanisms of action and adverse reactions of selected agents. **Prerequisites:** VTPP 423 or grade of C or better in BIOL 320; junior or senior classification or approval of instructor.

VTPP 427 Applied Biomedical Physiology II

Credits 3. 3 Lecture Hours. Human physiology focused on fluid balance and acid-base balance; development of an understanding of physiology as it applies to the cardiovascular, autonomic, renal, respiratory, gastrointestinal, endocrine, reproductive system; clinical applications related to organ systems. **Prerequisites:** VTPP 423 or grade of D or better in BIOL 320; junior or senior classification.

VTPP 434 Physiology for Bioengineers I

Credits 4. 3 Lecture Hours. 2 Lab Hours. Engineering analysis of living systems; quantitative aspects of physiology and engineering applications to clinical medicine; body fluid balance, solute transport, endocrinology, reproduction physiology, neurophysiology, skeletal and smooth muscle physiology. **Prerequisite:** Biomedical engineering (BMEN) major or approval of instructor.

VTPP 435 Physiology for Bioengineers II

Credits 4. 3 Lecture Hours. 2 Lab Hours. Engineering analysis of living systems; quantitative aspects of physiology and engineering applications to clinical medicine; vascular physiology, cardiac physiology, bone physiology, regenerative medicine, renal physiology, pathophysiology. **Prerequisite:** VTPP 434 or approval of instructor.

VTPP 438 Analysis of Genomic Signals

Credits 3. 2 Lecture Hours. 2 Lab Hours. Overview of current high throughput technology for data acquisition and analysis of genomic signals (e.g. mRNA or proteins); emphasis on the microarray technology, methods for analyzing microarray data, and approaches to model the underlying phenomena from the systems biology perspective. **Prerequisites:** Junior or senior classification; BIMS 320/GENE 320 or GENE 320/BIMS 320 and BIOL 111, BIOL 112 or BIOL 213 or equivalent; STAT 302 or equivalent.

VTPP 444 Practicum in Biomedical Research

Credits 3. 3 Other Hours. Team or group development of sustainable collaborations that include biomedical research, high-impact educational practices and community service; emphasis on lifelong learning and the impact of research on biomedical issues and physiology; focus on connecting research experience to future career goals. **Prerequisites:** VTPP 223 and VTPP 224, or VTPP 234 and VTPP 235, or VTPP 232 and VTPP 233, or VTPP 207 and VTPP 208; junior or senior classification; instructor approval.

VTPP 452 Fetal and Embryo Physiology

Credits 3. 3 Lecture Hours. Examination of the physiologic processes driving embryonic development and pregnancy; focus on embryo implantation, establishment of the placenta, development of the fetal circulatory systems and the molecular processes governing embryo differentiation and development; special emphasis on the major organ systems affected by pediatric disease and on the actions of teratogens. **Prerequisites:** BICH 409, BICH 410, or equivalent; or approval of instructor.

VTPP 481 Seminar

Credits 4. 4 Other Hours. Exposure to scientists from a variety of biomedical disciplines through attendance at seminars followed by review and discussion of current scientific work in physiology and related subjects, and subsequent student seminar presentations. **Prerequisites:** Junior or senior classification; approval of instructor.

VTPP 485 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Course for junior and senior students who desire additional laboratory work in physiology to supplement required courses. **Prerequisites:** Junior or senior classification and approval of department head.

VTPP 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified area of physiology, pharmacology, endocrinology or toxicology. May be repeated for credit. **Prerequisite:** Junior or senior classification.

VTPP 491 Research

Credits 0 to 4. 0 to 4 Other Hours. Laboratory and/or field research supervised by a faculty member. **Prerequisites:** Junior or senior classification; approval of instructor.

WFSC - Wildlife & Fisheries Sci (WFSC)

WFSC 425 Marine Fisheries

Credits 3. 3 Lecture Hours. Survey of fisheries for marine vertebrates and invertebrates primarily in the Gulf of Mexico and South Atlantic with special emphasis being directed to their biology, economics and management.

WGST - Women's & Gender Studies (WGST)

WGST 200 Introduction to Women's and Gender Studies

Credits 3. 3 Lecture Hours. Historical and cross-cultural perspectives on women's roles in culture, the workplace, the family and other socio-political institutions; the social construction of gender; sexuality and racism; social control mechanisms and ideologies.

