University of Tennessee, Chattanooga   2025-2026 Undergraduate Catalog

Course Descriptions

<u>Contract All Courses</u> |

Courses certified as satisfying General Education Requirements are identified in the course title with a two letter category abbreviation. General Education categories are listed below.

<u>Writing and Communication (WC)</u>   <u>Humanities and Fine Arts (HF)</u>   <u>Natural Science (LL, LC & LB, NL)</u>

<u>Behavioral and Social Science (SB)</u>   <u>Quantitative Reasoning (QR)</u>   <u>Individual and Global Citizenship (CZ)</u>

Mathematics

A minimum grade of C must be made on any mathematics course used as a prerequisite for any other mathematics course.

MATH 2300 - Mathematical Models, Functions, and Applications

(3) Credit Hours

Lab-based activities designed to strengthen and expand knowledge of topics in secondary mathematics, focusing on topics from precalculus and elementary calculus. Explorations involve the use of multiple representations, transformations, data analysis techniques and interconnections among geometry, probability and algebra. Most labs include significant use of various technologies. The use of quantitative approaches and building relationships between discrete and continuous reasoning are recurrent themes. Spring semester. Lecture 3 hours. Prerequisites: University, STEM, and major department grade point averages of at least 2.5. STEM 1020 or <u>STEM 1030</u> and <u>MATH 1950</u> with minimum grades of C, or STEM education program director approval. Admission to the STEM Education program.

MATH 2450 - Introduction to Differential and Difference Equations

(3) Credit Hours

Techniques and applications of first-order nonlinear differential equations, second and higher-order linear differential equations, difference equations, the Laplace transform, and systems of linear differential equations. Fall, Spring, and Summer semesters. Lecture 3 hours. Prerequisites: <u>MATH 1960</u> with a minimum grade of C or Department Head approval.

MATH 2530 - Multivariable Calculus for Applied Statistics

(3) Credit Hours

Integration techniques, differential calculus and optimization of functions of several variables, least squares and

regression, multiple integrals, continuous random variables and probability distributions. Spring semester. Prerequisites: MATH 1830

 or MATH 1950

 with minimum grade C or Department Head approval. No credit in MATH 2530 after completion in MATH 2560

.

MATH 2560 - Calculus with Analytic Geometry III

(4) Credit Hours

Third course in calculus and analytic geometry. Topics include vector algebra and vector functions, functions of several variables and partial differentiation, gradient, divergence, and curl, line, surface, and volume integrals, Green's, Stokes', and Gauss's theorems.

Fall, Spring, and Summer semesters. Lecture 4 hours. Prerequisites: MATH 1960

 with a minimum grade of C or Department Head approval.

MATH 2999R - Group Studies

(1-9) Credit Hours

On demand. Prerequisites: Department Head approval. Department may have additional prerequisite requirements.

MATH 3000 - Introduction to Logic and Proof

(3) Credit Hours

Fundamental ideas used in many areas of mathematics. Introduces the concepts of sets, functions, equivalence relations, ordering relations, logic, techniques of proof, mathematical induction, rational and irrational numbers, axiomatic theories, and selected topics from combinatorics. Students will regularly write proofs emphasizing precise reasoning and clear exposition to develop mathematical maturity.Fall, Spring, and Summer semesters. Lecture 3 hours. Prerequisites: MATH 1960

 or MATH 2200

 with a minimum grade of C or Department Head approval.

MATH 3100 - Applied Statistics (QR)

(3) Credit Hours

Introduction to probability and statistical methods with applications to various disciplines. Study of basic statistical distributions, sampling, hypothesis testing, and estimation problems. Fall, Spring, and Summer semesters.Lecture 3 hours. Prerequisites: MATH 1960

 or MATH 2530

 with a minimum grade of C or Department Head approval. Credit not allowed in both MATH 3100 and the sequence MATH 4130

 and MATH 4140

.

General Education Category: Quantitative Reasoning

MATH 3150 - Mathematical Foundations of Artificial Intelligence

(3) Credit Hours

This course will introduce students to AI through a discussion of its history (briefly) and a focus on mathematical underpinnings. The subfields of machine learning and deep learning will be discussed. Applications of AI, in both technical and non-technical fields, societal impacts, and possible future directions for the field will be explored. Spring semesters. Prerequisites: MATH 2200
, MATH 2560
, or Department Head approval.

MATH 3250 - Introduction to Modern Algebra

(3) Credit Hours

Groups, rings, fields, and other selected topics. Prerequisites: MATH 2200
 and MATH 3000
 with minimum grades of C or Department Head approval. Credit not allowed in both MATH 3250 and MATH 4250
.

