**Accounting**

**ACC 201 Introduction to Financial Accounting (4)**

An accelerated introduction to accounting theory, including the nature and need for accounting principles and accounting concepts. Coverage includes financial statement preparation and analysis, internal control, and accounting systems.

**ACC 205 Managerial Accounting (4)**

Controller use of accounting data to assist with decisions on budgeting, factor and product combinations, pricing, and for performance evaluation of segments of the firm. Prerequisites: ACC 201, MAT 111 or equivalents, or permission of instructor.

**ACC 310 Income Tax I (4)**

Analysis of federal income tax legislation and IRS interpretations affecting individuals' returns. This includes analysis of accounting methods used to determine gross income, deductions, capital gains/losses, and business income. Also includes instruction on availability and use of tax services. Prerequisite: ACC 201 or equivalent.

**ACC 311 Income Tax II (4)**

Impact of federal tax legislation and IRS regulation on taxation of corporations, partnerships, estates and trusts. Special attention is given capital gains/losses, normal tax and surtax, income and deductions of domestic and international/multi‑national organizations. Prerequisite: ACC 310 or equivalent.

**ACC 312 Accounting Systems & Computer Applications (3)**

Introduces students to topics in the area of accounting information systems. In addition to gaining exposure to commercially used accounting packages, students will gain an understanding of system documentation techniques including data flow diagrams, flowcharting, and E-R diagrams; internal control design and assessment; database design; information acquisition; and transactional accounting systems and accounting cycles. Prerequisite: ACC 201 or equivalent and computer literacy.

**ACC 370 Cost Accounting (3)**

Cost accounting and related analytical concepts. Topics include cost accumulation, variance analysis, joint costs, and standard costing. Prerequisite: ACC 201 or equivalent.

**ACC 385 Intermediate Accounting I (4)**

An advanced theory course in accounting, including problems in corporation accounting, evaluation of items on the balance sheet, and statement of income. The course emphasizes the opinions, statements, and other current publications of the American Institute of Certified Public Accountants and the Financial Accounting Standards Board. Prerequisite: ACC 201 or equivalent.

**ACC 386 Intermediate Accounting II (4)**

Continuation of Intermediate Accounting I. Topics include Stockholder's Equity and more complex accounting topics, including accounting for pensions, leases and income taxes, and the Statement of Cash Flows. Prerequisite: ACC 385 or equivalent.

**ACC 450 Auditing (4)**

Auditing standards and techniques used in audit engagements; preparation of audit working papers and audit reports. Prerequisite: ACC 386 or equivalent.

**ACC 475 Advanced Accounting Problems (4)**

Advanced accounting problems cover partnerships, home office and branch relationships, fiduciary accounting, governmental and institutional units, consolidated financial statements, corporate mergers and acquisitions, and other advanced problems. Prerequisite: ACC 386 or equivalent.

**ACC 491 Independent Study (Variable 1‑4)**

Extensive study and research on a particular topic of student interest under the supervision of a faculty member. The student is required to submit a written proposal which includes a description of the project, its duration, educational goals, method of evaluation, and number of credits to be earned. Prerequisites: Matriculated students only, permission of instructor and dean of subject area.

**ACC 492 Accounting Internship (4)**

Supervised, discipline related experience in a business organization. Emphasis is on application, process, and techniques used by business to sustain business and promote growth. Specific skills and competencies needed to be a successful decision-maker will be targeted. Oversight will be provided by the School internship coordinator and the sponsoring organization. Periodic meetings with the supervisor, mid-semester evaluation, and a final, comprehensive written report are required. Prerequisite: Permission of instructor.

**Anthropology**

**ANT 250 Consumerism and Social Justice (4)**

Explores consumption by considering its place in society, the impact of markets and branding on adults and children, consumer identity, the differences between free and fair trade, global trade, food supplies, and the potential links between shopping and social justice.

**ANT 270 Anthropology of Popular Culture (4)**

Anthropological perspectives will be used to examine the role of mass media and popular culture in everyday life in the United States. We will explore various forms of popular culture, and how race, ethnicity, class, and sexual orientation are expressed and negotiated in mass media that pervades everyday life. Some topics that will be addressed include: film, music, television, the Internet, food, consumerism, branding, celebrity, deviance, and the meaning of “cool.”

**ANT 280 Refugee Cultures in the U.S. (4)**

Refugees are people who have fled their home countries due to war, ethnic or religious conflict, or other problems, and are not able to return for fear of persecution. The United States has welcomed refugee groups from many countries and helped them find new homes and communities throughout the country. This course uses a multidisciplinary approach from anthropology to address the history, adaptation, and resettlement experiences of refugee cultures in the U.S. A mix of video, books, news articles, discussions, and optional field trips will be used. An emphasis will be placed on personal stories and experiences from resettled refugee men and women.

**ANT 301 General Anthropology (4)**

Examines the general characteristics of a holistic cultural approach. Presents a general theory of human cultural development. Places specific anthropological issues, such as the origin of gender roles, inequality, and the nature of the state, in theoretical and cross-cultural perspective. Integrates data from cultural anthropology, linguistics, biological anthropology, archaeology, and applied anthropology research and practices where appropriate. Designed for upper division students with no previous background in anthropology. Meets new General Education Social Science requirement.

**ANT 303 Cultural Diversity (4)**

Examines the nature of social and cultural systems of diversity. Investigates cultural practices Relevant to the constitution of such social constructs as race, class, gender and sexuality. Emphasizes the processes through which such ideas, products and culturally and historically constructed social worlds, become parts of a taken-for-granted social universe. Integrates the relationship between conceptions of race, class and gender and sociological and anthropological practice. Meets new General Education Social Science requirement.

**ANT 310 Introduction to Cultural Anthropology (4)**

Provides an understanding of contemporary human issues through the study of diverse human cultures, with an emphasis on non-Western societies and practices. Basic concepts and ethnographic techniques practiced by cultural anthropologist are presented. Topics include family, language, kinship, health, gender, economics, politics, ecology, art and religion. Examination of issues such as globalization and the study of online communities and cultures.

**ANT 321 Distinction: Race, Class and Gender (4)**

Examines the nature of social and cultural systems of distinction. Investigates cultural practices relevant to the constitution of such social constructs as race, class, gender and sexuality. Emphasizes the processes through which such ideas, products of culturally and historically constructed social worlds, become parts of a taken-for-granted social universe. Integrates the relationship between conceptions of race, class and gender and sociological and anthropological practice. Prerequisite: ANT 301 or SOC 110, or an introductory anthropology or sociology course. Restricted to Sociology and Criminal Justice majors.

**ANT 382 Cultures, Health and Healing (4)**

Presents the essential elements of a cultural perspective through examination of health and illness-related behavior. Places disease and illness in holistic perspective. Explores specific issues in medical anthropology, such as the way various cultures conceive disease and illness, cross-cultural conflict in health care delivery, industrial and non-industrial approaches to therapeutic intervention, the relationship of disease and human evolution, and alternative approaches to the study of such issues. Assumes no previous study in anthropology, although this would be helpful. Prerequisite: ANT 301 or SOC 110 or an introductory anthropology or sociology course.

**ANT 460 Ethnography (4)**

Provides an intensive survey of ethnographic practice in anthropology, sociology, and other fields. Examines a wide range of ethnographic materials focusing on the actual production of ethnographic materials including the use of "participant observation," the collection and making of the ethnographic text, questions of ethics in field work practice, and recent relevant feminist and postmodern discussions. Provides students' with the skills and information required in fieldwork practice. Covers specific projects that require students to generate primary field data and complete an analysis of this data using one or several of the theoretical perspectives covered during the semester. Prerequisite: ANT 301 or SOC 110 or an introductory anthropology or sociology course. Cross listed with ANT 531.

**ANT 490 Selected Topics in Anthropology (4)**

An in-depth treatment of a selected topic in Anthropology. Provides students with the opportunity to investigate Anthropological subject matter that will not be repeated in a future seminar. Prerequisites: ANT 301 or SOC 110 or an introductory anthropology or sociology course.

**ANT 491 Independent Study (Variable Credit 1-4)**

Extensive study and research on a particular topic of student interest under the supervision of a faculty member. The student is required to submit a written proposal which includes a description of the project, its duration, educational goals, method of evaluation, and number of credits to be earned. Prerequisite: Matriculated student only, permission of instructor and dean of subject area.

**Art**

**ART 110 Principles of Two Dimensional Design (4)**

A foundation studio course focusing on the visual dynamics of the two-dimensional picture plane, with special attention on the application of basic design principles to problem-solving in the fine and applied arts. Explores a variety of hands-on techniques pertaining to image creation, manipulation, and construction including space, line, shape, value, texture, color, and their design relation to one another. Combining technical and artistic skills, students will create 5-8 portfolio pieces. Meets General Education The Arts requirement.

**ART 120 Studio Art: Visual and/or Performing (2)**

An introduction and hands-on experience with the style and techniques of a visiting artist. Suitable lecture/demonstration of background and personal approach to the work will be shared by the artist. Students in a studio/workshop type of environment will participate in sequential exercises designed to allow them adopt and adapt some of those stylistic elements and/or features in their own work (visual and/or performing). Meets new General Education Arts requirement.

**ART 135 Drawing (2)**

This is a beginning course in free‑hand drawing for the layperson. The student will be guided through a sequence of lessons beginning with line quality, the vocabulary of lines, and proceed through drawing materials and techniques, foreshortening and shading. Emphasis will be placed on the representation of forms in drawing. Lessons will consist of lecture‑demonstrations, class work, and homework. The expected result is to provide the student with more confidence in the self‑expression and appreciation of drawing. Meets new General Education Arts requirement.

**ART 140 Painting ‑ Technique & Style (4)**

An investigation of visual art forms and techniques that influence and express qualities of American culture. Aspects of design, color and style will be explored through studio experience, lecture, slides, and demonstrations, to enable the student to use the elements of line and color to create visual space on a flat surface. Meets new General Education Arts requirement.

**ART 341 Painting II - Techniques & Style (2)**

Continuation of the investigation of visual art forms and techniques for students who wish to improve visual literacy. Students will explore several major styles in the modern Western tradition, applying and experimenting with the brush and pigment techniques through which those styles are achieved. Meets new General Education Arts requirement.

**ART 350 History of American Art (4)**

A survey of important trends and significant styles of American painting and sculpture from colonial times, including works of Sargent, Whistler, Homer, Inness, Johns, and Pollock. Lectures, slides, and museum tours. Meets new General Education Humanities or Arts requirement.

**Astronomy**

**AST 222 Astronomy (4)**

A survey of the nature of celestial bodies within the solar system, as well as constellations and phenomena in and beyond our galaxy. Also covered are comets, meteoroids, asteroids, black holes, quasars, pulsars, supernovae, star clusters, and double stars. Meets new General Education Natural Sciences requirement.

**Biology**

**BIO 101T Introduction to Biology Lecture (3)**

Biological issues are at the forefront of public attention, from cloning to climate change to conservation, and understanding these issues takes an increasing amount of scientific literacy as the issues become more complex. Covers the scientific knowledge base behind many of these issues, and also explores current areas of agreement and contention and applications of these data in technology and society. Three hours of lecture each week. This class must be taken with the laboratory course BIO 101L in the same semester. Successful completion of both co-requisite lecture and lab courses (BIO 101T and BIO 101L) is required. **Students may NOT receive degree credit for both BIO 101T/L and BIO 103T/L or 104T/l.** Meets new General Education Natural Science requirement.

**BIO 101L Introduction to Biology Laboratory (1)**

Laboratory section to accompany BIO 101T. Application of theoretical material from Introduction to Biology Lecture in experimental procedures. Three hours of laboratory each week. This class must be taken with the lecture course BIO 101T in the same semester. Successful completion of both co-requisite lecture and lab courses (BIO 101T and BIO 101L) is required. Should a student need to repeat one co-requisite, they must repeat both co-requisites. **Students may NOT receive degree credit for both BIO 101T/L and BIO 103T/L or 104T/L.** Meets SUNY General Education Natural Science category.

**BIO 103T Biology I Lecture (3)**

First part of a two semester sequence of introductory biology. Focuses on chemistry of living organisms, cell structure and function, metabolic processes, genetics and evolution. Three hours of lecture each week. This class must be taken with the laboratory course BIO 103L in the same semester. Successful completion of both co-requisite lecture and lab courses (BIO 103T and BIO 103L) is required. Should a student need to repeat one co-requisite, they must repeat both co-requisites.  **Students may NOT receive degree credit for both BIO 101T/L and BIO 103T/L.**  Meets new General Education Natural Science requirement.

**BIO 103L Biology 1 Laboratory (1)**

Laboratory section to accompany BIO 103T. Application of theoretical material from Biology 1 Lecture in experimental procedures. Three hours of laboratory each week. This class must be taken with the lecture course BIO 103T in the same semester. Successful completion of both co-requisite lecture and lab courses (BIO 103T and BIO 103L) is required. Should a student need to repeat one co-requisite, they must repeat both co-requisites. Meets SUNY General Education Natural Science category. **Students may NOT receive degree credit for both BIO 101T/L and BIO 103T/L.**

**BIO 104T Biology II Lecture (3)**

Second part of a two semester sequence of introductory biology. Focuses on the diversity, anatomy, and physiology of living organisms. Three hours of lecture each week. This class must be taken with the laboratory course BIO 104L in the same semester. Successful completion of both co-requisite lecture and lab courses (BIO 104T and BIO 104L) is required. Should a student need to repeat one co-requisite, they must repeat one co-requisite, they must repeat both co-requisites. Prerequisites: BIO 103T and BIO 103L or equivalent. **Students may NOT receive degree credit for both BIO 101T/L and BIO 104T/L.**

**BIO 104L Biology II Laboratory (1)**

Laboratory section to accompany BIO 104T. Application of theoretical material from Biology II Lecture in experimental procedures. Three hours of laboratory each week. This class must be taken with the lecture course BIO 104T in the same semester. Successful completion of both co-requisite lecture and lab courses (BIO 104T and BIO 104L) is required. Should a student need to repeat one co-requisite, they must repeat both co-requisites. Prerequisites: BIO 103T and BIO 103L or equivalent. **Students may NOT receive degree credit for both BIO 101T/L and BIO 104T/L.**

**BIO 105 Introduction to Ecology (4)**

Study of interactions living organisms have with their physical and biological environments. Special attention is given to population dynamics, pollution control, and the consequences when ecological systems are disturbed. Meets new General Education Natural Science requirement.

**BIO 106 Solutions for a Sustainable World (4)**

Examines a broad survey of environmental, social and economic problems and explores solutions for a sustainable future on local, bioregional and global levels. Topics include population growth and consumption, world poverty, global climate change, renewable energy, transportation and biofuels, water conservation, GMO’s, local and organic food production, green building, socially responsible business investing, carbon cap and trade, microlending, environmental racism, and ecovillages among others. The instructor, student teams and guest speakers will give presentations on these issues. Students will see examples of sustainable solutions in their local community on scheduled site visits. Meets new General Education Natural Science requirement.

**BIO 130T Plant Biology (3)**

Plants provide us with oxygen, food, and most of the raw materials we use; they form the very basis of life as we know it. Examines the structure, classification, and physiology of plants, and addresses current issues and technologies surrounding plants such as bioengineered food and botanical forensics. Three hours of lecture each week. This class must be taken with the laboratory course BIO 130L in the same semester. Successful completion of both co-requisite lecture and lab courses (BIO 130T and BIO 130L) is required. Should a student need to repeat one co-requisite, they must repeat both co-requisites. Meets SUNY General Education Natural Science category.

**BIO 130L Plant Biology Laboratory (1)**

Laboratory section to accompany BIO 130T. Application of theoretical material from Plant Biology Lecture in experimental procedures. Three hours of laboratory each week. This class must be taken with the lecture course BIO 130T in the same semester. Successful completion of both co-requisite lecture and lab courses (BIO 130T and BIO 130L) is required. Should a student need to repeat one co-requisite, they must repeat both co-requisites. Meets SUNY General Education Natural Science category.

**BIO 215T Anatomy & Physiology I Lecture (3)**

Covers organs and organ systems of the human body. This course emphasizes the anatomy and physiology of cells and the integumentary, nervous, respiratory, and circulatory systems. Three lecture hours per week. This course must be taken with BIO 215L at SUNY Polytechnic during the same semester. Prerequisites: BIO 101/101L or BIO 103/103L and CHE 110/110L or CHE 130/130L, or permission of the instructor. Successful completion of both co-requisite courses (BIO 215T and BIO 215L) is required. Should a student need to repeat one co-requisite, s/he must repeat both co-requisites. Meets the SUNY General Education Natural Science category.

**BIO 215L Anatomy & Physiology 1 Lab (1)**

Covers organs and organ systems of the human body in a laboratory setting. This course emphasizes the anatomy and physiology of cells and the integumentary, nervous, respiratory, and circulatory systems. Three laboratory hours per week. This course must be taken with BIO 215 at SUNY Polytechnic during the same semester. Prerequisites: BIO 101/101L or BIO 103/103L and CHE 110/110L or CHE 130/130L, or permission of the instructor. Successful completion of both co-requisite courses (BIO 215T and BIO 215L) is required. Should a student need to repeat one co-requisite, s/he must repeat both co-requisites. Meets the SUNY General Education Natural Science category.

**BIO 216T Anatomy & Physiology II Lecture (3)**

Covers organs and organ systems of the human body in a laboratory setting. This course emphasized the anatomy and physiology of the skeletal, muscular, endocrine, digestive, urinary, and reproductive systems. Three lecture hours per week. This course must be taken with BIO 216L at SUNY Polytechnic during the same semester. Prerequisites: BIO 215/215L or permission of the instructor. Successful completion of both co-requisite courses (BIO 216T and BIO 216L) is required. Should a student need to repeat one co-requisite, s/he must repeat both co-requisites. Meets the SUNY General Education Natural Science category.

**BIO 216L Anatomy & Physiology II Laboratory (1)**

Covers organs and organ systems of the human body in a laboratory setting. This course emphasizes the anatomy and physiology of the skeletal, muscular, endocrine, digestive, urinary, and reproductive systems. Three laboratory hours per week. This course must be taken with BIO 216 at SUNY Polytechnic during the same semester. Prerequisites: BIO 215/215L or permission of the instructor. Successful completion of both co-requisite courses (BIO 216T and BIO 216L) is required. Should a student need to repeat one co-requisite, s/he must repeat both co-requisites. Meets the SUNY General Education Natural Science category.

**BIO 222 Nutrition and Health (4)**

Examines the nature of nutrients, their metabolism and physiological function, and the factors that may influence the degrees to which these nutrients are required for healthy functioning. Nutritional health issues and the influence of drugs and environmental factors on nutrition and health will be emphasized. Meets new General Education Natural Science requirement.

**BIO 224 Biology of Aging (4)**

Introduces biological concepts with emphasis on the process of aging. Topics include demographics, concepts of aging, anatomy and physiology as well as general non‑medical assessments of the elderly. Students cannot receive credit for both BIO 350 (Advanced Physiology) and BIO 224. Meets new General Education Natural Science requirement.

**BIO 225 Biology of the Sexes (4)**

Examines the genetic and physiological basis of male and female differentiation in different organisms, the evolution of reproduction as a genetic strategy, physical differences of the sexes and parenting in mammals. Addresses how societal constructs of gender have influenced the development of theories in various scientific disciplines and the roles of gender for scientists. Meets new General Education Natural Science requirement.

**BIO 230 Plant Anatomy (4)**

In-depth examination of the internal organization of plants, particularly angiosperms, with an emphasis on understanding anatomy from a structure-function standpoint. Three hours of lecture and three hours of laboratory each week. Prerequisites: BIO 104

**BIO 250 Medical Genetics (4)**

Central concepts of genetics are explored and their clinical applications to multiple situations are defined. Also, information obtained from assessment processes are translated into practice, and ethical and practice principles and their use in the counseling of patients and families are discussed. Does not meet SUNY General Education Natural Science requirement. Prerequisites: BIO 215 and 216 or permission of the instructor.

**BIO 270 Cell Biology (4)**

Survey of modern cell biology which includes the chemistry of cellular molecules, structure, functions and specializations of cells and organelles. Four hours of lecture each week. Prerequisites: BIO 104

**BIO 275T Microbiology Lecture (3)**

Covers the fundamentals of microbiology including the study of bacteria, viruses, fungi, algae and protozoa as well as microbial structure, metabolism, culturing, control and genetics. Three hours of lecture each week. This class must be taken with the laboratory course BIO 275L in the same semester. Successful completion of both co-requisite lecture and lab courses (BIO 275T and BIO 275L) is required. Should a student need to repeat one co-requisite, they must repeat both co-requisites. Prerequisites: BIO 101

or CHE 110 or equivalents, or permission of instructor.

**BIO 275L Microbiology Laboratory (1)**

Laboratory section to accompany BIO 275T course. Application of theoretical material from Microbiology Lecture in experimental procedures. Three hours of laboratory each week. This class must be taken with the lecture course BIO 275T in the same semester. Successful completion of both co-requisite lecture and lab courses (BIO 275T and BIO 275L) is required. Should a student need to repeat one co-requisite, they must repeat both co-requisites. Prerequisites: BIO 101 and CHE 110 or equivalents, or permission of instructor.

**BIO 300T Ecology Lecture (3)**

Covers interactions at the organismal, population (single species and species interactions), and community level. Applications of ecological theory to current environmental problems are examined throughout the course, and various statistical methods are used to analyze and interpret data. Three hours of lecture each week. This class must be taken with the laboratory course BIO 300L in the same semester. Successful completion of both co-requisite lecture and lab courses (BIO 300T and BIO 300L) is required. Should a student need to repeat one co-requisite, they must repeat both co-requisites.

**BIO 300L Ecology Laboratory (1)**

Laboratory section to accompany BIO 300T. Application of theoretical material from Ecology Lecture in experimental procedures. Three hours of laboratory each week. This class must be taken with the lecture course BIO 300T in the same semester. Successful completion of both co-requisite lecture and lab courses (BIO 300T and BIO 300L) is required. Should a student need to repeat one co-requisite, they must repeat both co-requisites. Prerequisites: BIO 104T and BIO 104L; STA 100 or STA 225 or MAT 225 or equivalents.

**BIO 315 Plant/Animal Physiology (4)**

Examines functional responses of organisms such as photosynthesis, water relations, movement, hormones, and growth in plants and, in animals, the nervous, endocrine, circulatory, respiratory, digestive, and reproductive systems. Four hours of lecture each week. Prerequisite: BIO 270.

**BIO 340 Vertebrate Zoology (4)**

Focuses on the biology, ecology, taxonomy and comparative anatomy of animals within the vertebrates. Students will have “hands-on” experience with live and preserved specimens in the field and laboratory. Three hours of lecture and three hours of laboratory each week. Prerequisites: BIO 104.

**BIO 341 Invertebrate Zoology (4)**

Focuses on the biology, ecology, taxonomy and comparative anatomy of animals within the invertebrate phylum. Students will have “hands-on” experience with live and preserved specimens in the field and laboratory. Three hours of lecture and three hours of laboratory each week. Prerequisites: BIO 104.

**BIO 342 Animal Behavior (4)**

Biological study of vertebrate and invertebrate animal behavior. Basic topics covered include animal learning, mechanisms of behavior, foraging, competition, defense against predation, aggression, sensory systems, communication, mating systems and parental care behavior. Four hours of lecture per week. Prerequisites: BIO 104.

**BIO 350 Advanced Physiology (4)**

An integrated study of human physiology at the biochemical, cellular, tissue, and organ level. Designed primarily for upper division science and nursing majors. Emphasis will be on explanation of biochemical and cellular mechanisms in the major organ systems of the human body. Prerequisite: BIO 216 or permission of instructor.

**BIO 351 Genetics (4)**

A broad coverage of the field of genetics to include discussion of the transmission, chemical nature and function of genetic material, with special attention to its importance in medicine, agriculture, and other aspects of human life and culture. Prerequisite: BIO 104 or permission of instructor.

**BIO 375 Applied and Environmental Microbiology (4)**

General principles and application of industrial and environmental microbiology focusing on useful microbial processes. Investigate role of microbes in water pollution control, environmental health, element cycling in the environment, industrial applications, and biomedical applications. Three hours of lecture and three hours of laboratory per week. Prerequisites: BIO 101 or BIO 103 and CHE 130.

**BIO 380 Evolution (4)**

Introduction to evolutionary theory. Includes the historical development of components of evolutionary theory, population level microevolution, the fossil record and macroevolution, and current methods in evolutionary research including their application to genetic engineering. Meets new General Education Natural Science requirement. Prerequisite: BIO 104

**BIO 390 Junior Seminar (1)**

Introduction to the general principles and procedures of scientific research with emphasis on the use of scientific literature and methods of research. Seminar, 1 hour each week. Prerequisite: Junior status.

**BIO 401 Phylogenetics (4)**

Introduces students to methodologies of reconstruction evolutionary history. The history of various approaches is covered as well as current and emerging philosophical debates in the field. Modern methods utilizing computational analysis will be taught along with specific issues regarding different types of data. Prerequisites: BIO 270, BIO 351, BIO 380

**BIO 470 Molecular Biology (4)**

Modern molecular biology with an emphasis on gene structure and activity and the biochemistry related to the understanding of the functions of the gene. Three hours of lecture and three hours of laboratory each week. Prerequisites: BIO 104, BIO 270

**BIO 472 Oncology (4)**

This course will provide an introduction to the field of cancer biology, covering how cancer develops from defects in genes that govern normal cell growth and death processes. Throughout the course, an emphasis will be placed on comparing the common cellular pathways that are deregulated across many cancer types, thus highlighting the pharmacological targets of current cancer therapies. Also, a special section will cover the use of engineered nanomaterials for cancer prevention and novel treatment strategies. After covering relevant introductory concepts, a review and research paper will be assigned to the class, with students taking the lead in a topical discussion of the research paper. At least 1 week will be allowed for preparation. Guidelines for how to best structure these discussions will be provided. Prerequisites: BIO 270 and BIO 351 or equivalents.

**BIO 487 Senior Life Science Seminar (1)**

A capstone seminar focusing on biology research conducted by seniors and faculty. Seminar, 1 hour each week. Prerequisites: BIO 390 and Senior status.

**BIO 488 Senior Bioinformatics Seminar (1)**

Capstone seminar focusing on bioinformatics research conducted by seniors and faculty. Seminar, 1 hour each week. Prerequisites: BIO 390 and Senior status.

**BIO 489 Senior Biotechnology Seminar (1)**

Capstone seminar focusing on biotechnology research conducted by seniors and faculty. Seminar, 1 hour each week. Prerequisites: BIO 390 and Senior status.

**Business**

**BUS 101 Introduction to Business (4)**

A survey course that will provide an introduction to current business practices in a changing global economy. Includes an overview and introduction to the functional areas in American business such as accounting, finance, marketing, management, human resources, and production. Selected business topics will be covered to illustrate how the concepts, structures, and theories are related within business. Enrollment is restricted to freshmen/sophomore students or by permission of instructor.

**BUS 105 Business Law I (4)**

A case‑approach analysis of business transactions in the legal environment. Coverage includes: court structure and processes, contracts, sales, commercial paper, secured transactions, and property transactions. Related local, state, and federal statutes and forms are also considered.

**BUS 302 Web Analytics for Managers (2)**

Focuses on the methods and concepts that today’s business managers can use to effectively manage their electronic commerce site activity. Through gaining a better understanding of web analytics, managers become better informed of their company’s online activities, enabling them to improve their marketing, sales and profit results. Examines the various ways that web activity is measured and analyzed, including the metrics that provide the essential data for analysis and the technologies that are used to track and report web activity.

**BUS 303 What’s the Big Idea (3)**

Student will be introduced to how to develop an idea into an entrepreneurial vision. This will include conceptualizing and presenting an idea to potential team members and investors, focusing your idea, understanding competition and looking for missing opportunities in a market, learn how to form a team and financial planning to support your idea. This course and ITS 303 cannot both be taken for credit.

**BUS 304 Idea to Startup (3)**

Students will develop an action plan for their business. This will include developing a plan to get your product to market, develop a proof of concept or demo, develop a business plan, which can be used to pitch your idea to investors, and refine the team which will help you get your idea to market. The culmination of the final project is a presentation to investors. This course and ITS 304 cannot both be taken for credit.

**BUS 306 Business Law II (3)**

Designed to extend the student's legal knowledge of business transactions by stressing issue recognition and case analysis. Topics covered include agency, property, suretyship, legal liability, bankruptcy, and business organization. Prerequisite: BUS 105.

**BUS 310 Principles of Insurance (4)**

Introduction to basic principles of life, health, property, liability, and other forms of insurance from the viewpoint of the purchaser. Emphasis will be on universal insurance concepts and not specific policy provisions. Consideration is given to the importance of risk in personal and business transitions and various methods of handling risk with emphasis on insurance.

**BUS 345 Real Estate Transaction (4)**

The principal purpose is to develop an understanding of the legal framework and basic principles that apply to real estate transactions. Residential and commercial real estate transactions will be examined in detail. Specific legal issues are presented in a problem‑solving format and may include: introduction to real estate, recording statutes, title abstracting and title insurance, survey and legal descriptions, mortgages, leases, deeds of conveyance, settlements and closings and Real Estate Settlement Procedures Act.

**BUS 420 Employee Benefits (4)**

Concepts of group life, health, retirement, and emerging employer sponsored benefit plans. Emphasis is on plan design and management with special attention to cost funding, regulation and tax considerations. The impact of government programs such as Social Security on individual insurance and employee benefit programs and potential impact of proposals such as national health insurance. Prerequisite: MGT 318.

**BUS 451 Issues in Business and Society (4)**

Analysis of forces external to the firm which influence its goals, structure and operation. Includes legal and regulatory constraints, primarily as they reflect the philosophical backgrounds of free enterprise and managerial enterprise, and managerial enterprise viewpoints current in American business. Also, the social, political, and technological factors which influence managerial/non‑managerial behavior in the firm, and the firm's impact on society. Actual cases influencing the firm or industry objectives, and the philosophy of private enterprise will dominate the subject matter.

**BUS 485 Management Policy (4)**

Emphasis is placed upon analysis of the factors upon which ultimate business decisions are made; construction and review of business plans, and business strategies in domestic and foreign operations under varying political, economic and legal constraints. Special attention is given to actual situation analysis. Current functional and managerial techniques are applied to a variety of case problems. Prerequisites: Senior status and completion of all business core requirements.

**BUS 491 Independent Study (Variable 1-4)**

Extensive study and research on a particular topic of student interest under the supervision of a faculty member. The student is required to submit a written proposal which includes a description of the project, its duration, educational goals, method of evaluation, and number of credits to be earned. Prerequisites: Matriculated students only; permission of instructor and dean of subject area.

**BUS 492 Business Internship (4)**

Supervised, discipline based experience in business organization. Emphasis on application, process, and techniques used by business to sustain and promote growth. Specific skills and competencies needed to be a successful decision-maker are targeted. Oversight provided by the School internship coordinator and the sponsoring organization. Periodic meetings with the internship coordinator, mid-semester evaluation and a final, comprehensive written report are required. Pre-requisite: Permission of Instructor. Only S/U grades are awarded for this course.

**Chemistry**

**CHE 110T Essentials of Chemistry Lecture (3)**

An introduction to chemistry for non‑science majors. The course will cover some key topics in chemistry, with emphasis on its impact on society. Three hours of lecture each week. This class must be taken with the laboratory course CHE 110L in the same semester. Successful completion of both co-requisite lecture and lab courses (CHE 110T and CHE 110L) is required. Should a student need to repeat one co-requisite, they must repeat both co-requisites. Meets SUNY General Education Natural Science category. **Students may NOT receive degree credit for both CHE 110T/L and CHE 130T/L or CHE 131T/L.**

**CHE110L Essentials of Chemistry Laboratory (1)**

Laboratory section to accompany CHE 110T. Application of theoretical material from Organic Chemistry 1 Lecture in experimental procedures. Three hours of laboratory each week. This class must be taken with the lecture course CHE 110T in the same semester. Successful completion of both co-requisite lecture and lab courses (CHE 110T and CHE 110L) is required. Should a student need to repeat one co-requisite, they must repeat both co-requisites. Meets SUNY General Education Natural Science category.

**CHE 130T Introductory Chemistry I Lecture (3)**

First course in two semester sequence of introductory chemistry for students in the sciences or related programs. Topics include: measurements, forms of matter, stoichiometry, chemical reactions, gases, thermochemistry, atomic structure, structure of the periodic table, chemical bonding and molecular geometry, properties of solids and liquids, and properties of solutions. Three hours of lecture each week. This class must be taken with the laboratory course CHE 130L in the same semester. Successful completion of both co-requisite lecture and lab courses (CHE 130T and CHE 130L) is required. Should a student need to repeat one co-requisite, they must repeat both co-requisites. **Students may NOT receive degree credit for both CHE 110T/L and CHE 130T/L.** Restricted to Biology, Civil Engineering, Mechanical Engineering majors.

**CHE 130L Introductory Chemistry 1 Laboratory (1)**

Laboratory section to accompany CHE 130T. Application of theoretical material from Introductory Chemistry Lecture in experimental procedures. Three hours of laboratory each week. This class must be taken with the lecture course CHE 130T in the same semester. Successful completion of both co-requisite lecture and lab courses (CHE 130T and CHE 130L) is required. Should a student need to repeat one co-requisite, they must repeat both co-requisites. Restricted to Biology, Civil Engineering, Mechanical Engineering majors.

**CHE 131T Introductory Chemistry II Lecture (3)**

Second course in a two semester sequence of college-level introductory chemistry for students in the sciences or related technology programs. Topics include: periodic patterns in the chemical table, organic compounds, chemical kinetics, equilibria, thermodynamics, electrochemistry, elemental occurrence in nature and usage in industry, coordination compounds and lastly, nuclear chemistry. Three hours of lecture each week. This class must be taken with the laboratory course CHE 131L in the same semester. Successful completion of both co-requisite lecture and lab courses (CHE 131T and CHE 131L) is required. Should a student need to repeat one co-requisite, they must repeat both co-requisites. **Students may NOT receive degree credit for both CHE 110T/L and CHE 131 T/L.**  Restricted to Biology, Civil Engineering, and Mechanical Engineering majors. Pre-requisites: CHE 130T and CHE 130L or equivalent.

**CHE 131L Introductory Chemistry II Laboratory (1)**

Laboratory section to accompany CHE 131T. Application of theoretical material from Introductory Chemistry II Lecture in experimental procedures. Three hours of laboratory each week. This class must be taken with the lecture course CHE 131T in the same semester. Successful completion of both co-requisite lecture and lab courses (CHE 131T and CHE 131L) is required. Should a student need to repeat one co-requisite, they must repeat both co-requisite. Prerequisites: CHE 130T and CHE 130L or equivalent. Restricted to Biology, Civil Engineering, Mechanical Engineering majors.

**CHE 230T Organic Chemistry I Lecture (3)**

First course in two semester sequence. Topics include: Bonding and molecular orbital theory, structures of non-conjugated organic compounds, nomenclature, stereochemistry, basic organic reactions, structural determinations via infrared spectroscopy (IR), mass spectrometry (MS), and nuclear magnetic resonance spectroscopy (NMR) and basic synthetic approaches. Three hours of lecture each week. This class must be taken with the laboratory course CHE 230L in the same semester. Successful completion of both co-requisite lecture and lab courses (CHE 230T and CHE 230L) is required. Should a student need to repeat one co-requisite, they must repeat both co-requisites. Prerequisites: CHE 131T and CHE 131L or equivalent.

**CHE 230L Organic Chemistry I Laboratory (1)**

Laboratory section to accompany CHE 230T. Application of theoretical material from Organic Chemistry I Lecture in experimental procedures. Three hours of laboratory each week. This class must be taken with the lecture course CHE 230T in the same semester. Successful completion of both co-requisite lecture and lab courses (CHE 230T and CHE 230L) is required. Should a student need to repeat one co-requisite, they must repeat both co-requisites. Restricted to Biology majors. Prerequisites: CHE 131T and CHE 131L or equivalent.

**CHE 231T Organic Chemistry II Lecture (3)**

Second semester of a two semester sequence. Topics include: Conjugated and aromatic organic compounds, ultraviolet/visible spectroscopy, reactions of aromatic compounds, alcohols, thiols, ethers, epoxides, sulfides, aldehydes, ketones, carboxylic acids, reactions of carbonyl compounds, aliphatic and aromatic amines, nomenclature, basic synthetic approaches and an introduction to biological molecules. Three hours of each week. This class must be taken with the laboratory course CHE 231L in the same semester. Successful completion of both co-requisite lecture and lab courses (CHE 231T and CHE 231L) is required. Should a student need to repeat one co-requisite, they must repeat both co-requisites. Restricted to Biology majors. Prerequisites: CHE 230T and CHE 230L or equivalent.

**CHE 231L Organic Chemistry II Laboratory (1)**

Laboratory section to accompany CHE 231T. Application of theoretical material from Organic Chemistry II Lecture in experimental procedures. Three hours of laboratory each week. This class must be taken with the lecture course CHE 231T in the same semester. Successful completion of both co-requisite lecture and lab courses (CHE 231T and CHE 231L) is required. Should a student need to repeat one co-requisite, they must repeat both co-requisites. Restricted to Biology majors. Prerequisites: CHE 230T and CHE 230L or equivalent.

**CHE 330 Instrumental Analysis (4)**

Analytical chemistry course that deals with chemical analysis utilizing electronic instrumentation. Topics include: infrared, Raman, atomic emission, atomic absorption, atomic fluorescence, NMR and mass spectrometry; electrochemical techniques such as ion selective electrodes, polarography, coulometry, amperometry, conductance; and chromatographic techniques such as gas, liquid column and HPLC. Three hours of lecture and three hours of laboratory each weeks. Prerequisite: CHE 231 or equivalent.

**CHE 430T Biochemistry I Lecture (3)**

First course in a two semester sequence. Topics include: Molecular components of the cell such as amino acids, proteins, enzymes, sugars, lipids, lipoproteins, nucleotides, vitamins and coenzymes. Also covered are energy yielding processes such as the ATP cycle, glycolsis, tricarboxylic acid cycle, the phosphogluconate pathway, redox enzymes and electron transport, oxidative phosphorylation, fatty acid metabolism, amino acid degradation and photosynthesis. Three hours of lecture each week. This class must be taken with the laboratory course CHE 430L in the same semester. Successful completion of both co-requisite lecture and lab courses (CHE 430T and CHE 430L) is required. Should a student need to repeat one co-requisite, they must repeat both co-requisites. Restricted to Biology majors. Prerequisites: CHE 231T and CHE 231L or equivalent.

**CHE 430L Biochemistry I Laboratory (1)**

Laboratory section to accompany CHE 430T. Application of theoretical material from Organic Chemistry II Lecture in experimental procedures. Three hours of laboratory each week. This class must be taken with the lecture course CHE 430T in the same semester. Successful completion of both co-requisite lecture and lab courses (CHE 430T and CHE 430L) is required. Should a student need to repeat one co-requisite, they must repeat both co-requisites. Restricted to Biology majors. Prerequisites: CHE 231T and CHE 231L or equivalent.

**CHE 431 Biochemistry II (4)**

Second course in a two semester sequence. Topics include: synthesis of carbohydrates, lipids, amino acids and nucleotides, the conversion of biochemical energy into motility, membrane transport mechanisms, hormones and the regulation of metabolic processes, metabolic organization, the structure and properties of DNA, protein synthesis, genes and their regulation and systematic morphogenesis. Three hours of lecture and three hours of laboratory per week. Prerequisite: CHE 430T and CHE 430L or equivalent

**Chinese**

**CHI 101 Elementary Chinese (4)**

Designed for students with no previous knowledge of Chinese. Introduces students to the official Chinese language called “Mandarin” by English speakers, *putonghua* in the People’s Republic of China, and *Kuo-yu* in Taiwan. The course aims to help students obtain the four basic language skills of listening, speaking, reading and writing the Chinese language. Students will learn basic vocabulary and sentence structures for use in essential daily-life situations through various forms of oral practice. Pinyin (the most widely-used Chinese phonetic system) will be taught as a tool to learn the spoken language. Students will also learn Chinese characters. Approximately 200 words and expressions in both Pinyin and character forms will be taught. While linguistic aspects of the Chinese language are the primary focus, introduction to the social and cultural background of the language will also form an important part of the course. Meets the new General Education Foreign Language requirement.

**Civil Engineering**

**CE 210 Elementary Surveying (3)**

Introductory course in surveying methods and theory. Topics will include land surveying, construction surveying, and route surveying. Two hours of lecture and two hours of lab per week. Prerequisites: MAT 151.

**CE 220 Professionalism (2)**

Provides students with the non-technical skills necessary to become a member of the engineering profession. Class topics will include ethics, peer review and critiquing others, oral presentations, written reports, engineering impacts on society, guidance for licensure, and contemporary issues in engineering. Two hours of lecture per week. Prerequisite: Sophomore Standing.

**CE 301 Structural Engineering (4)**

Introduce students to the classic analysis methods of determinate and indeterminate structures, including deflection, calculation of beams and frames, work energy methods, flexibility method, slope deflection method, moment distribution method, approximate structural analysis, and influence line concept for moving loads. Three hours of lecture and one hour of lab per week. Prerequisite: ESC 230. Restricted to Civil Engineering major.

**CE 302 Transportation Engineering (3)**

Introduction to basic concepts in transportation engineering including: planning, design, and operations. Introduces the challenges and issues in modeling transportation problems. Studies of various concepts related to the design of highway facilities, level of service, and demand for transportation services. Concepts related to signal optimization, policy implications and the basics of transportation planning. Prerequisite: MAT 152.

**CE 303 Environmental Engineering (4)**

Students in the class will be introduced to topics relevant to environmental engineering. Topics to be covered in class include pollution in air, water and solid wastes, as well as, engineering approaches for treatment and remediation of the pollution in these environmental media. Three hours of lecture and one hour of lab per week. Prerequisites: MAT 151 and BIO 101T, and BIO 101L or CHE 130T and CHE 130L. Restricted to Civil Engineering major.