WGST 205/SOCI 215 Introduction to Lesbian, Gay, Bisexual, Transgender, and Queer Studies

Credits 3. 3 Lecture Hours. Interdisciplinary survey of the histories of and theories regarding Lesbian, Gay, Bisexual, Transgender, Queer (LGBTQ +) identities and communities; the social construction of sexuality and gender; institutional ways in which homophobia, biphobia, and transphobia are systematically deployed; advocacy by and on behalf of LGBTQ+ individuals; evolution of desire and subjectivity. **Cross Listing:** SOCI 215/WGST 205.

WGST 207/SOCI 207 Introduction to Gender and Society

Credits 3. 3 Lecture Hours. Similarities and differences between females and males in a number of cultures throughout the world; sociological analysis of gender in relation to social structure. **Cross Listing:** SOCI 207/WGST 207.

WGST 210/PBSI 210 Psychological Aspects of Human Sexuality

Credits 3. 3 Lecture Hours. Interface between human sexuality, reproductive development and gender roles across the lifespan; theoretical and research literature promotes understanding of hormonal influences, learning processes, cultural differences, sexual response and love and attraction. **Prerequisite:** PBSI 107. **Cross Listing:** PBSI 210/WGST 210.

WGST 213/SOCI 213 Gender and Health

Credits 3. 3 Lecture Hours. An examination of social and historical context of health in the U.S., including inequities in health by gender, race, class and gendered issues in health professions. **Cross Listing:** SOCI 213/WGST 213.

WGST 220/GLST 220 Feminist Approaches to Science, Technology, and Medicine

Credits 3. 3 Lecture Hours. Introduction to selected topics about gender and the history of science; focus on feminist critique of science, technology, and medicine; exploration of the connections between the biomedical sciences and the politics of gender and sexuality in a global context. **Cross Listing:** GLST 220/WGST 220.

WGST 285 Directed Studies

Credits 0 to 3. 0 to 3 Other Hours. Readings and/or research for specific needs of students majoring or minoring in women's and gender studies. **Prerequisites:** WGST 200 and approval of instructor.

WGST 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified area of women's/gender studies. May be repeated for credit.

Prerequisite: Approval of director.

WGST 291 Research

Credits 0 to 3. 0 to 3 Other Hours. Research conducted under the direction of faculty member in women's and gender studies. May be taken four times for credit. **Prerequisites:** WGST 200; freshman or sophomore classification; and approval of instructor.

WGST 300/PBSI 300 Psychology of Women

Credits 3. 3 Lecture Hours. Theoretical and research literature relevant to psychological assumptions about the female personality; challenges to and verification of these assumptions by recent experimental studies. **Prerequisite:** PBSI 107. **Cross Listing:** PBSI 300/WGST 300.

WGST 303 Psychology of Women of Color

Credits 3. 3 Lecture Hours. Interdisciplinary theories to study the unique yet intersectional experiences of women from different racial groups, ethnicities, nationalities and cultural backgrounds; scholarly research from the diversity science field; contemporary topics that have developed in a global context; examination of complex issues, which affect women of color across the lifespan. **Prerequisites:** Grade of C or better in AFST 201, PBSI 107, or WGST 200, or approval of instructor. **Cross Listing:** AFST 303 and PBSI 303.

WGST 315/SOCI 315 The Marriage Institution

Credits 3. 3 Lecture Hours. Courtship, engagement, marriage, family formation, personal adjustment, conflict, financing and child rearing. **Prerequisite:** Junior or senior classification. **Cross Listing:** SOCI 315/WGST 315.

WGST 316/SOCI 316 Sociology of Gender

Credits 3. 3 Lecture Hours. Sociological explanations of status differences between men and women; cross-cultural comparisons; gender role socialization, cultural stereotypes, discrimination; gender roles and status in the family, economy, religion, science, other social institutions; deviance, victimization and gender; recent social changes. **Cross Listing:** SOCI 316/WGST 316.

WGST 318/ECON 318 The Economics of Gender and Race

Credits 3. 3 Lecture Hours. Theories and evidence on gender and race differences in labor market outcomes; labor supply and the role of family formation; the effect of human capital and discrimination on earnings; analysis of government policies; international comparisons. **Prerequisites:** ECON 323 with a grade of C or better; junior or senior classification. **Cross Listing:** ECON 318/WGST 318.

WGST 320 Feminist Inquiry and Research Methods

Credits 3. 3 Lecture Hours. Interdisciplinary exploration of feminist research methods and inquiry in the humanities, social sciences and sciences; ethical approaches to research; questions of epistemology; feminist research design. **Prerequisites:** WGST 200.