MATH 3310 - Mathematical Programming I

(3) Credit Hours

Examines the basic concepts and applications of mathematical programming. Topics include formulation of mathematical models, linear programming, the simplex algorithm, duality, sensitivity analysis, transportation problems and assignment problems. Prerequisites: MATH 2200
 or Department Head approval.

MATH 3510 - Introduction to Analysis I

(3) Credit Hours

Rigorous treatment of real analysis covering sets, functions, cardinality, algebraic, order, and completeness properties of the real number system, infinite sequences, limits, and continuity.

Fall semester. Lecture 3 hours. Prerequisites: MATH 2450
, MATH 2560
, and MATH 3000
, all with minimum grades of C, or Department Head approval.

MATH 3810 - Introduction to Quantum Information Science and Technology

(3) Credit Hours

The purpose of this course is to present quantum information science and technology (QIST) to students, at an introductory (junior/senior undergraduate) level. This course will showcase potential applications of QIST in areas ranging from computing and secured communication to biomedical sensing and even finance. QIST is built upon

fundamental concepts from physics, mathematics and computer science. Except for the specified prerequisites, the course will be self-contained with respect to the background needed to gain an understanding of QIST. Spring semester. Prerequisites: PHYS 1350
 or CPSC 1100
, MATH 2200
, or Department Head approval.   May be registered as PHYS 3810, MATH 3810, or CPSC 3810. Credit allowed in only one of the three courses.

MATH 3820 - Communicating Mathematics

(3) Credit Hours

Introduction to the techniques and tools of written and oral communication in mathematics. Fall and Spring semesters. Lecture 3 hours.Prerequisites: MATH 3250
 or MATH 3510
 or MATH 4200
 or MATH 4250
 with a minimum grade of C or Department Head approval.

MATH 3999R - Group Studies

(1-9) Credit Hours

On demand. Prerequisites: Department Head approval. Department may have additional prerequisite requirements.

MATH 4000 - The Historical Development of Mathematics

(3) Credit Hours

Examination of central ideas, major developments, and important issues in mathematics from ancient times to the present. Historical overview of the evolution of the discipline through comparative examination of specific theories and results. Prerequisites: MATH 3000
 with a minimum grade of C or Department Head approval.

MATH 4010 - Basic Concepts of Geometry

(3) Credit Hours

Deficiencies in Euclidean geometry, Euclid's parallel postulate, introduction to non-Euclidean geometry, consistency and validity of non-Euclidean geometry, incidence geometries, affine geometries, linear, planar, and spatial order properties. Prerequisites: MATH 3000
 with a minimum grade of C or Department Head approval.

MATH 4050 - Introduction to Point Set Topology

(3) Credit Hours

Introductory set theory, topologies and topological spaces, continuous mappings, compactness, connectedness, separation axioms and metric spaces. Prerequisites: MATH 3510
with a minimum grade of C or Department Head approval.

MATH 4060 - Applied Knot Theory

3 Credit Hours

Introduction to Knot Theory and its applications. Topics include: Seifert surface, genus, linking number, Kauffman bracket polynomial, Jones polynomial, tangles, braids, knotoids, entanglement of open curves in 3-space, entanglement in systems employing Periodic Boundary Conditions, entanglement of random walks, applications to DNA supercoiling, DNA recombination, entanglement in polymer melts and solutions.Prerequisites: MATH 2030
or MATH 3000
with a minimum grade of C, or Department Head approval.

MATH 4130 - Introduction to Probability and Statistics

(3) Credit Hours

Introduction to the theory of probability and its applications, counting techniques, discrete and continuous random variables and their distributions, mathematical expectation, moment generating functions. Prerequisites: MATH 2530
or MATH 2560
with a minimum grade of C or Department Head approval.

MATH 4140 - Mathematical Statistics (QR)

(3) Credit Hours

A continuation of MATH 4130
with an introduction to the Central Limit Theorem, statistical inference, probability distributions of functions of random variables. Prerequisites: MATH 4130
with a minimum grade of C or Department Head approval.
General Education Category: Quantitative Reasoning

MATH 4160 - Applied Statistical Methods

(3) Credit Hours

One and two Factor ANOVA, simple and multiple regression and correlation, and time-series analysis. This course is recommended for students planning to take actuarial exams. Prerequisites: MATH 3100
or MATH 4130
or ENCE 2220
with a minimum grade of C, or Department Head approval.

MATH 4170 - Nonparametric Statistics

(3) Credit Hours

Theory of distribution-free statistics, ranking statistics, rank correlation, U-statistics, nonparametric point and interval estimation, empirical distribution function methods, combinatorial problems; runs, matching, occupancy; limiting distributions. Prerequisites: MATH 3100
 or MATH 4130
 or ENCE 2220
 with a minimum grade of C or Department Head approval.