**CE 304 Geotechnical Engineering (3)**

Soil properties, identification and classification of earth material; subsurface exploration; soil strength, stresses, settlement, substructure design; computer applications. Prerequisites/co-requisites: ESC 230.

**CE 330 Fluid Mechanics (3)**

Hydraulic considerations for wells, pumps, and distribution systems, including conservation of mass, momentum, and energy incompressible flow of fluids with introduction of compressible flow: dimensional analysis and similitude; laminar and turbulent flows; empirical methods. Hydrologic design and analysis of drainage. Hydrologic cycle components necessary for determining design flows. Use of computer analysis techniques. Prerequisite: CHE 231T and CHE 231L or equivalent.

**CE 335 Water Resources Engineering (3)**

Students will explore water resources engineering processes in pipe flows, pipe networks, open channel flow, and surface and groundwater hydrology. This course is designed to review the fundamentals and practices of water resources engineering with a focus on engineering applications of hydraulics and hydrology. The concepts of fluid mechanics (hydrostatics, conservation laws) will be applied to analyze flow phenomena are illustrated in demonstrations and field trips. The course will prepare interested students for future careers in water supply, wastewater treatment, floodplain management, storm water management, and groundwater management. Prerequisite/Co-requisite: CE 330.

**CE 410 Structural Steel Design (3)**

Analysis and design of structural steel members for tensile, compressive, flexural and combined loading. Prerequisite: CE 301.

**CE 411 Reinforced Concrete Design (3)**

Strength design concepts, beams, columns, slabs, retaining walls, single and combined footings. Computer applications. Prerequisite: CE 301.

**CE 412 Finite Element Analysis (3)**

Modern analysis techniques used to investigate a variety of systems in engineering and science. Computational models of problems are developed using energy concepts, structural mechanics, and matrix operations. The methods used are implemented using a general finite element program and the accuracy of the results is evaluated. The learned theoretical approach is applied to common structural elements such as trusses, beams, frames, and plates. Prerequisites: ESC 230, MAT 260, and MAT 253.

**CE 420 Traffic Engineering (3)**

Teaches students the fundamentals of traffic engineering and traffic flow theory: traffic signal design, intersection design, and traffic impact studies. Students will be taught using Highway Capacity Software, SYNCHRO, and other traffic software packages. Prerequisite: CE 302.

**CE 421 Highway Engineering (3)**

Principles of geometric design of highways, intersections, interchanges, and terminals. Practical issues of vertical and horizontal curvature, highway evaluation, driver and vehicle dynamics, and traffic safety are also addressed. Computer-aided design and modeling. Prerequisite: CE 302.

**CE 422 Transportation Terminal Design (3)**

Transportation terminal design requires that engineers look at the interactions between passengers, freight and the transportation systems that they use. The design of terminals is a key component of a transportation system. Terminals are designed to provide security, storage, and access to different modes of transportation. The course will focus on airports, rail stations and truck terminals. Prerequisite: CE 302.

**CE 430 Hydrology and Storm Water Management (3)**

Students will learn about hydrologic design and the analysis of drainage and storm water management systems. This will include hydrologic cycle components necessary for determining design flows and pipe flow calculations. Computer modeling. Prerequisite: CE 303.

**CE 431 Hazardous and Solid Waste Treatment (3)**

Teaches students about hazardous and solid waste including: waste identification, subsurface fate and transport, toxicology, environmental/public health and risk assessment, site characterization and assessment tools, remediation tools and technologies. Prerequisite: CE 303.

**CE 432 Water & Waste Water Unit Design (3)**

Design-based environmental engineering course. Unites design of drinking water and waste-water treatment plants. Applies microbiology, water chemistry principles, and units of treatment-plant design techniques. Prerequisite: CE 303.

**CE 433 Groundwater Hydrology (3)**

Students will learn the fundamental science and engineering behind groundwater systems. Explore hydrogeology topics including but not limited to: the hydrologic cycle, groundwater flow, and wellhead protection and management. Students are required to analyze contemporary issues in hydrogeology via critical thinking, engineering design, and teamwork, technical reporting, and presentation. Prerequisite: CE 303.

**CE 440 Construction Management (3)**

Provides students with an overview of the responsibilities and risk associated with management within the construction industry. Emphasis is given to responsibilities and relationships between owners, contractors, labor and suppliers, construction estimates and schedules, construction contracts and safety.

**CE 480 Capstone Design I (3)**

This course will provide students with the opportunity to work as part of a multi-disciplinary Civil Engineering design team. The course will consist of developing the preliminary design plans with presentations and reports. Students will learn about the regulatory process, LEED design, and site planning. Lectures in professional practice and teaming will augment the design project. Prerequisites/co-requisites: Senior standing and completion of one class in a CE emphases.

**CE 481 Capstone Design II (3)**

This course will provide students with the opportunity to work as part of a multi-disciplinary Civil Engineering design team. The course will consist of a design project with presentations and reports. Lectures in professional practice and teaming will augment the design project. Prerequisites/Co-requisites: Senior standing, successful completion of CE 480 and completion of one of the CE emphases.

**Civil Engineering Technology**

**CTC 101 Introduction to Engineering Technology (2)**

Required for all freshmen in Civil Engineering Technology. Topics include academic requirements, advisement, software packages, career opportunities, and project management. Additional topics include professional, ethical and social responsibilities; respect for diversity and a knowledge of contemporary professional, societal and global issues; and a commitment to quality, timeliness and continuous improvement. Cross listed with MTC 101.

**CTC 162 Computer Aided Design (4)**

The use of AutoCAD software to develop geothermic models for engineering technology applications. Blue print reading and basic drawing fundamentals. Basic geometric dimensioning and tolerancing. Introduction to the creation and visualization of three-dimensional models. Four hours of lecture per week. Laboratory activity will be substituted for lecture as appropriate. Cross –listed with MTC 162.

**CTC 212 Microstation (2)**

Basics of CAD as applied to civil engineering technology using Microstation software for typical civil technology applications such as: structures design drawings, highway layouts, detailing, etc. One hour of lecture and two hours of laboratory per week. Prerequisite: Basic understanding of geometry and trigonometry.

**CTC 213 AutoCAD (2)**

A refresher course in the basics of AutoCAD as applied to civil engineering technology using AutoCAD software for typical civil technology applications such as: structural design drawings and details, highway layouts, etc. One hour of lecture and two hours of laboratory per week.

**CTC 215 Sustainable Energy Systems (2)**

An introduction to sustainable energy systems. Topics include solar energy, wind energy, wind energy, fuel cell technology, biomass energy, geothermal energy, clean coal technology, ocean energy, hydroelectric power, and nuclear power. Two hours of lecture per week. Cross-listed with ETC 215 and MTC 215

**CTC 218 Statics (2)**

Analysis of equivalent systems of forces, free body diagrams, equilibrium of particles and rigid bodies, centroids, friction, and forces in structures. Two hours of lecture per week, with laboratory work substituted for lecture as appropriate. Prerequisites: PHY 101T, PHY 101L and MAT 120. Cross listed with MTC 218.

**CTC 222 Strength of Materials (2)**

Effect of shape and composition on strength of materials. Moments of inertia, shear forces and bending moments in beams, torsion of shafts, thermal expansion, and pressure vessels. Two hours lecture per week, with laboratory work substituted for lecture as appropriate. Prerequisites: PHY 101T, PHY 101L, MAT 120 and CTC 218. Cross listed with MTC 222.

**CTC 240 Civil Materials and Testing (2)**

Course covers properties and testing of common materials used in the design and construction of civil projects. Coverage includes aggregates, Portland cement concrete, bituminous materials and ferrous metals. Course consists of one hour of lecture and two hours of laboratory per week. Corequisite: CTC 222.

**CTC 250 Elementary Surveying (4)**

Introductory course in surveying methods and theory. Topics will include land surveying, construction surveying, and route surveying. Two hours of lecture and four hours of laboratory per week. Prerequisites: CTC 162, CTC 212, CTC 213 or equivalent.

**CTC 255 Soils and Foundations (4)**

An introduction to geotechnics and its application to problems in engineering design and construction. Topics will include soil properties, soil testing, compaction and stabilization, stress distribution in soil, soil shear strength and lateral earth pressure. The principles of soil mechanics will be applied to the design of foundations and retaining structures, and to the study of slope stability. Course consists of three hours of lecture and two hours of laboratory per week. Prerequisite: CTC 222

**CTC 260 Hydrology (2)**

Introductory course in surface water hydrology. Topics include watershed delineation, unit hydrographs, IDF curves, time of concentration and routing. The rational and TR-55 methods will be used to determine peak flows.

**CTC 261 Hydraulics (3)**

Introductory course in applied hydraulics. Topics include fluid statics, buoyancy, open channel flow, conduit flow, culvert hydraulics and design, storm water systems. Course consists of two hours of lecture and two hours of laboratory per week. Prerequisite: CTC 218.

**CTC 275 Construction Methods (4)**

Provides students with an overview of the methods and materials used in the construction industry. It will look at the equipment, materials, and methods used to construct buildings and roads. The lab will focus on field trips and small building projects to give students a hands-on feel for the construction industry. Three hours of lecture and two hours of laboratory per week. Students may not receive credit for both CTC 375 and CTC 413 or CTC 414.

**CTC 301 Professionalism in the Work Place (2)**

Topics include lifelong learning; professional, ethical and social responsibilities; respect for diversity and a knowledge of contemporary professional, societal and global issues; and a commitment to quality, timeliness, and continuous improvement. Cross listed with MTC 301.

**CTC 320 Structural Analysis (4)**

An investigation of the analysis of both determinate and indeterminate structures. Emphasis is placed on application of the principles of mechanics on the analysis of structural systems. Three hours of lecture and two hours of laboratory per week. Lab hours will be used for experiments and problem solving using computer applications. Prerequisite: CTC 218 and CTC 222or equivalents.

**CTC 340 Transportation Analysis (4)**

Introductory course to Transportation Engineering. Topics include highway design, traffic analysis, capacity planning, and computer modeling. Three hours of lecture and two hours of laboratory per week. Pre/Corequisite: MAT 121.

**CTC 415 Construction Estimating and Scheduling (4)**

Teaches students the basic concepts of estimating and scheduling construction projects. Students will learn how to estimate quantities, determine project length, and determine labor and equipment needs. Group projects during lab times will allow students to gain practical experience. Three hours of lecture and two hours of laboratory per week. Students may not receive credit for both CTC 370 and CTC 415. Prerequisite: CTC 275 or equivalent or permission of instructor.

**CTC 422 Design of Steel Structures (4)**

The design of steel structures from conceptual design through the production of contract documents. Emphasis is placed on application of the AISC Code (Allowable Stress Design) and applicable building codes to steel structures using conventional and computer-aided methods. Course consists of three hours of lecture and two hours of laboratory per week. Prerequisite: CTC 320.

**CTC 424 Design of Concrete Structures (4)**

The design of reinforced concrete structures from conceptual design through the production of contract documents. Emphasis is placed on application of the ACI Code and applicable building codes to concrete structures using conventional and computer-aided methods. Course consists of three hours of lecture and two hours of laboratory per week. Prerequisite: CTC 320.

**CTC 430 Engineering Dynamics (4)**

Kinematics of particles and rigid bodies. Kinetics of particles and rigid bodies with translation, rotation and plane motion using the methods of force - mass - acceleration, work-energy, and impulse momentum. Three hours of lecture and two hours of laboratory per week. Cross listed with MTC 430. Prerequisite: CTC 218 or equivalent. Pre/Corequisite: MAT 122 or equivalent.

**CTC 440 Highway Design (4)**

Course emphasizes the highway design process using conventional and computer methods. Industry standard design handbooks and software are used to complete a highway design project involving site planning, earthwork, geometric design, pavement design, cost estimating and project management. Three hours of lecture and two hours of laboratory per week. Prerequisites: Surveying and familiarity with CAD software.

**CTC 450 Water and Wastewater Systems (4)**

Topics include water quality, water supply systems, solid waste management and pollution control. Co-requisite: CHE 110T and CHE 110L.

**CTC 465 Special Topics in Civil Technology (Variable 1-4)**

A study of a selected topic of interest to civil technologists which will enhance the student's ability to practice in his/her profession.

**CTC 470 Construction Administration (4)**

Advanced course in the responsibilities and risk associated with project management within the construction industry. Subjects addressed relate to special problems encountered in construction and the management of those problems. Special emphasis is given to responsibilities, relationships between owners, contractors and labor, construction safety and construction contracts. Prerequisites: CTC 275 or permission of instructor.

**CTC 475 Economic Analysis in Technology (4)**

Methods for choosing between alternatives based on the time value of money. Replacement studies, depreciation and after-tax analysis, risk, uncertainty and sensitivity analysis. Prerequisite: MAT 121. Cross listed with MTC 475.

**CTC 476 Finite Element Applications (4)**

Concepts of Finite Element Analysis and their applications. Analysis of determinate and indeterminate structures, bar, truss, plate, and shell elements. Condition of plane stress and plane strain. Model generation to include fluid flow, combined elements and automatic meshing. Extensive use of ALGOR software. Three hours of lecture and two hours of laboratory per week. Cross listed with MTC 476. Prerequisite: CTC 218, CTC 222, MAT 122 and a formal course in computing or permission of instructor.

**CTC 490 Capstone Design (3)**

Provides students with the opportunity to work as part of a multi-disciplinary Civil Engineering Technology design team. The course will consist of a design project with presentations and reports. Lectures in professional practice and teaming will augment the design project. Two hours of lecture and two hours of laboratory per week. Prerequisites: Senior standing and at least 2 of the following: CTC 422, CTC 424, CTC 340, CTC 440, CTC 415, CTC 470, or permission of instructor.

**CTC 491 Independent Study (Variable 1-4)**

Extensive study and research on a particular topic of student interest under the supervision of a faculty member. The student is required to submit a written proposal which includes a description of the project, its duration, educational goals, method of evaluation, and number of credits to be earned. Prerequisites: Matriculated students only, permission of instructor and dean of subject area.

**CTC 492 Internship/Co-Op Assignment (2 or 4)**

Provides part-time supervised experience in a professional atmosphere which supplements classroom instruction. Two written reports on the work experience and two supervisor’s evaluations required. One site visit or conference call planned. Required contact hours min. 150. Prerequisite: Permission of instructor. Free elective; CANNOT be counted as a technical elective. Course is graded as satisfactory/unsatisfactory.

**Communication**

**COM 106 Introduction to Digital Media and Design (4)**

Introduces students to production, design and project management environments for digital projects. Students will develop communication and design skills, with an emphasis on text-based communication and presentation of numeric data in textual and graphical modes. The class is writing-intensive. Students will be introduced to the processes of critiquing, revising and critically reflecting on their own work.

**COM 108 Introduction to Digital Media Production (4)**

Introduces foundational design theory and basic skills needed to produce digital media in a variety of formats. Projects will be completed in graphic, video and interactive modes. Students will gain hands-on experience in digital media studios and production environments.

**COM 112 Digital Photography and Imaging (4)**

Explores concepts and techniques in digital photography and imaging. Builds and reinforces digital imaging skills including manipulation, light effects, scanning, color correction and special effects. Combines design theory and hands-on work, introducing basic aesthetic issues in photography and image manipulation and the ethical concerns associated with the medium. Students will generate a portfolio of images based on specific themes. Meets the General Education Art requirement.

**COM 213 Introduction to Animation and Vector Graphics (4)**

Using a mix of theoretical and practical assignments, students will develop an understanding of the conceptual issues regarding digital vector-based animation, from scripts, storyboards and production of short animation sequences. Students are introduced to various software tools used to produce vector-based animation. Students will generate a portfolio of animations.

**COM 216 Digital Media and Information in Society (4)**

An introduction to the impact of mass and digital media on American society. Through study of communication theory and a comparison of broadcast to digital media, and creation of original digital media projects, students will explore the relevance of the emerging information technologies within various disciplines and their own lives. Meets General Education Humanities requirement.

**COM 219 Introduction to Video Game Design and Culture (4)**

Students will relate game experiences, play games and build a game relating to their interests. Different game design frameworks will be discussed, analyzed and implemented. The course will cover table top games, serious games and gamification of different fields. Students will also complete a final project in which they will create a game mod using an existing game engine. Students will keep a game journal logging their experiences playing video games. Programming experience and artistic ability are not required.

**COM 239 Gamification Theory (4)**

Introduces gamification as the use of frameworks and common design tropes from the game industry in new contexts. Focuses on theory exploring behavior and design within games and gaming, as well as game thinking in non-game contexts. Introduction to gamification theory as it applies in a variety of non-entertainment applications such as education, health, marketing and research.

**COM 242 Introduction to Video Production (4)**

Covers the fundamentals of basic video and audio production. The student develops skills necessary to serve on production crews and operate a digital video camera by producing a variety of short video projects. Also covers the fundamentals of video production with emphasis on direction, and operation of associated field and studio equipment, developing the various skills necessary to produce quality video.

**COM 260 Introduction to Web Site Design (4)**

Explores various processes associated with development of Web sites, including planning, analysis, design, implementation and promotion. Introduces students to basic Web design skills and tools in the context of design principles.

**COM 295 Topics in Communications (1-4)**

An introductory course in selected topics in Communications not currently covered in any of the listed classes. Topics are chosen to illustrate different fields and applications which are all part of communications.

**COM 300 Oral Communication (4)**

Designed to train students' capacity for oral communication, this course emphasizes research, organization, and presentation of speeches which inform, persuade, and entertain. Delivery, style, and audience analysis will be stressed. Small group discussions will aid the students to interact with others, and to apply the theories and techniques of debating. Extemporaneous speeches are also required and evaluated by the group.

**COM 302 Presentational Speaking (4)**

Students will submit a proposal and present a paper just as they would at a professional technical communication conference. Public speaking skills will be augmented with the latest graphic presentation skills and software. Students will research, write, and organize a talk to either persuade or inform an audience of technical communication professionals. This course is designated for technical communication majors; others on a space available basis. Students may not receive credit for both COM 302 and COM 300.

**COM 306 Report Writing and Technical Communication (4)**

Students will learn to communicate more effectively in a professional environment through ample practice with individual as well as group composed documents (i.e. memos, letters, instructions, proposals, and analytical reports) and the oral presentation of a formal report. Since the course is usually taught in a computer lab, word processing and computer graphics are used to enhance the reports. Meets Upper Division Writing.

**COM 307 Business Communications (4)**

Business communication will give students preparation for effective writing in business and related fields. Because an understanding of persuasion is key to effective business communication, students will practice and master both audience and rhetorical analysis for all formal assignments, and the standards of formatting for various business documents. Specifically, students will write single and multiple audience routine and specialized correspondences using direct and indirect organization patterns, resumes and job letters, proposals, annotated bibliographies and multi-part research papers. Students will write graded and ungraded work individually and in teams, and part of the course will be devoted to self and team evaluation. A graded oral presentation will also be part of the class. Meets Upper Division Writing requirement.

**COM 308 Analytical & Research Writing (4)**

Students pursue a research project of their own design, using primary and secondary sources. Scholarly and theoretical sources are analyzed in class and used in the research essay. Students keep a research log and practice a variety of research methods. Meets Upper Division Writing.

**COM 309 Machinima and 3D Animation (4)**

Machinima combines “machine” and “cinema” to form an emerging mode of digital media production. This studio course focuses on creating digital productions integrating source material from film and games utilizing computer graphics engines. Students will review and critique work created by early machinima artists, comparing machinima to traditional film techniques, and exploring opportunities emerging game and film production strategies offer to machinima artists. Legal and ethical issues associated with intellectual property will be examined. Students will be expected to produce their own independent work within this genre utilizing advanced computer graphics engines. Prerequisites: COM 219 and COM 239 or permission of instructor (concurrent).

**COM 310 Technical Editing (4)**

A study of the principles of editing and their application to a wide variety of documents. Students will complete two major projects, one in copyediting and one in comprehensive editing. For both projects, students work with documents and clients from off campus. Students edit many sample documents and review each other’s work in class. Prerequisite: COM 306 or equivalent. Cross listed with IDT 531.

**COM 311 Public Relations Writing (4)**

Designed to teach students the basic concepts of effective public relations writing and to give them a solid foundation in the use of multiple communication tools that are used in the public relations industry. The emphasis is on media techniques, preparation of materials, and the dissemination of them through appropriate channels. Meets Upper Division writing requirement.

**COM 316 Media and Communication (4)**

The impact of the mass media (television, radio, journalism, film) upon American society is well‑documented. Emerging technologies (computer-mediated communication, cable video, satellite communications) will further change the ways in which we communicate. Through study of communication theory, survey of traditional and new media, and creation of original media projects, students will explore the relevance of the new technologies to their own disciplines. Meets new General Education Humanities requirement.

**COM 319 Asset Production (4)**

Asset Production for Video Games is a course that will instruct students how to create assets for use in real-time game engines. Students will learn and demonstrate the process of model and texture creation that is utilized in the current world of professional video game production. By the end of the semester, students will have created props, vehicles, and environments that can be viewed and interacted with through real-time game levels. The course will be broken down into lectures and labs where students will learn and practice a new aspect of asset production each week through the use of various industry standard content creation tools. The course will cover 3D modeling, UV unwrapping, texturing, sound integration, and the building of custom game levels. Programming experience and artistic ability is not a prerequisite to the course. Prerequisites: COM 219, COM 239, or permission of instructor.

**COM 320 Information Design (4)**

Students will be exposed to the nature of visual language and how designers use and readers process such information. Theories and research that relate to visual communication will be covered. Students will analyze and evaluate selected readings and examples; and students will use modern desktop publishing techniques to design and produce printed material. Additionally, the theory of design of online material will be discussed with particular emphasis on publication of World Wide Web home pages. Projects will include home page design and publication. Concepts covered earlier in the course will be applied to computer screen design. Prerequisite: Knowledge of basic computer skills.

**COM 340 Writing and Production in Digital Media (4)**

Develops skills in writing, editing and producing digital media, including commercial Web, blogging and micro-blogging, video and audio scripting and non-linear texts. Emphasis on peer review, editing and revision. Exploration of current tools and techniques used for the production and distribution of digital media, including social networks, collaborative systems, and interactive platforms. Meets Upper Division Writing requirement.

**COM 342 Field and Studio Video Production (4)**

Covers the fundamentals of basic video and audio production. The student develops skills necessary to serve on production crews and operate a digital video camera. Also covers the fundamentals of video production with emphasis on direction, and operation of associated field equipment, developing the various skills necessary to produce quality video.

**COM 350 Visual Thinking and Writing (4)**

Teaches students to think visually and convert complex concepts and processes into visual designs and models. Students work in stages beginning with writing assignments and make revisions leading to visualizations. Meets Upper Division Writing requirement.

**COM 375 Designing and Writing Interactive Texts (4)**

Examines and applies techniques associated with designing and writing interactive texts, ranging from traditional web pages to wikis, social networking platforms and stand-alone works of fiction and non-fiction.  Analysis of contemporary applications of interactive text in digital culture and professional environments.  Emphasis on creating original works as well as reengineering existing linear texts in interactive platforms.

**COM 380 Critical Perspectives on Digital Society (4)**

Exposes students to a range of critical/cultural theories and approaches to the study of new media, including those allied to medium theory, cultural studies, political economy of communication, ideological inquiry, globalization, and commercialism. Students will explore multiple theorists/theoretical positions in depth. Cross-listed with IDS 380

**COM 400 Computer Software Documentation (4)**

Explains how to write professional computer documentation, from writing a proposal, to gathering data, to designing a document and related visuals, to running a usability test on the material, to revising style and polishing the final reference. Discusses the nature of visual language and considers the utilization of modern desktop publishing techniques to develop communication ideas and transfer them onto the printed page. Student teams develop a software documentation package using the school's desktop publishing hardware and software. Meets Upper Division Writing requirement.

**COM 411 Digital Network Communications: Issues and Implications (4)**

Examines the various facets of networked communication, including a survey of its history and emergence. An exploration of the social and collaborative nature of networked communication and key issues including copyright, and intellectual property. Emphasis is placed on the nature of networks, and on critical examination of the social, political, legal and educational aspects of networked communication.

**COM 414 Advanced Digital Graphic Design (4)**

Designed to increase the student’s ability to creatively design within the digital domain. Major topics include: essentials for successful digital design, color and color accuracy in the digital world, symmetric and asymmetric layout techniques, creative use of shapes and space, large file management techniques, theoretical and applied typography, professional production methods to increase workflow, and stereographic imagery. Prerequisite: Basic Photoshop knowledge.

**COM 416 Advanced Digital Animation (4)**

This course builds on the design, layout, and basic animation features learned in previous courses by adding more advanced interactivity and user input as well as development of more complex 3D-like imagery and storyline techniques. Where the previous course focuses on object-oriented directed imagery and sound, this course involves more advanced scripting techniques to develop a vocabulary of concepts, skills, and aesthetic practices for producing more meaningful animation. The course blends direct technical instruction — including programming in ActionScript and server-side file and scripting access — with narrative and aesthetic development and discussion with the goal of moving past linear animation to more evolving and interactive animation practices.

**COM 417 Visual Identity and Branding (4)**

A studio course in visual communication. Brand identity is the use of design to project a memorable graphic image of brands, services, corporations, institutions, organizations or other groups. Branding experiences include brand identity, promotion and advertising. The course will include logos, multiple design, and advertising applications with coordinated visual elements. Prerequisite: COM 320

**COM 419 Video Game Design Studio (4)**

Students will apply video game industry frameworks to build and “gamify” information products in areas such as health care, network security and journalism. Students will learn skills related to game creation that can be used in real world settings to design and market a full-featured product. Programming and design skills common to the video game industry will be covered. The students will be expected to engage in teamwork, promotion of their game, creation of their game’s assets and engagement into the video game industry.

**COM 422 Advanced Photography (4)**

This class will go beyond the basic principles of digital photography and into a more in depth study of photographic principles, techniques, and contemporary criticism. Specifically, the class will cover photographic fundamentals such as camera types, exposure, shutter speed, f/stop, depth of field, lens types and uses, flash and off-camera flash, studio lighting and printing. Students will become adept with advanced digital manipulation techniques in *Adobe Photoshop*. At the end of the course, the student will have produced a portfolio of images demonstrating proficiency in the aesthetics of the photographic medium, as well as essays covering the history and criticism of photographic arts and artists. Prerequisite: COM 112 or equivalent or permission of instructor (concurrent).

**COM 429 Professional Game Production (4)**

Focuses on the business of video games, market models, and promotion in a global electronic marketplace. Examines a full spectrum of game experiences and deconstructs their systems, in the context of the global game industry. Analyzes the many facets of creating a player-centric game experience from the cultural significance of games and play to conceptualizing and proving concepts for a broad range of game media target markets and purposes. Prerequisites: COM 219 and COM 419 or permission of the instructor (with concurrency).

**COM 460 Advanced Web Site Design (4)**

This course builds on the design, layout, and development principles learned in previous courses by teaching students to approach web site design and structure in a new way. Where previous courses focus on designing the front end of a static web site, COM 460 focuses on developing the back end of a dynamic web site. Students will produce an interactive commercial web site, incorporating specific data structures, web elements, and web technologies, while employing the design principles learned in previous courses. Prerequisite: COM 420.

**COM 490 Special Topics in Communications (Variable 1-4)**

An in‑depth treatment of a selected topic not normally treated extensively in other communication courses. The subject matter will be related to current trends in communication. Prerequisite: Permission of instructor.

**COM 491 Independent Study (Variable 1-4)**

Extensive study and research on a particular topic of student interest under the supervision of a faculty member. The student is required to submit a written proposal which includes a description of the project, its duration, educational goals, method of evaluation, and number of credits to be earned. Prerequisites: Matriculated students only, permission of instructor and dean of subject area. Standard grading or S/U option at discretion of faculty supervisor. Options must be chosen no later than last day to add/drop.

**COM 492 Digital Media Internship (Variable 2‑8)**

A professional experience designed to provide exposure to the field of digital media design and communication. Students either work on or off campus under the direction of a qualified digital media professional. Permission of program faculty and internship sponsor required.

**COM 495 Senior Practicum in Communication (4)**

Integrates academic and practical experience by placing students in an industrial, corporate or professional writing setting. Students will choose clients in various businesses and industries, and they will work either on or off site in completing their major projects. As students work through the documentation process, they will be given detailed classroom instruction about writing and editing in the corporate culture. This course is designed as a one semester practicum where students will meet with the instructor in the classroom and with their clients on a weekly basis. Prerequisites: COM 306 and COM 320, and permission of instructor.

**COM 499 Portfolio Review and Professional Development (4)**

Gives Communication and Information Design majors a first-hand look at the job search process (professional development) and portfolio development. Students will be expected to research some aspect of the field, complete and write up an informational interview, submit a portfolio

for review, and go on an actual interview. Prerequisite: COM 302, COM 306, COM 320, COM 380. Corequisite: COM 495. Student must be in his/her last or next to last semester in the program.

**Community and Behavioral Health**

**CBH 290 Special Topics in Health and Well-Being (4)**

Investigates a topic in health and well-being. Students may receive credit in future semesters for a different topic. Prerequisites: SOC 100 or SOC 110 and PSY 100.

**CBH 375 Psychosocial Context of Health and Wellbeing (4)**

Integrates psychological and sociological perspectives in understanding health and well-being. Examines topics such as health models, mind-body connections, stress/illness connection, stigma, environmental links to health, health policy, and social disparities/inequalities in health and well being. Prerequisites: STA 100 and CBH 475

**CBH 440 Fundamentals of Grant Writing**

Provides an overview of the fundamentals of grant writing, including locating funding sources, program design and program evaluation. Prerequisites: SOC 100, SOC 110 or Introductory SOC or ANT course.

**CBH 490 Selected Topics in Health and Well-Being (4)**

In-depth treatment of a topic in health and well-being. Student may receive credit in future semester for a different topic. Prerequisites: SOC 100 or SOC110 and PSY 100.

**CBH 491 Independent Study in Health and Wellbeing (Variable 1-4)**

Provides a structure for extensive study and/or directed research (under faculty supervision) on a topic. Application form must include a description of the project, its duration, educational goals, method for evaluation, and a suggested number of credits. Prerequisite: matriculated students only; permission of the Instructor.

**CBH 492 Methods of Inquiry in Health and Well-Being (4)**

First of a two-semester methods/capstone sequence, students will receive training in both qualitative and quantitative methods, as well as participate in a practicum experience related to health and well-being. Students will draft an individual research proposal to be implemented in the second semester of the sequence (CBH 493). Prerequisites: SOC 100, PSY 100; Co-requisites: SOC 370, PSY 377.

**CBH 493 Project Seminar in Health and Well-Being (4)**

Second of a two-semester methods/capstone sequence in Community and Behavioral Health, students will continue with the practicum placement from CBH 492 and will carry out an individual research project in the area of health and well-being. Prerequisite: CBH 492.

**CBH 495 Practicum in Health and Wellbeing (4)**

Integrates academic and practical experience during a semester-long placement in a health/wellness setting. Emphasis on developing knowledge, skills, and competence as a professional. Project requirements will vary, based on the setting. Prerequisite: minimum of 3.0 GPA and permission of the Instructor.

**Computer Engineering Technology**

**CET 101 Fundamentals of Electrical and Computer Engineering Technology (4)**

Introduction to basic circuit laws and analysis, transient circuits and first order circuits. Introduction to electronic devices and linear electronics. Examine the concepts of power systems, programmable logic controllers, and transistor switches. May not be taken for credit by graduates of associate degree programs in electrical/electronic or computer engineering technology. Three hours of lecture and two hours of laboratory per week. Corequisite: MAT 120 or equivalent or permission of instructor. Cross-listed with ETC 101.

**CET 102 Electric Circuits (4)**

Units and definitions. Ohm’s Law and Kirchhoff’s Laws. Analysis of resistive circuits. Circuit analysis using superposition, nodal and mesh methods, Norton Thevenin theorems, and current and voltage divider rules. Transient and sinusoidal steady state response of circuits containing resistors, capacitors, and incutors. Three hours of lecture and two hours of laboratory per week. Cross listed with ETC 102

**CET 103 Electronics I (4)**

Introduction to semiconductors, conductors, and insulators. Analysis of transistors, diodes, and their related application in rectifier and amplifier circuits. Wave‑form interpretation, AC‑DC load lines, biasing techniques, small signal amplifiers, and h parameters. Three hours of lecture and two hours of laboratory per week. Prerequisite: ETC 102 or permission of instructor. All students who have an EET associate degree may not enroll in this course for credit. Cross listed with ETC 103.

**CET 203 Electronics II (4)**

Introduction to operational amplifier circuits incorporating feedback. Amplifier configurations, feedback amplifiers, applications of Op‑Amps in analog computers, and active filters. Three hours of lecture and two hours of laboratory per week. Prerequisite: ETC 103 or equivalent or permission of instructor. All students who have an EET associate degree may not enroll for this course for credit. Cross listed with ETC 203

**CET 210 Digital Systems I (4)**

Fundamentals and advanced concepts of digital logic. Boolean algebra and functions. Design and implementation of combinatorial and sequential logic, minimization techniques, number representation, basic binary arithmetic and finite state machines. Logic families and digital integrated circuits and use of CAD tools for logic design. Prerequisite: ETC 102 or equivalent or permission of instructor. All students who have an EET associate degree may not enroll in this course for credit. Cross listed with ETC 210.

**CET 265 Digital Systems II (4)**

Study of Digital Systems Design using the Intel family of microprocessors and their peripheral support integrated circuits. Incorporate Intel assembly language to develop programs to run the Intel hardware. Devices studied include the 8255A PPI and 8251 PCI. Design and implementation of Intel hardware and software will be emphasized. Interfacing and testing of the computer’s internal buses using logic analyzers and other test equipment will also be included. Three hours of lecture and two hours of laboratory. Prerequisite: ETC 210 or equivalent. Cross listed with ETC 265.

**CET 299 Quality Control and Workplace Issues (2)**

To provide a broad educational understanding of the impact of engineering solutions in a global and societal context along with a knowledge of contemporary issues and career opportunities. Also, focus will be placed on the process controls necessary for the practice of electrical and computer engineering. Cross listed with ETC 299.

**CET 342 Microprocessor and Embedded Systems Programming and Design (4)**

Programming the microprocessor for embedded systems application. Includes an introduction to interfacing components and hardware of the microprocessor. Three hours of lecture and two hours of laboratory per week. Prerequisite: ETC 110 or permission of instructor. No prior microprocessor background needed. Cross listed with ETC 342.

**CET 345 Sequential Logic Design (4)**

Introduces advanced sequential logic design through the use of hardware description languages. Students will obtain hands-on experience about digital systems in Hardware languages such as Verilog and VHDL. FPGA will be extensively used in the lab. The functionality, limitations, and usage of standard sequential components and PLDs will be discussed. Various CAD tools will be used for modeling, synthesizing and implementing several digital systems. Three hours of lecture and two hours of laboratory per week. Prerequisite: CET 210 or equivalent. Cross listed with ETC 345.

**CET 355** **Introduction to Nanosystems VLSI (4)**

Introduces CMOS devices and manufacturing technology. CMOS logic gates and their layout will be introduced. Propagation delay, noise margins, and power dissipation will be studied. Students will gain knowledge on memory design. Various CAD tools will be used. Four hours of lecture per week. Prerequisite: CET 210 or equivalent. Cross listed with ETC 355.

**CET 416 Data Communication & Computer Network Technology (4)**

The principles and techniques of data and computer communications are covered in detail in this course. Topics include principles of data transmissions, data encoding, digital communication techniques, transmission codes, error detection and correction, protocols, communication networks, interfacing and architecture. Three hours of lecture and two hours of laboratory per week. Cross listed with ETC 416.

**CET 423 Microprocessor Interfacing (4)**

Analysis of microprocessor interfacing with operational hardware. Three hours of lecture and two hours of laboratory per week. Prerequisites: ETC 110 or equivalent and ETC 342 or permission of instructor. Cross listed with ETC 423.

**CET 429 Microprocessors, Microprogramming and Computer Architecture (4)**

Design of microprocessor and computer central processing units. Stresses the architecture and microprogramming of the processor. Three hours of lecture and two hours of laboratory per week. Prerequisite: ETC 110 or equivalent or permission of instructor. Cross listed with ETC 429.

**CET 431 PC Integration and Maintenance (4)**

This course stresses the architecture and design of personal computers and emphasizes the use of diagnostic hardware and software to evaluate PC systems in actual lab situations. Two hours of lecture and four hours of laboratory per week. Prerequisite: ETC 311 or ETC 342 or CS 220. Cross listed with ETC 431.

**CET 444 Special Topics in Microprocessors/Digital (4)**

Seminar on the state-of-the-art in microprocessor and digital techniques. Topics will vary as technology changes. May be taken more than once for credit provided topics are different. Prerequisite: ETC 110 or equivalent or permission of instructor. Cross listed with ETC 444.

**CET 445 System-on-Chip Embedded Systems I (4)**

Introduces advanced digital design through the use of hardware description languages for the specification, simulation and synthesis of complex digital systems. Students will obtain hands-on experience about System-on-Chip embedded systems. FPGA will be extensively used in the lab. Either Verilog or VHDL, the two most widely used digital modeling languages for the description of digital systems at the board and component level will be studied. Structural (device interconnection), dataflow (register transfer level), and behavioral (algorithmic) models will be utilized. Various CAD tools will be used for modeling, synthesizing, and implementing several digital systems. Three hours of lecture and two hours of laboratory per week. Prerequisite: CET 342 or CET 265 or equivalent. Cross listed with ETC 445.

**CET 466 System-on-Chip Embedded Systems II (4)**

Hardware and software concepts in the design and analysis of embedded systems will be covered. Memory types and peripheral interfaces used in embedded systems will be considered. Performance analysis of embedded systems design will be studied. Design tradeoffs made by different models of embedded systems will be identified. Students will obtain hands-on experience about System-on-Chip embedded systems. FPGA will be extensively used in the lab. Either Verilog or VHDL, the two most widely used digital modeling languages for the description of digital systems at the board and component level will be studied as well as C programming language. Three hours of lecture and two hours of laboratory per week. Prerequisite: CET 445 or equivalent. Cross listed with ETC 466.

**Computer Science**

**CS 100 Introduction to Computing Seminar (4)**

An introduction to programming and problem solving using a high level programming language such as Python. Designed for students who may want/need some preparation for CS 108.

**CS 108 Computing Fundamentals (4)**

Fundamental concepts of computing and programming. Topics include data types, control structures, functions, arrays, files, and the mechanics of running, testing, and debugging. The course also offers an introduction to the historical and social context of computing and an overview of computer science as a discipline. Course taught using the C programming language.

**CS 220 Computer Organization (4)**

Introduces students to the organization and architecture of computer systems as a hierarchy of levels, beginning with the standard von Neumann model and then moving forward to more recent architectural concepts. Topics include digital logic, microprogramming, conventional machine and assembly language levels. Emphasis is given to those aspects of computer hardware that effect programming. Prerequisites: CS 108 and MAT 115.

**CS 240 Data Structures and Algorithms (4)**

Fundamental concepts of data structures and the algorithms that proceed from them. Topics include recursion, the underlying philosophy of object-oriented programming, fundamental data structures including stacks, queues, linked lists, hash tables, trees, and graphs. The basics of algorithmic analysis, and an introduction to the principles of language translation. Prerequisites: CS 108 and MAT 115.

**CS 249 Object-Oriented Programming (4)**

Problem-solving and program design using an object-oriented approach. Starts with a review of control structures and data types with emphasis on structured data types and array processing. It then moves on to introduce the object-oriented programming paradigm, focusing on the definition and use of classes along with the fundamentals of object-oriented design. Other topics include an overview of programming language principles, simple analysis of algorithms, basic searching and sorting techniques, and an introduction to software engineering issues. Prerequisite: CS 240.

**CS 307 UNIX Programming Environment (4)**

Promotes effective use of the UNIX programming environment. Topics include: text editor, file system, utility programs, pipe and filter paradigm, construction and use of regular expressions, shell language programming, internet, and interprocess communication. Prerequisite: CS 108 or 317

**CS 311 Data Analysis (2)**

A hands-on introduction to data analysis using a microcomputer-based statistical package such as SPSS PC+. Topics include descriptive statistics, measures of association, and hypothesis testing. Emphasis is placed upon data collection, data organization and report generation. Prior coursework in statistics is helpful, but not required. *May not be taken by students who have received credit for CSC 323.*

**CS 321 Introduction to Web Programming (4)**

Hands-on introduction to Web programming. Students learn how to create Web pages, write programs to create dynamic Web applications, and understand basic Web development concepts, processes, and best practices. Students who take CS 321 may not take CS 351 for credit. Prerequisite(s): CS 108 and CS 307.

**CS 324 Introduction to Internet Tools in Windows (2)**

A hands-on introduction to the use of software Internet tools in Windows environments and the concepts and perspective in computing and communications essential to using them effectively. Topics include the Windows interface and environment, and tools for browsing, editing and Web site creation and maintenance available in the Windows environment. At the conclusion of the course, the student will have an understanding of computing communication environments and the ability to use Web software tools to construct, configure, and maintain a Web site.

**CS 330 Operating Systems and Networking (4)**

Integrates the fundamental concepts of operating systems and networking with the purpose of realizing workable models of modules and constructs. Topics include concurrency, synchronization, processes, threads, long and short term scheduling, memory management, I/O, file systems, device management and multimedia systems. Networking topics include basic network models, layered architectures, network hardware and standard protocols. Within this framework, client-server microkernel design is also presented. Prerequisites: CS 220 and CS 240.

**CS 345 Logic Design (4)**

A concentration on the digital logic level of computer organization. The theoretical and practical concepts covered include: Boolean algebra, simplification of Boolean functions, and analysis and synthesis of digital circuits with emphasis on mixed logic. The most common combinatorial and sequential integrated circuits, and algorithmic state machines are highlighted. Prerequisites: CS 220 and MAT 115.