WGST 330 Women in Ancient Greece and Rome

Credits 3. 3 Lecture Hours. Survey of women in classical Greece and Rome; emphases on female occupations and family relationships, legal and political status, traditional values, notorious women, how women were viewed and how they viewed themselves. **Prerequisite:** Junior or senior classification. **Cross Listing:** CLAS 330 and HIST 330.

WGST 333/ENGL 333 Lesbian, Gay, Bisexual, Transgender and Queer Literatures

Credits 3. 3 Lecture Hours. Representations of sexuality and gender from classical times to the present, studied in their historical and cultural contexts. **Prerequisites:** Junior or senior classification. **Cross Listing:** ENGL 333/WGST 333.

WGST 334 Women's Health

Credits 3. 3 Lecture Hours. A broad range of health issues that are either unique to women or of special importance to women; information for the health consumer; preparation as an advocate of healthy lifestyles; awareness of the role health plays in the life of all women. **Prerequisites:** Junior or senior classification. **Cross Listing:** HLTH 334 and PHLT 360.

WGST 342 The Rhetoric of Gender and Health

Credits 3. 3 Lecture Hours. Study of field of rhetoric of health and medicine with specific attention to the study of gender, including issues in reproduction, expertise and illness; range of methods and methodological approaches within the field. **Prerequisite:** Junior or senior classification. **Cross Listing:** ENGL 342 and COMM 342.

WGST 343/FILM 343 Sex, Gender and Cinema

Credits 3. 3 Lecture Hours. Exploration of a significant topic at the intersection of women's/gender studies and film, such as cinema and sexuality studies, cinema and women, and cinema and masculinity; may include discussion of production, film content, and/or reception. **Prerequisites:** Junior or senior classification or approval of instructor. **Cross Listing:** FILM 343/WGST 343.

WGST 367/POLS 367 Women in Government in Comparative Perspective

Credits 3. 3 Lecture Hours. Examination of women's representation in government based on comparison across multiple nation-states; focus on legislative and executive branches of democratic governments. **Prerequisites:** POLS 206; junior or senior classification or approval of department head. **Cross Listing:** POLS 367/WGST 367.

WGST 369/ENGL 369 Lesbian, Gay, Bisexual, Transgender, and Queer Authorship

Credits 3. 3 Lecture Hours. Exploration of LGBTQ+ authorship through film and literary criticism and theories of performing the self in the act of authoring. **Prerequisites:** Junior or senior classification. **Cross Listing:** ENGL 369/WGST 369.

WGST 374/ENGL 374 Women Writers

Credits 3. 3 Lecture Hours. History of literature by women in English; emphasis on continuity of ideas and on literary contributions; study of a variety of genres with particular attention to the significance of gender in the racial, social, sexual and cultural contexts of women writing in English. **Prerequisite:** Junior or senior classification; ENGL-374 also taught at Galveston campus. **Cross Listing:** ENGL 374/WGST 374.

WGST 377 Africana Women's History

Credits 3. 3 Lecture Hours. Black women's history from the precolonial era to the present; emphasis on the cultural, political, legal, economic, sexual, social, and religious factors that shaped their experiences across the African Diaspora and the world. **Prerequisites:** Junior or senior classification. **Cross Listing:** AFST 377 and HIST 377.

WGST 394 Gender and Genre

Credits 3. 3 Lecture Hours. Exploration and analysis of the ways in which a single literary and/or film genre resonates with gendered perspectives and sexual subjectivity. **Prerequisites:** Junior or senior classification; WGST 200 or FILM 251/ENGL 251 or ENGL 251/FILM 251.

WGST 401 Feminist Theory

Credits 3. 3 Lecture Hours. Inquiry-based examination of feminist theory from various periods and disciplinary perspectives, with application to societal debates and controversies. **Prerequisites:** WGST 200 or approval of instructor; junior or senior classification.

WGST 403 Language and Gender

Credits 3. 3 Lecture Hours. Language and gender from a sociolinguistic perspective; gender in the words and structures of language; gender representation and gendered language use in the media, and a variety of sociocultural contexts; language use in intimate relationships; computer-mediated discourse; language, sexuality, and sexual orientation. **Prerequisite:** Junior or senior classification. **Cross Listing:** ENGL 403 and LING 403.