**CS 348 LISP Programming (2)**

An intensive survey of the LISP programming language. Topics include: expressions, data types and representations, control structures, and input/output functions. Prerequisite: CS 240.

**CS 350 Information and Knowledge Management (4)**

The concept of information as a unifying theme. Investigates a range of issues in computer science, including database systems, artificial intelligence, human-computer interaction, multimedia systems, and data communication. Prerequisites: CS 240 and MAT 115.

**CS 351 Web Development and Internet (4)**

This course teaches students to install, configure and maintain an Internet/Intranet Web Server. Topics include: developing Web pages, Hypertext Markup Language (HTML), Common Gateway Interface (CGI) scripting, and displaying information on the Web via a Database Management System (DBMS). Students who take CS 351 may not take CS 321 for credit. Prerequisites: CS 108 and CS 307.

**CS 370 Software Engineering (4)**

Combines a range of topics integral to the design, implementation, and testing of a medium-scale software system with the practical experience of implementing such a project as a member of a programmer team. In addition, this course includes discussions on professionalism and ethical responsibilities in software development and human-computer interaction. Prerequisites: CS 220 and CS 249.

**CS 371 Software Engineering Projects (4)**

This course offers the student an opportunity to participate in a non‑trivial software engineering team project and to apply the concepts studied in CS 370. The following will be emphasized throughout the project: documentation of projects; different roles in a project; corporate, academic and military software development standards; specification and requirements documents; configuration, quality assurance, test, verification, integration plans; post‑development software support. Prerequisite: CS 370.

**CS 377 Introduction to the Theory of Computing (4)**

Introduction to theoretical computer science. Topics include: automata, formal languages, Turing machines, recursive function theory, computational complexity, and program correctness. Prerequisites: CS 240 and MAT 115.

**CS 381 Principles of Computer Security and Cryptography (4)**

Focuses on general principles of computer security and cryptography. Topics covered include threat trees, threat taxonomies, malware, common attacks, cryptographic principles, block ciphers, hash functions and public-key cryptography. Prerequisites: MAT 115 or MAT 413, CS 249 and CS 330.

**CS 407 UNIX System Administration (4)**

Topics will include: concepts involving system administration and maintenance procedures to facilitate normal system operation; technical details regarding problems that could result from operating system malfunction as well as threats to system security that are inherent in a multiprogramming environment; techniques and tools for hardware and software configuration management. Prerequisite: CS 307; Corequisite: CS 330.

**CS 409 Software Project Management (4)**

This course presents different techniques for managing software projects and technical staff and familiarizes the student with artifacts of project management. The topics to be covered include: user specification; project proposal; contracts; software cost models and estimation techniques; project planning; implementation management; project delivery. Prerequisite: CS 370.

**CS 420 Numerical Computing (4)**

Basic techniques of numerical computation. Topics include: computer arithmetic and error control, solution of non‑linear algebraic equations including some non‑linear optimization, polynomial interpolations including splines, curve fitting, integration, and an introduction to differential equations. Emphasis will be on non‑formal settings with a view toward applications. Prerequisites: Calculus and proficiency in a high-level programming language.

**CS 421 Computational Linear Algebra (4)**

Computational aspects of linear algebra, including linear optimization models, are explored. Topics include: different algorithms for solution of sets of linear algebraic equations, eigenvalue problems, linear programming, clustering techniques, and software requirements. Prerequisites: CS 240 and MAT 340 or equivalent.

**CS 431 Principles of Programming Languages (4)**

This course fosters a disciplined approach to the design of programs. Through carefully chosen assignments, the need for certain data structures and programming language features is made apparent. Several different programming languages are used. Topics include: structured programming, functional programming, recursion, and string processing. Prerequisite: CS 240.

**CS 441 Computer Systems Architecture (4)**

Core principle underlying past, current, future and theoretical machines are discussed in quantitative terms and illustrated with multiple architectures. The tradeoff between cost and efficiency of technologies is a primary focus. Instruction set architectures, instruction level parallelism, N address architectures, RISC/CISC/VLIW philosophies, memory hierarchies, introductory branch prediction, scheduling, data and instruction caching, and processor interfacing are reviewed. The role of simulation and modeling in architecture studies is also discussed. Prerequisite: CS 220.

**CS 445 UNIX Network Programming (4)**

The course explores computer networks from the implementation and programming point of view. The network architecture and communication protocols studied by the class allow connection of heterogeneous systems in an environment that may be geographically distributed. Prerequisites: CS 240 and knowledge of UNIX and C.

**CS 446 Local Area Network Architecture (4)**

An intensive study of LAN architecture models for Computer Science students. Topics include: contention‑free and contention-based models, hybrid nets, HSLANs, integrated voice/video/data models. Prerequisites: CS 220 and CS 330.

**CS 450 Computer Graphics (4)**

A conceptual and programmatic introduction to raster and vector graphics. Topics include object-oriented graphics application programming interfaces, hierarchical modeling, concepts of scene graphs, geometric transformations and transform groups, behaviors for animation and interaction, interactive tools for geometries and behaviors, classical application programming interfaces, web-related graphics technologies, and graphics file formats. Prerequisites: CS 240 and MAT 115.

**CS 451 Distributed Systems (4)**

A study of distributed protocol and software frameworks. Synchronous and asynchronous networks will be covered. Protocols for leader election and distributed consensus will be presented synchronous networks. Fault-tolerant protocols will be discussed for synchronous systems as well as their adaptability in asynchronous models. The use of shared memory and message passing as well as Byzantine failures will be discussed. Prerequisites: CS 240 and CS 330.

**CS 454 System Simulation (4)**

An introduction to the basic techniques of systems modeling and analysis through system simulation. Discrete and continuous system simulation models, use of various simulation packages and analysis of simulation output are included for consideration. Prerequisites: C, C++, or JAVA and senior status or permission of instructor.

**CS 477 Algorithms (4)**

How good is it? Is there a better algorithm to solve it? This course aims at developing a toolbox of algorithms for solving real problems that arise frequently in computer applications and the principles and techniques for determining their time and space requirements and efficiency. In addition, the general complexity spectrum is discussed to give students a grounding in intractability and unsolvability. Prerequisites: MAT 115 and CS 240.

**CS 480 Compiler Design (4)**

Basic concepts of formal languages and automata theory and their applications in compiler writing. Several practical parsing methods are discussed. Prerequisite: CS 240.

**CS 489 Cooperative Work‑Study in Computer Science (Variable 1‑4)**

Student will be employed by a cooperating firm or agency. Periodic progress reports will be required. Students should be paid by the employer. Prerequisites: Limited to Computer Science majors who have completed core courses and secured departmental approval. Additional restrictions are on file with the department. Only S/U grades are awarded for this course.

**CS 490 Selected Topics in Computer Science (Variable 1-4)**

Coverage of a specialized computer science topic, of current interest but not adequately treated in regular course offerings. The topic may, for example, be the theoretical and programmatic study of a methodology for a class of computational problems, an introduction to a research area of computing, or an in-depth examination of the usage and internals of a software artifact or framework. The same topic will not be repeated for at least two years. Prerequisites: CS 240 and MAT 115.

**CS 491 Independent Study (Variable 1‑4)**

Extensive study and research on a particular topic of student interest under the supervision of a faculty member. The student is required to submit a written proposal which includes a description of the project, its duration, educational goals, method of evaluation, and number of credits to be earned. Prerequisites: Matriculated students only, permission of instructor and dean of subject area.

**CS 495 Artificial Intelligence (4)**

An introduction to fundamental knowledge representation schemes and intelligent problem-solving techniques, and corresponding implementation software artifacts. Both symbol system and biology/society-based approaches are covered. Topics include state space heuristic search, constraint satisfaction, classical logic, fuzzy logic, Bayesian techniques, connectionism, genetic algorithms, swarm and multi-agent intelligence, and planning. Prerequisites: CS 240 and MAT 115.

**CS 498 Capstone Project (2)**

Offers students the opportunity to integrate their knowledge of computer science by completing a significant project. Periodic written and oral presentations are required. Most students will complete, report on, and present a project started while taking CS 370. Prerequisites: CS 330, CS 350, and CS 370.

**CSC 301J Introduction to Computing and JAVA Programming (4)**

Basic concepts of computing and computer programming are covered. An introduction to computing environments, the internet and applications programming using JAVA. No prior knowledge of computers or computing is expected. **Course is for non-majors. Computer Information Science/Systems majors will not receive Computer Science credit for this course.**

**CSC 301V Introduction to Computing and Visual Basic Programming (4)**

Basic concepts of computing and programming with object orientation using Visual Basic. Course is intended for beginners.

**CSC 310 Computers and Society (2)**

A half‑semester course examining the impact of computers in contemporary society. Topics include: components of a computer system, uses of computers in various disciplines and professions, and problems of data security and privacy.

**CSC 311B Word Processing (Windows) (1)**

A hands‑on introduction to word processing using Word for Windows or a similar Windows package. Topics include text entry, formatting, spell checking, search and replace, use of a thesaurus and grammar checker, printing, and merge printing. At the conclusion of this course, the student will have the skills necessary for the production of a term paper, resume, or similar prose document, and the ability to produce a customized form letter. *Students who have received credit for CSC 311 or CSC 311A may not take this course. Only S/U grades are awarded for this course.*

**CSC 311C Spreadsheets I (1)**

A hands‑on introduction to spreadsheets. Topics include building, saving and printing a worksheet, simple formatting, functions, and sorting. At the conclusion of the course, the student should be able to design a spreadsheet for statistical or financial applications, and to answer what‑if questions. *Students who have received credit for CSC 311 may not take this course*. Only S/U grades are awarded for this course.

**CSC 311E Microcomputer Database (1)**

A hands‑on introduction to the use of a microcomputer database using Microsoft Access or a similar product. Topics include database creation, data entry, sorting and report preparation, modification of the database structure, adding/deleting records, form and report generation. Only S/U grades are awarded for this course.

**CSC 311F Presentation Graphics (1)**

A hands‑on introduction to presentation graphics using PowerPoint or a similar package. Topics include text charts, bar/line charts, pie charts, slide shows and transition effects, and output to disk, monochrome and color hard copy, overhead transparencies, 35mm film recorder and videotape. At the conclusion of the course, the student will have the skills necessary to use a presentation graphics package to communicate effectively employing a variety of media. *Students who have received credit for CSC 312 may not take this course*. Only S/U grades are awarded for this course.

**CSC 311G Introduction to Desktop Publishing (1)**

A hands‑on introduction to the use of a desktop publishing package for the creation of fliers, posters, newsletters, and similar short publications. Topics include page layout, style sheets, text formatting, and image handling. Output to monochrome and color printers is covered. At the conclusion of this course, the student will be able to design and create a short publication. Prerequisite: Ability to use a word processing program, or CSC 311A, CSC 311B, or its equivalent. *This course may not be taken by students who have received credit for CSC 312.* Only S/U grades are awarded for this course.

**CSC 311K Spreadsheets II (1)**

Builds upon CSC 311C. Topics include lookup and reference functions, formula auditing, data validation, advanced charting, trend lines, data linking, data consolidation, and PivotTable construction/operation/reports. Only S/U grades are awarded for this course. Prerequisite: CSC 311C or permission of the instructor.

**CSC 317 Computer Systems and C/C++ Programming (4)**

The basic concepts of computer science and computer programming are covered. Computer hardware and applications programming using C are also introduced. No prior knowledge of computers or computing is required. This course is intended for non‑majors**. Computer Science or Computer Systems majors will not receive Computer Science credit for this course.**

**Computer Systems**

**IS 305 Application Programming with COBOL (4)**

Problem solving, algorithm development, and application development using the COBOL programming language. Emphasizes user interface, calculations, data sorting, report writing, data manipulation, data validation, string operations, intrinsic functions, and file handling based on the structured/procedural paradigm. Programming tools that leverage the power of the COBOL programmer are included. Prerequisite: CS 240.

**IS 310 Hardware and Network Infrastructure (4)**

Conceptual and practical study of the computer hardware, connectivity devices, and other supporting artifacts that comprise enterprise internal information systems and external systems like the public Internet. Topics include: fundamental digital logic; common integrated chips and boards for computer organization; execution of processor instructions; device interfacing; peripheral devices; common abstractions for enabling software development; major functions of an operating system; common connectivity devices and their operation. Prerequisite: CS 108.

**IS 320 Systems Analysis and Design (4)**

Examines the process of logically developing information systems. Focuses on the analysis, planning, and logical design phases of the systems development life cycle that culminate in the specification of functional system requirements. Concentrates on methods, techniques, and tools used to determine information requirements and the documentation of these requirements in a thorough and unambiguous form. Topics include: data collection; risk and feasibility analysis; requirements analysis; process modeling; data modeling; prototyping; joint application development; rapid application development; structured walkthroughs; project management; presentations; report writing. Prerequisite: CS 240.

**IS 324 SQL Programming (2)**

Designed to develop SQL programming proficiency. Emphasis is placed on the Data Definition Language (DDL) and Data Manipulation Language (DML) of SQL. Upon completion, students should be able to write SQL statements which create, update, and maintain database tables as well as write SQL queries to manipulate data in database tables. Prerequisite: CS 108 or equivalent knowledge. *Students may not receive degree credit for both IS 324 and IS 325*.

**IS 325 Database Management Systems (4)**

Introduction to fundamentals of database management systems, techniques for database design, and principles of database administration. Emphasizes data modeling, database design, database application development, and database management. Topics include conceptual models; logical models; normalization; query languages; architectures such as centralized, distributed and client/server; database integrity; database security; error recovery; and concurrency control. Prerequisite: CS 240.

**IS 330 Decision Support and Intelligent Systems (4)**

An introduction to the fundamentals of Decision Support Systems (DSS). Focuses on the logical aspects of data processing and analysis. Topics to be discussed include historical review of computerized decision support, DSS architecture. Data Warehouses, Online Analytical Processing (OLAP), and Data Mining. The student is introduced to the principles of Intelligent Systems with an emphasis on Expert Systems (ES) and Artificial Neural Networks (ANN). The organizational and business implications of decision support systems are reviewed. Prerequisite: CS 240.

**IS 340 E-Commerce (4)**

An introduction to the fundamentals of e-business and e-commerce. Topics to be discussed include e-business models, principles of electronic business transactions, Electronic Data Interchange (EDI), electronic checks, and digital cash. The student is introduced to the protocols of secure e-commerce including the basics of cryptography, digital signatures. Secure Sockets Layer (SSL), Secure Electronic Transaction Protocol (SET). The languages and e-commerce technologies to be discussed include Java, JavaScript, XML, intelligent agents, and networking protocols. Prerequisite: CS 240.

**IS 341 Geographic Information Systems (4)**

Students will learn the concepts and components of a geographic information system (GIS) as well as the essential skills of operating a functional GIS through the use of a GIS software package.

**IS 469 Information Technology Project Management (4)**

Enables students in the information technology area to understand project management principles for IT programs and be able to apply these principles to successfully manage IT projects. Covers the essentials of IT project management which include attributes of projects, project integration management, project scope, time, and cost management, project quality and risk management, human resources and communications management, and procuring IT projects and services from outside agencies. Includes individual and group assignments and activities, including a group case study, where students can apply what they have learned to real-life situations. Prerequisite: IS 320.

**IS 470 Database Programming (4)**

Provides rigorous coverage of database programming using the Structured Query Language (SQL) and SQL coupled with other programming languages. Topics include: database management systems (DBMS); data definition; data manipulation; data control; database administration; report generation; DBMS built-in and programmer-created procedures, functions, packages, and triggers. Prerequisite: IS 325 or equivalent and SQL programming proficiency.

**IS 490 Special Topics in Systems (Variable 1-4)**

An in-depth treatment of a selected topic not normally treated extensively in other Information System courses. The subject matter covered in this course will not be repeated in a future semester.

**IS 491 Independent Study/Information Systems (Variable 1-4)**

Extensive study and research on a particular topic of student interest under the supervision of a faculty member. The student is required to submit a written proposal which includes a description of the project, its duration, educational goals, method of evaluation, and number of credits to be earned. Prerequisites: Matriculated students only, permission of instructor and dean.

**IS 495 Computer Information Systems Practicum (2)**

Capstone course for Computer Information Systems (CIS) majors. Students form teams and each team spends an entire semester working to satisfy a set of requirements for a real-world organization. Teams will gain experience in all phases of the systems development life cycle (SDLC) and project management. Periodic written and oral presentations are required. Success requires student teams to work as a cohesive unit which draws upon components of the entire CIS curriculum. Prerequisites: IS 310, IS 320, and IS 325.

**Criminal Justice**

**CJ 101 Introduction to Criminal Justice (4)**

Provides an overview of the field of criminal justice, including the history, theory, and structure of the criminal justice system, with an emphasis on substantive and procedural criminal law, policing, prosecution/defense, the courts, and institutional and community corrections.

**CJ 204 Ethics in Criminal Justice (4)**

Introduces the Criminal Justice student to ethical decision making in the criminal justice system.

Explores ethical dilemmas and challenges in policing, criminal courts and corrections, using both philosophical principles/theories and hands-on criminal justice issues and applications. Prerequisite: CJ 101.

**CJ 290 Selected Topics in Criminal Justice (1-4)**

Provides the opportunity to study criminal justice topics not normally covered in the existing curriculum. Students may receive credit in future semesters for different topic areas. Prerequisite: CJ 101.

**CJ 310 Explaining Crime (4)**

Presents an overview of the sociological study of crime and criminal justice, primarily in the contemporary United States. Material is broken down into four major topics: 1.) types and categories of contemporary criminal behavior; 2.) myths and facts about contemporary crime patterns; 3.) theories about why crimes are committed; 4.) how known crimes are dealt with by the U.S. criminal justice system. Prerequisite: CJ 101.

**CJ 322 Police and Society (4)**

Introduces the functions, roles, and services of the various policing agencies in the United States. This includes the history, development, and role of the police as a component of the justice system, with particular attention to the relationship of the police to community, society, and related institutions of social control; societal control of the police as well as the influences of social change and urban decay and disorder on methods of policing. Prerequisite: CJ 101

**CJ 350 Sexual Offenders (4)**

Introduces the criminal justice student to the causes and treatments of sexual offending behavior and the ways the criminal justice and mental health emerging issues of tracking monitoring persistent offenders. Prerequisite: CJ 101.

**CJ 456 Crime Mapping Technologies (4)**

Examines geographic concepts and techniques as they apply to the study of crime. Uses sociological theories of spatial relations and urban studies (especially social ecology) to examine patterns of offending and victimization. Uses a range of data sets and computer applications, such as Geographic Information Systems (GIS) to map criminal behavior at the local, regional, state, and national levels. Explore policy implications of crime mapping capabilities. Prerequisite: CJ 101 and STA 100.

**CJ 460 Technological Surveillance and Constitutional Rights (4)**

Provides an intensive survey of surveillance technologies and their use in crime prevention and prosecution. Examines the legal and ethical issues of privacy, and how changes in technology are changing privacy debates and laws. Prerequisites: CJ 101 or equivalent, one 200 or 300 level criminal justice course, restricted to Juniors and Seniors.

**Economics**

**ECO 110 Microeconomics (4)**

An in‑depth analysis of the operation of market forces in determining resource allocation in the private sector via the price system. Comprehensive theoretical models of the consumer, the producer, and market structure are developed. The student will become acquainted with the techniques whereby economists analyze, for purposes of public policy, such issues as environmental restrictions, public utility rate fixing and other price controls, commodity taxation, minimum wage laws, occupational licensing, and the economics of crime and punishment. Meets new General Education Social Science requirement.

**ECO 112 Macroeconomics (4)**

A study of both classical and modern theory focusing on the determination of national income, employment, and the rate of inflation. The major versions of the classical and Keynesian systems are developed, including a review of the consumption function and the behavior of investment. Specific modern problems, such as the effects of wage‑price controls, the institutional difficulties surrounding monetary and fiscal policy‑making, and the growth/no growth issue, are discussed.

**ECO 330 Economics of Aging (4)**

Covers a variety of economic problems related to aging, from the viewpoints of both the individual and society as a whole. The economic characteristics of older persons will be examined, including labor force participation, financial circumstances, consumption patterns, and health status. Major attention will be given to formal and informal economic security arrangements including individual saving programs, public and private pension systems, health insurance, and other legal and financial devices. Long‑term projections of the aged population, and its impact on the American economy, will be reviewed. Meets new General Education Social Science requirement.

**ECO 425 Economics of the Environment (4)**

An economic analysis of environmental protection. Topics include: the economic nature of environmental problems; a description of air, water, and land pollution; global environmental issues; the economics of natural resource use, conservation, and recycling; and an analysis of the history and evolution of environmental policies in the United States. Prerequisite: ECO 110 or equivalent.

**ECO 491 Independent Study (Variable 1-4)**

Extensive study and research on a particular topic of student interest under the supervision of a faculty member. The student is required to submit a written proposal which includes a description of the project, its duration, educational goals, method of evaluation, and number of credits to be earned. Prerequisite: Matriculated students only, permission of instructor and dean of subject area.

**Electrical Engineering**

**ECE 101 Introduction to Engineering I**

Introduction to the engineering profession. Emphasizes engineering problem-solving techniques and the ethical and societal responsibility of engineers, including introduction to the use of computers, freehand sketching, and an introduction to engineering design. Focuses on engineering methods, computer-aided design, and mathematical modeling using software applications (e.g., MATLAB, Mathematica). Team work skills, research methods, professional report writing, and public presentation techniques are taught. Engineering analysis, design, and reporting are required during a semester project.

**ECE 251 Digital Logic Design (4)**

Fundamental and advanced concepts of digital logic. Boolean algebra and functions. Design and implementation of combinatorial and sequential logic, minimization techniques, number representation, and basic binary arithmetic. Logic families and digital integrated circuits and use of CAD tools for logic design. Three hours of lecture and two hours of laboratory per week.

**ECE 252 Computer Organization and Microprocessors (4)**

Organization of computer systems: processor, memory, I/O organization, instruction encoding and addressing modes. Introduction to microprocessors and microcontrollers. Design of hardware and software for microprocessor applications. Assembly language programming. Microprocessor system case studies. Three hours of lecture and two hours of laboratory per week. Prerequisite: ECE 251.

**ECE 260 Electric Circuits (4)**

Units and definitions. Ohm’s Law and Kirchhoff’s Laws. Analysis of resistive circuits. Circuit analysis using: Nodal and mesh methods, Norton and Thevenin theorems, and voltage divider. Transient and sinusoidal steady-state response of circuits containing resistors, capacitors, and inductors. Prerequisite: PHY 201T, PHY 201L and Pre/Corequisite: MAT 230.

**ECE 281 Electrical and Computer Engineering Seminar I (1)**

Overview of the fields of electrical engineering and computer engineering. Various sub-fields within EE and CoE will be explored, with emphasis on how they are interrelated. Issues relevant to careers in EE and CoE (e.g., typical tasks performed by EEs and CoEs) will be explored.

**ECE 301 Signals and Systems (4)**

Provides an introduction to continuous-time and discrete-time signals and linear systems. Topics covered include time-domain descriptions (differential and difference equations, convolution) and frequency-domain descriptions (Fourier series and transforms, transfer function, frequency response, Z transforms, and Laplace transforms). Three hours of lecture and two hours of laboratory per week. Prerequisites: MAT 230 and a grade of C or better in ECE 260.

**ECE 315 Electronics I (4)**

Introduction to electronics concentrating on the fundamental devices (diode, transistor, operational amplifier, logic gate) and their basic applications; modeling techniques; elementary circuit design based on devices, laboratory exercises. Three hours of lecture and two hours of laboratory per week. Prerequisite: ECE 260, Corequisite: ECE 251.

**ECE 323 Electromagnetics (3)**

Fundamentals of electromagnetic fields, Maxwell’s Equations, plane waves, reflections. Application to transmission lines, antennas, propagation, electromagnetic interference, electronics packaging, wireless communications. Prerequisite: ECE 301 and MAT 253.

**ECE 332 Semiconductor Devices (3)**

Basic theory of semiconductors, p-n junctions, bipolar junction transistors, junction and MOS field effect devices, device design and modeling, fabrication. Prerequisites: PHY 201T, PHY 201L, CHE 110T and CHE 110L or equivalent.

**ECE 351 Digital Systems Design (4)**

Synchronous sequential circuit design. Algorithmic state machine method; state reduction; control-datapath circuit partitioning. Design of sequential arithmetic circuits. Memory interfacing; bus-based design. Specification and synthesis of digital systems using hardware description language and implementation using programmable logic devices. Simulation, analysis, testing, and verification of digital systems. Three hours of lecture and two hours of laboratory per week. Prerequisite: ECE 251.

**ECE 352 Computer Architecture (3)**

RISC machines and instruction set architectures, computer arithmetic, performance evaluation, single cycle and multi-cycle datapaths, pipelined architecture, static and dynamic scheduling, instruction-level parallelism, advanced pipelining, superscalar and super-pipelined processors, memory hierarchy and organization, I/O, compiler issues. Co-requisite: ECE 351.

**ECE 359 Computer Networks (3)**

Introduce principles and practices in computer and communication networks. Emphasis is on the design, implementation, and management of IP backbone networks (the Internet), wired/wireless LAN’s , and mobile communication networks. Topics include: major network implementations, Internet protocols, LAN standards, network elements (switches, routers, bridges, and gateway), EMS/NMS, network security, and other current research topics. Prerequisite: MAT 370 or equivalent.

**ECE 361 Control Systems (4)**

Introduction to analysis, design and modeling of control systems. LaPlace transforms, transfer functions and transient analysis. Concepts of stability; polar and log-frequency plots. Numerical simulation and design of simple control systems. Three hours of lecture and two hours of laboratory per week. Prerequisite: ECE 301.

**ECE 377 Communications Systems (3)**

Fundamentals of communications systems. Modulation and demodulation methods. Characteristics of modern analog and digital communications methods. Prerequisite: ECE 301.

**ECE 382 Seminar II (1)**

Provides an overview of the professional aspects of the fields of Electrical Engineering and Computer Engineering. Topics to be covered include: typical career paths in ECE, engineering ethics, resume writing and job search techniques, preparing for graduate school, professional engineer license, etc.

**ECE 387 Design Lab (3)**

Students will complete a series of assigned design projects that rely on background in the areas of microprocessors, electronics, and signals & systems. Lecture will focus on various aspects of the design process as well as discussion of component characteristics. Prerequisite: ECE 315.

**ECE 402 Signal Processing (3)**

Discrete time and frequency analysis of linear systems. Random signals, correlation functions, power spectrum, and design of elementary digital filters. Prerequisite: ECE 301.

**ECE 416 Analog Circuit Design (3)**

Active and passive circuits, bias point and small signal analysis. Frequency response and transient characteristics of electronic circuits. Feedback and stability. Electronic circuit design and system applications (multistage amplifiers, active filters, etc.), numerical simulations. Technical Elective.

**ECE 462 Control Systems II (3)**

Conventional and state variable techniques for the analysis and design of analog and digital control systems, z-transform, sampled data systems, discrete state variable techniques, numerical simulation, and computer-aided design of control systems. Prerequisite: ECE 361.

**ECE 487 Senior Project I (4)**

Design projects in cooperation with local industry and other external clients. Specifications, proposal, time schedule, paper design. Periodic design reviews with client, written and oral progress reports, final presentation. Prerequisite: ECE 387 and senior standing.

**ECE 488 Senior Project II (4)**

Continuation of EE 487. Prototype fabrication and test. Demonstration and documentation of functioning system delivered to client. Prerequisite: ECE 487.

**ECE 490 Special Topics in Electrical and Computer Engineering (2-4)**

An in-depth study of topics selected from and based on new developments in communications technology and related areas. Topics may include areas of secure communications, mobile communications, image transmission and optical signal processing, computer-aided design, analysis of communications links and networks and integrated services digital network standards.

**ECE 491 Independent Study/Electrical and Computer Engineering (Variable 1-4)**

Extensive study and research on a particular topic of student interest under the supervision of a faculty member. The student is required to submit a written proposal which includes a description of the project, its duration, educational goals, method of evaluation, and number of credits to be earned. Prerequisites: Matriculated students only, permission of instructor and dean of subject area.

**Electrical Engineering Technology**

**ETC 101 Fundamentals of Electrical and Computer Engineering Technology (4)**

Introduction to basic circuit laws and analysis, transient circuits and first order circuits. Introduction to electronic devices and linear electronics. Examine the concepts of power systems, programmable logic controllers, and transistor switches. May not be taken for credit by graduates of associate degree programs in electrical/electronic or computer engineering technology. Three hours of lecture and two hours of laboratory per week. Corequisite: MAT 120 or equivalent or permission of instructor. Cross-listed with CET 101.

**ETC 102 Electric Circuits (4)**

Units and definitions. Ohm’s Law and Kirchhoff’s Laws. Analysis of resistive circuits. Circuit analysis using superposition, nodal and mesh methods, Norton Thevenin theorems, and current and voltage divider rules. Transient and sinusoidal steady state response of circuits containing resistors, capacitors, and incutors. Three hours of lecture and two hours of laboratory per week. Cross listed with CET 102.

**ETC 103 Electronics I (4)**

Introduction to semiconductors, conductors, and insulators. Analysis of transistors, diodes, and their related application in rectifier and amplifier circuits. Wave‑form interpretation, AC‑DC load lines, biasing techniques, small signal amplifiers, and h parameters. Three hours of lecture and two hours of laboratory per week. Prerequisite: ETC 102 or permission of instructor. All students who have an EET associate degree may not enroll in this course for credit. Cross listed with CET 103.

**ETC 203 Electronics II (4)**

Introduction to operational amplifier circuits incorporating feedback. Amplifier configurations, feedback amplifiers, applications of Op‑Amps in analog computers, and active filters. Three hours of lecture and two hours of laboratory per week. Prerequisite: ETC 103 or equivalent or permission of instructor. All students who have an EET associate degree may not enroll for this course for credit. Cross listed with CET 203

**ETC 210 Digital Systems I (4)**

Fundamentals and advanced concepts of digital logic. Boolean algebra and functions. Design and implementation of combinatorial and sequential logic, minimization techniques, number representation, basic binary arithmetic and finite state machines. Logic families and digital integrated circuits and use of CAD tools for logic design. Prerequisite: ETC 102 or equivalent or permission of instructor. All students who have an EET associate degree may not enroll in this course for credit. Cross listed with CET 210.

**ETC 215 Sustainable Energy Systems (2)**

An introduction to sustainable energy systems. Topics include solar energy, wind energy, fuel cell technology, biomass energy, geothermal energy, clean coal technology, ocean energy, hydroelectric power, and nuclear power. Two hours of lecture per week. Cross-listed with CTC 215 and MTC 215.

**ETC 216 Electronic Communications I (4)**

Introduction of analog electronic communication systems. Study of power measurements, signal types, methods of signal analysis and signal generation. Study of analog communication systems including both amplitude and angle modulation. Study concepts of radio and video transmission, as well as an introduction of digital modulation techniques. Prerequisite: ETC 102 or equivalent or permission of instructor.

**ETC 265 Sensor Technology (4)**

Fundamental principles of sensing. General performance sensor characteristics related to the measurement process. Operation principles and the design of the essential sensor systems with a focus on the semiconductor material sensors. Applications of sensor systems. Prerequisites: PHY 101T, PHY 101L, and ETC 102 or equivalent.

**ETC 288 Alternative Energy (2)**

Principles and techniques associated with the methods of energy extraction from solar, wind, geothermal and biomass sources. Power management, economic development and environmental considerations will be discussed.

**ETC 290 Introduction to Nanotechnology (4)**

An introductory course covering fundamentals of nanotechnology and its applications. Course content will cover diverse nanosystems including carbon nanotubes, semiconductor quantum dots, nanosensensors, molecular machines, and nanomedicine. The course will also survey the operation principles of the instruments used for nanostructures characterization and nanofabrication techniques. Prerequisite: PHY 101T and PHY 101L; CHE 110T and CHE 110L or permission of instructor. Cross listed with MTC 290.

**ETC 299 Quality Control and Workplace Issues (2)**

To provide a broad educational understanding of the impact of engineering solutions in a global and societal context along with a knowledge of contemporary issues and career opportunities. Also, focus will be placed on the process controls necessary for the practice of electrical and computer engineering. Cross listed with CET 299.

**ETC 300 Tools in Technology (2)**

Introduction to the field of CAD (Computer Aided Design) in the electrical engineering technology field. Will cover the proper design of schematic drawings and the techniques of designing printed circuit boards. Prerequisites: ETC 102 and ETC 110 or equivalents.

**ETC 308 Electrical Power Systems I (2)**

Fundamentals of power system analysis and design will be studied. Both the theory and modeling of power systems will be covered. Topics include power transformers, transmission-line parameters, steady-state operation of transmission lines, power flow and power system controls. Two hours of lecture per week. Prerequisite: ETC 102 Corequisite: MAT 230.

**ETC 316 Electronic Communications II (4)**

Study of communication signals, digital modulation techniques, telephony, digital, RF and cellular communications. Optical fiber and satellite communications are also introduced. Prerequisite: ETC 216 or equivalent.

**ETC 330 Assistive Technology (2)**

Introduction to the fundamentals of assistive technology for people with physical disabilities. Rehabilitation engineering with an emphasis on mechanical devices used to enhance mobility and manipulation, improving physical interaction with the environment. Topics include: prosthetics, manual wheelchairs, power wheelchairs, and alternative methods for computer access. Two hours of lecture per week. Cross listed with MTC 330.

**ETC 331 Control Systems (4)**

Basic control systems studied using Laplace transforms. Principles of electro‑mechanical control systems (electrical and mechanical), measuring means, components and their characteristics, and controller characteristics. Analysis of a control system by the frequency/phase responses and stability criteria. Three hours of lecture and two hours of laboratory per week. Prerequisite: ETC 104 or equivalent.

**ETC 342 Microprocessor and Embedded Systems Programming and Design (4)**

Programming and microprocessor for embedded systems application. Includes an introduction to interfacing components and hardware of the microprocessor. Three hours of lecture and two hours of laboratory per week. Prerequisite: ETC 110 or permission of instructor. No prior microprocessors background needed. Cross listed with CET 342.

**ETC 345 Sequential Logic Design (4)**

Introduces advanced sequential logic design through the use of hardware description languages. Students will obtain hands-on experience about digital systems in Hardware languages such as Verilog and VHDL. FPGA will be extensively used in the lab. The functionality, limitations, and usage of standard sequential components and PLDs will be discussed. Various CAD tools will be used for modeling, synthesizing and implementing several digital systems. Three hours of lecture and two hours of laboratory per week. Prerequisite: ETC 210 or equivalent. Cross listed with CET 345.

**ETC 355 Introduction to Nanosystems VLSI (4)**

Introduces CMOS devices and manufacturing technology. CMOS logic gates and their layout will be introduced. Propagation delay, noise margins, and power dissipation will be studied. Students will gain knowledge on memory design. Various CAD tools will be used. Four hours of lecture per week. Prerequisite: ETC 210 or equivalent. Cross listed with CET 355.

**ETC 356 Programmable Controllers (2)**

Use of programmable controllers to create relay logic ladder diagrams for the development of control systems.

**ETC 391 Fiber Optics (4)**

Principles and analysis of fiber optic components and systems, fiber optic sensors, integrated optoelectronics and applications of fiber optics in telecommunications and instrumentation. Three hours of lecture and two hours of laboratory per week. Prerequisite: One physics course with optics and/or permission of the instructor.

**ETC 392 Micro- and Nano-Electromechanical Systems (4)**

This course introduces the student to the emerging field of Microelectromechanical systems (MEMS) and to the more advanced level of miniaturization known as Nanoelectromechanical Systems (NEMS). Topics will include introduction of physical scaling laws, essential electrical and mechanical concepts, methods of fabrication and packaging of MEMS, principles of micro-actuation, emergence of nanoscale systems, visualization, and applications of micro and nano systems. Prerequisite: PHY 101T and PHY 101L; CHE 110T and CHE 110L; or equivalent. Cross listed with MTC 392.

**ETC 394 Nanoscale Materials (4)**

Fundamental aspects of Nanoscale materials, including electronic states and electrical properties, optical properties and interactions of nanoscale materials, ultrafast dynamics of metal nanoparticles, magnetic and magneto transport properties. Prerequisite: PHY 101T, PHY 101L, CHE 110T and CHE 110L or equivalent. Cross-listed with MTC 394.

**ETC 395 Semiconductor Microfabrication (4)**

Processes specific for the Silicon fabrication of VLSI circuits. Crystal growth and crystal structure. Chemical vapor deposition (CVD) growth, thermal oxidation, etching, metal deposition diffusion, ion implantation and photolithography. Process integration, MOS transistor fabrication, yield and reliability. Prerequisite: PHY 101T, PHY 101L, CHE 110T, CHE 110L or equivalent. Cross-listed with MTC 395.

**ETC 397 Fundamentals of Photovoltaic Energy (4)**

Rationale for renewable and photovoltaic (PV) energy utilization. Fundamentals of Semiconductor Physics. The physics of solar cells and solar cell operation. Technologies and materials used to fabricate solar cells. Fabrication of photovoltaic modules and solar generators. Measurement of PV element parameters. Prerequisite: MAT 121 and PHY 101T, and PHY 101L.

**ETC 416 Data Communication & Computer Network Technology (4)**

The principles and techniques of data and computer communications are covered in detail in this course. Topics include principles of data transmission, data encoding, digital communication techniques, transmission codes, error detection and correction, protocols, communication networks, interfacing and architecture. Three hours of lecture and two hours of laboratory per week. Cross listed with CET 416.

**ETC 419 Satellite Communication (2)**

Principles of satellite communications, techniques of transmitting speech, data and video using satellites. Prerequisite: ETC 316 or permission of instructor.

**ETC 421 Wireless Communication Systems (4)**

Study of the theory and the techniques used in the implementation of wireless communication systems. Principle and analysis of mobile communication systems, wireless LAN, personal communication networks and Land-Mobile/satellite communications systems are also included. Prerequisite: ETC 316.

**ETC 423 Microprocessor Interfacing (4)**

Analysis of microprocessor interfacing with operational hardware. Three hours of lecture and two hours of laboratory per week. Prerequisites: ETC 110 or equivalent and ETC 342 or permission of instructor. Cross listed with CET 423.

**ETC 429 Microprocessors, Microprogramming and Computer Architecture (4)**

Design of microprocessor and computer central processing units. Stresses the architecture and microprogramming of the processor. Three hours of lecture and two hours of laboratory per week. Prerequisite: ETC 110 or equivalent or permission of instructor. Cross listed with CET 429.

**ETC 431 PC Integration and Maintenance (4)**

This course stresses the architecture and design of personal computers and emphasizes the use of diagnostic hardware and software to evaluate PC systems in actual lab situations. Two hours of lecture and four hours of laboratory per week. Prerequisite: ETC 311 or ETC 342 or CS 220. Cross listed with CET 431.

**ETC 432 Process Control and Design of Experiments (4)**

Quality philosophy and fundamental quality tools. Process flow diagrams, control charts for variable measurement, process sampling and chart interpretation. Methods for process optimization through single and multiple factor experimental designs. Prerequisites: MAT 121, PHY 101T, and PHY 101L. Cross listed with MTC 432.

**ETC 433 Automatic Control Systems (4)**

Transfer function approach to the analysis and design of feedback control systems. Use of Bode diagrams, and root locus plots to predict system performances. Analog and digital simulation of industrial control system problems. Prerequisite: ETC 331 or equivalent.

**ETC 435 Digital Control and Robotics (4)**

Discrete time systems and transform sampling and reconstruction, state‑space technique and digital stimulation, stability of digital control systems, digital filtering and digital compensator design, discrete‑time optimal control, and applications in robotics. This course is the capstone for the control emphasis which requires working on a team project using a robot arm in place of the laboratory, with an oral and written presentation at the end. Three hours of lecture and two hours of laboratory per week. Prerequisites: ETC 331 and one course in computer programming.

**ETC 437 Digital Filters (4)**

Review of discrete‑time linear systems and random processes, z‑transforms, difference equations, and state‑space formulations. Discrete Fourier analysis and FFT algorithms, including discussions of recursive and non‑recursive filter transformations, FIR transversal and Kalman filters. Three hours of lecture and two hours of laboratory per week. Prerequisite: MAT 122.

**ETC 444 Special Topics in Microprocessor/Digital (Variable 1-4)**

Seminar on the state‑of‑the‑art in microprocessor and digital techniques. Topics will vary as technology changes. May be taken more than once for credit provided topics are different. Prerequisite: ETC 110 or equivalent or permission of instructor. Cross listed with CET 444.

**ETC 445 System-on-Chip Embedded Systems I (4)**

Introduces advanced digital design through the use of hardware description languages for the specification, simulation, and synthesis of complex digital systems. Students will obtain hands-on experience about System-on-Chip embedded systems. FPGA will be extensively used in the lab. Both Verilog and VHDL, the two most widely used digital modeling languages for the description of digital systems at the board and component level will be studied. Structural (device interconnection), dataflow (register transfer level), and behavioral (algorithmic) models will be utilized. Various CAD tools will be used for modeling, synthesizing, and implementing several digital systems. Three hours of lecture and two hours of laboratory per week. Prerequisite: ETC 342 or ETC 265 or equivalent. Cross listed with CET 445.

**ETC 446 Programmable Logic Devices (4)**

Synchronous sequential circuit design. Algorithmic state machine method; state reduction; control-data path circuit partitioning. Design of sequential arithmetic circuits. Memory interfacing; bus-based design. Specification and synthesis of digital systems using hardware description language and implementation using programmable logic devices. Simulation, analysis, testing, and verification of digital systems. Prerequisite: ETC 210 or equivalent.

**ETC 466 System-on-Chip Embedded Systems II (4)**

Hardware and software concepts in the design and analysis of embedded systems will be covered. Memory types and peripheral interfaces used in embedded systems will be considered. Performance analysis of embedded systems design will be studied. Design tradeoffs made by different models of embedded systems will be identified. Students will obtain hands-on experience about System-on-Chip embedded systems. FPGA will be extensively used in the lab. Either Verilog or VHDL, the two most widely used digital modeling languages for the description of digital systems at the board and component level will be studied as well as C programming language. Three hours of lecture and two hours of laboratory per week. Prerequisite: ETC 445 or equivalent. Cross listed with CET 466.

**ETC 480 Electrical Technology Senior Project I (2)**

This is the first of two two‑credit courses which must be taken as a pair. Extensive investigation, preparation, and development of a design project incorporating concepts from senior level courses. A written report is required. At the end of first semester, student should have all information and material required to complete the project in the following semester.

**ETC 481 Electrical Technology Senior Project II (2)**

This course involves the full implementation, testing, troubleshooting, and final demonstration of the senior project as proposed in ETC 480. An updated final report shall also accompany the final project. Note: Credit given only if ETC 480 has been successfully completed. Prerequisite: ETC 480.

**ETC 483 Optical Communications (4)**

Principles and techniques associated with the transmission of optical radiation in waveguides (fibers) and free space, low and high power optical sources, internal (direct) and external (indirect) modulations. Fiber optical waveguide and characteristics of free space, homodyne and hetrodyne detection, and design of optical communication systems. Three hours of lecture and two hours of laboratory per week. This is the capstone course for the concentration in communications and requires working on a team project in place of laboratory assignments with oral and written presentation at the completion of the project. The written report will include analysis, design and management of the project. Prerequisite: ETC 391 or permission of instructor.

**ETC 484 Thin Film Processing (4)**

Thin film synthesis: the fundamentals of crystal structures, the basic nucleation and growth mechanisms. Processes and technologies used for the thin film fabrication” chemical vapor deposition (CVD), Metal-organic CVD, molecular beam epitaxy (MBE), Plasma Assisted-MBE, sputtering, evaporation, etc., thin film growth equipment operation principles and the fundamentals of vacuum technology and gas delivery systems. Techniques for the monitoring and characterization of thin film parameters during the growth (in-situ) and after the growth (ex-situ). Prerequisite: PHY 101T, PHY 101L, CHE 110T and CHE 110L or equivalent. Cross listed with MTC 484.

**ETC 490 Special Topics in Communication Technology (2)**

An in-depth study of topics selected from and based on new developments in communications technology and related areas. Topics may include areas of secure communications, mobile communications, image transmission and optical signal processing, computer-aided design, analysis of communications links and networks and integrated services digital network standards. Prerequisites: ETC 316 and permission of instructor.

**ETC 491 Independent Study (Variable 1‑4)**

Extensive study of a particular topic of student interest under the supervision of a faculty member. The student is required to submit a written proposal which includes a description of the project, its duration, educational goals, methods of evaluation, and number of credits to be earned. Prerequisites: Matriculated students only, permission of instructor and dean of subject area.

**ETC 494 CO‑OP Assignment (Variable 2 or 4)**

Provides 14 weeks of supervised experience in an industrial or government installation applying technology knowledge towards the solution of engineering technology problems and developing abilities required in the student's career. At least two reports and two supervisors' evaluations are required. A minimum of 60 contact hours of industrial work is required per credit hour. May be taken repetitively up to a maximum of four credits. Prerequisite: Permission of employer and dean.

**ETC 495 Nanotechnology Research (3)**

This course introduces students with the scientific, technical and methodological aspects of nanotechnology research. Students will be required to work either individually or in a group on a research project and integrate knowledge of their majors into the evolving field of nanotechnology. Emphasis is placed on addressing interdisciplinary, economical, ethical, and environmental aspects of nanotechnology.

**Engineering Science**

**ESC 110 Introduction to Engineering (3)**

Students will be introduced to the engineering profession. Lectures will cover what engineering is, how engineers solve problems, the design aspects of engineering, and what types of projects engineers in different disciplines work through. The course will be 2 hours of class lectures and a 2 hour laboratory each week. Prerequisites: Admission to a B.S. in Engineering program or permission by instructor.

**ESC 120 Design Tools and Processes (3)**

Introduction to the basic tools and techniques in engineering design. Fundamentals of graphical communication, including sketching, computer-aided design, and parametric modeling. Two hours of lecture and a 2-hour laboratory each week. Prerequisites: Admission to a B.S. in Engineering program or permission by instructor.

**ESC 210 Engineering Mechanics-Statics (3)**

Equilibrium of coplanar force systems; analysis of frames and trusses; noncoplanar force systems; friction; centroids and moments of inertia. Three hours of lecture per week. Prerequisites: MAT 152 and PHY 201T and PHY 201L.

**ESC 220 Material Science (3)**

The fundamentals of material science are presented for the following topical areas: Physical Metallurgy, Mechanical Metallurgy, Testing of Materials Ceramics, Optical and Electronic Materials, Plastics and Polymers, Nanoscale Materials, Composite Materials and Adhesives. The use of these fundamentals in design and manufacturing applications and environments is explored. Prerequisites: PHY 201T, PHY 201L, CHE 130T and CHE 130L. Three lecture hours per week.

**ESC 230 Mechanics of Materials (4)**

Effect of shape and composition on mechanics of materials. Moments of inertia in beams, shear forces, beam deflection, beam and column design, torsion of shafts, thermal expansion, and pressure vessels. Experimental analysis of solid materials subjected to loads. Measurement and analysis of stress, strain, and deflection of mechanical and structural components. Three hours of lecture and two hours of lab per week. Restricted to Civil Engineering and Mechanical Engineering majors.

**ESC 240 Engineering Mechanics-Dynamics (3)**

Kinematics and kinetics of particles and rigid bodies using vector analysis. Force-mass-acceleration; work and energy, impulse and momentum, translating and rotating coordinate systems. Three hours of lecture per week. Prerequisites: PHY 201T, PHY 201L, MAT 230, ESC 210.

**ESC 370 Design of Engineering Experiments (3)**

Modern Methodologies for design of experiments and data analysis. This includes Analysis of Variance (ANOVA), factorial design, and response surface methods. The course is intended for engineers and it deals with the types of experiments that are frequently conducted in industrial settings. The principles taught in the course are applicable to all phases of engineering work including new product design and development, process development, and manufacturing process improvement. Prerequisites: Junior standing in Mechanical Engineering and permission of the instructor.

**English**

**ENG 090 Introduction to College Writing**

For students not meeting English 101 placement requirements. English 090 will prepare students for English 101 (Freshman Composition) by addressing fundamental writing issues at sentence, paragraph, and essay levels, with emphasis on student-generated writing and model essays. Only S/U grades are assigned for this course.

**ENG 101 Freshman Composition (4)**

An introductory expository writing course. Students will write a variety of short essays, culminating in a research essay. Emphasis is on close reading, discovering worthwhile topics, drafting and revising, and evaluation and presentation of evidence. Students will also be evaluated on the development and implementation of an oral presentation. Meets new General Education Basic Communication requirement. Prerequisite: COMPASS Placement Test score of 68 or higher or successful completion of ENG 090.

**ENG 105 Critical Reading and Writing (4)**

Students will write critical essays based on readings. The focus of this class will be critical reading and response. Students will be exposed to research methods including information gathering, source evaluation and analysis, synthesizing ideas and evidence and use of documentation. Readings for this class may be topical or organized around a theme. An oral presentation based on one of the course topics will be required and evaluated. Meets new General Education Basic Communication requirement. Prerequisites: ENG 101 or appropriate placement test score.

**ENG 110 Introduction to Literature (4)**

An introduction to the critical reading of various literary genres, with attention to the interpretation and evaluation of fiction, drama and creative non-fiction. Readings will represent a pan-historical approach to the study of literature and will include non-Western texts. The course will not be arranged by theme or topic; it is designed to cover a broad range of issues, themes, and topics through the study of various literary genres. This course provides a critical and aesthetic introduction to the major genres of literature.

**ENG 205 Creative Writing (4)**

Through writing prose fiction or poetry, students develop competency in narration, description, characterization, and other writing skills developing a personal “voice”. As students write, critique, and re‑write, they learn the skill of self‑criticism which is a necessary part of all writing. Meets new General Education Arts requirement.

**ENG 211 The Arts and Cultural Revolution (4)**

A study of one non-Western culture with emphasis on how its beliefs and customs are represented in the arts, including literature and visual arts, during periods of rapid technological and cultural change. Comparisons to parallel Western works will be made to clarify cultural difference. The culture studied will vary; current subjects are modern Japan, revolutionary Mexico, Russia since the Bolshevik Revolution, and modern Israel.

**ENG 310 Topics in American Literature (4)**

A study of a major period, genre, figure, or theme in American literature. Typical topics include science fiction, twentieth century poetry, slavery and the Civil War, and the image of women in American literature. May be taken more than once as topics change. Meets new General Education Humanities requirement.

**ENG 311 Topics in World Literature (4)**

A study of a major period, genre, figure, or theme in world literature. Typical topics include the modern European novel, technology in literature, Shakespeare, modernism, and women and power. May be taken more than once as topics change. Meets new General Education Humanities requirement.

**ENG 312 Studies in the Short Story (4)**

Examines the short story as a literary genre. The emphasis is on interpretation, though selections may vary each semester. Literary questions provide the occasion for students to develop reading and writing skills and to explore how literature and composition interact. Meets new General Education Humanities requirement.

**ENG 320 Recent American Poetry (4)**

Begins with several major poets of the 1920's: W.C. Williams, T.S. Eliot, and Wallace Stevens. These poets serve as background for the study of poetry since World War II. Some of the poets studied will be chosen by the class. Meets new General Education Humanities requirement.

**ENG 331 Black Voices (4)**

Students will become acquainted with several major figures of African‑American Literature and will examine their works in light of some of the political, cultural, and sociological influences evident within these works. Meets new General Education Humanities requirement.

**ENG 350 Dramatic Literature (4)**

The playwright is a shaper of events as well as a wordsmith. Plays from several cultural eras will be studied to clarify the dramatist's careful balance of plot, character, idea, language, and spectacle. Film and video versions of plays will supplement text study. Meets new General Education Humanities requirement.

**ENG 360 Reading the Film (4)**

By accepting film as a legitimate form of literary expression, we utilize the tools of literary analysis which allow us to "read" the images of the cinema. This course will review some of the components of the language of literature and will introduce the basic elements of film technique. Students will be asked to "read," understand, and critically evaluate the translation of literary elements into the language of film. Meets new General Education Humanities requirement.

**ENG 361 Film Direction: Alfred Hitchcock (Variable 2-4)**

Encourages students to critically examine the facets of the film image. Using Alfred Hitchcock as a model, students will be presented with the range of options available to a film director and shown some of the techniques employed to make a text (story) visual. Our focus will be on the rhetoric and style found in the language of the cinema as represented in the work of Alfred Hitchcock. Meets new General Education Humanities requirement.

**ENG 375 The Novel (4)**

A study of the nature and evolution of the novel, including the social conditions that stimulated its growth and the special characteristics and possibilities of the genre. Emphasis will fall on British and American novels from the 18th century to the present, including trends such as the novel of manners, realism, symbolic and impressionistic realism, and recent experiments ("fabulation," the non‑fiction novel). Meets new General Education Humanities requirement.

**ENG 491 Independent Study (Variable 1‑4)**

Extensive study and research on a particular topic of student interest under the supervision of a faculty member. The student is required to submit a written proposal which includes a description of the project, its duration, educational goals, method of evaluation, and number of credits to be earned. Prerequisites: Matriculated students only, permission of instructor and dean of subject area.

**Entrepreneurship**

**ENT 375 Introduction to Entrepreneurship (4)**

Introduction to entrepreneurship emphasizing the critical role of recognizing and creating opportunities in small business, new ventures, corporate projects, and other organizational settings. Topics include attributes of entrepreneurs, entrepreneurial careers, idea conceptualization, introduction to marketing and finance, profitability, opportunity evaluation, and introduction to business plan writing.

**ENT 378 Entrepreneurial Technology Management (4)**

Technology provides entrepreneurs with a vast, evolving medium for engaging in all phases of business activity. New business opportunities are literally evolving with the introduction of new technological developments. As pioneers in the exciting new dimension of business, students will study trends that have evolved, learn what methods and standards currently exist, learn how to analyze existing business web activity, and develop web business strategies for launching their own business activities on the net. Both classroom and computer laboratory are integrated providing a real-time learning by doing environment.

**ENT 485 Business Planning for Entrepreneurs (4)**

Focuses on planning activities that support entrepreneurial ventures including small businesses, franchises, non-profits, and internal corporate projects. Emphasis on generating a business plan for innovative entrepreneurial ventures and concepts. In depth study of written and oral documentation needed to generate a complete quantitative and qualitative business plan. Communication of financial, business, and rhetorical arguments will be covered. Prerequisite: ENT 375 and FIN 378.

**ENT 492 Entrepreneurship Internship (4)**

Supervised, discipline based experience in business organization. Emphasis on application, process and techniques used by business to sustain and promote growth. Specific skills and competencies needed to be a successful decision-maker are targeted. Oversight provided by the School internship coordinator, min-semester evaluation and a final, comprehensive written report are required. Prerequisite: ENT 375, ENT 378, and Permission of Instructor. Only S/U grades are awarded for this course.

**Finance**

**FIN 302 Financial Management Principles (4)**

General principles of corporate finance are presented. Topics include: the tax environment, an overview of financial planning and control, working capital management, and forms of long‑term financing. Objectives include an analysis of responsibilities and functions performed by financial analysts, whether representing a firm, a financial institution, an investment officer, or financial/management consultant. Prerequisite: ACC 201 or equivalent or permission of instructor.

**FIN 332 Fundamentals of Investments (4)**

The investment of capital funds is a complex field and topics studied include: investment and risk, determination of investment policy, types of security investments, sources of investment information, the broker, the stock market, and portfolio management.

**FIN 341 Financial Institutions (4)**

Analysis of financial institutions with emphasis on their sources of funds and operating characteristics. Emphasis also is given to the role of commercial banks in the money market and the relationship of the other major financial institutions to the commercial banks.

**FIN 343 Personal Finance (4)**

This course provides the informational and decision-making tools needed for planning and implementing a successful personal financial plan. It provides an overview of personal and family financial planning with an emphasis on financial recordkeeping, planning your spending, tax planning, consumer credit, making buying decisions, purchasing insurance, selecting investments and retirement and estate planning.

**FIN 378 Finance for Entrepreneurs (4)**

Focus on financial planning, analysis, and find raising to seed a small business through venture, angel, investment, and commercial capital sources. Topics include financial management for entrepreneurs over the life of the business including start-up financing, financial planning for growth, going public, selling off, bankruptcy, and other pertinent financing topics. Communication of entrepreneurial funding ideas through written and oral forms will also be discussed. Prerequisite: ENT 375

**FIN 411 Financial Management Problems (4)**

An in‑depth financial analysis of problems experienced by different firms is pursued using actual cases and outside reading to supplement text data. Studies will cover value of cash flow, capital planning, break‑even analysis, inventory control, financial structure, cost of capital, external growth, failure, reorganization, and liquidation. Prerequisite: FIN 302.

**FIN 420 Financial Planning and Control (4)**

Analytical techniques and procedures for dealing with capital structure problems of business. Emphasis will be on capital budgeting techniques and methods of ranking investment alternatives available to business. The student should become familiar with different theories of probabilities to minimize risk in financial planning and control. Prerequisite: FIN 411 or equivalent.

**FIN 491 Independent Study (Variable 1‑4)**

Extensive study and research on a particular topic of student interest under the supervision of a faculty member. The student is required to submit a written proposal which includes a description of the project, its duration, educational goals, method of evaluation, and number of credits to be earned. Prerequisites: Matriculated students only, permission of instructor and dean of subject area.

**FIN 492 Finance Internship (4)**

Supervised, discipline related experience in a business organization. Emphasis is on application, process, and techniques used by business to sustain business and promote growth. Specific skills and competencies needed to be a successful decision-maker will be targeted. Oversight will be provided by the School internship coordinator and the sponsoring organization. Periodic meetings with the supervisor, mid-semester evaluation, and a final, comprehensive written report are required. Prerequisite: Permission of instructor.

**First Year Seminar**

**FYS 101 First Year Seminar (1)**

To assist the first-time, full-time students in their academic and social integration of the college experience, this course will focus on accessing support services that enhance study skills and academic learning. Sessions on time management, stress management, study strategies and financial management are explored. Strategic reading and lecture notes, test taking and wellness activities are also addressed to assist students in meeting the academic demands of college life. Community service and civic responsibility are also addressed through this first year seminar.

**Fitness**

*See Health and Physical Activity*

**French**

**FRE 101 Elementary French (4)**

Introduces the basics of French language and culture. The student will develop the four language skills of listening, speaking, reading and writing through practice in pronunciation, listening comprehension and reading and writing of short passages. Integrated into the course is an introduction to the French way of life. Meets the new General Education Foreign Language requirement.

**FRE 102 Intermediate French (4)**

This course continues the basic grammar of FRE 101 to develop proficiency in French. It refines and polishes the four basic language acquisition skills: aural comprehension, speaking, reading, and writing. The focus is communication: listening, understanding, and responding in French. Instruction is primarily in French.

**General Studies**

**GEN 300 Academic Skills Enhancement (1)**

To help students reinforce the universal foundations of academic success, including critical thinking, study skills and time management. Additionally, to help students discover and benefit from their own individual strengths and experience. Assignments include readings from a variety of sources, self-reflection papers, and model assignments from different academic disciplines. To use this course as a first step toward a more rewarding academic career, students will produce a personalized Learning Plan and design and participate in a community service project.

Credits total in their chosen areas of concentration.

**Health and Physical Activity**

**FIT 100 Introduction to Fitness (1)**

Learn concepts of cardio, weight and flexibility training for long-term cardiovascular health, strength and endurance. The basic principles of exercise and the proper utilization of fitness equipment will be demonstrated and applied.

**FIT 101 Concepts of Aerobic Training (1)**

Learn concepts of aerobic training for weight loss, increased flexibility and for long-term cardiovascular health, strength and endurance. The basic principles of exercise and the proper utilization of fitness equipment will be demonstrated and applied.

**FIT 102 Athletic Conditioning (1)**

Concepts of total athletic conditioning, including cardiovascular, strength and agility training, through application of dynamic warm-up, flexibility, plyometrics and interval training.

**HLT 200 Peer Health Education I (2)**

An introduction to the field of peer health education with an emphasis on the development of a wellness lifestyle and self responsibility. Communication and interpersonal skills needed to peer counsel will be introduced. Course topics include drug, tobacco and alcohol use/abuse as well as sexually transmitted diseases. Students will be involved in campus outreach activities such as informational displays and data collection.

**REC 101 Introductory Racquetball (1)**

Learn basic skills, strategies and rules for competitive recreational play; utilize racquetball as a primary or secondary source for cardiovascular health, flexibility and endurance.

**REC 102 Introductory Golf (1)**

Learn basic skills, strategies and rules for competitive recreational play; utilize golf as a primary or secondary source for cardiovascular health, flexibility and endurance.

**Health Information Management**

**HIM 100 Introduction to the Health Information Management Field (3)**

Introduction to the health information field and professional ethics. Regulatory, certification, and licensure requirements for content and maintenance of hospital health records. Common healthcare statistics related to hospital and physician performance. Laboratory and lecture. Two hours of lecture and two hours of laboratory per week.

**HIM 111 Medical Terminology (3)**

The language of medicine including Latin/Greek prefixes, suffixes and root words. Diagnostic and procedural terms will be included.

**HIM 212 Pathophysiology for Health Information Management (3)**

A study of major disease processes including their symptoms, diagnosis, and treatment. Students will learn which diagnostic tests are used as well as the appropriate surgical techniques. Basic pharmacology and the most commonly used drugs will be discussed.

**HIM 220 Data Management and Analysis for Health Information (3)**

Use of database management software to manage and query health care data. Use of spreadsheet software to import data form health care databases. Data presentation principles. Calculation and use of special statistics related to the health care setting. These statistics are used for health facility planning and administration and for epidemiology. Pre/Co-requisite: CSC 311C.

**HIM 305 Inpatient Coding and Classification (3)**

Coding and classification schemes used for hospital inpatients will be discussed. Special emphasis will be placed on the International Classification of Disease-10th-Clinical Modification (ICD-10-CM) and International Classification of Disease-10th-Procedure Coding System (ICD-10-PCS). ICD-9CM will be discussed as legacy. Two hours of lecture and two hours of laboratory per week. Prerequisites: HIM 100/111/212, BIO 215T, BIO 215L, BIO 216T, and BIO 216L.

**HIM 306 Outpatient Coding and Classification (3)**

Coding and classification schemes used for outpatients in hospitals, ambulatory care centers and physician offices will be discussed. Special emphasis will be placed on Current Procedural Terminology, 4th edition (CPT-4), and reimbursement classifications. Two hours lecture and two hours laboratory per week. Prerequisites: BIO 215T, BIO 215L, BIO 216T and BIO 216L. Co-requisite: Completion of or concurrent enrollment in HIM 305.

**HIM 309 Legal Aspects of Health Information (3)**

Overview of the legal system, civil procedure, rules of evidence, tort law, corporation law, contracts, and antitrust laws. Discussion of specific laws related to health information such as patient consent, the legal health record, privacy, security, access, disclosure, release of information, required reporting, risk management, quality improvement, corporate compliance, medical staff, and worker-related issues.

**HIM 313 Management for the Health Professions (3)**

Introduces students to six basic management functions (planning, organizing, staffing, directing, controlling and decision making) in the context of health care such as hospitals, long term care facilities and other health related organizations. Concepts of management and management responsibilities (such as ethics, leadership and motivation) are related to selected functions. Students lead case discussion groups or critique journal articles on each management function.

**HIM 392 Professional Practice Experience I - Technical (3)**

The student will complete a three-week practicum in a hospital health information management services area. Students will practice technical skills learned during the first year of the health information management curriculum. (Note: Students who transfer from a health information technology program will transfer the equivalent of this course.) Prerequisites: HIM 100, HIM 305, HIM 306, and HIM 309, BIO 215T, BIO 215L, BIO 216T and BIO 216L; matriculated status in the SUNY Polytechnic Institute HIM program; and permission of the instructor.

**HIM 400 Non-Hospital Health Information Management Systems (2)**

Non-hospital health care settings offer exciting employment alternatives for health information managers. Included in this course will be a study of health information systems for psychiatric, developmental, occupational, long term, home health, correctional, emergency medical services, and veterinary care. In addition, disease registries will be covered. Prerequisites: HIM 392. Corequisite: HIM 494.

**HIM 401 Systems for the Evaluation and Improvement of Health Care Systems (3)**

A study of the historical basis for current trends in the evaluation of health care, and an explanation of the role of the health care manager in this process. Methods for assessing quality and appropriateness. Use of the system as a risk management tool. Two hours of lecture and two hours of laboratory per week. Prerequisites: HIM 100; STA 100.

**HIM 403 Introduction to Epidemiology (3)**

Preventing the incidence of disease requires an understanding of the risk factors associated with its cause. This course will provide a foundation for understanding the dynamics of health and disease in society, and impart a grasp of the fundamentals of epidemiology.

**HIM 425 Research in Health Information Management (3)**

A study of the application of research techniques to the health information management field. Students will perform small research studies and will review published research in the field. Prerequisite: STA 100.

**HIM 435 Health Care Management/Medical Information Systems (3)**

This course is intended to expose hospital managers to the areas where computers can assist in the direct care of the patient and the management of hospitals. Emphasis will be placed on how to evaluate computers and information systems for hospitals, the unique problems involved in implementing computerized systems in the health care environment, and strategies for minimizing problems. Prerequisite: HIM 220.

**HIM 440 Electronic Health Records (3)**

Addresses the definition, benefits, standards, functionality and confidentiality/security measures for the electronic health record. Case studies will be used to show how two health care organizations have developed their systems. Prerequisites: HIM 100, HIM 220, HIM 305, HIM 306.

**HIM 445 Healthcare Reimbursement (3)**

Overview of payment systems for voluntary healthcare insurance plans, government-sponsored healthcare programs, managed care plans, hospital inpatients, ambulatory care patients, and post-acute care patients. Also includes revenue cycle management, the importance of clinical coding compliance, and value-based purchasing. Prerequisites: CSC 311C, HIM 305, HIM 306, HIM 400 and STA 100.

**HIM 450 Health Information Services Management (3)**

Department management technique for health information management. Applications of systems analysis, computer science, budgeting, personnel management, and plant layout for the health information manager. Two hours lecture and two hours laboratory per week. Prerequisites: HIM 400, MGT 318 and permission of HIM Program Coordinator.

**HIM 490 Selected Topics in Health Information Management (Variable 1-4)**

Courses offered as Selected Topics in Health Information Management supplement regularly offered courses. Such courses enhance the student’s general knowledge of Health Information Management topics.

**HIM 491 Independent Study (Variable 1‑4)**

Extensive study and research on a particular topic of student interest under the supervision of a faculty member. The student is required to submit a written proposal which includes a description of the project, its duration, education goals, method of evaluation, and number of credits to be earned. Prerequisites: Matriculated students only, permission of instructor and dean of subject area.

**HIM 493 Senior Seminar (2)**

Final summary course with discussion of current events in the health information management field and preparation to enter the job market. Includes a final comprehensive examination on the curriculum (a mock certification examination for the registered health information administrator). Pre/Corequisite: HIM 450 and permission of HIM Program Coordinator.

**HIM 494 Professional Practice Experience II - Specialty (1)**

Rotations through various non-hospital health information management service areas in facilities, such as those dealing with mental health, developmental disabilities, long‑term care, hospice, home care, ambulatory care, disease registries, correctional health and occupational health. Co-requisite: HIM 400. Prerequisite: Matriculated status in the SUNY Polytechnic Institute HIM program.

**HIM 495 Professional Practice Experience III – Management (3)**

Completion of a three-week experience in the health information management services area of a type of health–related organization of the student's choice. Students will apply management skills learned in the health information management curriculum and they will complete at least one management-level project for the organization. Co-requisites: completion of or concurrent enrollment in HIM 450 and HIM 440. Prerequisite: Matriculated status in the SUNY Polytechnic Institute HIM program.

**History**

**HIS 101 American History: Colonies to Reconstruction (4)**

A description and analysis of the major factors accounting for the transformation of the earliest settlements into a sovereign national power. Emphasis will be placed on the role of immigration, changing institutional values and structures, and the interplay between economic and political forces. Meets new General Education American History requirement.

**HIS 102 American History: Reconstruction to the Present (4)**

A description and analysis of the principal forces involved in the growth of the U.S. from a society on the eve of massive industrialization into a technological consumer society. Features stressed will include the rise of the corporation, the development of an urban labor force, the changing role of government, and the integration of the United States into a global political and economic system. Meets new General Education American History requirement.

**HIS 150 History of Modern Europe (4)**

A political and social survey of the period 1815‑present. Primary attention is given to the major Western European states and Russia. Central themes of the course include: the decline of aristocratic dominance and the attempts of first the middle, and then the lower classes, to gain control of society, the origins of World War I, the war itself and its aftermath, the rise of totalitarianism and the coming of World War II, the Cold War, new prosperity, and the global age. Meets new General Education Western Civilization or Humanities requirement.

**HIS 240 Latin American Civilizations (4)**

A one-semester overview of Latin America, from the first encounters of European, African, and Native American cultures to the diverse and complex societies of the present. Study of the region’s indigenous and colonial past will help explain contemporary politics, economics, social relations, and cultural movements. Repercussions of the independence movements and subsequent democracies, monarchies, dictatorships and reform movements will be tracked. Students will evaluate demographic changes, social upheaval and revolution, industrialization and development, environmental degradation, and foreign intervention. Throughout the course, changes and continuities in race, class, gender, and other social roles will be identified and analyzed. Meets new General Education Other World Civilizations requirement.

**HIS 304 Technology in American History (4)**

A lecture and reading and writing intensive course in American History organized around the theme of technology. History is the understanding of change over time. As such, this course focuses on technology as a central organizing theme to study changes that have happened in America. We will do so by exploring the interrelationships and interactions among technology and the changing political, economic, social, intellectual and cultural contexts in America. As a result, students can become thoughtful analysts of technology in context. Cross-listed with IDS 304.

**HIS 306 Science and Technology in World History (4)**

An analysis of the histories of science and technology in the context of the broad outlines of world history and the history of western civilization. As such, this course is an exploration of the interrelationships and interactions among technology, different forms of knowledge about nature, and their political, economic, social, intellectual, and cultural contexts. That exploration will lay the foundation for a cross-cultural comparison of science and technology in the West and in other civilizations to analyze the significance of western science and technology’s dominance. Lectures will supplement the text, and will cover themes and issues important to understand the changes that occurred in the histories of science and technology. May not be taken for credit by students who previously took and passed HIS 307. Meets new General Education Western Civilization and Other World Civilizations requirements, or can be used to meet Humanities requirement. Cross-listed with IDS 306.

**HIS 308 Latinos in American History (4)**

A review and analysis of the major historical developments explaining the presence of the United States' largest emergent minority group, the Hispanics, or Latinos. Major themes include the colonial activities of the Spanish and Portuguese; subsequent historical developments involving Mexico, Puerto Rico, Cuba, and other areas of Central and South America; the experience of Latinos in the U.S. in the past 200 years; and the current status and culture of Latino groups in American society. *Meets new General Education American History requirement. Only students scoring about 84 on the NYS Regents in American History.*

**HIS 317 Topics in Black History (4)**

Deals with a variety of periods in Black History which have contributed to American life as it exists today. Topics will change each semester and may deal with such diverse matters as the African cultural roots of Afro‑American life, views of Black family life and institutions during slavery. Meets new General Education Western Civilization or Humanities requirement.

**HIS 330 American Women’s History: U.S. Historical Experiences in Hemispheric Perspective (4)**

An examination of the history of women in the United States from European colonization (ca. 1600) to the present, plus the opportunity to compare American women’s experiences with those of their peers throughout the Western Hemisphere. Themes addressed will include: race and ethnicity in colonization and coexistence, labor (paid and unpaid) and class issues, health and sexuality, religion and spirituality, and legal and political struggles. Meets new General Education American History requirement.

**HIS 360 Environmental History (4)**

The constantly changing relationship between Americans and the land has been a continuing theme in American history, beginning with the ideas and attitudes the colonists brought with them from Europe and continuing to the current environmental movement and its opposition. This course deals with American attitudes toward land, natural resources, and nature from the roots of our ideas in Western civilization to the present. This course will focus on Native American and European ideas about nature, explore the impact of the ideas of Thoreau, Muir, and Leopold, and analyze how science has changed our understanding of the relationship between Americans and nature. Meets new General Education Western Civilization requirement.

**HIS 370 Western Civilization and the World (4)**

A historical analysis of Western and other world civilizations. Explores the broad outlines of world history by comparing, contrasting, and relating the distinctive features of Western civilization to other world civilizations. Topics covered include the origins and varieties of civilizations, the divergent traditions in world civilizations, European hegemony and the end of European dominance, and globalization. This is a reading-intensive course in which lectures and discussions supplement the assigned reading. Meets new General Education Western Civilization and Other World Civilizations requirements.

**HIS 375 Gender Issues in World History (4)**

An examination of how gender roles have shaped the experiences of diverse men and women in a range of human societies worldwide, and how those roles have affected experiences of cultural interaction among societies in modern and recent history. Using historical monographs and primary sources, students will employ critical reading and writing skills to gain in-depth knowledge of these experiences and of trends in the field of gender history that can guide independent inquiry. Fulfills the SUNY General Education requirement in Western Civilizations and Other World Civilizations. Cross-listed with IDS 375.

**HIS 390 Topics in History (4)**

An in-depth examination of particular topics in history. Topics might include World War II, the history of women in America, the Sixties and the Vietnam War, history of presidential elections. Each course will use one or two general textbooks; in addition, every student will be required to perform research on a particular issue related to the topic of the course. May be taken more than once as topics change.

**HIS 491 Independent Study (Variable 1‑4)**

Extensive study and research on a particular topic of student interest under the supervision of a faculty member. The student is required to submit a written proposal which includes a description of the project, its duration, education, educational goals, methods of evaluation, and number of credits to be earned. Prerequisites: Matriculated students only, permission of instructor and dean of subject matter.

**Humanities**

**HUM 110 Humanities and the Postmodern World (4)**

The twenty-first century world is being shaped by an array of technological, social, and economic forces ranging from the ubiquity of media and information technologies to the globalization of economic processes. The role of humanities in interpreting and understanding the reshaped landscape of this postmodern world is examined by exploring various modes of human expression (for example, art, architecture, film, literature, philosophy) and studying how these try to make sense of this dynamic and sometimes disorientating social and cultural environment.

**HUM 220 Introduction to Social and Political Thought (4)**

An introduction to major ideas, themes and thinkers in social and political thought. While providing an overview of the western tradition, the course will also focus on recurring themes such as questions of power and authority, relations between the individual and the state, concepts of justice, equality, rights, and ideas of individualism, democracy, and community. Attention will be given to the development of ideas within their larger social, cultural and historical contexts.

**Interdisciplinary Studies**

**IDS 102 Art and Culture (4)**

A study of the ways that the arts represent major cultural changes focusing on non-western cultures. Several art forms (literature, performing, or visual arts) will be studied as they mirror social history. Emphasis falls on the appreciation and understanding of each art and its cultural context, with some comparison of the traditions of other-World and West. Students may also engage in some hands-on experience with these art forms. Specific topics may vary. A reading and writing intensive seminar course; meets the Other World Civilization SUNY General Education Requirement.

**IDS 103 Science, Technology, and Human Values (4)**

An exploration of the interrelationships between science and technology and their social and cultural contexts. This course is a topics-based investigation that introduces students to a multi-disciplinary examination of a specific topic with the goal of developing an integrated, coherent, and well-rounded understanding of both that topic and the value of interdisciplinary inquiry. Possible topics include health and illness, food, transportation, energy, information, and other subjects. A reading and writing intensive seminar class; meets the Humanities SUNY General Education Requirement.

**IDS 201 Perspectives on Knowledge (4)**

A critical and comparative analysis of different ways of knowing focusing on the western tradition with some cross-cultural comparisons. Begins by analyzing different ways humans have sought to know the truth, and by comparing and contrasting formal, universal ways of knowing with practical, experience-based, problem-oriented ways of knowing. The resulting understanding of knowledge provides the foundation for students to develop their own perspectives on knowledge. A reading and writing intensive seminar class; meets the Western Civilization SUNY General Education Requirement.

**IDS 203 Introduction to Science, Technology, and Society (4)**

Explores the humanistic and social dimensions of science and technology by looking at the interactions and interrelationships among science, technology, and society. We will explore: 1) the practice of science and technology to understand how scientific and technological work are conducted as creative and human enterprises; 2) how science and technology are shaped by different social and economic forces; 3) the impact of science and technology on society; 4) ethical issues related to science and technology.

**IDS 204 Understanding Human Nature (4)**

Examines human nature from a wide variety of disciplinary perspectives including philosophy, religion, psychology, sociology, biology, and literature. It also includes an examination of the implications of the relationships between humans and technology for our understanding of human nature. Meets the General Education Humanities requirement.

**IDS 220 Creativity and Culture (4)**

An introduction to the concepts and practices of creative activity in contemporary society. The course will explore both ideas and processes of creativity across multiple contexts, domains, and genres (e.g. fine arts, folk and popular arts, craft, design) with a focus on understanding the cultural contexts and processes of creativity. Students will engage in hands-on creative activities in different genres as well as reflect upon the aesthetic and practical dimensions of these experiences in order to appreciate and critically engage the goals, purposes, and processes of creative activities. Meets The Arts SUNY General Education Requirement.

**IDS 301 Monsters, Robots, Cyborgs (4)**

What is the significance of the troubling figures – the monsters, robots, and cyborgs – that haunt our collective imagination? In this course students will examine the monstrous figures and technological bodies that populate the cultural landscape, interpreting them within their social, historical, cultural, political, and intellectual contexts. Approached in this manner, we will explore how these figures reveal our anxieties about the world—anxieties about the social, political, moral, and technological orders that organize our world—and how we fit (and do not fit) within these structures and systems. Meets the General Education Humanities requirement.

**IDS 302 Postmodernism and Popular Culture (4)**

Begins with a foundational overview of major theories of Postmodernism from interdisciplinary perspectives (e.g. philosophy, sociology, psychology, history, anthropology, literary studies, political science). Students will then read, discuss and apply knowledge from more specialized scholarship that discusses some popular cultural practices and artifacts. Assignments include readings, discussion, quizzes, formal and informal writing, presentations, and a midterm and/or final exam. Topics may include: film, television, celebrity, technology, social networking, and self-publishing (blogs, wikis, etc.). Fulfills the General Education Humanities requirement.

**IDS 303 The Body in Western Thought and Culture (4)**

An examination of how the human body is conceptualized and represented in western thought and culture. Whereas the role of mind and intellect holds the privileged position in the western tradition, the human body, in its corporeality, materiality and mortality is the source of vexing problems. Yet it is impossible to understand either human existence or human experience without addressing our existence as embodied beings. This course will explore how the body and its problems are thought, addressed, and represented in western thought and culture. Topics may include the mind/body dualism, society and the body, and intersections of sex, gender, class, and race as they converge over the body.

**IDS 304 Technology in American History (4)**

A lecture and reading and writing intensive course in American History organized around the theme of technology. History is the understanding of change over time. As such, this course focuses on technology as a central organizing theme to study changes that have happened in America. We will do so by exploring the interrelationships and interactions among technology and the changing political, economic, social, intellectual and cultural contexts in America. As a result, students can become thoughtful analysts of technology in context. Cross-listed with HIS 304.

**IDS 306 Science and Technology in World History (4)**

An analysis of the histories of science and technology in the context of the broad outlines of world history and the history of western civilization. As such, this course is an exploration of the interrelationships and interactions among technology, different forms of knowledge about nature, and their political, economic, social, intellectual, and cultural contexts. That exploration will lay the foundation for a cross-cultural comparison of science and technology in the West and in other civilizations to analyze the significance of western science and technology’s dominance. Lectures will supplement the text, and will cover themes and issues important to understand the changes that occurred in the histories of science and technology. May not be taken for credit by students who previously took and passed HIS 307. Meets new General Education Western Civilization and Other World Civilizations requirements, or can be used to meet Humanities requirement. Cross-listed with HIS 306.

**IDS 311 Humor and Comedy in Society (4)**

Beyond being funny, the ways we generate, receive and consume comedy affects the way we view and participate in the world around us. Comedy helps us function in the world, and it shapes the way we perceive things on personal, political and social levels. Laughing at others and ourselves allows us to gain and withhold power, and as such a study of comedy is valuable to understanding aspects of the genre such as aggression, compliance, and transgression. IDS 311 offers a study of comedy from a variety of perspectives (e.g. philosophy, sociology, psychology, history, anthropology, literary studies, political science, and linguistics). Artifacts of study may include film, television, written texts, and radio. Topics of study may include gender and sexuality, ethnicity, political satire, and religious humor. Meets the General Education Humanities requirement. For IDS majors, this course partially fulfills the Cultural Analysis and Interpretation Area of Inquiry.

**IDS 375 Gender Issues in World History (4)**

An examination of how gender roles have shaped the experiences of diverse men and women in a range of human societies worldwide, and how those roles have affected experiences of cultural interaction among societies in modern and recent history. Using historical monographs and primary sources, students will employ critical reading and writing skills to gain in-depth knowledge of these experiences and of trends in the field of gender history that can guide independent inquiry. Fulfills the SUNY General Education requirement in Other World Civilizations. Cross-listed with HIS 375.

**IDS 380 Critical Perspectives on Digital Society (4)**

Exposes students to a range of critical/cultural theories and approaches to the study of new media, including those allied to medium theory, cultural studies, political economy of communication, ideological inquiry, globalization and commercialism. Students will explore multiple theorists/theoretical positions in depth. Cross-listed with COM 380.

**IDS 390 Selected Topics in Interdisciplinary Studies (Variable 4)**

A selected topic explored in depth from an interdisciplinary perspective. Students may receive credit for taking the course more than once provided the course has a different topic.

**IDS 400 Prominent Themes in Western Civilization Since the Renaissance (4)**

A reading and writing intensive course that examines the central themes, issues, and ideas in western civilization in the modern and postmodern eras in an interdisciplinary fashion. It incorporates knowledge from a variety of intellectual fields, including physics, biology, social science, philosophy, political science, and literature. In this course, students will read primarily original sources as well as some secondary sources. Meets the General Education Western Civilization requirement.

**IDS 401 Contemporary Worldviews (4)**

A reading and writing intensive course that studies a dominant characteristic of Western thought in the twentieth century through interdisciplinary readings. Students will read primary sources in history, philosophy, science, literature, the visual arts, or social sciences, and will study and compare the nature of the core idea in each discipline. Possible issues to be examined include the crisis of authority, the ecological consciousness, technology and culture. Meets the General Education Western Civilization requirement.

**IDS 410 Research and Critical Methods (4)**

Introduction to various modes of analyzing subjects in the humanities and social sciences. Students will gain an understanding of the techniques, methodologies, and vocabularies of research methods and will become familiar with debates regarding those research methods. Students will employ several research methods to assess their preferences for approaches to subject matter, and will design and carry out an interdisciplinary final project. Topics of study include: critical theory, film and visual arts criticism, historiography, literary criticism, and social science research issues.

**IDS 435 Art and Technology (4)**

A study of the interaction between technological change and artistic expression. Early historical examples will be used to establish fundamental principles of art and technology as sources of cultural value. The course will emphasize twentieth century developments in imaging, including film and digital art. Students will produce their own examples of traditional and electronically mediated art.

**IDS 492 Interdisciplinary Studies Internship (2-4)**

Intended for Interdisciplinary Studies majors to gain practical and/or professional experience in an area related to their individual program of study. Student will work with a qualified specialist in the relevant area and will be responsible for reporting to both that specialist and to a faculty supervisor. Students wishing to enroll must have filed their program of study and completed a minimum of 12 credits in their chosen area of concentration.