WGST 404/ANTH 404 Women and Culture

Credits 3. 3 Lecture Hours. Examines women's lives in evolutionary and cross-cultural perspective; women's roles in subsistence, politics, religion and economics in traditional cultures; women's roles in international development; the cultural and social construction of women's biology cross-culturally including circumcision, menstruation, pregnancy, childbirth and motherhood. **Prerequisite:** Junior or senior classification; approval of instructor. **Cross Listing:** ANTH 404/WGST 404.

WGST 407/COMM 407 Gender, Race and Media

Credits 3. 3 Lecture Hours. The contributions of women and ethnic groups to the evolution of the media; the portrayal of women and ethnic groups in the mass media; issues resulting from the recognition of women and ethnic groups as media audiences. **Prerequisite:** Junior or senior classification and approval of instructor. **Cross Listing:** COMM 407/WGST 407.

WGST 410/SOCI 410 Reproduction, Birth and Power

Credits 3. 3 Lecture Hours. Examination of topics related to reproductive practices, experiences and ideologies and of the constructed and contested meanings surrounding womanhood, motherhood, sexuality, reproductive freedom and eugenics. **Prerequisites:** SOCI 205; junior or senior classification. **Cross Listing:** SOCI 410/WGST 410.

WGST 411/COMM 411 Representations of Motherhood

Credits 3. 3 Lecture Hours. Examination of understandings of motherhood from a humanities perspective and over a variety of cultures and time periods, as reflected in written, media and/or oral texts. **Prerequisites:** Junior or senior classification or approval of instructor. **Cross Listing:** COMM 411/WGST 411.

WGST 413 Race, Gender, and the Environment

Credits 3. 3 Lecture Hours. Investigation of social inequalities related to environmental issues; focus on environmental justice and ecofeminism; exploration of the connections among racism, patriarchy, and the environment. **Prerequisites:** Junior or senior classification. **Cross Listing:** GLST 413 and HISP 413.

WGST 420/COMM 420 Gender and Communication

Credits 3. 3 Lecture Hours. Survey of the role of gender in communication processes; focus on communication differences between men and women in contexts such as the family, school and work organizations; discussion of media influence in gender stereotypes. **Cross Listing:** COMM 420/WGST 420.

WGST 421/SOCI 421 Gender & Crime

Credits 3. 3 Lecture Hours. Gender & Crime. Gender disparities in contemporary patterns of crime, victimization and incarceration; key concepts, major theories and empirical research studies around gender and crime. **Prerequisite:** Grade of C or better in SOCI 207/WGST 207, SOCI 211, SOCI 304, SOCI 316/WGST 316, WGST 200, WGST 207/ SOCI 207, or WGST 316/SOCI 316. **Cross Listing:** SOCI 421/WGST 421.

WGST 428/COMM 428 Women's Rhetoric

Credits 3. 3 Lecture Hours. Examination of the historical imbrication of masculinity and rhetoric in relation to women's participation in political life, reception of women's rhetoric in the public sphere, and remembrance and representation of women as rhetorical agents throughout history; consideration of women's rhetoric in various cultural arenas. **Prerequisite:** Junior or senior classification. **Cross Listing:** COMM 428/WGST 428.

WGST 430/MGMT 430 Employment Discrimination Law

Credits 3. 3 Lecture Hours. Legal issues surrounding employment discrimination, including disparate treatment and impact; intent; affirmative action; sexual harassment; pregnancy, sex, race, religious, salary, disability, age, and ethnic discrimination; policy issues and perspectives to aid human resource specialists and managers. **Prerequisite:** Senior classification. **Cross Listing:** MGMT 430/WGST 430.

WGST 445/SOCI 455 Queer Theory

Credits 3. 3 Lecture Hours. Examines origins of theories of gender and sexual diversity and their intersections with feminist theories; considers foundational and contemporary texts that address queer theory. **Prerequisites:** 6 hours in Women's and Gender Studies; senior classification or approval of instructor. **Cross Listing:** SOCI 455/WGST 445.

WGST 461/HIST 461 History of American Women

Credits 3. 3 Lecture Hours. Cultural, political, legal and religious factors that helped shape the role and character of women in American society from colonial times to the present; historical role of women in the development of the nation. **Cross Listing:** HIST 461/WGST 461.

WGST 462/POLS 462 Women and the Law

Credits 3. 3 Lecture Hours. The legal status of American women from the adoption of the Constitution to the present: constitutional developments; the 19th Amendment and the proposed Equal Rights Amendment; employment; family law; reproductive rights; education; sexual equality in context of other claims to equality; law and social norms. **Prerequisite:** POLS 206 or approval of department head. **Cross Listing:** POLS 462/WGST 462.