**IDS 499 Interdisciplinary Studies Project (4)**

A capstone seminar in which students design and complete an individual project demonstrating their mastery and integration of their individual Area of Concentration and the Interdisciplinary Studies core. Projects may take a range of forms appropriate to the student’s concentration and future goals, e.g. a research essay, marketing study, computer program or curriculum design. Projects must be approved by the student’s project supervisors. Students will participate in a seminar addressing research issues and will present their projects to their faculty supervisors at the end of the course.

**Idea to Startup**

**ITS 303 What’s the Big Idea (3)**

Student will be introduced to how to develop an idea into an entrepreneurial vision. This will include conceptualizing and presenting an idea to potential team members and investors, focusing your idea, understanding competition and looking for missing opportunities in a market, learn how to form a team and financial planning to support your idea. This course and BUS 303 cannot both be taken for credit.

**ITS 304 Idea to Startup (3)**

Students will develop an action plan for their business. This will include developing a plan to get your product to market, develop a proof of concept or demo, develop a business plan, which can be used to pitch your idea to investors, and refine the team which will help you get your idea to market. The culmination of the final project is a presentation to investors. This course and BUS 304 cannot both be taken for credit.

**Japanese**

**JPN 101 Elementary Japanese (4)**

Elementary Japanese is designed for students with little or no background knowledge of the Japanese language and culture. Will provide students with basic language and cultural knowledge, strategies and skills to help them interact in real and social situations they are most likely to encounter in Japan. Students will learn basic Japanese language structures that will serve as a base for further Japanese language acquisition. Meets SUNY General Education Foreign Language requirement.

**JPN 102 Intermediate Japanese (4)**

This course continues the basic grammar of JAP 101 to develop proficiency in Japanese. It refines the language acquisition skills of listening, speaking, reading, and writing. Students will learn to read and write with combinations of hiragana, katakana, and kanji. The course integrates aspects of Japanese culture to broaden understanding of the language.

**Management**

**MGT 307 Organization Behavior (4)**

Managerial practices will be studied using a strong emphasis on the importance of individuals’ behaviors influencing the effectiveness of organizational performance. The course combines a review of organizational behavior, based upon theory and research in the social sciences, and a variety of individual and small group activities intended to aid students in applying theory to the management of varied organizations. Subject matter includes key topics such as organization-structures, motivation, perception, conflict, communication, leadership, decision making, cultural diversity, and multinational perspectives for managers.

**MGT 318 Human Resources Management (4)**

Current managerial thought recognizes the importance of human resource contributions to organizational effectiveness and goal achievement. A key aspect of this course is the focus on state‑of‑the‑art systems which support basic business objectives as well as foster good working relations between employees and managers. Topics include: human resource planning; legislative and legal requirements; staffing; performance evaluation; employee relations; and compensation. Personal computer projects are included.

**MGT 320 Appraisal, Compensation & Motivation (4)**

The use of compensation as a motivator is a complex issue, but of paramount importance in all organizations. Key topics include motivation theory, performance appraisal, government regulation and internal and external pay equity. Students design a pay system for a hypothetical company. Prerequisite: MGT 318. Cross listed with HRM 620.

**MGT 415 Industrial and Labor Relations (4)**

Managerial success in many human resource-oriented work environments demand competency in the labor relations area. Labor relations extends beyond the traditional boundaries of contracts and grievances. This course provides the necessary background to enable the student to appreciate how the labor relations environment has developed; to function both formally and informally within that environment; and to understand economic, cultural and legal factors which may affect that environment in the future. Prerequisite: MGT 318 or permission of instructor.

**MGT 425 Human Resource Selection & Staffing (4)**

A systematic framework for understanding the process of recruitment, selection, and retention in organizations. This framework begins with planning, job analysis, and the analysis of external factors such as the legal environment. Presents recruitment sources, selection methods (e.g., structured interviews, written testing, work performance samples, validation), and staffing decision making criteria, and concludes with the issue of retention (how to keep the good employees hired). Topics include job analysis, recruitment, internal selection, external selection, testing, checking references, legal compliance, decision making, final match, and retention of employees. Prerequisite: MGT 318.

**MGT 491 Independent Study (Variable 1‑4)**

Extensive study and research on a particular topic of student interest under the supervision of a faculty member. The student is required to submit a written proposal, its duration, educational goals, method of evaluation, and number of credits to be earned. Prerequisites: Matriculated students only, permission of instructor and dean of subject area.

**MGT 492 Management Internship (4)**

Supervised, discipline related experience in a business organization. Emphasis is on application, process, and techniques used by business to sustain business and promote growth. Specific skills and competencies needed to be a successful decision-maker will be targeted. Oversight will be provided by the School internship coordinator and the sponsoring organization. Periodic meetings with the supervisor, mid-semester evaluation, and a final, comprehensive written report are required. Prerequisite: Permission of instructor.

**Management Information Systems**

**MIS 315 Introduction to Management Information Systems (4)**

The wide availability of powerful and affordable information technologies today has made it imperative for managers and entrepreneurs to not only appreciate the role that they play in achieving organizational goals but also develop skills to deploy them for both personal and organizational competitive advantage. This course introduces students to information technologies, the common systems built using such technologies, the major organizational processes that such systems sustain, and the development and management of systems in organizations. Topics covered include the role of business intelligence, e-commerce, hardware, software, databases, and telecommunications; information systems development and management.

**Management Science**

**MGS 411 Introduction to Management Science (4)**

A broad range of quantitative techniques and their applications in business are included in this course. Microcomputers and/or calculators are used extensively. The topics covered will be: cost‑volume‑profit analysis, linear programming‑graphical and simplex methods, transportation method, probability concepts and applications, decision theory, inventory and production models, and game theory. Prerequisites: MAT 112, STA 100.

**Marketing**

**MKT 301 Marketing Management Principles (4)**

Topics covered include: marketing's role in society and the firm, the marketing concept, product planning, consumer behavior, marketing research, channels of distribution, retailing, wholesaling, pricing, promotion, and planning and evaluating marketing strategy. Group discussions, case studies, and spreadsheet software are utilized.

**MKT 312 Marketing Management Problems (4)**

Analysis of problems encountered by firms in marketing goods and services. Emphasis is placed on the formation of strategies to integrate product planning, pricing, distribution, promotion, and service within the existing legal framework. Prerequisite: MKT 301 or equivalent.

**MKT 321 Advertising Management (4)**

Issues in the development and management of creative strategies to accomplish marketing objectives in a competitive economy. Includes the role, scope, and organization of advertising, the use of agencies, media investigations and campaigns, personal selling, and legal, regulatory, and ethical constraints. Prerequisite: MKT 301 or equivalent.

**MKT 378 Marketing for Entrepreneurs (4)**

Focuses on marketing activities required by entrepreneurial ventures, including small businesses, franchises, new ventures, non-profits activities, and internal corporate projects. Emphasis is placed on effectively and creatively marketing the innovative venture. This course focuses on the theoretical and practical aspects of marketing entrepreneurial ideas in written and oral form supported by numerical and qualitative arguments. Prerequisite: ENT 375.

**MKT 465 Consumer Behavior (4)**

Behavior science theories are examined for practical application in developing marketing strategies: motivation theory, consumer perception, attitude theory, and social referents. Case studies, class discussion, and projects are used to examine consumer behavior. Prerequisites: MKT 301 or equivalent.

**MKT 470 Marketing Research (4)**

Through the use of cases, exercises, and projects, the course reviews the application of research methods to gather marketing information. Applied marketing research studies are examined in steps: plan, design, execution, and interpretation. Prerequisites: MKT 301 and STA 100 or equivalents.

**MKT 491 Independent Study (Variable 1‑4)**

Extensive study and research on a particular topic of student interest under the supervision of a faculty member. The student is required to submit a written proposal which includes a description of the project, its duration, educational goals, method of evaluation, and number of credits to be earned. Prerequisites: Matriculated students only, permission of instructor and dean of subject area.

**MKT 492 Marketing Internship (4)**

Supervised, discipline related experience in a business organization. Emphasis is on application, process, and techniques used by business to sustain business and promote growth. Specific skills and competencies needed to be a successful decision-maker will be targeted. Oversight will be provided by the School internship coordinator and the sponsoring organization. Periodic meetings with the supervisor, mid-semester evaluation, and a final, comprehensive written report are required. Prerequisite: Permission of instructor.

**Mathematics**

**MAT 090 Preparation for College Mathematics (0)**

A mathematics skills course designed for the student who needs to develop basic arithmetic, geometry and pre-algebra skills. Only S/U grades are assigned for this course.

**MAT 110 College Algebra (4)**

Techniques of algebra manipulation needed for success in the Calculus courses will be introduced and developed. Topics will include: sets, polynomials, factoring, rational expressions, exponents, radicals, coordinate geometry, inequalities, simultaneous equations, quadratic equations, and partial fractions. Applications with word problems will be included.

**MAT 111 College Mathematics (4)**

The course provides a basic background in critical thinking and problem solving through the language and methods of mathematics. Topics include a review and extension of algebra, geometry, quantitative reasoning and data analysis. An emphasis is placed upon logic and reasoning in a mathematical context. Students who have previously completed MAT 112 or higher may not enroll in this course for degree credit. Prerequisite: High school algebra and geometry. A terminal college course in mathematics for students who will not take other mathematics courses (such as Precalculus, Elements of Calculus, etc.). Meets new General Education Mathematics requirement.

**MAT 112 Elements of Calculus (4)**

This is a terminal introductory course in calculus suitable for business, computer science, and telecommunications majors. Topics in both the differential and the integral calculus are covered. These include: functions and graphs, the derivative, differentiation rules, optimization problems, rates of change, exponential and logarithmic functions, the antiderivative, the definite integral, and integration by substitution and by parts. Applications will be drawn from diverse areas such as business, economics, and the life sciences. Students who have previously completed MAT 121 or higher may not enroll in this course for degree credit. Prerequisite: MAT 110 College Algebra or equivalent. Meets new General Education Mathematics requirement.

**MAT 115 Finite Mathematics (4)**

A rigorous introduction to discrete mathematics as it is used in computer science. Topics include functions, relations, sets, propositional and predicate logic, simple circuit logic, proof techniques, elementary combinatorics, and discrete probability. Meets new General Education Mathematics requirement.

**MAT 120 Precalculus (4)**

Introduces the student to some of the fundamental concepts needed to be able to study calculus. Topics include: algebra review, functions, graphing, exponential, logarithmic, and circular functions, trigonometry, complex numbers, and vectors. Students who have previously completed MAT 121 or higher may not enroll in this course for degree credit. Prerequisite: MAT 111 or equivalent. Meets new General Education Mathematics requirement.

**MAT 121 Calculus for Engineering Technology I (4)**

Introduces the student to the differential calculus. Topics include: analytic geometry in a plane, functions, limits, the derivative and differentiation rules, partial derivatives, related rates, extrema, curve sketching, mean value theorem, linear approximations and parametric equations. Prerequisite: MAT 120 or equivalent. Meets new General Education Mathematics requirement.

**MAT 122 Calculus for Engineering Technology II (4)**

Introduces the student to the integral calculus. Topics include: the indefinite and definite integrals, areas, volumes, work, the exponential, logarithmic, inverse trigonometric, and hyperbolic functions, integration techniques, improper integrals, L'Hopital's rule, Taylor polynomials and polar co‑ordinates. Prerequisite: MAT 121 or equivalent.

**MAT 151 Calculus I (4)**

More advanced than MAT 121, this course is required for mathematics and engineering majors, and is recommended for mathematics minors. Covers the concept of the derivative and begins the study of integration. Topics include: functions, limits, continuity, the derivative, differentiation rules, mean value theorem, related rates, extrema, curve sketching, Newton’s method, linear approximations, definite and indefinite integrals, the fundamental theorem of calculus and parametric equations. Meets new General Education Mathematics requirement. Prerequisite: MAT 120 or equivalent with a grade C or better, or permission of instructor. MAT 121 and MAT 151 cannot both be taken for credit.

**MAT 152 Calculus II (4)**

More advanced than MAT 122, this course is required for mathematics and engineering majors, and is recommended for mathematics minors. Continues the study of integration and also includes infinite series. Topics include: integration techniques, transcendental functions, applications of integration, conic sections, L’Hopital’s rule, improper integrals, sequences and series, and polar co-ordinates. Meets new General Education Mathematics requirement. Prerequisite: MAT 151 with a grade C or better or equivalent or MAT 121 with permission of instructor. MAT 152 and MAT 122 cannot both be taken for credit.

**MAT 225 Applied Statistical Analysis (4) (Cross Listed with STA 225)**

Deals in depth with statistical methods used to analyze data. Applications are drawn from many diverse areas. Topics include: measures of location and scale for frequency distributions, addition and multiplication laws for probability, the binomial, Poisson, and normal distributions, inferences about proportions and location parameters in one‑sample and two‑sample problems, analysis of completely randomized and randomized blocks designs, simple linear regression and correlation, sign test, median test, rank sum test, and signed rank test. Prerequisites: MAT 112, MAT 122 or MAT 152.

**MAT 230 Differential Equations (4)**

An introduction to the theory of ordinary differential equations and matrices. The emphasis is on the development of methods important in engineering and the physical sciences. Topics include: theory and applications of first order and second order differential equations, Laplace transform method, matrix algebra, determinants, Cramer's rule, eigenvalues, and systems of linear differential equations. Applied Mathematics majors must take MAT 260 and can’t receive credit for this course. Prerequisite: MAT 122 or equivalent.

**MAT 253 Calculus III (4)**

Many properties of systems studied in applied science are functions of several variables or vector valued functions. This course develops the calculus of such functions. Topics include: vectors and vector valued functions, analytic geometry in space, functions of several variables, partial differentiation, the gradient, maxima and minima, Lagrange multipliers, and multiple integrals, line and surface integrals, Stokes and Divergence theorems. Prerequisite: MAT 122 or equivalent.

**MAT 260 Ordinary Differential Equations and Series Solutions (4)**

The course will allow students to become familiar with the subject of differential equations. It covers methods of solutions such as: separation of variables, integrating factor, reduction of order. Differential equations with constant and variable (Cauchy-Euler) coefficients are treated as well as series solutions of differential equations are introduced (method of Frobenius, Bessel and Legendre equations). Laplace transform and system of Linear first order equations are covered. Examples of applications of differential equations in physics, engineering are given. Prerequisite: MAT 152 with a grade C or better, or permission of instructor.

**MAT 290 Topics in Mathematics (1-4)**

An introductory course in selected topics in Mathematics not currently covered in any of the listed classes. Topics are chosen to illustrate different fields and applications which are all part of mathematics.

**MAT 335 Mathematical Modeling (4)**

Designed to teach the student some of the skills necessary to construct and critique mathematical models of physical and industrial processes. The student will apply skills acquired in MAT 230 to the models presented. Topics include: applications of first and second order ordinary differential equations, systems of nonlinear ordinary differential equations, stability, phase plane analysis, optimization, conservation laws and finite differences. Prerequisite: MAT 230 and familiarity with a computer language, or permission of instructor.

**MAT 340 Linear Algebra (4)**

Many systems studied in science, engineering, and computer science involve a linear relationship among many variables. Linear algebra is the mathematical description of such problems. Topics include: systems of linear equations, Gaussian elimination, matrices, determinants, Cramer's rule, vector spaces, linear transformations, eigenvalues and eigenvectors. Prerequisite: MAT 121 or permission of instructor.

**MAT 345 Introduction to Graph Theory (4)**

Provides students with an introduction to graphs and their properties. Topics include graphs and digraphs, eulerian and hamiltonian graphs, connectivity, planarity, shortest path problems, trees, and coloring. Attention will be paid to theorems and their proofs. Applications will be given throughout the course. Prerequisite: MAT 122 or MAT 413.

**MAT 370 Applied Probability (4)**

An introduction to the theory of probability and its applications. Topics include: basic set theory, elementary probability, counting arguments, conditional probability and independence, random variables and their properties, functions of random variables, distribution functions, probability models and applications such as stochastic processes. Prerequisite: MAT 122.

**MAT 380 Abstract Mathematics: An Introduction (4)**

An introduction to rigorous mathematics. Students will be exposed to the building blocks of mathematical theory – axioms, definitions, theorems, and proofs. The emphasis will be on constructing proofs and writing clear mathematics. The language and methods of mathematics will be explored while introducing students to the basics of set theory, number theory, topology on the real line, and functions. Prerequisite: MAT 122.

**MAT 381 Modern Algebra (4)**

An introductory course in Abstract/Modern Algebra. Topics will include elementary theory of groups, rings and fields: Groups, Subgroups, Quotient Groups, Symmetry, Rings, Fields, and Extension Fields. We will explore connections between Modern Algebra, Number Theory and Linear Algebra. SUNY Polytechnic Institute mathematics course at 200 level or higher excluding MAT 225 or, permission of the instructor.

**MAT 401 Series and Boundary Value Problems (4)**

Introduces advanced mathematical methods used to solve certain problems in engineering and the physical sciences. Topics include: sequences and series, Fourier series and transforms, series solutions of ordinary differential equations, partial differential equations, and solution of some boundary value problems. Prerequisite: MAT 230 or equivalent.

**MAT 413 Discrete Mathematics for Computer Science (4)**

Background to understanding computer science as the science of clear and concise descriptions of computable, discrete sets. Provides conceptual tools useful for any advanced study in computer science. Topics include: review of set theory, logic and relational calculus, algebraic structures (lattices, Boolean algebra, semi‑groups, groups, rings, etc.) and morphisms and their application in computer science (automata theory, coding, switching theory, etc.), formal languages and their acceptors, and elements of information theory and of the theory of computability.

**MAT 420 Complex Variables and their Applications (4)**

An introductory study of functions involving complex numbers. Subjects are selected based upon their importance in physical and engineering applications. Included are complex numbers, complex functions, analytic functions, complex integration, infinite series, residue theorem, contour integration, conformal mapping and application of harmonic functions. Prerequisite: MAT 122 or equivalent.

**MAT 425 Real Analysis (4)**

Introduces the student to a rigorous development of the real number system and the theory of Calculus on the real number line. Topics include: basic set theory, the real number system, sequences and series, limits and continuity, the derivative, the Riemann Integral, the Fundamental Theorem of Calculus, and sequences and series of functions. Prerequisite: MAT 381.

**MAT 430 Number Theory and Its Applications (4)**

Introductory course in Number Theory that will introduce students to the basic concepts as well as some modern applications. Topics include: prime numbers, Greatest Common Divisors, The Euclidean Algorithm, congruences, Fermat’s Little Theorem, primality testing, etc. Applications of Number Theory: cryptography, pseudorandom numbers, etc. Prerequisite: MAT 380 or MAT 381 or MAT 413 or permission of the instructor. Cross listed with 530.

**MAT 450 Partial Differential Equations (4)**

A study of Partial Differential Equations, or Pde’s, and their applications in science and engineering. The basic development of physical models leading to partial differential equations is discussed. Solution methods and basic theory are presented. Topics include: first order Pde’s, method of characteristics, the canonical second order Pde’s, separation of variables, Hilbert space methods, finite difference methods. Prerequisites: MAT 260 and MAT 253.

**MAT 460 Numerical Differential Equations (4)**

Fundamental mathematical methods associated with the numerical solution of ordinary and partial differential equations are investigated. Algorithms emphasizing both standard and newly developed methodologies are developed in the context of theoretical and practical considerations. Mathematical questions such as convergence, accuracy, and appropriateness of method are developed in a systematic manner. A variety of mathematical models and problems of current interest are used to emphasize many of the core results. Students will learn to develop their own algorithms and to use algorithms from existing high quality numerical libraries. Many of the models studied in this course will come from both standard mathematical models and topics related to current faculty research interests. Topics include: Runge-Kutta methods, finite difference techniques, finite element techniques, approximation methods, error estimation, and accuracy. Prerequisites: MAT 253, MAT 260 and familiarity with a programming language.

**MAT 490 Selected Topics in Mathematics (Variable 1-4)**

An in-depth treatment of a selected topic not normally treated extensively in other mathematics courses. Prerequisite: Permission of instructor.

**MAT 491 Independent Study (Variable 1‑4)**

Extensive study and research on a particular topic of student interest under the supervision of a faculty member. The student is required to submit a written proposal which includes a description of the project, its duration, educational goals, method of evaluation, and number of credits to be earned. Prerequisites: Matriculated students only, permission of instructor and dean of subject area.

**MAT 492 Applied Mathematics Internship (4)**

The internship is available to qualified Applied Mathematics majors. It is designed to provide students with an opportunity to integrate academic and practical experience in an industrial setting in a field related to mathematics. Before the internship is approved, the student, the employer, and a Mathematics faculty member develop a contract concerning the nature of the internship. Weekly reports and a final presentation are required for the internship. Prerequisites: 3.0 or better GPA in major and approval of Applied Mathematics faculty.

**Mechanical Engineering**

**ME 220 Kinematics and Mechanisms (3)**

Synthesis and analysis of mechanisms using analytical and graphical methods, covering the synthesis of linkages and other mechanisms, and the analysis of position, velocity, acceleration and force of mechanisms. Introduces the principles behind the operation of various machine elements and their associated design and analysis techniques. Three hours of lecture per week. Prerequisites: ESC 120 and ESC 210.

**ME 310 Design and Manufacturability (3)**

Development of the detailed process knowledge for key manufacturing processes including: manual and machine assembly, machining, injection molding, thermoforming, and casting. Topics discussed include the required tools, machines, process physics, and materials behavior associated with each of the manufacturing processes leading to the final product. Prerequisites: ESC 120, ESC 220 and ESC 230.

**ME 320 Fluid Mechanics (3)**

An introduction to the fundamentals of fluid mechanics, including: physical properties of fluids, hydrostatics, conservation laws with both control volume analysis and differential analysis, Bernoulli’s equation, potential flows, simple viscous flows (solved with Navier-Stokes equations), dimensional analysis, conduit flow, boundary layers and an introduction to compressible flow. Prerequisites: MAT 253, ESC 240, and ME 330.

**ME 330 Engineering Thermodynamics I (3)**

Basic thermodynamics concepts, properties of pure substances, first and second law analysis of systems and control volumes, exergy analysis, and introduction to vapor power systems. Three hours of lecture per week. Prerequisites: CHE 130T and CHE 130L, ESC 220 and MAT 260.

**ME 340 Engineering Thermodynamics II (3)**

Analysis and modeling of propulsion and power systems, including combustion, compressible flow nozzles, chemical equilibrium, moist air systems, PV devices and fuel cells. Three hours of lecture per week. Prerequisite: ME 330

**ME 390 Machine Design (3)**

Design and analysis of standard mechanical components for static and fluctuating loads. Specification of components such as shafts, bearings, and power transformers. Three hours of lecture per week. Prerequisite: ESC 240, ME 220, and ME 310.

**ME 410 Heat Transfer (3)**

An introduction to heat and mass transfer phenomena commonly found in the practice of engineering. The study of the fundamental heat transfer mechanisms of conduction, convection, radiation exchange, and mass transfer. The mathematics of heat transfers in single and two dimensions and under steady and transient flows are discussed and applied using a wide set of problems. Applications of the principles of heat transfer to heat exchangers and pipe flows are presented. An introduction to mass transfer and diffusion is included. Three hours of lecture per week. Prerequisites: ME 320 and ME 330.

**ME 420 Thermal Sciences Laboratory (2)**

Reinforcement and enhancement of the student’s understanding of the fundamentals of fluid mechanics, thermodynamics, and heat transfer learned in ME 320, 330 and 380 respectively. Experiments conducted are designed to demonstrate the applications of the basic fluid and thermal science principles and to provide a more intuitive and physical understanding of these disciplines. The work is accomplished in groups; individual written reports and oral presentations are required. Prerequisites: ME 320, ME 330 and ME 380.

**ME 422 Heating, Ventilating and Air Conditioning (3)**

The analysis and design of heating air conditioning systems. Topics include: psychometrics, comfort & health, heating and cooling loads, solar radiation, air distribution systems and refrigeration. Three hours of lecture per week. Prerequisite: ME 410.

**ME 424 Computational Fluid Dynamics (3)**

An introduction to computational fluid dynamics (CFD) which provides a basic understanding of how CFD problems are set and which factors affect the success and failure of a CFD analysis. Included topics are: the mathematical and physical fundamentals of CFD, formulation of CFD problems, basic principles of numerical approximation (including: grids, consistency, convergence, stability, and order of approximation) methods of discretization with focus on finite difference and finite volume techniques, methods of solution of transient and steady-state fluid mechanics and heat transfer problems, commonly used numerical methods for heat transfer and fluid flows, plus a brief introduction into turbulence modeling. Prerequisites: ME 320, MAT 450 and MAT 460.

**ME 425 Sustainable Energy: Choosing Among Options (3)**

The technical, economic, environmental and physical resources constraints of energy sources are discussed in terms of both national and global development needs. The current states of both non-renewable and renewable technologies are presented in terms of their potential contribution to sustainable energy resources required for continued viable economic development. Prerequisite: ME 330, or senior standing or permission of instructor.

**ME 430 Introduction to Nonlinear Dynamics and Chaos (3)**

An introduction to the theory and phenomenology of nonlinear dynamics and chaos in dissipative systems. The content is structured to be of general interest to undergraduates in engineering, science and mathematics. The course concentrates on simple models of dynamical systems, their relevance to natural phenomena and methods of data analysis and interpretation. The emphasis is on nonlinear phenomena which may be described by a few variables that evolve with time. Prerequisites: PHY 201T, PHY 201L, and MAT 253.

**ME 440 Analytical Dynamics (3)**

Advanced analytical methods of classical dynamics are taught, and connections are made between classical and modern mechanics. The emphasis is placed on using the methods of Lagrangian and Hamiltonian mechanics to model and analyze dynamic systems. Prerequisite: ESC 240 and MAT 340.

**ME 446 Modeling and Control of Dynamic Systems (3)**

Design and analysis of feedback control for mechanical and electro-mechanical dynamic systems. Topics include system modeling, transfer function, Laplace transform, block diagram and signal-flow graph, control system characteristics and performance, stability analysis, root locus method, Bode diagram, state-space equations, linearization, and feedback control schemes. Three hours of lecture per week. Prerequisite: ESC 240 and MAT 340.

**ME 449 Finite Element Analysis (3)**

Modern analysis techniques used to investigate a variety of systems in engineering and science. Computational models of problems are developed using energy concepts, structural mechanics, and matrix operations. The methods used are implemented using a general finite element program and the accuracy of the results is evaluated. The learned theoretical approach is applied to common structural elements such as trusses, beams, frames, and plates. Prerequisites: ESC 230, MAT 260, and MAT 253.

**ME 450 Microelectromechanical Systems (3)**

Microelectromechanical Systems (MEMS) covers fundamental topics including: materials properties, fabrication techniques, basic structure mechanics, sensing and actuation, circuit and system, packaging, calibration and testing. Explores applications such as: micro-sensors and actuators, micromanipulation, microfluid systems and biomedical systems. Three hours of lecture per week. Prerequisites: ESC 220, ECE 260, MAT 260.

**ME 460 Modeling of Metal Cutting Processes (3)**

Using state-of-the-art analysis techniques, common metal cutting processes such as turning, milling and drilling are studied. Modeling, stability and machined surface accuracy are discussed. Topics covered include cutting force models, regenerative chatter and predictive models for chatter-free processes. Prerequisites: ESC 240, ME 310

**ME 471 Introduction to Mobile Robotics (3)**

The fundamentals of mobile robotics are taught. The emphasis is placed on robot mobility which allows a mobile robot to move through an environment to perform its tasks, covering the aspects of locomotion, sensing, localization and motion planning. Also covered are computer modeling and programming of mobile robots. Prerequisite: ESC 120, ESC 240, and MAT 340.

**ME 472 Fundamental Principles of Robot Manipulators (3)**

The fundamental principles of robot manipulators are taught, including the kinematics, dynamics, trajectory generation and control. Also covered are computer modeling and analysis of robot manipulators, and programming of robot manipulators. Prerequisite: ESC 120, ESC 240 and MAT 340.

**ME 480 Capstone Design I (3)**

This is the first course of a two-semester sequence (fall and spring) for seniors intended as a “capstone” design project where students have the opportunity to utilize the broad range of their undergraduate experience in a realistic team design project. Projects are selected to provide interaction with industry sponsor(s) and cross-fertilization of ideas and to simulate anticipated future professional experience for the team members. Written specifications, literature review, planning, and completion of the selected project are required for graduation. The product of each project is a comprehensive report or design proposal having both global and detail completeness. The project may involve development of cost information necessary to effect construction and may involve construction and commissioning of the designed apparatus. Six hours of class time per week is scheduled to accommodate: lectures, team working sessions, team meeting times and oral presentations. Prerequisites: Senior standing or permission of the Mechanical Engineering advisor.

**ME 482 Capstone Design II (3)**

This is the second course of a two-semester sequence (fall and spring) for seniors intended as a “capstone” design project where students have the opportunity to utilize the broad range of their undergraduate experience in a realistic team design project. Projects are selected to provide interaction with industry sponsor(s) and cross-fertilization of ideas and to simulate anticipated future professional experience for the team members. Written specifications, literature review, planning, and completion of the selected project are required for graduation. The product of each project is a comprehensive report of design proposal having both global and detail completeness. The project may involve development of cost information necessary to effect construction and may actually involve construction and commissioning of the designed apparatus. Six hours of class time per week is scheduled to accommodate: lectures, team working sessions, team meeting times and oral presentations. Prerequisites: ME 480 and Senior standing or permission of the mechanical Engineering advisor.

**Mechanical Engineering Technology**

**MTC 101 Introduction to Engineering Technology (2)**

Required for all freshmen in Mechanical Engineering Technology. Topics include academic requirements, advisement, software packages, career opportunities, and project management. Additional topics include professional, ethical and social responsibilities; respect for diversity and a knowledge of contemporary professional, societal and global issues; and a commitment to quality, timeliness and continuous improvement. Cross listed with CTC/ITC 101.

**MTC 136 Material Science Applications (2)**

Composition, structure, and behavior of metallic and non‑metallic materials, and their effect on the physical, mechanical, and electrical properties of that material. Analysis of crystalline structure, physical properties, and service analysis of materials for physical, mechanical, and electrical properties.

**MTC 162 Computer Aided Design (4)**

The use of AutoCAD software to develop geometric models for engineering technology applications. Blue print reading and basic drawing fundamentals. Basic geometric dimensioning and tolarancing. Introduction to the creation and visualization of three-dimensional models. Four hours of lecture per week. Laboratory activity will be substituted for lecture as appropriate. Cross listed with CTC 162.

**MTC 198 Industrial Instrumentation (2)**

A freshman-level course that teaches the fundamentals of devices and methods used to instrument industrial processes and commercial products. Focuses on conventional instruments, electro-mechanical transducers, and computer-based data acquisition equipment and techniques. Two hours of lecture per week, with laboratory work substituted for lecture as appropriate. Prerequisite: Introductory Physics, Algebra, and Trigonometry. Students who completed this course cannot take MTC 398 for credit.

**MTC 210 Introductory Heating, Ventilating and Air Conditioning (HVAC) (2)**

Topics include principles of fluid mechanics, thermodynamics and heat transfer relevant to HVAC, concepts of air conditioning, principles of mechanical refrigeration, psychrometrics and load estimating. Two hours of lecture per week.

**MTC 211 Manufacturing Processes (4)**

Machining and non-machining methods of processing materials into manufactured components will be discussed. Both traditional and non-traditional machining processes are covered. Machine shop equipment and practices, along with different types of tooling, will be reviewed. Two hours of lecture and four hours of laboratory per week. Prerequisite: MTC 162.

**MTC 215 Sustainable Energy Systems (2)**

An introduction to sustainable energy systems. Topics include solar energy, wind energy, fuel cell technology, biomass energy, geothermal energy, clean coal technology, ocean energy, hydraulic power, and nuclear power. Two hours of lecture per week. Cross listed with ETC 215 and CTC 215.

**MTC 218 Statics (2)**

Analysis of equivalent systems of forces, free body diagrams, equilibrium of particles and rigid bodies, centroids, friction, and forces in structures. Two hours of lecture per week, with laboratory work substituted for lecture as appropriate. Prerequisites: PHY 101T, PHY 101L and MAT 120. Cross listed with CTC 218.

**MTC 220 Introductory Hydrogen and Fuel Cell Technology (2)**

Topics include working principles of fuel cells, types of fuel cells, hydrogen production, hydrogen safety, hydrogen engines and vehicles, hybrid solar hydrogen car and hydrogen economy. Two hours of lecture per week.

**MTC 222 Strength of Materials (2)**

Effect of shape and composition on strength of materials. Moments of inertia, shear forces and bending moments in beams, torsion of shafts, thermal expansion, and pressure vessels. Two hours lecture per week, with laboratory work substituted for lecture as appropriate. Prerequisites: PHY 101T, PHY 101L, MAT 120 and MTC 218. Cross listed with CTC 222.

**MTC 240 Solid Modeling and 3D Printing (2)**

The fundamentals of feature-based solid modeling with standard 3D CAD software, graphical modeling of mechanical parts and assemblies, design and creation of 3D printed components. Two hours of lecture per week. Students who have taken MTC 405 may not take this course for credit. Prerequisite: MTC 162 or equivalent.

**MTC 290 Introduction to Nanotechnology (4)**

An introductory course covering fundamentals of nanotechnology and its applications. Course content will cover diverse nanosystems including carbon nanotubes, semiconductor quantum dots, nanosensensors, molecular machines, and nanomedicine. The course will also survey the operation principles of the instruments used for nanostructures characterization and nanofabrication techniques. Prerequisite: PHY 101T and PHY 101L; CHE 110T and CHE 110L; or permission of instructor.Cross listed with ETC 290.

**MTC 301 Professionalism in the Work Place (2)**

Topics include lifelong learning; professional, ethical and social responsibilities; respect for diversity and a knowledge of contemporary professional, societal and global issues; and a commitment to quality, timeliness, and continuous improvement. Cross listed with CTC 301.

**MTC 308 Mechanical Components (4)**

Fundamental principles of design, working stresses, analysis and design of mechanical components such as shafting, springs, screws, belts, and chains. Four hours of lecture per week, with laboratory work substituted for lecture as appropriate. Prerequisites: MTC 218 and MTC 222 or equivalent, or permission of instructor.

**MTC 320 Applications Project I (2)**

Individual student designed project in a major field, includes: written specifications of project requirements, project plan, milestone identification, implementation, and descriptive report. An oral presentation regarding the project is required. Course includes a one-hour lecture per week. Students will work on an independent basis for the other hour.

**MTC 321 Applications Project II (2)**

Individual student designed project in a major field, includes: written specifications of project requirements, project plan, milestone identification, implementation, and descriptive report. An oral presentation regarding the project is required. Course includes a one-hour lecture per week. Students will work on an independent basis for the other hour.

**MTC 327 Production & Operations Management (4)**

Modern production and operations management in an industrial setting. Planning, organizing, and controlling using the relevant qualitative and quantitative approaches. Covers topics such as forecasting, capacity requirement, planning, work standards, scheduling, fundamentals of inventory control, and material requirement planning.

**MTC 330 Assistive Technology (2)**

Introduction to the fundamentals of assistive technology for people with physical disabilities. Rehabilitation engineering with an emphasis on mechanical devices used to enhance mobility and manipulation, improving physical interaction with the environment. Topics include: prosthetics, manual wheelchairs, power wheelchairs, and alternative methods for computer access. Two hours of lecture per week. Cross listed with ETC 330.

**MTC 352 Thermodynamics (2)**

Energy determination science for fluids systems. Enthalpy, entropy, and internal energy properties. Problems in energy state change, steady flow within elementary mechanical systems, and the measurement of energy.

**MTC 362 Experimental Stress Analysis (4)**

Empirical determination of stresses in mechanical components. Static and dynamic stress analysis of combined tension, torsion, and bending loads. Use of commercial instrumentation. Three hours of lecture and two hours of laboratory per week.

**MTC 363 Mechanisms Analysis and Design (4)**

The kinematic study of mechanisms, including velocity and acceleration analysis of linkages, cams, and gears in mechanical systems. Introduction to inertia forces in uniform motion machinery. Prerequisites: MTC 218 and MAT 122 or equivalents.

**MTC 373 Statistical Quality Control (4)**

Modeling and inferences of process quality. Philosophy and methods of statistical process control and quality improvement in the modern business environment. Techniques for quality troubleshooting, decision-making, and implementation. Review of basic concepts or statistics will be included. Prerequisite: STA 100 or STA 225 or permission of instructor.

**MTC 388 Solid Modeling with Pro/ENGINEER (2)**

Creating three-dimensional solid models of mechanical components using Pro/ENGINEER. Topics include feature-based modeling, protrusions, sweeps, blends and component assembly models. Two hours of lecture per week, with laboratory work substituted for lecture as appropriate.

**MTC 392 Micro- and Nano-Electromechanical Systems (4)**

This course introduces the student to the emerging field of Microelectromechanical systems (MEMS) and to the more advanced level of miniaturization known as Nanoelectromechanical Systems (NEMS). Topics will include introduction of physical scaling laws, essential electrical and mechanical concepts, methods of fabrication and packaging of MEMS, principles of micro-actuation, emergence of nanoscale systems, visualization, and applications of micro and nano systems. Prerequisite: Prerequisite: PHY 101T and PHY 101L; CHE 110T and CHE 110L; or equivalent. Cross listed with ETC 392.

**MTC 394 Nanoscale Materials (4)**

Fundamental aspects of Nanoscale materials, including electronic states and electrical properties, optical properties and interactions of nanoscale materials, ultrafast dynamics of metal nanoparticles, magnetic and magneto transport properties. Prerequisite: PHY 101T and PHY 101L; CHE 110T and CHE 110L; or equivalent. Cross-listed with ETC 394.

**MTC 395 Semiconductor Microfabrication (4)**

Processes specific for the Silicon fabrication of VLSI circuits. Crystal growth and crystal structure. Chemical vapor deposition (CVD) growth, thermal oxidation, etching, metal deposition diffusion, ion implantation and photolithography. Process integration, MOS transistor fabrication, yield and reliability. Prerequisite: PHY 101T and PHY 101L; CHE 110T and CHE 110L; or equivalent. Cross listed with ETC 395.

**MTC 398 Mechanical Measurements (4)**

A junior-level course on devices and methods for measuring mechanical phenomena such as temperature, pressure, speed, displacement, acceleration, and force. Uncertainty, accuracy, and precision of measurements are presented. Focuses on electro-mechanical transducers and computer-based data acquisition techniques, experimental methods, analysis of collected data, and computer generation of technical reports. Laboratory activity will be substituted for lecture as appropriate. Students who have taken MTC 198 may not register and receive credit for MTC 398. Prerequisites: Introductory Physics, Algebra, Trigonometry.

**MTC 420 Capstone Experience (2)**

Student-designed project in a focused mechanical area. Includes written specifications of project requirements, literature review, planning, milestone identification, implementation, and a comprehensive written report. Projects must have a well-documented teamwork component. An oral presentation of the complete project is required. Course includes a one-hour lecture per week; students work on an independent basis for the other hour. Student must have senior status.

**MTC 430 Engineering Dynamics (4)**

Kinematics of particles, lines, and bodies, and the kinetics of particles and of rigid bodies with translation, rotation, and plane motion using the methods of force‑mass‑ acceleration, work‑energy, and impulse‑momentum. Three hours of lecture and two hours of laboratory per week. Prerequisite: MAT 122 or equivalent.

**MTC 432 Process Control and Design of Experiments (4)**

Quality philosophy and fundamental quality tools. Process flow diagrams, control charts for variable measurement, process sampling and chart interpretation. Methods for process optimization through single and multiple factor experimental designs. Prerequisites: MAT 121, PHY 101T and PHY 101L. Cross listed with ETC 432.

**MTC 442 Computer-Aided Manufacturing (4)**

Basic concepts of Computer Assisted Manufacturing. Computer aided process planning, material requirement planning, machinability data bases, computer numerical control systems, group technology, and integrated manufacturing systems. Requires two hours of lecture and four hours of laboratory per week. Prerequisites: MTC 211 or permission of instructor.

**MTC 450 Solar Energy Concepts (4)**

Energy resources, energy consumption patterns, and future energy supplies. Physical, technical, and economical aspects of solar energy as a present and future source of energy. State‑of‑the‑art applications of solar energy to domestic household applications. Four‑hour lecture per week, with laboratory work substituted for lectures as appropriate.

**MTC 454 Engineering Heat Transfer (4)**

Introduction to heat transfer, steady state conduction-one & multi dimensions, unsteady state conduction, principles of convection, heat exchangers, condensation and boiling heat transfer, mass transfer, radiation heat transfer, special topics in heat transfer. Three hours of lecture and two hours of laboratory per week. Prerequisites: MTC 352 or equivalent, or permission of instructor. Students who have taken MTC 451 and/or MTC 452 may not register for MTC 454 for additional degree credit.

**MTC 455 Laser Technology (2)**

Analysis of basic laser fundamentals, including optics and laser hardware. Operational characteristics of specific laser systems. Two‑hour lecture per week, with laboratory work substituted appropriately.

**MTC 461 Fluid Mechanics and Systems (4)**

Introduction to fluid mechanics. Study of the principles of statics and dynamics applied to fluids. Some of the topics covered are: Pressure variation in fluids, flow in conduits, flow measurements, special topics in fluid mechanics, etc. Three hours of lecture and two hours of laboratory per week. Students may not receive credit for both CTC 461 and MTC 461.

**MTC 462 Turbomachinery (4)**

Application of the laws of thermodynamics and fluid mechanics to cascades, axial flow turbines and compressors, centrifugal pumps, fans and compressors, and radial flow turbines. Four‑hour lecture per week with laboratory work substituted for lecture as appropriate. Prerequisites: MTC 352 and MTC 461 or permission of instructor.

**MTC 464 Vibration Analysis (4)**

Methods for computing natural frequency of mechanical vibrations in machinery. Damped and forced vibrations of two dimensional, linear, or linearized systems, using both theoretical and instrumental investigations. Analysis of absorbers and isolators. Prerequisites: MTC 218, MTC 222, and MAT 230.

**MTC 465 Advanced Machine Design (4)**

In-depth study of major mechanical elements. Topics include: steady loading, variable loading, flexible elements, clutches, brakes, failure prevention theories, and metal fatigue. Students are expected to integrate course material as well as previous experience into a major mechanical design project. Prerequisites: MTC 218 and MTC 222, MTC 308 or MTC 362, and Calculus II, or permission of instructor.

**MTC 466 Wind Turbines (4)**

Introduction to Wind Turbines. Topics include: wind resources, aerodynamic principles, blade manufacture, control methods, performance testing, ecological effects, planning and regulations for wind energy development. Prerequisite: MTC 461 or equivalent or permission of the instructor. Four hours lecture per week.

**MTC 470 Mechanisms of Flow and Fractures in Machine Components (4)**

The nature of plastic flow and the fracture in solids, applications to the propagation of cracks and failures in machine components. Roles of strengthening mechanisms to reduce failure will be emphasized. Laboratory exercises may be substituted for lecture when appropriate. Prerequisites: MTC 218, MTC 222 and MTC 336 or equivalents.

**MTC 471 Space Technology (2)**

The course addresses the application of some of the well‑known principles of science and engineering in space technology. The particular topics covered are: spacecraft structure, power systems, propulsion systems, fundamentals of spacecraft dynamics, orbital maneuvers, attitude maneuvers and control systems, spacecraft testing. Students will research an individually selected topic on space technology and make written and oral presentations on it. Prerequisite: PHY 101T, PHY 101L or equivalent or permission of instructor.

**MTC 475 Economic Analysis in Technology (4)**

Methods for choosing between alternatives based on the time value of money. Replacement studies, depreciation and after-tax analysis, risk, uncertainty and sensitivity analysis. Cross listed with CTC 475. Prerequisite: MAT 121

**MTC 476 Finite Element Applications (4)**

Concepts of finite element analysis and their applications. Analysis of structure, plate, shell, pipes, plane stress and plane strains. Extensive use of FEA software package ALGOR. Three hours of lecture and two hours of laboratory per week. Prerequisites: MAT 122, MTC 218 and MTC 222, and a formal course in computing or permission of instructor.

**MTC 478 Computational Fluid Dynamics (CFD) (4)**

The course addresses some of the fundamental aspects of computational Fluid Dynamics (CFD). The specific topics covered in the course are: The Governing Equations of fluid Dynamics, Mathematical Behavior of Partial Differential Equations, Basic Aspects of Discretization, Grids with appropriate Transformations, CFD Techniques: The Lax-Wendroff technique, MacCormack’s technique, some applications: One-dimensional Nozzle Flows, Two-Dimensional Supersonic Flow-Prandtl-Meyer Expansion Wave, Incompressible Couette Flow, Navier-Stokes equations. Prerequisites: MTC 352 and 461 and MAT 230 or equivalent or permission of instructor.

**MTC 484 Thin Film Processing (4)**

Thin film synthesis: the fundamentals of crystal structures, the basic nucleation and growth mechanisms. Processes and technologies used for the thin film fabrication: chemical vapor deposition (CVD), Metal-organic CVD, molecular beam epitaxy (MBE), Plasma Assisted-MBE, sputtering, evaporation, etc., thin film growth equipment operation principles and the fundamentals of vacuum technology and gas delivery systems. Techniques for the monitoring and characterization of thin film parameters during the growth (in-situ) and after the growth (ex-situ). Prerequisite: PHY 101T and PHY 101L; CHE 110T and CHE 110L; or equivalent. Cross listed with ETC 484.1

**MTC 491 Independent Study (Variable 1-4)**

Extensive study and research on a particular topic of student interest under the supervision of a faculty member. The student is required to submit a written proposal which includes a description of the project, its duration, educational goals, method of evaluation, and number of credits to be earned. Prerequisites: Matriculated students only, permission of instructor and dean of subject area.

**MTC 494 CO-OP Assignment (2 or 4)**

This course provides 14 weeks of supervised experience in an industrial or government installation, applying technology knowledge towards the solution of engineering technology problems, and developing abilities required in the student’s career. At least three reports, two written and one oral, and two supervisors’ evaluations are required. May be taken repetitively up to a maximum of four credits. Prerequisite: Permission of employer and Dean of Engineering Technology.

**Music**

**MUS 301 SUNY Jazz (1)**

Introduces students to the performance of jazz in an ensemble. Study of basic jazz theory and improvisational techniques. Analysis of musical styles and performers. Students will rehearse ensemble works and perform in a public setting. Prerequisite: Instructor’s permission, based on student’s ability to perform a musical instrument appropriate to jazz performances. Meets new General Education Arts requirement.

**Nanoscale Science and Nanoscale Engineering**

**N ENG 101 (= N SCI 101) Nanotechnology Survey (3)**Introduction to the definitions, principles and applications of nanotechnology. Discussion of emergent nanoscale properties, atomic and molecular self-assembly and concepts of bottom-up and top-down processing and fabrication. Introduction to selected nanoscale systems, including quantum dots, carbon nanotubes, and graphene. Only one version of N SCI 101 or N ENG 101 may be taken for credit.

**N ENG 102/102Z (= N SCI 102/102Z) Societal Impacts of Nanotechnology (3)**Introduction to the societal implications of nanotechnology innovation including public perception of nanotechnology, public impacts, nanomaterials risk assessment, and impacts of nanotechnology on public health policy and energy/environmental sustainability. Only one version of N SCI 102 or N ENG 102 may be taken for credit.

**N ENG 103 (= N SCI 103) Economic Impacts of Nanotechnology (3)**Introduction to the economic impacts of nanotechnology innovation. Basic economic principles will be presented and discussed in terms of emerging nanotechnologies. Topics will include economics of nanoelectronics; nanoscale technologies for energy and the environment; and nanobioscience/nanobioengineering. Only one version of N SCI 103 or N ENG 103 may be taken for credit.

**N ENG 104 (= N SCI 104) Disruptive Nanotechnologies (3)**Nanoscale technological innovation as central to the economic growth process will be examined within a historical context leading to an understanding of nanoscale technology evolution in industrial revolution. The technological, economic and business significance of nanotechnology will be discussed as an “enabling” force with profound economic, business and societal impacts. Emerging new models of innovation by firms and by regions will be explored as well as related measurement tools to better understand the economic and business environment of disruptive nanotechnologies. Only one version of N SCI 104 or N ENG 104 may be taken for credit.

**N ENG 114 (= N SCI 114) Chemical Principles of Nanoscale Science and Engineering I (3)**Fundamental chemical principles for nanoscale materials and systems. Basic chemical concepts of energy, enthalpy, thermodynamics, and quantum atomic theory are introduced with a focus on application to nanoscale materials and application architectures. Fundamentals of chemical bonding in nanoscale materials (covalent, ionic) are covered. N ENG 114, N SCI 114 and Prerequisite(s): four years of high school science (earth science, biology, chemistry and physics), and mathematics through precalculus, or equivalent.

**N ENG 115 (= N SCI 115) Chemical Principles of Nanoscale Science and Engineering Laboratory I (1)**Laboratory experiences focus on the fundamental chemical principles for nanoscale materials and systems. Basic chemical concepts of energy, enthalpy, thermodynamics, and quantum atomic theory are introduced with a focus on application to nanoscale materials and application architectures. Fundamentals of chemical bonding in nanoscale materials (covalent, ionic) are covered. N ENG 115, and N SCI 115 may be used interchangeably toward the prerequisite in any course; only one version may be taken for credit. It is recommended that students take the lecture course and the laboratory simultaneously unless advised differently by their faculty advisor. Prerequisite(s) or co-requisite(s): four years of high school science (earth science, biology, chemistry and physics), and mathematics through precalculus, or equivalent.

**N ENG 116 (= N SCI 116) Chemical Principles of Nanoscale Science and Engineering II (3)**Introduces concepts of gas law, phases, equilibrium, and rates of reaction, applicable to nanoscale systems. Further development of the concepts and nature of chemical bonding are covered as well as applications of chemical principles to the structure of matter, molecular materials, and crystals. Only one of N SCI 116 or N ENG 116 may be taken for credit. Prerequisite(s): satisfactory completion of N SCI/N ENG 114 or permission of instructor.

**N ENG 117 (= N SCI 117)** **Chemical Principles of Nanoscale Science and Engineering Laboratory II (1)**Laboratory experiences focus on the concepts of gas law, phases, equilibrium, and rates of reaction, applicable to nanoscale systems. There is further development of the concepts and nature of chemical bonding and application of chemical principles to the structure of matter, molecular materials, and crystals. N ENG 117, N SCI 117 may be used interchangeably toward the prerequisite in any course; only one version may be taken for credit. It is recommended that students take the lecture course and the laboratory simultaneously unless advised differently by their faculty advisor. Prerequisite(s): satisfactory completion of N SCI/N ENG 114 and N SCI/N ENG 115 or permission of instructor.

**N ENG 126 (= N SCI 126) Physical Principles of Nanoscale Science and Engineering I (3)**Newtonian mechanics, motion, momentum, work-energy equivalence as applied to nanoscale materials and systems. Topics include: static, dynamics, and mechanics of bulk and nanoscale materials. Only one of N SCI 126 or N ENG 126 may be taken for credit. Prerequisite(s): four years of high school science (earth science, biology, chemistry and physics), and mathematics through precalculus, or equivalent.

**N ENG 127 (= N SCI 127)** **Physical Principles of Nanoscale Science and Engineering Laboratory I (1)**Laboratory experiences focus on Newtonian mechanics, motion, momentum, work-energy equivalence as applied to nanoscale materials and systems. Topics include: static, dynamics, and mechanics of bulk and nanoscale materials. N ENG 127, N SCI 127 may be used interchangeably toward the prerequisite in any course; only one version may be taken for credit. It is recommended that students take the lecture course and the laboratory simultaneously unless advised differently by their faculty advisor. Prerequisite(s) or corequisite(s): four years of high school science (earth science, biology, chemistry and physics), and mathematics through precalculus, or equivalent.

**N ENG 128 (= N SCI 128) Physical Principles of Nanoscale Science and Engineering II (3)**The course explores concepts of charge, electrostatic potential, current, and fields relevant to nanoscale materials, devices, and systems. Electrical properties of bulk and nanoscale metals, semiconductors, insulators, RCL circuit behavior, and Lorentz force are applied to nanoscale systems and materials. Only one of N SCI 128 or N ENG 128 may be taken for credit. Prerequisite(s): satisfactory completion of N SCI/N ENG 126 or permission of the instructor.

**N ENG 129 (= N SCI 129) Physical Principles of Nanoscale Science and Engineering Laboratory II (1)**Laboratory experiences focus on concepts of charge, electrostatic potential, current, and fields relevant to nanoscale materials, devices, and systems. The electrical properties of bulk and nanoscale metals, semiconductors, insulators, RCL circuit behavior and Lorentz force will be applied to nanoscale systems and materials. N ENG 129, N SCI 129 may be used interchangeably toward the prerequisite in any course; only one version may be taken for credit. It is recommended that students take the lecture course and the laboratory simultaneously unless advised differently by their faculty advisor. Prerequisite(s): satisfactory completion of N SCI/N ENG 126 and N SCI/N ENG 127 or permission of the instructor.

**N ENG 133 (= N SCI 133) Biological Principles of Nanoscale Science and Engineering I (3)**This course will introduce basic concepts in nanobiology and nanomedicine. The course will initially focus on fundamental biological principles such as DNA/RNA synthesis and replication, protein synthesis, and cellular structure/function. It is recommended that students take the lecture course and the laboratory simultaneously unless advised differently by their faculty advisor. Only one version of N SCI 133 or N ENG 133 may be taken for credit. Prerequisite(s): four years of high school science (earth science, biology, chemistry and physics), and mathematics through precalculus, or equivalent. Admission to the CNSE undergraduate programs and permission of the instructor.

**N ENG 134 (= N SCI 134)** **Biological Principles of Nanoscale Science and Engineering Laboratory I (1)**Laboratory experiences focusing on fundamental biological principles such as DNA/RNA synthesis and replication, protein synthesis, and cellular structure/function. Laboratories will introduce students to techniques and tools used in nanobioscience laboratories. Only one version of N SCI 134 or N ENG 134 may be taken for credit. Prerequisite(s): four years of high school science (earth science, biology, chemistry and physics), and mathematics through precalculus, or equivalent. Admission to the CNSE undergraduate programs and permission of the instructor.

**N ENG 135 (= N SCI 135) Biological Principles of Nanoscale Science and Engineering II (3)**The course will cover topics relating to the interface between nanosystems and biological systems. This will include general information about biomimetic systems and the uses of nanotechnology for biological research. It is recommended that students take the lecture course and the laboratory simultaneously unless advised differently by their faculty advisor. Only one version of N SCI 135 or N ENG 135 may be taken for credit. Prerequisite(s): satisfactory completion of N SCI/N ENG 133 and 134.

**N ENG 136 (= N SCI 136)** **Biological Principles of Nanoscale Science and Engineering Laboratory II (1)**Laboratory experiences focusing on the interface between nanosystems, biological systems, biomimetic systems, and the uses of nanotechnology for biological research. Laboratories will introduce students to techniques and tools used in nanobioscience laboratories. Only one version of N SCI 136 or N ENG 136 may be taken for credit. Prerequisite(s): satisfactory completion of N SCI/N ENG 133 and 134.

**N ENG 140 (= N SCI 140) Physical Principles of Nanoscale Science and Engineering III (3)**Formalism of vibratory phenomena (waves, oscillators, complex response functions) and scattering (including diffraction) as applied to nanoscale materials and systems. Wave nature of matter, DeBroglie hypothesis, fundamentals of the double slit experiment, electron diffraction, modern physics are covered. N ENG 140, and N SCI 140 may be used interchangeably toward the prerequisite in any course; only one version may be taken for credit. Prerequisite(s): satisfactory completion of N SCI/N ENG 128 and N SCI/N ENG 129 or permission of the instructor.

**N ENG 141 (= N SCI 141)** **Physical Principles of Nanoscale Science and Engineering III (1)**Laboratory experiences focus on vibratory phenomena (waves, oscillators, complex response functions) and scattering (including diffraction) as applied to nanoscale materials and systems. N ENG 141, and N SCI 141 may be used interchangeably toward the prerequisite in any course; only one version may be taken for credit. It is recommended that students take the lecture course and the laboratory simultaneously unless advised differently by their faculty advisor. Prerequisite(s): satisfactory completion of N SCI/N ENG 128 and N SCI/N ENG 129 or permission of the instructor.

**N ENG 201(= N SCI 201) Introduction to Nanoscale Engineering Design and Manufacturing (3)**Offers an introduction to basic principles, concepts, and knowledge of nanoscale engineering (design and manufacturing). The primary focus is on state-of-the-art semiconductor based chip design and technology. It includes emerging nanoscale processing-enabled future generation manufacturing. Lecture topics include design fundamentals, nanoscale functional components, design-for-manufacturing, nanoelectronics, and selected examples of real-world applications. Prerequisites: Satisfactory completion of NSCI/NENG 114 and 115, NSCI/NENG 116 and 117, NSCI/NENG 126 and 127, NSCI/NENG 128 and 129, MAT 151 or equivalent, and MAT 152 or equivalent.

**N ENG 202 Introduction to Computer Programming for Engineers (3)**Program and how to use computational techniques to solve nanoengineering problems. Topics include algorithms, simulation techniques, and use of software libraries. Prerequisite(s): satisfactory completion of N SCI/T SCI/N ENG, and N SCI/N ENG 126 and 127, and admitted to CNSE undergraduate programs.

**N ENG 203 Introduction to Nanoengineering Electronics (3)**An introductory hands-on course that provides basic knowledge and expertise to students to enable them to design and build custom electronic circuits, equipment and instruments. The course offers training in schematics, circuit board design, assembly as well as the ability to construct and test analog and digital circuits using electronic components. Prerequisites: Satisfactory completion of NSCI/NENG 114 and 115, NSCI/NENG 116 and 117, NSCI/NENG 126 and 127, NSCI/NENG 128 and 129, MAT 151 or equivalent and MAT 152 or equivalent.

**N ENG 301 Thermodynamics and Kinetics of Nanomaterials (3)**Develops the fundamentals of thermodynamics of nanoscale systems with respect to thermal, particle (chemical reaction-rate and stoichiometry) and mechanical equilibrium – with select applications to nano-biomolecular systems. Also introduces foundational concepts and approaches for kinetics and transport in nanoscale systems and materials including multi-component and ‘many phase’ nanoscale chemical and nano-biomolecular systems. Prerequisites: Satisfactory completion of MAT 230, NENG 128 and 129, ENG 202, and NENG 203.

**N ENG 302 Electronic, Optical and Magnetic Properties of Nanomaterials (3)**Presents the fundamental electronic, optical and magnetic properties of nanoscale materials and material systems as derived from underlying atomic, molecular and electronic configurations. Emphasis will be placed on understanding how these properties vary between different types of materials and how they can be tailored for specific nanotech applications (eg. Optoelectronic and photonic devices, transistors, LEDs, magnetic storage devices and solar cells). Course will include selected experimental spectroscopic, electrical and magnetic measurements/demos on prototypical nanoscale material or device systems. Prerequisites: Satisfactory completion of MAT 230, NENG 128 and 129, NENG 202, and NENG 203.

**N ENG 303 Mechanics of Nanomaterials (3)**Introduction to atomic and molecular origins of elastic response in nanscale materials. Presentation of elasticity theory in isotropic and anisotropic solids and generalization to classic stress-strain empirics in rectilinear structures (beams, rods, shafts, etc…). Introduction to ineleastic and nonlinear deformation in nanoscale materials – including thermal expansion, plastic deformation, fracture, creep, and dislocation-mediated plasticity in crystalline materials. Applications to selected nanoscale material systems including carbon-based nanomaterials and nanolectronic devices. Prerequisites: Satisfactory completion of MAT 230, NENG 128 and 129, NENG 202, and NENG 203.

**N ENG 304 Fluid Mechanics and Transport Processes (3)**Presents the fundamentals of heat, mass, and momentum transport as applied to micro and nanoscale systems, with specific emphasis on applications in the semiconductor industry. Both steady state and time-dependent problems will be covered as will convective transport in microfluidic devices and radiative heat transfer. Prerequisites: Satisfactory completion of NENG 301, NENG 302,NENG 303 and MAT 260. MAT 450 is recommended but not required.

**N ENG 390X Capstone Research I (3)**First course in a 3-course series representing an original, substantive, team-based research project to introduce the student to professional-level nanoscale science and engineering research. During this introductory course the student will work with a CNSE research team to investigate and identify a topical research problem of interest to the wide fields of nanoscale science and engineering. Emphasis will be placed on a functional understanding of the current technical, peer-reviewed literature in the area of interest and the drafting of a coherent research plan with relevant proof-of-concept research results. Prerequisite(s): satisfactory completion of N ENG 301, N ENG 302, and N ENG 303.

**N ENG 400 Topics in Nanoscale Engineering (3)**  
Selected topics in nanoscale engineering. May be repeated for credit when topic differs. Consult class schedule for specific topic. Prerequisite(s): permission of instructor.

**N ENG 405 Micro and Nano Materials Processing Technology (4)**Provides a basic knowledge of manufacturing processes utilized in the fabrication of semiconductor devices in the 300 and 450 mm fab environment. Processing that includes oxide deposition, photolithography, ion implantation, doping, passivation, etching, electroplating, planarization, etc. that are used in state-of-the-art fabrication of transistors, integrated circuits and similar device structures will be reviewed. Prerequisites: satisfactory completion of NENG 304 and NENG 390.

**N ENG 406 Fundamentals of Nanoelectronics (4)**Introduces students to nanoscale electronic devices. Includes basic, band theory-derived operation of semiconductor devices including p-n junctions (diodes) and transistors (bi-polar and classic field-effect devices). Classic, solid-state analysis of energy bands, electrostatic band-bending, diffusion current, drift current, carrier generation, and carrier recombination in both equilibrium and field-biased conditions. This analysis is combined with the introduction/review of quantum statistics for holes and electrons. Specific applications are treated with respect to metal-semiconductor contacts and selected semi-metal (carbon) systems. Students will be introduced to device-level testing through the use of advanced wafer level probes in the CNSE 300mm full flow process facility. Prerequisites: Satisfactory completion of NENG 304 and NENG 390.

**N ENG 407 Thin Film and Nanomaterials Characterization (4)**Introduces students to nanoscale electronic devices. Includes basic, band theory-derived operation of semiconductor devices including p-n junctions (diodes) and transistors (bi-polar and classic field-effect devices). Classic, solid-state analysis of energy bands, electrostatic band-bending, diffusion current, drift current, carrier generation, and carrier recombination in both equilibrium and field-biased conditions. This analysis is combined with the introduction/review of quantum statistics for holes and electrons. Specific applications are treated with respect to metal-semiconductor contacts and selected semi-metal (carbon) systems. Students will be introduced to device-level testing through the use of advance wafer level probes in the CNSE 300mm full flow process facility. Prerequisites: Satisfactory completion of NENG 304 and NENG 390.

**N ENG 408 Industrial Nanomanufacturing (3)**Materials and manufacturing based on nanoprocess systems. Industrial engineering concepts are introduced and the student prepared to perform basic engineering tasks, including design of workstations, cells and lines. The key in operating a manufacturing facility is to make optimum use of all of the available resources including labor, capital, technology, materials and time. Quality systems will cover metrology and overall systems for industrial and service companies, including DOE, SPC, ISO, QS, TQM. The materials used in electronic manufacturing will be reviewed including materials and components that are used to produce chips and systems. DOE will cover statistical methods for determining settings of independent experimental variables, prior to experimentation, in order to make meaningful inferences based upon subsequent measurements or simulations. Prerequisite(s): satisfactory completion of N ENG 405 and N ENG 406.

**N ENG 411 Nanoelectronic IC Fabrication Processes (3)**Basic tools and principles of single electronic component construction and some of the problem areas encountered are discussed. Structural and electrical differences between logic, DRAM, and flash devices will be given. Fundamental modules of ion implantation, PECVD, LPCVD, RIE behavior, control of profiles, diffusion, lithography, yield control tactics, deposition, and oxidation kinetics will be covered. Future changes will be given in terms of factors that drive speed of microprocessors. Prerequisite(s): permission of instructor.

**N ENG 412 Micro and Nano Devices and Circuits (3)**Micro-and nanoelectronic device definition, configuration, and modeling – including nanoelectronic circuit analysis and design. This course presents operational electronic principles of semiconductor devices (diodes and field-effect(MOS) devices) in terms of electronic transport and development of compact circuit models. Approaches and techniques to analyze and design transistor-based circuits are presented including low-swing and large-signal approaches. Exemplars are analyzed including basic amplification integrated circuits. Prerequisites: Permission of instructor.

**N ENG 413 Nanoscale Optical and Optoelectronic Devices (3)**  
Introduces the student to integrated nanoscale optical and optoelectronic devices. Material focuses on semiconductor-based devices including integrated optical modulators, detectors, laser diodes and special devices including vertical cavity-based geometries. Fabrication of nanoscale optical and optoelectronic devices will center on monolithic integration (e.g. Si-Ge based devices) and hybrid (e.g. III-V\_+Si) integrated systems incorporating integrated waveguides (Si photonics) and CMOS.System applications of optoelectronic devices will be discussed. Prerequisite: Permission of instructor.

**N ENG 414 Applications of Fields and Waves to Nanoscale Systems (3)**Starting from Maxwell's Equations, this course explores fundamental properties of quasistatic and dynamic properties of electromagnetic waves including: radiation, diffraction, plane waves in lossless and lossy media, skin effect, flow of electromagnetic power, Poynting's Theorem, interaction of fields with matter and particles, and applies these concepts to nanoscale systems and devices. Prerequisite(s): permission of instructor.

**N ENG 415 Nanoelectronic Devices (3)**  
In-depth review and analysis of the configuration, device physics, and operating modes in current and emerging nanoelectronic devices. Includes ‘post-roadmap’ devices beyond conventional MOS-based technology including carbon-based logic devices, memristor-based devices, single-electron devices, molecular devices (e.g.resonant tunneling) and other quantum-confined device structures. Prerequisite: Permission of instructor.

**N ENG 421 Introduction to Solar Cell Nanotechnology (3)**Covers physics of photovoltaic devices. Provides an introduction and overview of semiconductor physics relevant to solar cells, p-n junctions, and design and function of solar cells. Discussions will focus on first, second and third generation solar PV that includes mono and multi-crystalline silicon, thin films (CIGS, CdTe, GaAs) and tandem cells, as well as next generation organic and perovskite based solar cells. Topics will include nanotechnology impacts on solar devices that include cells, modules, measurement techniques, metrology, systems, reliability, operation, maintenance and economics of emerging solar cell technologies. Prerequisite: Permission of instructor.

**N ENG 422 Introduction to Fuel Cell Nanotechnology (3)**  
The course provides an introduction to the basic science and technology of fuel cells. It begins with an overview of the various types of fuel cells and their technologies including hydrogen production and storage. Next, the fundamental principles involved in the design and analysis of fuel cell components and systems are described. Topics include the thermodynamics of fuel cells, namely, cell equilibrium, standard potentials, and Nernst equation; ion conduction and sorption in proton-exchange membranes; mass transport in gas-diffusion layer; and kinetics and catalysis of electrocatalytic reactions of anode and cathode for hydrogen, direct methanol, solid oxide, and molten carbonate fuel cells. The transport and reaction in fuel cells are finally combined to provide their overall design and performance characteristics. Prerequisite(s): permission of instructor.

**N ENG 423 Renewable and Alternate Energy Nanotechnologies (3)**Provides a broad overview of the global energy landscape, growing energy demand and various energy options impacted by nanotechnology innovations. Diverse sources of renewable energies that include solar, hydroelectric, wind, biomass, fuel cells will be discussed in the context of efficiency, current state of development and economic feasibility. In addition, applying nanotechnology innovations to batteries, solar cells, super capacitors, fuel cells and superconductors will be reviewed. Prerequisite: Permission of instructor.

**N ENG 424 Nanoscale Chemical and Biological Sensors (3)**Principles of design, operation, and implementation principles of chemical and biological sensors. Focus on the application of fundamental sensing mechanisms and architectures to prevailing and emerging techniques for device design and integration within a specific chemical and/or biological sensing system. Emphasis will be placed on the engineering of the signal transduction mechanism and implications towards design and fabrication. Prerequisite(s): permission of instructor.

**N ENG 431 Advanced Materials Processing for NEMS/MEMS (4)**  
The course will cover advanced topics of good practices in the selection of organic and inorganic materials based on properties, processes and economics for product design. Students fabricate MOS capacitors, nanomechanical cantilevers, and micro/nanofluidic mixers. Prerequisite(s): permission of instructor.

**N ENG 432 Interfacial Engineering in Nanobiological Systems (3)**Fundamentals of interfacial dynamics, energy transduction, kinetics, and transport for nanobiological and bioengineered systems. This course will explore how biological systems interact with engineered systems at the nanoscale, including how energy is generated and transduced at the nano-bio interface.

**N ENG 433 NEMS/MEMS for Chemical and Biological Sensors (3)**  
NEMS/MEMS design, processing, fabrication approaches, and operational principles for chemical and biological sensors. Focus on fabrication strategies and techniques for integrating specific transduction techniques and engineered coatings for chemical and biological applications. Emphasis will be placed on design and fabrication to enable target sensitivity and selectivity. Prerequisite(s): permission of instructor.

**N ENG 434 BioMEMS and BioNEMS (3)**Introduction to the cross-disciplinary application of MEMS and NEMS to the biological sciences. Topics include the interaction of living cells/tissues with nanofabricated structures, micro/nanofluidics for the movement and control of solutions, and the development of I/O architectures for efficient readout of bio-reactions. Prerequisite(s): permission of instructor.

**N ENG 435 Nanobiological Systems (3)**  
Introduction to basic concepts in nanobiology and the interface between nano and biological systems. This course will seek to introduce basic nanobiological concepts to non-biologists. The course will initially focus on fundamental biological principles such as DNA/RNA synthesis/replication, protein synthesis, and the biochemistry of basic biomolecules and cells. The course will then discuss nanobiological applications. These include biosensors, bioinformatics, nanobiological materials, and biomimetics. Prerequisite(s): permission of instructor.

**N ENG 441 Nanoscale Patterning (3)**The class will follow the transition of a sample pattern from a CAD file to its physical realization for both production manufacturing and research. Topics covered include optical reduction lithography, electron beam lithography, imprint lithography and resist systems. Sources of error and error characterization of pattern placement, size control and pattern fidelity. Practical limits of resolution will be discussed. Prerequisite(s): permission of instructor.

**N ENG 442 Light Optics for Nanoengineering (3)**  
Applied optics for nanoscale patterning and metrology. Paraxial optics, lens makers equation, 3rd order optics, Seidel aberrations, Zernike polynomials, compound systems, numerical aperture, diffraction limit. Specific examples applied to lithography using 193nm immersion and EUV techniques. Optical specifications for patterning and metrology equipment including economic tradeoffs are covered as well as techniques for optical resolution enhancement. Prerequisite(s): permission of instructor.

**N ENG 443 Charged Particle Optics for Nanoengineering (3)**Applied optics using charged particles for nanoscale patterning and metrology. Lorentz force law, electrostatic and magneto static lenses. Sources, correction and deflection elements, geometrical optics based upon relativistic classical mechanics, quantum based wave optics are introduced. Prerequisite(s): permission of instructor.

**N ENG 444 Electron Beam Pattern Generation (3)**  
A comprehensive review of electron beam pattern generator technology including beam generation, control electronics, mechanical subsystems and system software. Special attention will be given to issues that arise when patterning for nanoscale dimensions and accuracy such as proximity effects and throughput limitations. Prerequisite(s): permission of instructor.

**N ENG 451 Nanophotonics (3)**Presents and reviews recent advances in nanophotonic devices/systems and photonic integrated circuits (PICs). Includes operating principles of nanophotonic devices (light sources, modulators, couplers, waveguides, and optical plasmonics) and PIC fabrication methodologies including monolithic and polylithic integration schemes. Prerequisite: Permission of instructor.

**N ENG 452 Magnetic Nanostructures (3)**  
Fundamentals and applications of magnetic and spintronic nanostructures. Includes an overview of quantum-based magnetism (magnetic moments, exchange interaction, para-, ferro- and antiferro-magnetism), magnetic device geometries (e.g. magnetic tunnel junctions), and spintronic materials and nanostructured devices (e.g. spin-torque transfer). Topics will include applications in spin-based logic and memory devices. Prerequisite: Permission of instructor.

**N ENG 453 Organic Semiconductors (3)**Presents an overview of organic semiconductors and selected applications. Introduction to band theory and HOMO/LUMO structures in molecular and organic semiconducting systems. Includes structure-property relations based on molecular conformation and long-range/short-range order (e.g. band gap, carrier mobility, doping, etc…) Device configurations will be reviewed including FET geometries, diode geometries, and photo-emitting/detecting geometries. Prerequisite: Permission of instructor.

**N ENG 454 Analysis of Thin Films and Interfaces (3)**  
The engineering of functional thin films requires detailed analysis of the nanostructured films and their interfaces to develop optimum properties. Techniques covered include Grazing Incidence X-Ray Diffraction (GIXRD), Auger Electron Spectroscopy (AES), Rutherford Backscattering Spectroscopy (RBS), Secondary Ion Mass Spectroscopy (SIMS), Time of Flight SIMS, and X-Ray photoelectron Spectroscopy (XPS). Prerequisite: Permission of Instructor.

**N ENG 455 Nanoscale Polymer Science & Engineering (3)**Introduces students to polymer terminology, structure and properties of polymeric materials, synthesis and use of natural and synthetic polymers, and characterization, processing and manufacturing of polymeric or macromolecular materials at the nanoscale for applications in semiconductors, bioscience and energy. Specific topics cover definitions, classifications and states of matter, homopolymers, tacticity and stereochemistry, copolymers, block polymers, branched polymers, mechanical properties of elasticity and viscoelasticity, glass transition, step and chain growth polymerization, initiators, terminators, ceiling temperature, smart polymers, thermo-responsiveness, molecular weight and polydispersity, polymer melts, rubber elasticity, crystalline and amorphous structures, photoreactive and semiconducting polymers, and nanocomposition, relevant to polymer engineering applications. Prerequisite: Permission of instructor.

**N ENG 456 Nanoscale Interfacial Engineering (3)**  
The dynamic behavior of fluid interfaces. Concepts of interfacial stress, dynamic interfacial properties, and surfactant adsorption applied to surface tension driven flow, interfacial instabilities, and the influence of surface-active agents on interfacial hydrodynamics. Prerequisite(s): permission of instructor.

**N ENG 457 Modeling of Nanomaterials and Systems (3)**Topics covered include modeling and simulation of nanomaterials systems. The course provides an introductory understanding of materials behavior in order to predict nanostructured properties at atomistic scales by applying fundamental principles of modeling and simulation. Prerequisites: Permission of instructor.

**N ENG 490 Capstone Research II. Team Research and Project Review (3)**  
Second course in a 3-course series representing and original, substantive, team-based research project to introduce the student to professional-level nanoscale science and engineering research. During this intermediate course the student will report progress of the CNSE research team in the designated project area focusing on the student's efforts and results. This 'project review' will conform to prevailing formats and reporting structures for profession-level industry or government-funded research to introduce the student to professional research management. Emphasis will be placed on implementation of the student's research plan and reporting of progress or challenges encountered. N ENG 491 is the honors version of N ENG 490; only one version may be taken for credit. Prerequisite(s): satisfactory completion of N ENG 304 and N ENG 390X.

**N ENG 491 Capstone Research II. Team Research and Project Review (Honors) (3)**N ENG 491 is the honors version of N ENG 490; only one version may be taken for credit. Prerequisite(s): satisfactory completion of N ENG 304 and N ENG 390X and admission to the Nanoengineering Honors Program.

**N ENG 492W Capstone Research III. Team Research and Final Report (3)**  
Third course in a 3-course series representing and original, substantive, team-based research project to introduce the student to professional-level nanoscale engineering research. During this final course the student will provide a final report on the research project with an emphasis placed on achievement of the initial goals of the study as well as challenges encountered and lessons learned. N ENG 493W is the honors version of 492W; only one version may be taken for credit. Prerequisite(s): N ENG 490 or 491 (Honors) and permission of instructor.

**N ENG 493W Capstone Research III. Team Research and Final Report (Honors) (3)**This course is the honors program version of N ENG 492W; the student will take on a more in-depth topic, and the research thesis produced will be presented publicly to the CNSE faculty and students. N ENG 493W is the honors version of 492W; only one version may be taken for credit. Prerequisite(s): permission of CNSE Honors Director and satisfactory completion of N ENG 491.

**N ENG 498 Current Topics in Nanoscale Science and Engineering (1-6)**  
Seminar course for upper-level undergraduate students. Students will receive individualized instruction regarding literature review on topics relevant to student's capstone research and concentration areas. Prerequisite(s): permission of instructor.

**N SCI 101 (= N ENG 101) Nanotechnology Survey (3)**Introduction to the definitions, principles and applications of nanotechnology. Discussion of emergent nanoscale properties, atomic and molecular self-assembly and concepts of bottom-up and top-down processing and fabrication. Introduction to selected nanoscale systems, including quantum dots, carbon nanotubes, and graphene. Only one version of N SCI 101 or N ENG 101 may be taken for credit.

**N SCI 102/102Z (= N ENG 102/102Z) Societal Impacts of Nanotechnology (3)**Introduction to the societal implications of nanotechnology innovation including public perception of nanotechnology, public impacts, nanomaterials risk assessment, and impacts of nanotechnology on public health policy and energy/environmental sustainability. Only one version of N SCI 102 or N ENG 102 may be taken for credit.

**N SCI 103 (= N ENG 103) Economic Impacts of Nanotechnology (3)**Introduction to the economic impacts of nanotechnology innovation. Basic economic principles will be presented and discussed in terms of emerging nanotechnologies. Topics will include economics of nanoelectronics; nanoscale technologies for energy and the environment; and nanobioscience/nanobioengineering. Only one version of N SCI 103 or N ENG 103 may be taken for credit.

**N SCI 104 (= N ENG 104) Disruptive Nanotechnologies (3)**Nanoscale technological innovation as central to the economic growth process will be examined within a historical context leading to an understanding of nanoscale technology evolution in industrial revolution. The technological, economic and business significance of nanotechnology will be discussed as an “enabling” force with profound economic, business and societal impacts. Emerging new models of innovation by firms and by regions will be explored as well as related measurement tools to better understand the economic and business environment of disruptive nanotechnologies. Only one version of N SCI 104 or N ENG 104 may be taken for credit.

**N SCI 114 (= N ENG 114) Chemical Principles of Nanoscale Science and Engineering I (3)**Fundamental chemical principles for nanoscale materials and systems. Basic chemical concepts of energy, enthalpy, thermodynamics, and quantum atomic theory are introduced with a focus on application to nanoscale materials and application architectures. Fundamentals of chemical bonding in nanoscale materials (covalent, ionic) are covered. N ENG 114, N SCI 114 may be used interchangeably toward the prerequisite in any course; only one version may be taken for credit. Prerequisite(s): four years of high school science (earth science, biology, chemistry and physics), and mathematics through precalculus, or equivalent.

**N SCI 115 (= N ENG 115) Chemical Principles of Nanoscale Science and Engineering Laboratory I (1)**Laboratory experiences focus on the fundamental chemical principles for nanoscale materials and systems. Basic chemical concepts of energy, enthalpy, thermodynamics, and quantum atomic theory are introduced with a focus on application to nanoscale materials and application architectures. Fundamentals of chemical bonding in nanoscale materials (covalent, ionic) are covered. N ENG 115, and N SCI 115 may be used interchangeably toward the prerequisite in any course; only one version may be taken for credit. It is recommended that students take the lecture course and the laboratory simultaneously unless advised differently by their faculty advisor. Prerequisite(s) or corequisite(s): four years of high school science (earth science, biology, chemistry and physics), and mathematics through precalculus, or equivalent.

**N SCI 116 (= N ENG 116) Chemical Principles of Nanoscale Science and Engineering II (3)**Introduces concepts of gas law, phases, equilibrium, and rates of reaction, applicable to nanoscale systems. Further development of the concepts and nature of chemical bonding are covered as well as applications of chemical principles to the structure of matter, molecular materials, and crystals. Only one of N SCI 116 or N ENG 116 may be taken for credit. Prerequisite(s): satisfactory completion of N SCI/N ENG 114 or permission of instructor.

**N SCI 117 (= N SCI 117)** **Chemical Principles of Nanoscale Science and Engineering Laboratory II (1)**Laboratory experiences focus on the concepts of gas law, phases, equilibrium, and rates of reaction, applicable to nanoscale systems. There is further development of the concepts and nature of chemical bonding and application of chemical principles to the structure of matter, molecular materials, and crystals. N ENG 117, N SCI 117 may be used interchangeably toward the prerequisite in any course; only one version may be taken for credit. It is recommended that students take the lecture course and the laboratory simultaneously unless advised differently by their faculty advisor. Prerequisite(s): satisfactory completion of N SCI/N ENG 114 and N SCI/N ENG 115 or permission of instructor.

**N SCI 126 (= N ENG 126) Physical Principles of Nanoscale Science and Engineering I (3)**Newtonian mechanics, motion, momentum, work-energy equivalence as applied to nanoscale materials and systems. Topics include: static, dynamics, and mechanics of bulk and nanoscale materials. Only one of N SCI 126 or N ENG 126 may be taken for credit. Prerequisite(s): four years of high school science (earth science, biology, chemistry and physics), and mathematics through precalculus, or equivalent.

**N SCI 127 (= N ENG 127) Physical Principles of Nanoscale Science and Engineering Laboratory I (1)**Laboratory experiences focus on Newtonian mechanics, motion, momentum, work-energy equivalence as applied to nanoscale materials and systems. Topics include: static, dynamics, and mechanics of bulk and nanoscale materials. N ENG 127, N SCI 127 may be used interchangeably toward the prerequisite in any course; only one version may be taken for credit. It is recommended that students take the lecture course and the laboratory simultaneously unless advised differently by their faculty advisor. Prerequisite(s) or corequisite(s): four years of high school science (earth science, biology, chemistry and physics), and mathematics through precalculus, or equivalent.

**N SCI 128 (= N ENG 128) Physical Principles of Nanoscale Science and Engineering II (3)**The course explores concepts of charge, electrostatic potential, current, and fields relevant to nanoscale materials, devices, and systems. Electrical properties of bulk and nanoscale metals, semiconductors, insulators, RCL circuit behavior, and Lorentz force are applied to nanoscale systems and materials. Only one of N SCI 128 or N ENG 128 may be taken for credit. Prerequisite(s): satisfactory completion of N SCI/N ENG 126 or permission of the instructor.

**N SCI 129 (= N ENG 129)** **Physical Principles of Nanoscale Science and Engineering Laboratory II (1)**Laboratory experiences focus on concepts of charge, electrostatic potential, current, and fields relevant to nanoscale materials, devices, and systems. The electrical properties of bulk and nanoscale metals, semiconductors, insulators, RCL circuit behavior and Lorentz force will be applied to nanoscale systems and materials. N ENG 129, N SCI 129 may be used interchangeably toward the prerequisite in any course; only one version may be taken for credit. It is recommended that students take the lecture course and the laboratory simultaneously unless advised differently by their faculty advisor. Prerequisite(s): satisfactory completion of N SCI/N ENG 126 and N SCI/N ENG 127 or permission of the instructor.