WGST 463 Gender in Asia

Credits 3. 3 Lecture Hours. Gender dynamics in Asia; changes in gender roles; women's movements; women and the economy; women and politics; men's and women's private lives. **Prerequisite:** Junior or senior classification or approval of instructor. **Cross Listing:** ASIA 463 and SOCI 463.

WGST 470 Lesbian, Gay, Bisexual, Transgender, and Queer Cinemas

Credits 3. 3 Lecture Hours. Examination of cinema by and about LGBTQ individuals or communities; discussion of production, film content and reception. **Prerequisites:** Grade of C or better in WGST 200, FILM 215/GLST 215, FILM 251/ENGL 251, ENGL 251/FILM 251, or FILM 299, and junior or senior classification; or approval of instructor.

WGST 473/HIST 473 Women's History in the Modern U.S.

Credits 3. 3 Lecture Hours. History of women in the U.S. from the late nineteenth century to the present; role of intersectionality in defining the experience of modern womanhood; women as activists, workers, consumers, mothers, and feminists; experiences, lives and influence of women of color; examination of contemporary social, political and economic histories. **Prerequisite:** Junior or senior classification or approval of instructor; HIST-473 also taught at Galveston campus. **Cross Listing:** HIST 473/WGST 473.

WGST 474/ENGL 474 Studies in Women Writers

Credits 3. 3 Lecture Hours. A different topic each term examining women's writing through historical period, genre, cross-cultural study and/or feminist literary theory. May be repeated for credit. **Prerequisites:** 3 credits of literature at the 300-level; junior or senior classification. **Cross Listing:** ENGL 474/WGST 474.

WGST 476/HIST 476 Sex and Sexuality in History

Credits 3. 3 Lecture Hours. Changing ideas about sex and sexuality over time; includes their interaction with ideas about gender, race, class, religion, science, technology, medicine, politics and popular culture; historical and cultural processes creating modern concerns about sex and sexuality. **Prerequisite:** Junior or senior classification. **Cross Listing:** HIST 476/WGST 476.

WGST 477/HIST 477 Women and Gender in Modern European History

Credits 3. 3 Lecture Hours. Women in Europe from the 18th century to the present: women's contributions to their societies; realities of their daily lives and their responses; perceptions of women; role of institutions in defining women's roles; significance for women of industrialization, revolution, warfare, scientific discoveries; interaction of class, race and gender. **Cross Listing:** HIST 477/WGST 477.

WGST 481 Senior Seminar

Credits 3. 3 Lecture Hours. Inquiry-based investigation of an issue, problem, or question, using gender or feminism as the organizing principle for analysis; methods and materials of scholarship in the field; includes opportunities for student research. **Prerequisite:** WGST 200 and junior or senior classification; or approval of instructor.

WGST 484 Internship in Women's and Gender Studies

Credits 0 to 4. 0 to 4 Other Hours. Directed internship in a public or private organization to provide students with on-the-job training and applied research experience; opportunity to observe first hand issues and problems covered in women's and gender studies courses; designed to enhance and clarify the student's career objectives. **Prerequisites:** WGST 200, junior or senior classification, and approval of instructor.

WGST 485 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Readings and/or research for specific needs of students majoring or minoring in women's and gender studies. **Prerequisites:** WGST 200 and approval of instructor.

WGST 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified area of women's and gender studies. May be repeated for credit.

WGST 491 Research

Credits 0 to 3. 0 to 3 Other Hours. Research conducted under the direction of faculty member in women's and gender studies. May be taken four times for credit. **Prerequisites:** WGST 200; junior or senior classification; and approval of instructor.

ZOOL - Zoology (ZOOL)

ZOOL 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of zoology. May be repeated for credit. **Prerequisite:** Approval of instructor.

Z00L 291 Research

Credits 1 to 4. 1 to 4 Other Hours. Active research of basic nature under the supervision of a Department of Biology faculty member.

Prerequisites: Freshman or sophomore classification and approval of instructor.

Z00L 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of zoology. May be repeated once for credit.

Z00L 491 Research

Credits 1 to 4. 1 to 4 Other Hours. Active research of basic nature under the supervision of a Department of Biology faculty member.

Prerequisites: Junior or senior classification and approval of instructor.