**N SCI 133 (= N ENG 133) Biological Principles of Nanoscale Science and Engineering I (3)**This course will introduce basic concepts in nanobiology and nanomedicine. The course will initially focus on fundamental biological principles such as DNA/RNA synthesis and replication, protein synthesis, and cellular structure/function. It is recommended that students take the lecture course and the laboratory simultaneously unless advised differently by their faculty advisor. Only one version of N SCI 133 or N ENG 133 may be taken for credit. Prerequisite(s): four years of high school science (earth science, biology, chemistry and physics), and mathematics through precalculus, or equivalent. Admission to the CNSE undergraduate programs and permission of the instructor.

**N SCI 134 (= N ENG 134)** **Biological Principles of Nanoscale Science and Engineering Laboratory I (1)**Laboratory experiences focusing on fundamental biological principles such as DNA/RNA synthesis and replication, protein synthesis, and cellular structure/function. Laboratories will introduce students to techniques and tools used in nanobioscience laboratories. Only one version of N SCI 134 or N ENG 134 may be taken for credit. Prerequisite(s): four years of high school science (earth science, biology, chemistry and physics), and mathematics through precalculus, or equivalent. Admission to the CNSE undergraduate programs and permission of the instructor.

**N SCI 135 (= N ENG 135) Biological Principles of Nanoscale Science and Engineering II (3)**  
The course will cover topics relating to the interface between nanosystems and biological systems. This will include general information about biomimetic systems and the uses of nanotechnology for biological research. It is recommended that students take the lecture course and the laboratory simultaneously unless advised differently by their faculty advisor. Only one version of N SCI 135 or N ENG 135 may be taken for credit. Prerequisite(s): satisfactory completion of N SCI/N ENG 133 and 134.

**N SCI 136 (= N ENG 136) Biological Principles of Nanoscale Science and Engineering Laboratory II (1)**Laboratory experiences focusing on the interface between nanosystems, biological systems, biomimetic systems, and the uses of nanotechnology for biological research. Laboratories will introduce students to techniques and tools used in nanobioscience laboratories. Only one version of N SCI 136 or N ENG 136 may be taken for credit. Prerequisite(s): satisfactory completion of N SCI/N ENG 133 and 134.

**N SCI 140 (= N ENG 140) Physical Principles of Nanoscale Science and Engineering III (3)**Formalism of vibratory phenomena (waves, oscillators, complex response functions) and scattering (including diffraction) as applied to nanoscale materials and systems. Wave nature of matter, DeBroglie hypothesis, fundamentals of the double slit experiment, electron diffraction, modern physics are covered. N ENG 140, and N SCI 140 may be used interchangeably toward the prerequisite in any course; only one version may be taken for credit. Prerequisite(s): satisfactory completion of N SCI/N ENG 128 and N SCI/N ENG 129 or permission of the instructor.

**N SCI 141 (= N ENG 141)** **Physical Principles of Nanoscale Science and Engineering III (3)**Laboratory experiences focus on vibratory phenomena (waves, oscillators, complex response functions) and scattering (including diffraction) as applied to nanoscale materials and systems. N ENG 141, and N SCI 141 may be used interchangeably toward the prerequisite in any course; only one version may be taken for credit. It is recommended that students take the lecture course and the laboratory simultaneously unless advised differently by their faculty advisor. Prerequisite(s): satisfactory completion of N SCI/N ENG 128 and N SCI/N ENG 129 or permission of the instructor.

**N SCI 201(= N ENG 201) Introduction to Nanoscale Engineering Design and Manufacturing (3)**Offers an introduction to basic principles, concepts, and knowledge of nanoscale engineering (design and manufacturing) to undergraduate students at CNSE. The primary focus is on state-of-the-art semiconductor based chip design and technology. It includes emerging nanoscale processing-enabled “future generation manufacturing”. Lecture topics include design fundamentals, nanoscale functional components, design-for-manufacturing, nanoelectronics, and selected examples of real-world applications. Prerequisites: Satisfactory completion of NSCI/NENG 114 and 115, NSCI/NENG 116 and 117, NSCI/NENG 126 and 127, NSCI/NENG 128 and 129, MAT 151 or equivalent, and MAT 152 or equivalent.

**N SCI 202 Computer Control of Instrumentation (2)**Introduction to computer-based automation and control for instrumentation. This course will focus on the use of software (e.g., LabView) and interface cards for controlling processing and analytical tools as well as customized configuration of multiple pieces of equipment for integrated experimental data acquisition and analysis. Prerequisite(s): satisfactory completion of N SCI/T SCI/N ENG 115, N SCI/N ENG 116 and 117, N SCI/N ENG 126 and 127, N SCI/N ENG 128 and 129, A MAT 112 or A MAT 118 or T MAT 118, and A MAT 113 or A MAT 119 or T MAT 119, or equivalent.

**N SCI 203 Advanced Circuits Laboratory (3)**  
Provides students with a working knowledge of reading electronic circuit schematics and the foundational understanding in electronic circuits to enable students to design, build, and analyze standard analog and digital circuitry. Course will include signal measurement and analysis principles and techniques. Students will utilize modern equipment and automation software for circuit design, analysis, measurement and data acquisition. Prerequisites: Satisfactory completion of NSCI/NENG 114 and 115, NSCI/NENG 116 and 117, NSCI/NENG 126 and 127, NSCI/NENG 128 and 129, MAT 151 or equivalent and MAT 152 or equivalent.

**N SCI 204 Finite Element Modeling (2)**Introduction to principles of finite element modeling and utilization of standard commercial software packages (MATLAB, Intellisuite, ANSYS) for modeling of mechanical, transport, and electromagnetic response of nanoscale systems. Prerequisite(s): satisfactory completion of N SCI/T SCI/N ENG 115, N SCI/N ENG 116 and 117, N SCI/N ENG 126 and 127, N SCI/N ENG 128 and 129, A MAT 112 or A MAT 118 or T MAT 118, and A MAT 113 or A MAT 119 or T MAT 119, or equivalent.

**N SCI 205 Numerical Simulation (2)**  
Introduction to standard numerical simulation approaches for nanoscale materials, system and devices using custom and commercial packages. Topics will include direct numerical calculation, simulators and field solvers in addition to statistical (Monte Carlo) approaches for materials analysis. Prerequisite(s): satisfactory completion of N SCI/T SCI/N ENG 115, N SCI/N ENG 116 and 117, N SCI/N ENG 126 and 127, N SCI/N ENG 128 and 129, A MAT 112 or A MAT 118 or T MAT 118, and A MAT 113 or A MAT 119 or T MAT 119, or equivalent.

**N SCI 210 Introduction to Nanobioscience Methods and Skills (3)**  
This course introduces undergraduate nanoscale science students to the skills, techniques, and methods used in the biological and life sciences. Nanoscience students will be introduced to genetics, molecular and cell biology, virology, bacteriology, immunology, stem cell research. Students will learn the details and background necessary for a solid understanding of biological systems and the nanotechnology that enables the study of these systems. The course will examine laboratory and statistical methods including quality control, normal ranges, and universal precautions and data interpretation. Prerequisite(s): satisfactory completion of N SCI/N ENG 116 or permission of instructor.

**N SCI 220 Structure of Matter (3)**Course focusing on the chemical bonding and symmetry of clusters, crystal lattices, amorphous materials and organized molecular structures. Emphasis will also be placed on various concepts, constructs, and techniques for characterizing nanoscale structures including the structure factor, diffraction, and the radial distribution function. Prerequisite(s): satisfactory completion of N SCI/T SCI/N ENG 115, N SCI/N ENG 116 and 117, N SCI/N ENG 126 and 127, N SCI/N ENG 128 and 129, A MAT 112 or A MAT 118 or T MAT 118, and A MAT 113 or A MAT 119 or T MAT 119, or equivalent.

**N SCI 230 Thermodynamics and Statistical Mechanics for Nanoscale Systems (3)**Applications of thermodynamics and statistical mechanics to nanoscale materials and systems with an emphasis on the laws of thermodynamics, phase equilibria, chemical potential, Gibbs-Duhem relation, Boltzman, Fermi-Dirac, and Bose-Einstein distribution functions, ensemble behavior. Prerequisite(s): satisfactory completion of N SCI/T SCI/N ENG 115, N SCI/N ENG 116 and 117, N SCI/N ENG 126 and 127, N SCI/N ENG 128 and 129, A MAT 112 or A MAT 118 or T MAT 118, and A MAT 113 or A MAT 119 or T MAT 119, or equivalent.

**N SCI 240 Biochemical Principles for Nanoscale Science (3)**This course will cover basic chemical concepts of chemical/biological signaling, surface binding, and selectivity. The course will also focus on chemical interactions at gas, fluid, and solid interfaces for nanobiosystems. Includes laboratory section. Prerequisite(s): admission to the nanoscience honors program and satisfactory completion of N SCI/T SCI/N ENG 115, N SCI/N ENG 116 and 117, N SCI/N ENG 126 and 127, N SCI/N ENG 128 and 129, A MAT 112 or A MAT 118 or T MAT 118, and A MAT 113 or A MAT 119 or T MAT 119, or equivalent.

**N SCI 300 Integrated NanoLaboratory I (3)**  
Advanced laboratory training for undergraduates. This laboratory will promote hands-on use of advanced CNSE processing, characterization, and integration laboratories including selected toolsets for 200mm and 300mm wafer design, fabrication, processing and metrology. Course will focus on operating principles of selected processing, testing, and metrology tools. Prerequisite(s): satisfactory completion of N SCI 220, N SCI 230 and A MAT 220.

**N SCI 305 Integrated NanoLaboratory II (3)**Advanced laboratory training for undergraduates. This laboratory will promote hands-on use of advanced CNSE processing, characterization, and integration laboratories including selected toolsets for 200mm and 300mm wafer design, fabrication, processing and metrology. Course will focus on integration of processing, fabrication, and metrology tools for construction, analysis, and testing of device structures. Prerequisite(s): satisfactory completion of N SCI 300 and permission of instructor.

**N SCI 310 Nanoscale Surfaces and Interfaces (3)**  
Structure of surfaces and interfaces at the nanometer length scale. Diffusion, adsorption, chemisorption, and physisorption of atomic and molecular species at surfaces and interfaces are covered. Provides an overview of analytic approaches for surface and interfacial characterization and metrology. Prerequisite(s): satisfactory completion of N SCI 220, and N SCI 230.

**N SCI 320 Advanced Physical/Chemical Concepts for Nanoscale Science (3)**Advanced course focusing on physical/chemical concepts and their application to nanoscale materials and systems. Topics will include advanced treatment of energy levels, orbital theory, spectroscopy, phase transformations, kinetics, and diffusion. Prerequisite(s): satisfactory completion of N SCI 220, and N SCI 230.

**N SCI 330 Energetics and Kinetics in Nanobiological Systems (3)**  
For this course, energy transduction, kinetics, and transport for nanobiological systems will be explored at an advanced level. Topics covered will include oxidation/reduction pathways, electron transport, chemical/electrical gradients, energy transduction and basic biochemical kinetics. Prerequisite(s): satisfactory completion of N SCI 220, and N SCI 230.

**N SCI 350 Introduction to Quantum Theory for Nanoscale Systems (3)**Introduction to solid-state quantum theory for nanoscale systems. Fundamental quantum mechanical formalisms applicable to solid-state materials, solution of Schrödinger equation for period potentials and application to nanoscale phenomena, such as tunneling and localization are covered. Prerequisite(s): satisfactory completion of N SCI 220, and N SCI 230.

**N SCI 360 Nanoscale Molecular Materials and Soft Matter (3)**  
Structure-property relations and chemistry of synthetic polymers, biological macromolecules, gels, foams, emulsions and colloids. Prerequisite(s): satisfactory completion of N SCI 300 and N SCI 350.

**N SCI 390X Capstone Research I. Introduction and Literature Review (3)**First course in a 3-course series representing and original, substantive, team-based research project to introduce the student to professional-level nanoscale science research. During this introductory course the student will work with a CNSE research team to investigate and identify a topical research problem of interest to the wide fields of nanoscale science. Emphasis will be placed on a functional understanding of the current technical, peer-reviewed literature in the area of interest and the drafting of a coherent research plan with relevant proof-of-concept research results. Prerequisite(s): permission of instructor and satisfactory completion of N SCI 300 and N SCI 350.

**N SCI 400 Topics of Nanoscale Science (3)**  
Selected topics in nanoscale science. May be repeated for credit when topic differs. Consult class schedule for specific topic. Prerequisite(s): permission of instructor.

**N SCI 410 Quantum Origins of Material Properties (3)**  
This course will focus on the quantum properties of a variety of materials systems and how these properties govern bulk and nanoscale material characteristics. Topics will focus on discrete energy levels and orbital theory and relation to spectroscopy, material phase transformations and kinetics. Prerequisite(s): satisfactory completion of N SCI 300, and N SCI 305, and N SCI 360.

**N SCI 420 Electronic Properties of Nanomaterials (3)**Electron transport in metals, properties of dielectric materials including insulators and semiconductors. Topics include electron energies in solids, the statistical physics of carrier concentration and motion in crystals, and energy band models in silicon and well as compound semiconductors. Prerequisite(s): satisfactory completion of N SCI 300, and N SCI 305, and N SCI 360.

**N SCI 421 Nanoscale Electronic Devices (3)**  
This course will focus on nanoscale device and device geometries based on semiconductor materials. Topics include drift and diffusion currents, recombination-generation of carriers, continuity equations, and the p-n junction under equilibrium and bias conditions, and metal-semiconductor Schottky and ohmic contacts. Non-idealities associated with real diodes are introduced. Prerequisite(s): satisfactory completion of N SCI 300, and N SCI 305, and N SCI 360.

**N SCI 422 Concepts in Molecular Electronics (3)**This course will focus on nanoelectronic materials based on individual molecules or nanoscale molecular assemblies. Will examine electronic polymers, carbon nanotubes, molecular wires, and discuss aspects of electronic band structure and carrier densities, and charge transport in 1-dimensional covalently bonded materials. Prerequisite(s): satisfactory completion of N SCI 300, and N SCI 305, and N SCI 360.

**N SCI 423 Magnetic and Spintronic Materials and Devices (3)**  
Introduction to magnetic materials and nanoscale structures for spintronic manipulation. This course will focus on the fundamental science of magnetism and local electron spin manipulation, transport and coupling. Devices based on the addition of the spin degree of freedom to conventional charge-based electronic devices, such as Spin-FET will be discussed. Prerequisite(s): satisfactory completion of N SCI 300, and N SCI 305, and N SCI 360.

**N SCI 424 Optoelectronic Materials and Devices (3)**Introduction to semiconductor optoelectronic materials for optoelectronic applications. This course will cover topics including design, operating principles and practical device features. Review of relevant semiconductor physics, optical processes in semiconductors, waveguides, and microcavities will be discussed. Operational principals of light emitting diodes and lasers, photodetectors, and solar cells will be introduced. Prerequisite(s): satisfactory completion of N SCI 300, and N SCI 305, and N SCI 360.

**N SCI 430 Nanoscale Physical Properties in Reduced Dimensions (3)**  
Origin of electrical, optical, and thermomechanical properties in two-, one- and zero dimensional systems, including thin films, graphene, carbon nanotubes, nanowires, and quantum dots. Prerequisite(s): satisfactory completion of N SCI 300, and N SCI 305, and N SCI 360.

**N SCI 431 Growth of Nanostructured Materials (3)**Nucleation and growth in confined systems, growth of carbon nanotubes, plasma and thermally assisted deposition processes, nature of plasmas. Prerequisite(s): satisfactory completion of N SCI 300, and N SCI 305, and N SCI 360.

**N SCI 432 Particle Induced Chemistry (3)**  
Processing materials with nanometer-scale resolution using energetic particle beams. Topics include EUV lithography, electron beam lithography, and electron- and ion-beam induced etching and deposition from precursors. Prerequisite(s): satisfactory completion of N SCI 300, and N SCI 305, and N SCI 360.

**N SCI 433 Properties of Nanoscale Composite Structures (3)**  
Introduction to mechanical, electronic, magnetic, and optical properties of nanoscale composite structures. Topics will include multilayer composites, nanoparticle composites, porous media, and biomaterial composites. Prerequisite(s): satisfactory completion of N SCI 300, and N SCI 305, and N SCI 360.

**N SCI 434 Nanostructural Characterization Techniques (3)**Prevailing methods and instrumentation for characterization and metrology of nanostructured materials and devices. Topics include nanoscale microscopy (optical, electron-based, ion-based, and scanning-probe based), composition analysis (optical and x-ray spectroscopy, electron spectroscopy, ion spectroscopy) and selected structural analyses (x-ray and electron diffraction). Prerequisites: Satisfactory completion of NSCI 300, NSCI 305, and NSCI 360.

**N SCI 440 Biological Architectures for Nanotechnology Applications (3)**  
Concepts of structure, function and self-assembly in biological systems and their applications in nanotechnology. Topics include structure and function of biological macromolecules, self-assembly of these molecules, and their use for nanofabrication and other nanoscale applications. Prerequisite(s): satisfactory completion of N SCI 300, and N SCI 305, and N SCI 360.

**N SCI 441 Nanobiology for Nanotechnology Applications (3)**The course will provide an understanding of how structure, functionality, energy transduction and kinetic properties of biological systems can be applied to nanotechnology. Topics will include biosensors, bio-MEMS/NEMS, biomolecular electronics, energy production, or other nanobiological systems. Prerequisite(s): satisfactory completion of N SCI 300, and N SCI 305, and N SCI 360.

**N SCI 442 Nanoscale Bio-Inorganic Interfaces (3)**  
This course will introduce fundamental concepts for interfacial dynamics in nanobiosystems. Biological and chemical interactions with nanomaterials will be explored, as well as advanced concepts of chemical/biological signaling, surface binding, and selectivity. Biological-inorganic interfaces will be explored including novel approaches for material characterization and integration in nanoscale and microscale devices. Prerequisites: satisfactory completion of N SCI 300, N SCI 305, and N SCI 360.

**N SCI 443 Biological Routes for Nanomaterials Synthesis (3)**Applications of biological synthesis routes for nanomaterials fabrication. Emphasis will be placed on adaptation of genetic and biochemical routes for the production of tailored materials for molecular self-assembly or nanoscale interfacial engineering. Prerequisite(s): satisfactory completion of N SCI 300, and N SCI 305, and N SCI 360.

**N SCI 490 Capstone Research II. Team Research and Project Review (3)**  
Second course in a 3-course series representing and original, substantive, team-based research project to introduce the student to professional-level nanoscale science and engineering research. During this intermediate course the student will report progress of the CNSE research team in the designated project area focusing on the student’s efforts and results. This ‘project review’ will conform to prevailing formats and reporting structures for profession-level industry or government-funded research to introduce the student to professional research management. Emphasis will be placed on implementation of the student’s research plan and reporting of progress or challenges encountered. N SCI 491 is the honors version of N SCI 490; only one version may be taken for credit. Prerequisite(s): satisfactory completion of N SCI 300, N SCI 305, N SCI 360 and N SCI 390X.

**N SCI 491 Capstone Research II. Team Research and Project Review (Honors) (3)**N SCI 491 is the honors version of N SCI 490; only one version may be taken for credit. Prerequisite(s): satisfactory completion of N SCI 300, and N SCI 305, N SCI 360, and N SCI 390X and admission to the Nanoscience Honors Program.

**N SCI 492W Capstone Research III. Team Research and Final Report (3)**  
Third course in a 3-course series representing and original, substantive, team-based research project to introduce the student to professional-level nanoscale science research. During this final course the student will provide a final report on the research project with an emphasis placed on achievement of the initial goals of the study as well as challenges encountered and lessons learned. N SCI 493W is the honors version of 492W; only one version may be taken for credit. Prerequisite(s): permission of instructor.

**N SCI 493W Capstone Research III. Team Research and Final Report (Honors) (3)**This course is the honors program version of N SCI 492W; the student will take on a more in-depth topic, and the research thesis produced will be presented publicly to the CNSE faculty and students. Only one version of N SCI 492W and N SCI 493W may be taken for credit. Prerequisite(s): permission of CNSE Honors Director and completion of N SCI 491.

**N SCI 498 Current Topics in Nanoscale Science and Engineering (1-6)**  
Seminar course for upper-level undergraduate students. Students will receive individualized instruction regarding literature review on topics relevant to student’s capstone research and concentration areas. Prerequisite(s): permission of instructor.

**N NSE 197 Supervised Undergraduate Research (1-6)**Supervised participation and research in an established nanoscale science or nanoscale engineering project designed for the freshman or sophomore undergraduate student who desires to engage in study at the introductory or survey level. This participation and research may build upon related prior academic achievement and experience. May be repeated, but each registration must be for an approved nanoscale science or nanoscale engineering project. The normal credit load for this course is 3 credits; students desiring more than 3 credits must submit a request including justification to the CNSE Office of Student Services. Prerequisite(s): permission of CNSE Director of Student Services and supervising CNSE instructor.

**N NSE 239 Between Object and Image (3)**  
This course will examine the relationship between objects and the images we form of them. It will explore the process of observation with the unaided eye as well as with a variety of instruments that make it possible to observe objects with nanoscale to astronomical dimensions. The subjects discussed will include the interaction of light with matter, optical devices including cameras, microscopes and telescopes, digital imaging, human vision and cognition. It will be demonstrated that keen observation, analysis and creativity are key requirements for both science and art and that the boundaries between the two are at times nonexistent. Because of the range of topics covered, none will be explored in great depth, but it is hoped that this course will encourage further study and that interrelationships between various fields will be more fully appreciated. Since this course is very interdisciplinary a variety of guest lecturers with expertise in specific topics will be invited to participate and provide their insights into many of the topics discussed. T NSE 239 is the Honors College version of N NSE 239; only one version may be taken for credit. Prerequisite(s): mathematics background must include high school algebra and geometry. High school or other physics is preferred.

**T NSE 239 Between Object and Image (3)**Honors College version of N NSE 239. Same topics as N NSE 239 but topics are covered in greater depth. This course is for students with greater than average ability and background in nanoscale science; only one version may be taken for credit. Prerequisite(s): mathematics background must include high school algebra and geometry. High school or other physics is preferred.

**N NSE 397 Independent Study and Research (1-6)**Independent study or research in an area of nanosciences and nanoengineering designed for the undergraduate student who desires to engage in study of a subject beyond the introductory or survey level, particularly that which builds upon related prior academic achievement and experience. May be repeated, but each registration must be for an approved project. The normal credit load for this course is 3 credits; students desiring more than 3 credits must submit a request including justification to the CNSE Director of Student Services (1-6 credits as approved). Prerequisite(s): consent of supervising CNSE instructor; permission by CNSE Director of Student Services. Further information and application requirements may be obtained from the CNSE Director of Student Services.

**Network and Computer Security**

**NCS 181 Introduction to Cybersecurity (4)**

Introduction to the field of information system security. The kinds of information system security threats that might be faced by home and/or small business users and prudent security countermeasures used to counteract them are covered. Security issues faced by users of information systems will be explained as well as the potential damage the may cause. Provides the student with knowledge necessary to protect themselves against many of the information systems security threats faced in everyday life.

**NCS 205 Introduction to Linux (4)**

Linux operating system fundamentals with a focus on system administration and networking services. System administration topics include the Linux command line, managing users, shell scripting, system services, system hardening, and software installation. Linux networking topics include networking services DNS, SSH, DHCP, routing, and security. Significant time will be spent working with the command line on a Linux system. Prerequisites: CS 100, CS 108, or equivalent.

**NCS 210 Telecommunications Transmission Technology (4)**

This course will familiarize students with the three principal transmission technologies used in data communications: copper wire, fiber optics, and radio frequency wireless. Each physical layer medium is covered in detail to understand the nature of the communications channel it provides, and the impairments that affect data communications signals. Transmission media standards, signaling, loss budgets, and the relative advantages and disadvantages of each transmission technology will be treated in detail.

**NCS 315 Networking of Information Systems (4)**

An integrated study of fundamental principles and representative technologies underlying computer and device networks. Topics include: key networking protocols and relevant implementation stacks; interconnection devices; sample distribution software frameworks; management issues in networked computers and peripherals; deployment requirements for distributed software applications; common tools for the management of networks and distributed software. Prerequisite: IS 310.

**NCS 316 Data Network Design (4)**

Data network design issues and applications, point‑to‑point network design, multipoint network design, data collection and verification and an overview of protocols. Network design tools such as ITGURU and OPNET are used for network design and simulation. Use of simulation results to design a private line or packet switched based data communications network. Three hours of lecture and one hour of laboratory per week. Prerequisites: NCS 315 and STA 100.

**NCS 320 Information Assurance Fundamentals (4)**

A fast paced introduction to the field of Information Assurance. The various kinds of threats that might be faced by an information system and the security techniques used to thwart them are covered. Hacker methods, viruses, worms, and system vulnerabilities are described with respect to the actions that must be taken by a Network Manager to combat them. The basics of cryptography are covered including hash functions, symmetric cryptography, public key cryptography, cryptography algorithms, and cryptographic applications in computer and network security. Prerequisites: CS 108, and NCS 181 or equivalent.

**NCS 330 Information Assurance Ethics, Policies and Disaster Recovery (4)**

This course covers the development of information systems security policies for small and large organizations with specific regard to components such as email, web servers, web browsers, firewalls, and personal applications. The course covers cyber ethical standards for information system users and administrators, and their role as a driver in developing disaster recovery plans and procedures are also covered. Prerequisites: NCS 181 or equivalent.

**NCS 350 Wireless Systems and Security (4)**

Investigation of technologies, networks, standards and services of wireless systems in the context of satellite, cellular, wireless local area networks (802.11), personal area networks (Bluetooth and Zigbee) and metropolitan networks (WiMax). Specific topics to be examined include network design and infrastructure, 2G/3G cellular standards, wireless media access control protocols, wireless network routing, congestion control, location management, and security in wireless networks. Prerequisites: NCS 210 and NCS 315.

**NCS 384 Network Intrusion Detection (4)**

The need for intrusion detection systems (IDS) is described. Several basic IDS design approaches and implementation methods are presented. Basic attack methods employed by network attackers and the resulting signatures are explained. The business case for justifying the acquisition of IDS is explored. Builds upon the foundations of Information Assurance covered in NCS 320. Provides additional background and skills in the area of network IDS for those students interested in the areas of network and data security. Prerequisites: NCS 315 and NCS 320.

**NCS 416 Digital and Internet Telephony (4)**

Consists of both lecture and application oriented lab assignments. Emphasizes digital and internet telephony fundamentals including the convergence of voice, data and multimedia communications using the Internet Protocol. Three hours of lecture and two hours of laboratory. Prerequisite: NCS 210 and NCS 315.

**NCS 425 Internetworking (4)**

Intended to introduce new content and extend previously learned networking skills which will empower students to enter the workforce and/or further their education in the area of telecommunications networking. A task analysis of current industry standards and occupational analysis is used in the development of content standards. Instruction introduces and extends the student’s knowledge and practical experience with switches. Local area networks (LAN’s) and Virtual Local Area Networks (VLAN’s) design, configuration and maintenance. Students develop practical experience in skills related to configuring LAN’s, WAN’s, routing protocols and network troubleshooting. Prerequisite: IS 315.

**NCS 430 Penetration Testing (4)**

An in-depth hands-on experience in the area of Penetration testing. Students will study the fundamentals and key steps of a penetration test, as well as gain hands-on experience and exposure to the tools and methods utilized by networking security professionals while conducting white hat penetration tests in a controlled lab environment. A large portion of this course is based on hands-on red team activities that require the delivery of detailed documentation that outlines the processes employed in order to achieve the goals of the exercise. Prerequisites: NCS 315, CS 307.

**NCS 435 Computer Forensics (4)**

Introduction into the field of computer forensics in networked systems. The student will receive training in the methods, techniques and tools used by those practicing computer forensics in support of audit, security privacy and legal functions. Specific legal issues regarding seizure and chain of custody will be addressed. Students will have opportunity to learn computer forensics applications, methods and procedures through hands-on lab activities. Prerequisites: NCS 210, NCS 315, NCS 320.

**NCS 440 Virtualization (4)**

An in-depth look at the area of virtualization and related current research topics. This will be accomplished through lecture and interactive discussion of research papers, as well as hands-on experience with virtualization technologies. Topics include: Virtualization Concepts and Theory, Security, Networking, Performance and Storage. Pre-requisites: NCS 315, CS 307.

**NCS 450 Network Security (4)**

Detailed coverage of network threats, vulnerabilities and security protocols as countermeasures to advance the students’ understanding of computer security, network security, e-mail and internet security. Focus is on security issues across the entire network protocol stack from the physical to the application layer. Specific topics include physical layer security, secure routing protocols, IPsec, SSH, TLS, Web security, authentication and key management, and network borne malware such as worms and viruses. Prerequisites: NCS 315.

**NCS 460 Advanced Wireless Security (4)**

Provides advanced coverage of wireless networks and the special security problems they pose. Topics include measures taken to secure wireless personal area networks (PAN’s), wireless LAN’s, cellular wireless networks, and ad-hoc wireless networks. Threats, vulnerabilities and countermeasures specific to each type of networks will be enumerated and studied in detail. Coverage includes the use of cryptography and cryptographic primitives in secure protocols, wireless device security, and security policy management. The treatment of ad-hoc wireless network security will cover secure routing protocols and intrusion detection systems. Prerequisites: NCS 350, NCS 450.

**NCS 490 Special Topics in Network and Computer Security (4)**

An in-depth study of selected topics based on: new developments in the field, more in-depth treatment of topics than covered in regular courses, or topics not normally covered in an undergraduate program in Network and Computer Security. Prerequisites: NCS 210, NCS 320, and permission of the instructor.

**NCS 494 Network and Computer Security Internship/Co‑op (2 or 4)**

Part‑time supervised experience in a professional atmosphere which supplements classroom instruction. Two written reports on the work experience, two supervisor's evaluations and one site interview required. Required contact hours min. 150. Prerequisite: Permission of instructor.

**NCS 495 Network and Computer Security Capstone (2)**

Offers students the opportunity to demonstrate knowledge of network and computer security by completing and presenting a significant project. The topic should be of contemporary significance in the field. Periodic written and oral examinations are required. Prerequisites: Permission of the instructor.

**Nursing**

**NUR 300 Transitions: Bridge to Baccalaureate Nursing Education (2)**

The learner will be introduced to the role of the baccalaureate professional nurse. Learners will maximize opportunities and benefits of obtaining a baccalaureate education. Learners will explore the relationship of nursing literature and evidence based practice in professional nursing. Concepts covered will prepare the learner for increased success throughout the nursing program, as they engage in adult learning principles and active learning concepts. The learner will critically reflect on their beginning transition into a baccalaureate prepared professional nurse, fully engaged in the educational process.

**NUR 313 Theoretical Bases for Professional Nursing Practice (3)**

Assessment of individuals across the life span is addressed as they experience wellness and illness. The focus is on the interrelatedness of all components of health assessment. Apply the framework of selected nursing theories of a comprehensive assessment of the individual’s health. Health assessment skills are refined within the full scope of professional Nursing Practice. Accountability and responsibility of the ethical nurse is emphasized. Critical thinking skills are enhanced as the student develops a beginning level of competency in physical and psychological assessments within faculty supervised laboratory settings with well individuals. Therapeutic communication skills are also facilitated throughout the obtainment of personal health data and the formulation of nursing diagnoses. (Lab – 3 hours per week) Prerequisite: NUR 300.

**NUR 314 Comprehensive Health Assessment (3)**

Assessment of individuals across the life span is addressed as they experience wellness and illness. The focus is on the interrelatedness of all components of health assessment. Apply the framework of selected nursing theories of a comprehensive assessment of the individual’s health. Health assessment skills are refined within the full scope of professional Nursing Practice. Accountability and responsibility of the ethical nurse is emphasized. Critical thinking skills are enhanced as the student develops a beginning level of competency in physical and psychological assessments within faculty supervised laboratory settings with well individuals. Therapeutic communication skills are also facilitated throughout the obtainment of personal health data and the formulation of nursing diagnoses. (Lab – 3 hours per week) Prerequisite: NUR 300.

**NUR 320A Nursing Theory for Professional Nursing Practice (2)**

A theoretical and empirical foundation within the discipline of nursing is essential to the formation of the professional nurse. Selected nursing theories and Standards of Practice, as described in the New York State Education Law and the American Nurses’ Association (ANA) Standards of Professional Nursing Practice, are introduced to guide the accelerated RN/BS/MS student to further the development of their professional nursing practice. Critical reflection, caring, principles of teaching/learning, collaboration, role theory and development, and health and wellness are explored to develop the student’s understanding of nursing. Reflection and articulation of values and ideals within the profession and self are encouraged and described within personal philosophies of nursing. Prerequisite: NUR 300.

**NUR 325 Epidemiology in Nursing (2)**

The concepts and methods of descriptive epidemiology are introduced and applied to health care delivery and professional nursing practice. Patterns of acute and chronic disease occurrences and progression are studied. The discovery of unusual disease patterns is also critically examined across culturally diverse communities. Methods to uncover epidemiological causes, frequency, and the distribution of disease; and the critical appraisal of the literature and screening programs are explored to promote a theoretical and empirical foundation for practice. The utilization of epidemiological information and evidenced-based data will be applied across populations to reduce risk, prevent disease, and optimize health among communities. Prerequisite: NUR 300.

**NUR 330A Nursing Research for Professional Nursing Practice (2)**

Professional standards of practice, the moral obligation to safeguard human subjects, and the ethic of care are emphasized as professional nurses participate in research activities. Learners critically review qualitative and quantitative research designs. The integration of knowledge from nursing, the arts, and sciences provides a basis for analyzing nursing research and applying this knowledge to professional nursing practice. The application of these studies as they relate to the foundation of practice, research utilization, and evidence based nursing is examined by students in the accelerated RN/BS/MS program. Prerequisite: NUR 300.

**NUR 340A Nursing Leadership (1)**

Designed for the accelerated RN to BS/MS programs of study, students learn to evaluate and integrate communication, management, change and leadership within the micro-systems of the healthcare institution. This course focuses on developing the leadership and management function of the professional nurse through a synthesis of knowledge from previous nursing courses, and leadership and management theories. Through the leadership project, the student will further develop and refine the skills necessary to coordinate, manage and deliver nursing care. Prerequisites: NUR 320A and 330A (or equivalent), current NYS Registered Professional Nurse license, Health Clearance.

**NUR 344 Ethical Issues in Nursing (2)**

Provides the professional nurse with information regarding ethical and legal issues that they may confront in a variety of health care settings. The student will explore and discuss ethical issues utilizing theoretical knowledge emanating from a variety of theorists. The ANA Code of Ethics will be introduced, discussed, and applied to health care scenarios. The professional nurse will critically examine ethical issues and their ramifications and thus learn the importance of collaboration in ethical situations. Several ethical decision making models will be presented and discussed to assist the student in clarifying their personal and professional roles. The professional nurse will develop skills essential for ethical decision making through exploration of these topics. Prerequisite: NUR 300.

**NUR 377 Introduction to Clinical Nursing Education (2)**

This introductory course will explore the functions of the clinical nurse educator. This course will provide a practical approach to clinical nursing instruction. Evidence-based clinical teaching methodologies will be explored, with emphasis on the process of educating a diverse nursing body.

**NUR 381 Nursing Education and Instruction for Long Term Care (2)**

Students will examine nurse educator competencies and apply principles of teaching and learning, adult learning theory, critical reflection, and active learning strategies to teach nurses and other health care personnel in clinical and classroom settings. A variety of informational sources such as lecture, discussions groups, and web enhanced instruction will be explored and related to personal experiences in service and academic learning environments. Research, literature, and case studies supporting these techniques with plans for assessment of learning outcomes will be explored throughout this course to enhance one’s teaching practice.

**NUR 383 Palliative Care (2)**

In recognition of the universal need for humane end-of-life care, it is essential that nurses appreciate their unique opportunity and responsibility for insuring that individuals at the end of life experience a peaceful death. Recognition of the limits and inappropriate use of technological resources and apprehensions of the public about suffering and expenses associated with dying contribute to a renewed interest in humane end-of-life care. Precepts underlying palliative care principles are crucially examined and include the assumptions that individuals live until the moment of death; that care is sensitive to diversity, and gives attention to the physical, psychological, and spiritual concern of the patient and the patient’s family. By stimulating scholarly discourse on this important reality, this course serves as a catalyst for integrating palliative care into traditional models of care delivery.

**NUR 384 Evidence-based Practice in Nursing (2)**

The exploration and application of evidence-based practice (EBP) is the emphasis of this course. Students will learn how to solve practice problems by formulating and EBP question and answer it using the best evidence available. An in-depth look at performing literature searches and utilizing practice guidelines will be presented. EBP implementation models will help students learn the best way to explore practice questions and present change. Students will have the opportunity to exercise these skills through a written assignment and examination of internet resources (e.g. Cochrane Library).

**NUR 385 Transformational Leadership for Nurses (2)**

The exploration and application of transformational leadership for Nurses is the emphasis of this course. Students explore leadership styles and an innovation model to investigate the significance and application of transformational leadership. Profiles of leaders and analysis of team approaches are explored within a variety of practice arenas. Critical reflection of the individual nurse’s role as a leader and the student’s personal leadership development will be explored as it relates to transforming others.

**NUR 386 The Nurse Practice Act (2)**

The course provides an overview of the nurse practice act from its’ past to the present. It will assist the professional nurse in designing the nurse practice act of the future. The practice act and the influences affecting nursing practice and the health care delivery system will be discussed.

**NUR 387 History of Nursing (2)**

Awareness of historical events in the discipline of nursing fosters socialization within the profession, facilitates comprehension of current nursing issues and prepares the nurse for future trends in the discipline. Critical reflection of the historical roots in nursing enhances the development of professional nursing roles. Exploration of nursing history promotes critical thinking skills and allows for understanding of the impact of historical events on practice today.

**NUR 388 Civility and Horizontal Violence (2)**

Violence between and among nurses is a behavioral interaction found within all types of workplace environments. This course examines the nuances of horizontal violence among professionals within health care settings. Emphasis on civility and preventing horizontal violence explored through effective communication strategies, anger management, and standards of professional behavior.

**NUR 389 Introduction to Integrative Nursing (3)**

Concepts of integrative or holistic nursing, as they apply to self-care and to client populations, are introduced in this course. Nursing theory in holistic practice is explored. The psychophysiology of mind-body healing is utilized as a basis for understanding nursing from a holistic perspective. A variety of complementary and alternative therapies (CAM) are investigated within the framework of evidence-based practice.

**NUR 390 Nursing Research (3)**

Professional standards of practice with the ethical obligation to safeguard human subjects impacts the professional nurses practice and participation in research activities. Students learn to critically review qualitative and quantitative research designs and explore their relevance within culturally diverse populations. The integration of knowledge from nursing, the arts, and sciences provides a basis for the development of critical reflection. Students will apply critical reflection with peer collaboration to foster independent judgment and decision making in one’s practice. The student will identify innovative approaches to healthcare through research and evidence based practice. Prerequisites: NUR 313 and STA 100.

**NUR 444 Nursing Leadership (3)**

The professional nurse functions in the role of leader, manager, collaborator, teacher, counselor, innovator and advocate in the delivery of health care to the client across the care continuum. This course focuses on developing the leadership and management function of the professional nurse through a synthesis of knowledge from the arts and sciences, previous nursing courses, leadership and management theories, and professional ethics. Using selected theories and relevant research findings, the student develops and refines the skills necessary to coordinate, manage, and deliver nursing care within the healthcare micro-system. (30 hour precepted leadership clinical experience.) Prerequisites: NUR 313, 390, 308 or 306 or 307, upper division writing course, matriculated status, all clinical requirements.

**NUR 455 Public Health Nursing Science (5)**

The basic concepts of public and community health and their interrelationship with people, nursing, and the environment are examined. Structure, function, and programs of the health care system are explored. Critical reflection and research are used to assess and analyze culturally diverse populations and community resources as they impact health of populations at risk. The concepts and methods of descriptive epidemiology are introduced and applied to health care delivery and professional nursing practice. The professional role, ethics, and standards of public health theoretical frameworks. Principles of teaching and learning, decision making, leadership, collaboration and management within the larger social system are analyzed for their impact on health care. Prerequisites: NUR 314, NUR 444. Pre/Co-Requisite: BIO 250, BIO 350. Co-requisite: NUR 474.

**NUR 474 Public Health Nursing Science Clinical (1)**

A 45 hour clinical that builds on nursing theory and aspects of clinical practice, the focus is on health teaching and health care opportunities in a variety of culturally diverse community settings. Population based practice, health promotion and disease prevention is emphasized at individual, family, community and system level. Nursing family systems, developmental, and caring theories are applied to public health nursing. Incorporating a multifaceted approach, levels of prevention, communication skills, transcultural assessment, epidemiology, and public/community health standards are examined and applied. Opportunities for critical reflection, collaboration, professional growth, and lifelong learning are integrated within clinical experiences. (45 hour clinical component) Prerequisites: NUR 314, NUR 444, all clinical requirements. Pre/Co-requisites: BIO 250, BIO 350. Co-requisite: NUR 455

**NUR 478 Care Management (4)**

Focuses on the elements of care management of individuals and families across the health care continuum. This course will expand upon the concepts of care transitions from hospital to the community setting with an emphasis on the challenges related to transitioning such as financial management, resource utilization, and overall care coordination. Students will engage in analytic discussions to further develop their understanding of family systems, systems of care, clinical practice and community nursing roles. Personal reflection on one’s own practice in contemporary nursing will be included in order to allow the student to think holistically, ethically and morally as they grapple with the real-world challenges and contemporary care management issues in our healthcare environment. (20 hour clinical experience) Prerequisites: NUR 455, NUR 474, all clinical requirements.

**NUR 490 Culminating Seminar (3)**

The connections of nursing theory, research, and practice are the emphasis of this culminating experience. Opportunity for collaboration with peers and faculty is provided as students develop and participate in research and scholarly activities. Inquiry into scholarly works is explored to further enhance nursing knowledge, research utilization, and professional practice. Personal values and beliefs are reexamined as the student describes one’s transformed view of self and practice as a maturing professional in nursing. Critical reflection of one’s personal growth and commitment to ongoing professional development is examined within the context of achieving professional excellence. (20 hour clinical experience) Prerequisite/Co-requisite: NUR 478; Student must be within 4 credits of graduation at completion of Culminating Seminar.

**NUR 491 Independent Study (Variable 1‑4)**

This is an independent study of selected contemporary problems within the nursing discipline. The student is required to submit a written proposal which includes a description of the project, its duration, education goals, method of evaluation, and number of credits to be earned. Prerequisites: Matriculated students only, permission of instructor and dean of subject area.

**Philosophy**

**PHI 101 Introduction to Philosophy (4)**

An examination of the major figures, subfields, topics, and questions of western philosophy. The emergence of philosophy in Ancient Greece is almost synonymous with the emergence of Western Civilization. Furthermore, many developments in Western civilization have been founded on and/or enabled by developments in philosophy. This course will explore the major figures and issues of western philosophy. It will survey the major subfields of philosophy (epistemology, metaphysics, ethics, political philosophy, aesthetics) by examining their historical and intellectual development. In addition, philosophical figures and issues will be introduced by discussing their place within the larger historical context of Western Civilization. Finally, developments in western philosophy will be related to developments in non-western philosophy. Topics might include: knowledge and certainty, the mind/body problem, reality and being, the existence of God, freedom and determinism, the notion of the self, the good, justice, the state, beauty, and the nature of art. Meets General Education Western Civilization requirements.

**PHI 120 Introduction to Asian Philosophy (4)**

An examination of the major traditions, foundational texts, and key figures in Asian philosophy. The practice and concept of philosophy in a non-western context will be explored, and fundamental ontological, epistemological, ethical, and political questions will be addressed. Geographic regions to be discussed include India, China, and Japan, and traditions to be studied could include Vedanta, Buddhism, Daoism, Confucianism, Moism, Legalism, and Zen. Meets General Education Other World Civilizations requirement.

**PHI 130 World Religions (4)**

An examination of the origins, philosophies and development of the major religions of the world. Ways of knowing other than western, science-oriented ones will be explored, and a fundamental knowledge of religious answers to questions about ultimate meaning will be pursued. Religions to be studied include Hinduism, Buddhism, Judaism, Christianity, Islam, Confucianism, Jainism, Sikhism, Shinto, Taoism, and Zoroastrianism. Meets new General Education Other World Civilizations requirement.

**PHI 201 Ethical Theories and Problems (4)**

An examination of the major ethical theories and contemporary ethical problems of western philosophy. The basics of moral reasoning will be discussed, and both classic and modern ethical theories will be studies. Ethical theories to be examined could include Virtue Ethics, Utilitarianism, Deontology, Moral Sentiment, Contractarianism, Existentialism, and Feminism, and these ethical theories will be applied to ethical problems, which could include abortion, euthanasia, famine, torture, capital punishment, terrorism, etc. Meets General Education Humanities requirement.

**PHI 350 Technology and Ethics (4)**

Traditional ethical theory and the problems in applying theory to contemporary technological situations. Ethics in communication receives special emphasis. Meets new General Education Humanities requirement.

**PHI 360 Environmental Philosophy and Technology (4)**

An examination of the complex role that technology plays in philosophical and ethical questions concerning the natural environment. While technology promises numerous solutions to the current environmental crisis (e.g., clean energy, geoengineering, bioremediation, etc.), it also undeniably contributes to the destruction of the environment (e.g., global warming, species extinction, pollution, etc.) This course will explore the ethical and philosophical issues that emerge from the intersection of technology and the natural environment. It will also examine the influence that technology’s impact on the environment has on human society. Topics may include: anthropocentrism vs. ecocentrism, genetically modified organisms, animal rights, resource inequality, subsistence vs. luxury emissions, asymmetrical distribution of the effects of global warming, geoengineering, and ecological restoration. Meets new General Education Humanities requirement.

**Physics**

**PHY 101T General Physics I Theory (3)**

Within an algebra-based framework, this course covers topics in classical mechanics, including the kinematics in one and two dimensions, the Newton’s laws of motion, work and energy, linear momentum, rotational motion, and selected topics on vibration and waves. Three hours of lecture each week. This class must be taken with the laboratory course PHY 101L in the same semester. Successful completion of both co-requisite lecture and lab courses (PHY 101T and PHY 101L) is required. Should a student need to repeat one co-requisite, they must repeat both co-requisites. Prerequisites: MAT 111 or equivalent. Meets SUNY General Education Natural Science category.

**PHY 101L General Physics Laboratory (1)**

Laboratory section to accompany PHY 101T. Application of theoretical material from General Physics I Lecture in experimental procedures. Three hours of laboratory each week. This class must be taken with the lecture course PHY 101T in the same semester. Successful completion of both co-requisite lecture and lab courses (PHY 101T and PHY 101L) is required. Should a student need to repeat one co-requisite, they must repeat both co-requisites. Meets SUNY General Education Natural Science category.

**PHY 102T General Physics II Theory (3)**

Within an algebra-based framework, this course covers topics in electricity and magnetism, including electric forces and fields, electric potential, electric current, DC circuit, magnetism, electromagnetic induction, and selected topics from electromagnetic waves and optics. Three hours of lecture each week. This class must be taken with the laboratory course PHY 102L in the same semester. Successful completion of both co-requisite lecture and lab courses (PHY 102T and PHY 102L) is required. Should a student need to repeat one co-requisite, they must repeat both co-requisites. Prerequisite: PHY 101T and PHY 101L. Meets SUNY General Education Natural Science category.

**PHY 102L General Physics II Laboratory (1)**

Laboratory section to accompany PHY 102T. Application of theoretical material from General Physics II Lecture in experimental procedures. Three hours of laboratory each week. This class must be taken with the lecture course PHY 102T in the same semester. Successful completion of both co-requisite lecture and lab courses (PHY 102T and PHY 102L) is required. Should a student need to repeat one co-requisite, they must repeat both co-requisites. Meets SUNY General Education Natural Science category.

**PHY 201T Calculus Based Physics I Theory (3)**

Within a mathematical framework that includes basic geometry, trigonometry, algebra, calculus and vectors, this course covers topics in mechanics including kinematics of one, two and three dimensional motion, dynamics and Newton’s laws of motion, work, kinetic energy, potential energy, kinematics and dynamics of rigid bodies, and periodic motion. Three hours of lecture each week. This class must be taken with the laboratory course PHY 201L in the same semester. Successful completion of both co-requisite lecture and lab courses (PHY 201T and PHY 201L) is required. Should a student need to repeat one co-requisite, they must repeat both co-requisites. Prerequisite: MAT 151 or equivalent. Co-requisite: MAT 152. Meets SUNY General Education Natural Science category.

**PHY 201L Calculus Based Physics I Laboratory (1)**

Laboratory section to accompany PHY 201T. Application of theoretical material from Calculus Based Physics I Lecture in experimental procedures. Three hours of laboratory each week. This class must be taken with the lecture course PHY 201T in the same semester. Successful completion of both co-requisite lecture and lab courses (PHY 201T and PHY 201L) is required. Should a student need to repeat one co-requisite, they must repeat both co-requisites. Meets SUNY General Education Natural Science category.

**PHY 202T Calculus Based Physics II Theory (3)**

This course covers topics on electricity and magnetism, including Coulomb’s Law, Electric Potential, Capacitance and Dielectrics, Current, Resistance, Electromotive Force, Magnetic Fields, Biot-Savart’s Law, Ampere’s Law, Electromagnetic Induction, Faraday’s Law, Maxwell’s Equations, and selected topics on the Electromagnetic Waves. Three hours of lecture each week. This class must be taken with the laboratory course PHY 202L in the same semester. Successful completion of both co-requisite lecture and lab courses (PHY 202T and PHY 202L) is required. Should a student need to repeat one co-requisite, they must repeat both co-requisites. Prerequisite: PHY 201 or equivalent. Meets SUNY General Education Natural Science category.

**PHY 202L Calculus Based Physics II Laboratory (1)**

Laboratory section to accompany PHY 202T. Application of theoretical material from Calculus Based Physics II Lecture in experimental procedures. Three hours of laboratory each week. This class must be taken with the lecture course PHY 202T in the same semester. Successful completion of both co-requisite lecture and lab courses (PHY 202T and PHY 202L) is required. Should a student need to repeat one co-requisite, they must repeat both co-requisites. Meets SUNY General Education Natural Science category.

**PHY 203 Calculus Based Physics III (4)**

The third course in three course calculus based physics sequence. Covers selected topics from thermodynamics (temperature and heart, thermal properties of matter and laws of thermodynamics) and waves (mechanical waves, wave interference and normal modes). Includes lecture and laboratory. Prerequisite: PHY 202 or equivalent.

**PHY 220 Electronics for Scientists (4)**

Designed to give students who do not intend to become Electrical Engineers or Technologists a good background in the field of analog and digital electronics. Upon completion of this course, the student should have a practical understanding of test equipment and basic analog circuits such as power supplies, analog switches of operational amplifiers as well as a practical understanding of the operation and use of digital integrated circuits and their application to more complicated data acquisition systems used in modern chemical instrumentation. Three hours of lecture and three hours laboratory per week. May not be taken be electrical engineering, electrical technology or computer engineering technology students. Prerequisite: One year of high school physics or equivalent.

**PHY 290 Topics in Physics (1-4)**

An introductory course in selected topics in Physics not currently covered in any of the listed classes. Topics are chosen to illustrate different fields and applications which are all part of Physics.

**PHY 351 Modern Physics (4)**

Provides a broad overview of the major developments and breakthroughs in physics since the beginning of the 20th century, including Einstein’s special theory of relativity, quantum nature of light, wave nature of particles, introduction to quantum mechanics, atomic structure, molecular and condensed mater physics, nuclear physics, particle physics and cosmology. Includes three hours of lecture and three hours of laboratory per week. Prerequisites: PHY 202T, PHY 202L and MAT 230 or equivalents.

**PHY 361 Intermediate Mechanics (4)**

Newtonian theory is used to describe the mechanical behavior of objects. Topics include: Newton’s laws of motion, momentum and energy, motion of a particle in one or more dimensions, motion of a system of particles, rigid body motion, introduction to Lagrange and Hamilton’s equations. Prerequisites: MAT 230, MAT 253, and PHY 201T and PHY 201L or equivalents.

**PHY 371 Electromagnetism (4)**

The laws of electricity and magnetism are developed using the language of vector calculus. Topics include: Coulomb's Law, the electrostatic field and potential, Gauss' Law, dielectrics, capacitors, electric current, the steady magnetic field, Biot‑Savart Law, Ampere's Law, magnetic materials, Faraday's Law, the displacement current, Maxwell's Equations, and plane electromagnetic waves. Prerequisites: MAT 230, MAT 253, and PHY 202T and PHY 202L or equivalents.

**PHY 381 Quantum Mechanics (4)**

An introduction to the theory and applications of Quantum Mechanics. Topics will include: wave‑particle duality, Heisenberg uncertainty principle, quantum states and operators, Schroedinger equation and quantum statistics. Applications will be selected from atomic and solid state physics, including semiconductors and lasers. Prerequisites: MAT 260/230, MAT 253, PHY 351 or equivalents.

**PHY 472 Electromagnetic Waves and Radiation (4)**

Within an advanced mathematical framework that involves vector and tensor algebra, differential and integral calculus, methods of ordinary and partial differential equations, and special techniques of electromagnetism, this course studies the solutions of the Maxwell’s equations (a system of coupled partial differential equations) in various physical situations. It provides an in depth analytical study of electromagnetic waves, their structure, propagation, reflection, transmission, interaction with matter and the mechanisms for their generation by antennas. Prerequisite is Electromagnetism (PHY 371) or equivalent.

**PHY 490 Special Topics in Physics (4)**

A detailed examination of a topic in physics not treated extensively in other physics courses. Prerequisite: Permission of instructor.

**PHY 491 Independent Study (Variable 1-4)**

Extensive study and research on a particular topic of student interest under the supervision of a faculty member. The student is required to submit a written proposal which includes a description of the project, its duration, educational goals, method of evaluation, and number of credits to be earned. Prerequisite: Matriculated students only, permission of instructor and dean of subject area.

**Political Science**

**POS 110 American Public Policy (4)**

An introduction to the major features of the policy making process in the United States. Emphasis on the structures and institutions of the American political system and the role of citizens in political process. Examination of democratic theory and political philosophy in the American context. Meets new General Education Social Science requirement.

**POS 262 Online Politics (4)**

The emergence of the Internet, and especially the Web, as a significant factor in American and global life has challenged traditional views of communication and politics. In this course, we use some core concepts of political communication, information design and technology, and deliberative democracy to examine the role of information technologies in candidate and issue campaigning, online voting, protest and advocacy movements, law-making and electronic governance. Students will be required to engage as participant-observers of a Web-based political activity using a methodological approach appropriate to their analysis. Meets the General Education Social Sciences requirement.

**POS 252 The Politics of Life and Death (4)**

Examines the nature of political debate and policy-making in the United States on issues related to human life. Four issues will be examined: assisted reproduction, human cloning, abortion, and assisted suicide. For each of the issues, we will review the scientific and philosophical context, assess the actions of the legislative, judicial, executive and administrative branches of the national and state governments, and explore the nature of public discourse. This course assumes an interest in and understanding of American politics and political institutions. Though not a prerequisite, completion of an introductory course in American politics is recommended prior to enrollment. Meets new General Education Social Science requirement.

**POS 340 Elections and Political Behavior (4)**

An exploration into the roots and consequences of political behavior with a focus on the "average" citizen. Topics include the formation and importance of political values, the dimensions of political participation, and the implications of empirical evidence for electoral strategy and contemporary democratic theory. Meets new General Education Social Science requirement.

**POS 342 Constitutional Law (4)**

An examination of the Constitution of the United States and its interpretation by the judiciary, with an emphasis on the activities of the Supreme Court. Analysis of issues concerning the separation of powers, federal-state relationships, economic regulation, and political and civil rights. Meets new General Education Social Science requirement.

**POS 400 Topics in Political Science (4)**

An in‑depth examination of a current topic in political science. Examples might include political psychology, media and politics, political ethics, and presidential elections. May be taken more than once as topics change.

**POS 491 Independent Study (Variable 1‑4)**

Extensive study and research on a particular topic of student interest under the supervision of a faculty member. The student is required to submit a written proposal which includes a description of the project, its duration, educational goals, method of evaluation, and number of credits to be earned. Prerequisites: Matriculated students only, permission of instructor and dean of subject area.

**POS 492 Political Science Internship (Variable 1-4)**

Internship is designed to provide practical work in a position related to political science or public policy, and to compare and contrast real-world experience with scholarly assessment of political actors or behavior. Students either work on or off campus. Minimum of 45 hours of contact time per credit required. Prerequisite: Permission of faculty member; approval of internship agreement. Only S/U grades are awarded for this course.

**Psychology**

**PSY 100 Principles of Psychology (4)**

Surveys the field of psychology, emphasizing issues of current importance. Topics covered include research methodology and the influence of biological, social, and environmental factors on behavior. No credit will be given to students who have previously taken an introductory psychology course. Meets new General Education Social Science requirement.

**PSY 220 Life-span Developmental Psychology (4)**

Examines the physical, cognitive, social, and emotional development of individuals from conception to death. Special attention is given to the environmental and biological factors that contribute to normal development in childhood, adolescence, adulthood and aging. Prerequisite: PSY 100 or equivalent.

**PSY 222 Abnormal Psychology (4)**

Examines the dimensions, theories, and empirical findings in human psychopathology. Topics covered will include: concepts of abnormality, theories, classification, etiology, assessment, and treatment of the major psychopathologies. Prerequisite: PSY 100 or equivalent.

**PSY 242 Social Psychology (4)**

Examines principles of social behavior in a variety of settings. Topics include: attitude formation and change, group dynamics, interpersonal attraction, social perception, altruism, and aggression. Prerequisite: PSY 100 or equivalent.

**PSY 262 Learning and Motivation (4)**

Examines historical and modern concepts of learning and motivation, Pavlovian and operant conditioning, and their application. The relationship of learning to motivation and physiological, cognitive, and social theories of motivation will also be discussed. Prerequisite: PSY 100 or equivalent.

**PSY 273 Dying, Death & Bereavement (4)**

Examines psycho‑social conceptualizations of dying, death and grief in contemporary society with special emphasis on one's own feelings and attitudes towards death and coping and supportive strategies of the dying and bereaved persons. Socio‑cultural, legal/ethical issues are also explored. Prerequisite: PSY 100 or equivalent or permission of instructor.

**PSY 290 Special Topics in Psychology (4)**

PSY 290: Special Topics in Psychology would afford students the opportunity to take a wider range of courses than the current curriculum allows. Whereas PSY 490 (Selected Topics in Psychology) is designed to allow in-depth treatment of psychological subject matter, PSY 290 would be run as a survey course of a general subject area in psychology (e.g. Youth and Adolescence, Urban Issues, Culture). Reading materials and assignments would vary, depending on topic and instructor. However, each instructor teaching PSY 290 will ensure that the course is structured to include coverage of basic concepts, theory, and methodologies associated with the field, written assignment(s) requiring critical analysis of course material, and opportunities for students to develop oral presentation skills. Restricted to Psychology majors.

**PSY 310 Research Methods in Psychology (4)**

This lecture and laboratory course will provide experience in the use of a variety of research designs and methods of data analysis. Students design research projects in small groups by selecting an appropriate sampling procedure and devising a method of collecting and analyzing data. Prerequisites: STA 100 or equivalent and PSY 305 or permission of instructor.

**PSY 325 Psychology of Gender (4)**

Reviews the major findings and theories related to sex roles and sex typing. It will also examine gender specific issues (e.g. motherhood/fatherhood). Prerequisite: PSY 100 or equivalent.

**PSY 331 Psychology of Personality (4)**

A study of determinants of personality and methods of studying personality, including various systems of psychology and their interpretations of personality structure and development. Prerequisite: PSY 100 or equivalent.

**PSY 352 Industrial and Organizational Psychology (4)**

Examines the behavior of people in industrial work environments. Topics include attitudes toward work, organizational climate, appraising employee performance and interest, engineering psychology, worker efficiency, accident behavior, leadership styles, and effectiveness. Prerequisite: PSY 100 or equivalent.

**PSY 360 Perception (4)**

A presentation of the basic facts and theories of human perception, concentrating primarily on vision. Topics to be covered include psychophysics, form and space perception, the constancies, the effects of learning, motivation, and set on perception, selective attention, and perceptual development. Prerequisite: PSY 100 or equivalent.

**PSY 365 Educational Psychology (4)**

Provides an overview of the psychological theory and research in relation to educational practices. Cognitive, motivational, interpersonal and socio-cultural influences on learning and retention in educational institutions will be examined. Characteristics and developmental needs of the learner throughout lifespan, along with evaluative measures of learning/instructions will be considered. Prerequisite: PSY 100.

**PSY 377 Health Psychology (4)**

Health and illness is experienced within a broad psychosocial context. Physical states affect mental states and mental and emotional experiences have the capacity to influence the course of physical health and illness. Investigates the relationship that exists between physical and mental health. Emphasizes the role that psychological, cultural and social factors have for both physical health and illness, and also examines stress and stress management techniques. Prerequisite: PSY 100.

**PSY 385 Evaluation Research (4)**

Application of various research methods to the planning, monitoring, and evaluation of social intervention programs. Topics include research design, questionnaire construction, survey methods, computer applications, and the critical analysis of evaluation studies. Assignments in class and field settings will provide students with practical experience in the design of evaluation studies, data collection and analysis, and the writing of evaluation reports. Prerequisite: PSY 310 or SOC 332 or equivalent.

**PSY 390 Engineering Psychology and Human Performance (4)**

Deals with the systematic application of relevant information about human capabilities and limitations to design of things and procedures people use. Topics include: information displays, acquisition of skills, person‑machine system properties, work space, applied anthropometry, accidents, and psychological factors in transportation. Prerequisite: PSY 100 or equivalent.

**PSY 405 History and Systems of Psychology (4)**

Examines theoretical systems of psychology in historical perspective. Classical and contemporary theories of human behavior will be analyzed in terms of their impact on various fields of psychology. Prerequisite: PSY 100 or equivalent. Restricted to Psychology majors only.

**PSY 410 Forensic Psychology**

The focus of this course will be to examine the relationship between psychology and the legal system. The format is designed to be a combination of lecture, in-class discussion, and online work. Video clips/documentaries and professional work samples/case examples will also be utilized. Course readings, assignments, and class discussions will facilitate the following goals: To survey the major areas of interest shared by psychology and law; to discuss some of the major ethical dilemmas faced by mental health professionals working with legal system; to become familiar with different types of forensic psychological evaluations conducted in criminal cases; to become familiar with some of the landmark legal case that impact forensic psychologists; to be introduced to various career opportunities in forensic psychology. Prerequisite: PSY 100 or equivalent.

**PSY 415 Psychology of Aggression and Nonviolence (4)**

Deals with the factors associated with aggression and nonaggression. Topics include theories of aggression, control of aggression, personality patterns of violent and nonviolent individuals, psychology of power, conflict resolution, and techniques for teaching nonviolent behavior. Prerequisites: PSY 305 or PSY 315 or PSY 331 or PSY 242 or permission of instructor.

**PSY 425 Cognitive Psychology (4)**

A survey of memory, thinking, language, and problem solving. The course will follow the history of psychological theory on cognition from associationism to gestalt approaches to modern information processing approaches and artificial intelligence. Particular attention will be paid to practical and clinical applications of research. Prerequisite: PSY 262 or PSY 360 or permission of instructor.

**PSY 444 Applied Social Psychology (4)**

Intended to expose students to interventions by social psychologists in real‑world problem solving. Topics include applied nature of social psychology; social psychology of education, religion and politics; cross‑cultural psychology; social psychology and legal issues; consumer behavior; social psychology and social policy; and conservation and environmental concerns. Prerequisites: PSY 305 or PSY 331 or PSY 242 or PSY 352 or equivalent or permission of instructor.

**PSY 445 Group Dynamics and Interpersonal Communication (4)**

Examines interaction in small groups. Topics include group structure and development, and aspects of group process such as problem‑solving, decision‑making, productivity, creativity, power, conflict resolution, leadership, and communication. Skill in application of concepts of group dynamics is developed through exercises in experiential learning and observation. Prerequisite: PSY 242 or PSY 352 or equivalent.

**PSY 460 Neuropsychology (4)**

The mind arises from the brain and every topic in psychology has a biological basis. This course is a survey of the biological bases of a wide array of topics, including perception, motivation, emotion, bodily movement, learning, memory and language. Prerequisite: PSY 100 or equivalent.

**PSY 470 Psychological Testing (4)**

Examines the basic concepts of measurement theory and their application to developing, administering, and interpreting psychological tests. Moral, ethical, and legal issues associated with testing and the use of test results are considered. Prerequisites: PSY 222 or PSY 331 or PSY 352 or equivalent.

**PSY 477 Principles of Psychological Counseling (4)**

Examines the theories and techniques used in counseling situations. Special attention will be given to interviewing skills, ethical issues, and the interpersonal dynamics that comprise the major therapeutic approaches. Prerequisites: PSY 222 or PSY 331 or equivalent, or permission of instructor.

**PSY 490 Selected Topics in Psychology (4)**

An in depth treatment of a selected topic in Psychology. Provides students with the opportunity to investigate psychological subject matter. Students may receive credit in a future semester for different topic areas. Prerequisite: PSY 100 or an introductory psychology course.

**PSY 491 Independent Study (Variable 1‑4)**

Extensive study and research on a particular topic of student interest under the supervision of a faculty member. The student is required to submit a written proposal which includes a description of the project, its duration, educational goals, method of evaluation, and number of credits to be earned. Prerequisite: Matriculated students only, permission of instructor and dean of subject area.

**PSY 492 Practicum in Psychology (4)**

Supervised, discipline‑related experience in a community service agency is provided. The major emphasis is to help the student in applying theoretical knowledge to real life situations, and to develop skills and competence as a professional. Regular meetings with agency supervisor and practicum coordinator are an essential feature of the practicum. Minimum GPA 3.0 and permission of the psychology department are required for admission. Prerequisites: PSY 305, PSY 310, and PSY 385 or equivalent. This course will not be a substitute for one of the three advanced courses required to complete the credits to major in the Psychology program.

**PSY 493 Senior Seminar in Psychology (4)**

Special topics of current interest and relevance are treated in‑depth. Emphasis is placed on the critical analysis of current research literature and development of independent projects by seminar members. Topics vary from semester to semester. Prerequisites: Senior standing, PSY 310 and PSY 385 or equivalent and permission of instructor.

**Recreation**

*See Health and Physical Activity*

**Science, Technology, and Society**

**STS 200 Introduction to Science, Technology, and Society (4)**

Science and technology are integral parts of our society and our lives today. They influence the way we live and work and affect the way we understand ourselves and the world around us. Yet what, exactly, are science and technology? How do scientists develop new knowledge, and how do engineers and technologists develop new technologies? How do technologies affect our lives and our society? This course examines those issues by exploring the social dimensions of science and technology and by looking at the interactions and interrelationships among science, technology, and society. We will explore: 1.) the practice of science and technology to understand how scientific and technological work is conducted as a creative and human enterprise; 2.) how science and technology are shaped by different social and economic forces; and 3.) the impacts of science and technology on society.

**STS 490 Topics in Science, Technology and Society (Variable 1-4)**

An in-depth examination of particular topics in science, technology and society. Topics may include: Science, Technology, and Identity; Science, Technology, and the Environment; Science, Technology, and Gender; Science, Technology and Religion; Science, Technology, and Science Fiction. Typically, a topics course will use two or three general textbooks, and every student will be required to perform research on a particular issue related to the topic. May be taken more than once as topics change.

**STS 491 Independent Study (Variable 1-4)**

Extensive study and research on a particular topic of student interest under the supervision of a faculty member. The student is required to submit a written proposal which includes a description of the project, its duration, educational goals, methods of evaluation, and the number of credits to be earned. Prerequisites: STS 300 and permission of instructor and dean of subject matter.

**Sociology**

**SOC 100 Introduction to Sociology (4)**

Introduces the sociological perspective in understanding the everyday lives of members of a society. Emphasizes the influence of socialization, culture, inequality, institutionalization, conflict and collective behavior. Focuses primarily on the United States. Meets new General Education Social Science requirement. *Senior Sociology majors may not register for this course.*

**SOC 110 Social Problems (4)**

Examines social problems in industrial society, and how social institutions can lead to their creation, perpetuation, and solution. Focuses on particular social issues, such as poverty, power, race, ethnicity, gender roles, work, health, education, and war. Explores similarities and differences between sociological and other social science approaches to the study of social problems. Emphasis placed on the United States. Meets new General Education Social Science requirement.

**SOC 210 Sociology of the Family (4)**

Analyzes the nature of gender roles in the family, a basic social institution. Examines various patterns of family organization and problems confronting the family. Emphasizes the family in the United States. Prerequisite: SOC 100 or SOC 110 or an introductory sociology course.

**SOC 220 Sociology of Gender (4)**

Explores contemporary theories, understandings and performances of gender, with attention to the intersections of race, class, gender and sexuality. Also examines the relationships of gender to life opportunities and experiences, social structures and societal reproduction. Prerequisite: SOC 100 or SOC 110 or an introductory sociology course.

**SOC 230 Sociology of Racial and Ethnic Relations (4)**

Explores the complex and dynamic nature of race and ethnicity in American society, with a combined focus on historic and ethnographic approaches. Topics covered include the patterns of racial and ethnic inequality, the evolving social construction of race and ethnicity, the changing perceptions of and explanations for race relations, the intersection of race and ethnicity with other forces (such as social class and gender), and the social pressure for and against assimilation and acculturation. Prerequisite: SOC 100 or SOC 110 or an introductory sociology course.

**SOC 240 Class Inequality: Poverty and Wealth in the United States (4)**

Focuses on income inequality in the United States, as defined as by an unequal distribution of wealth, power, and status. Addresses how inequality has become institutionalized, thereby becoming an important part of the everyday, taken-for-granted operation of society. Acknowledges how changes in these arrangements are resisted and how those groups at the bottom of the power hierarchy may acquiesce in their own exploitation. Examines the influence of economic systems, the race and gender systems, belief systems, political systems and state systems on inequality structures. Assesses the utility of qualitative research in providing a subjectivist understanding of poverty. Requires an experiential activity that may be off-campus. Prerequisite: SOC 100 or SOC 110 or an introductory sociology course.

**SOC 250 Sociology Through Film (4)**

Popular culture both reflects and influences larger trends in society. Feature-length film, as a pervasive form of media, will be used to illustrate sociological concepts and issues, with a particular focus on how films reinforce and reproduce dominant cultural themes. Possible topics include social class and the American Dream, race relations and institutional violence, corporate crime, and love, connection, and alienation in modern life. Through lecture and class discussion, students will become acquainted with the social forces and dynamics related to these and other concepts and examine how these themes are depicted in popular movies. Prerequisite: SOC 100 or SOC 110 or an introductory sociology course.

**SOC 260 Cults and New Religious Movements (4)**

This course serves as an introduction to the social-scientific study of NRMs within North America. Its main goal is to provide you with a critical understanding of major concepts and controversies surrounding NRMs. In a more practical sense it will expose you to a survey of the relevant social-scientific research, while simultaneously introducing you to prominent examples of different types of NRMs (e.g., Heaven’s Gate, The People’s Temple, the Branch Davidians, the Unification Church, The Children of God, Aum Shinrykyo, Scientology). Prerequisties: SOC 100 or SOC 110 or any introductory sociology class.

**SOC 290 Special Topics in Sociology (1-4)**

Treatment of a special topic in Sociology. Provides student with the opportunity to investigate sociological subject matter. Students may receive credit in future semester for different topic area. Prerequisite: SOC 100 or SOC 110 or an introductory sociology course.

**SOC 310 History of Sociological Theory (4)**

Presents a historical overview of the emergence and development of sociological theory, with emphasis on theorists such as Comte, Spencer, Marx, Durkheim, Weber, Mead, and post‑WWII theorists. Prerequisite: SOC 100 or SOC 110 or an introductory sociology course.

**SOC 314 Sociology of Deviance (4)**

Presents major sociological theories of deviance. Examines specific forms of deviance, such as drug abuse, crime, sexual deviance, and mental illness. Prerequisite: ANT 301 or SOC 110 or an introductory anthropology or sociology course. Prerequisite: SOC 100 or SOC 110 or an introductory sociology course.

**SOC 320 Social Policy (4)**

Examines various attempts to apply social science knowledge to address social problems and bring about appropriate change in human behavior. Explores the process by which social policy is developed and implemented. Examples are taken from both the United States and other cultures. Among possible topics are social service, needs assessment, health and healing, work, education, and technological change. Prerequisite: SOC 100 or SOC 110 or an introductory sociology course.

**SOC 332 Methods of Inquiry (4)**

Provides experience in the design and implementation of social science research. Topics covered include philosophies of social science, development of theories and hypotheses, modes of observation, methods of sampling and techniques of analysis. Students will design and implement several research projects during the semester. Use of computers is required, though no prior experience is assumed. Prerequisite: SOC 100 or SOC 110 or an introductory sociology course.

**SOC 350 Chemical Dependencies and Human Behavior (4)**

Explores sociological perspectives on the acquisition, continuation, and elimination of human dependency on chemical substances like drugs and alcohol. Aims to bridge the gap between professional and academic skills and information. Prerequisite: SOC 100 or SOC 110 or an introductory sociology course.

**SOC 351 Sociology of Crime (4)**

Introduces the study of crime and the criminal justice system. Examines the causes of crime, including violent crime, crimes against property, substance abuse, sexual offenses, white collar, and organized crime. Considers the efforts of the police, courts, penal system, and community to deal with the various types of crime, as well as the social policy implications of our understanding of and approaches to the problem of crime. Prerequisite: SOC 100 or SOC 110 or an introductory sociology course.

**SOC 362 The Sociology of Terrorism (4)**

The Sociology of Terrorism is a course that examines the social scientific phenomenon of terrorism, which has re-emerged as a major focus of Western political and social study in response to the 9/11 terrorist attacks. The course will begin by taking an evolutionary approach to defining terrorism by grounding it in its historical roots and tracing its growth to contemporary forms of terrorism. The middle section of the course is devoted to examining the “how” and the “why” behind terrorism and political violence, paying particular attention to issues surrounding the media, radicalization, and suicide terrorism. It then concludes with an examination of how governments combat terrorist groups, how terrorist groups eventually disengage from violence and a consideration of the future of terrorism. This course relies primarily on sociological approaches to understanding terrorism, but will at times focus on material from other disciplines, such as social psychology and political science. The aim of the course is to introduce the student to key issues, while teaching how to cogently and critically analyze contemporary issues surrounding terrorism and political violence. Prerequisites: SOC 100 or SOC 110 or an introductory sociology course.

**SOC 370 Sociology of Health and Illness (4)**

Integrates varied sociological perspectives with the study of health and illness. Investigates the relationship between social structure and the experience of health or illness. Examines the organization and delivery of medical services in the United States. Focuses on the individual’s experience of illness. Links sociological theory and sociological practice in the healthcare arena. Prerequisite: SOC 100 or SOC 110 or an introductory sociology course.

**SOC 380 Returning From War (4)**

The problems facing veterans, as well as their families and communities, as individuals return from wart are explored here, including the experience of war, the physical and emotional consequences of war, as well as the social context in which war is waged and individuals attempt to return to their non-combat lives. Prerequisite: SOC 100 or SOC 110 or an introductory sociology course.

**SOC 410 Power and Violence in the Family (4)**

Issues of power and control are part of every relationship and can lead to emotional, physical, and sexual violence. Through lectures and class discussion the student will gain an understanding of the fundamental dynamics of abusive situations, the consequences for all concerned, and the policy implications. (Designed specifically to meet the needs of students interested in the human services field.) Prerequisite: SOC 100 or SOC 110 or an introductory sociology course.

**SOC 411 Sociology of Community (4)**

Explores a range of communities, including urban, rural, suburban, and virtual. Takes an active approach to examining problems facing communities, including poverty, crime, growth and economic revitalization, and explores ways of addressing these problems. Prerequisite: SOC 100 or SOC 110 or an introductory sociology or anthropology course.

**SOC 424 Social Welfare Policy (4)**

Investigates the history, concepts, programs, and practices of social welfare policies in the United States. Promotes an appreciation for the interrelatedness of practice and policy analysis in the field of social welfare scholarship. Prerequisite: SOC 100 or SOC 110 or an introductory sociology course.

**SOC 446 The Individual and Society (4)**

Presents various ways to conceptualize the mutual influences of individual‑level and social‑structural processes. Addresses specific topics within social psychology, "human nature," communication and language, perception, socialization, and the acquisition of roles, ideologies, and values. Embraces the symbolic interactionist perspective. Focuses on understanding alcoholism. Prerequisite: SOC 100 or SOC 110 or an introductory sociology course.

**SOC 450 Sociology of Corrections (4)**

Introduces students to correctional institutions by examining the history and philosophy of corrections; the social organization of prison societies as total institutions; the management of prisons; prison violence and court‑mandated attempts to restore civility; jails and community corrections; and critiques of traditional approaches to corrections. Prerequisite: SOC 100 or SOC 110 or an introductory sociology course.

**SOC 452 White Collar Crime (4)**

Focuses upon crime that occurs within organizational and occupational contexts. Applies the major theories of crime causation to such illegality whether committed for the benefit of an employing organization, by individuals through the exercise of State authority, by individuals in their particular professional capacity, or for other types of individual gain. Explores legal and social strategies for controlling these practices. Prerequisite: SOC 100 or SOC 110 or an introductory sociology course.

**SOC 453 Comparative Criminal Justice Systems (4)**

Compares the American Criminal Justice System to Criminal Justice Systems of a number of other advanced industrial societies, especially in Western Europe. Focal areas include overall policy/philosophy and social organization. Special emphasis upon the alternatives to American approaches, referred to broadly as harm reduction, including decriminalization, diversion before entering the CJS, diversion after entering the CJS, effective rehabilitation, and successful re-entry. Prerequisite: SOC 100 or SOC 110 or an introductory sociology course.

**SOC 455 Sociology of Law and the Courts (4)**

Examines the social origins of law and the institutions by which it is administered; the effect of law on the reproduction of social arrangements; the history of legal ideas and their influence on legislation and court precedents; and the relation of law to the problem of social order and control. Primary emphasis is on criminal law and courts. Prerequisite: SOC 100 or SOC 110 or an introductory sociology course.

**SOC 465 Sociology of Occupations and Professions (4)**

Presents previous and current sociological approaches to the structure of labor markets, both occupational and professional. Analyzes changes in these markets. Examines the relations between labor markets and other social institutions, such as the family, the school, race/ethnicity, gender, and class. Analyzes professions as particular types of occupation, the social consequences of professionalization, and the implications of current patterns of labor market recruitment, mobility, segregation, and segmentation. Prerequisite: ANT 301 or SOC 110, or an introductory anthropology or sociology course. Prerequisite: SOC 100 or SOC 110 or an introductory sociology course.

**SOC 480 Social Network Analysis (4)**

This seminar will provide you with an introduction to the theories and methods related to the social-scientific study of networks, as well as familiarity with the most commonly used social network analysis software: UCInet. As a result, there will be a balance between lecture classes, where core theoretical and methodological concepts related to SNA will be presented and discussed, and lab classes where you will learn hands on skills related to gathering, analyzing, and interpreting relational data. While you will undoubtedly encounter formulae and mathematical equations throughout the duration of this course, there will be a particular emphasis on applied knowledge of social network methods. Prerequisites: SOC 100 or SOC 110, SOC 332, STA 100.

**SOC 490 Selected Topics in Sociology (4)**

An in-depth treatment of a selected topic in Sociology. Provides students with the opportunity to investigate sociological subject matter. Students may receive credit in a future semester for different topic areas. Prerequisite: SOC 100 or SOC 110 or an introductory sociology course.

**SOC 491 Independent Study (Variable 1‑4)**

Provides a structure for extensive study and/or directed research (under faculty supervision) on a topic. Application form must include a description of the project, its duration, its educational goals, method for its evaluation, and a suggested number of credits. Prerequisite: SOC 100 or SOC 110 or an introductory sociology course. Matriculated students only; permission of instructor and program coordinator required.

**SOC 493 Senior Seminar in Sociology (4)**

Explores in depth a particular sociological topic chosen by the instructor. Emphasizes critical analysis of current sociological literature and the development of independent projects by students. Topic varies. Prerequisite: SOC 310 and SOC 332. Permission of instructor required.

**SOC 495 Practicum in Sociology (4)**

Integrates academic and practical experience during one semester placement in an appropriate social service, criminal justice, or work‑related community setting. Involves execution of a social practice project, negotiated among student, staff, and placement supervisor. Students must apply for admission to the course. Prerequisites: Completion of at least 2 Sociology/Anthropology courses at this campus prior to the start of this class and a 3.0 GPA and permission of instructor.

**Spanish**

**SPA 101 Elementary Spanish (4)**

Designed to give the beginning student an awareness of how members of another culture communicate and live. Student achieves this by using language skill of listening, speaking, reading, and writing. The process entails study of pronunciation, basic grammar, selected vocabulary, and the culture that the language represents. Meets the new General Education Foreign Language requirement.

**SPA 102 Intermediate Spanish (4)**

Refines the skills learned in an introductory Spanish class in oral comprehension, speaking, reading, and writing. The course instruction will be primarily in Spanish. Meets the new General Education Foreign Language requirement. Prerequisite: SPA 101.

**Statistics**

**STA 100 Statistical Methods (4)**

Study of the methods whereby data are collected, analyzed, and presented. Topics include: frequency distributions, measures of location, dispersion, and skewness, probability and probability distributions, and various topics in statistical inference. Class incorporates data analysis software. Meets the new General Education Mathematics requirement.

**STA 225 Applied Statistical Analysis (4)**

This course deals in‑depth with statistical methods used to analyze data. Applications are drawn from many diverse areas. Topics include: measures of location and scale for frequency distributions, addition and multiplication laws for probability, binomial, Poisson, and normal distributions, inferences about proportions and location parameters in one‑sample and two‑sample problems, analysis of completely randomized and randomized blocks designs, simple linear regression and correlation, sign test, median test, rank sum test, and signed rank test. Prerequisites: MAT 112, or MAT 121 or MAT 152.

**STA 290 Topics in Statistics (1-4)**

An introductory course in selected topics in Statistics not currently covered in any of the listed classes. Topics are chosen to illustrate different fields and applications which are all part of Statistics.

**STA 410 Applied Regression Analysis (4)**

Many students in engineering and the physical sciences require a continuation and further development of statistical inference within the context of linear models. Basic statistical concepts are briefly reviewed and the ordinary least squares (OLS) approach developed. Multiple regression analysis is developed with an emphasis on model specification and assessment of model assumptions. Analysis of Covariance models are developed and studied. Matrix representations are also developed and allow a more rigorous approach. A computational environment for simulation and data analysis (for example SPSS or R) is integrated throughout the course.

# **Theater**

**THR 300 Theater Production (4)**

A balance between academics and studio work. Students will learn about theatre history and production as well as actively participate in the mounting of a theatrical work. Using the varied talents of the class, we will select polished scenes, a one act play, a full length play, or an interactive educational play about current issues. The production may be a public performance or merely in-class final design and performance presentations. If a public performance, members of the class will provide the artistic and technical staffing of the production, under the overall guidance of the class instructor. Additional assistance may be provided by student volunteers not enrolled for credit. Because theatre is an art which draws upon many areas of skill and intelligence, some reflective work will be done to document each student’s personal journey. There will be some class visits to areas theaters and/or productions as these opportunities become available. Meets new General Education Arts requirement.