MATH 4200 - Linear Algebra and Matrix Theory

(3) Credit Hours

Vector spaces, linear transformations, eigenvalue and similarity transformations, orthogonal and unitary transformations, normal matrices, Jordan form. Prerequisites: MATH 2200
, MATH 3000
 with a minimum grades of C or Department Head approval.

MATH 4250 - Modern Algebra I

(3) Credit Hours

A rigorous introduction to the basic concepts and applications of modern algebra. Emphasis on groups, subgroups, cosets, isomorphisms and homomorphisms, normal subgroups, quotient groups, an introduction to rings and fields, polynomials, arithmetic in integral domains.Prerequisites: MATH 2200
 and MATH 3000
 with minimum grades of C or Department Head approval. Credit not allowed in both MATH 3250
 and MATH 4250.

MATH 4270 - Elementary Number Theory

(3) Credit Hours

Topics include divisibility, primes and unique factorization, Euclid's algorithm, congruences, arithmetic functions, theorems of Fermat, Euler and Wilson, primitive roots, and quadratic reciprocity. Prerequisites: MATH 3000
 with a minimum grade of C or Department Head approval.

MATH 4300 - Mathematics of Interest

(3) Credit Hours

Mathematical theory of interest with applications, including accumulated and present value factors, annuities, yield rates, amortization schedules and sinking funds, depreciation, bonds and related securities. Recommended for students planning to take actuarial exams. Prerequisites: MATH 1920 or MATH 1960
 with a minimum grade of C or Department Head approval.

MATH 4310 - Mathematical Programming II

(3) Credit Hours

Goal programming, network models, integer programing, dynamic programming, Karmarkar's method, complexity and convergence analysis of optimization algorithms.Prerequisites: MATH 2030
 or MATH 3000
, and MATH 3310
 with a minimum grades of C or Department Head approval.

MATH 4320 - Nonlinear Optimization

(3) Credit Hours

Examines the basic concepts and applications of nonlinear optimization. Topics convex analysis, optimality conditions, Lagrangian duality, Saddle point optimality conditions, convergency of optimization algorithms. Prerequisites: MATH 3310
 with minimum grade of C or Department Head approval.

MATH 4350 - Mathematics of Finance

(3) Credit Hours

Mathematical aspects of finance; theory of pricing derivatives of financial instruments; options in Black-Scholes model; portfolio optimization; capital asset pricing model. Offered alternate Spring semesters. Prerequisites: MATH 3100
 or MATH 4130
 with a minimum grade of C, or Department Head approval.

MATH 4460 - Partial Differential Equations

(3) Credit Hours

Classification and derivation of some elementary partial differential equations arising in applications. Separation of variables, Sturm-Liouville problems and orthogonality, Fourier Series. Diffusion, wave, and Laplace's equations in various coordinate systems with various boundary and initial conditions. Laplace transform methods and D'Alembert's solution. First order equations and weak solutions. On demand. Prerequisites: MATH 2450
 and MATH 2550 or MATH 2560
, all with minimum grades of C, or Department Head approval.

MATH 4510 - Introduction to Analysis II

(3) Credit Hours

Rigorous development of the derivative, the definite integral, sequences and series of functions, and improper integrals. Prerequisites: MATH 3510
 with a minimum grade of C or Department Head approval.

MATH 4570 - Introduction to Complex Variables

(3) Credit Hours

Techniques and applications of complex variables. Emphasizes analytic functions, Cauchy's theorem, residue theorem, maximum modulus theorem, Laurent series, classification of singularities, the fundamental theorem of algebra, and conformal mapping. Fall odd years. Lecture 3 hours. Prerequisites: MATH 2560
 with a minimum grade of C or Department Head approval.

MATH 4600 - Introduction to Numerical Analysis

(3) Credit Hours

Study of numerical solutions of nonlinear equations in one variable, direct and iterative methods for systems of linear equations, interpolation and polynomial approximation, numerical differentiation and integration, numerical methods for ordinary differential equations.Spring semester. Lecture 3 hours.Prerequisites: MATH 2200
 and MATH 2450
 and CPSC 1100
 all with minimum grades of C or Department Head approval.

MATH 4650 - Mathematical Foundations of Quantum Information Science & Technology

(3) Credit Hours

This course provides a comprehensive introduction to the mathematical foundations underpinning quantum information science. Topics include relevant concepts from linear algebra and complex variables, Hilbert spaces, tensor products, operator theory, measurement of a quantum system, entanglement, and quantum algorithms. By the end of the course, students will be equipped with the mathematical tools necessary to engage in advanced studies and research in quantum information science. Fall semester. Prerequisites: MATH 2200
, MATH 2450
, MATH 2560
 or Department Head approval.

Effective Spring 2026.

MATH 4700 - Techniques of Applied Mathematics

(3) Credit Hours

Additional topics in vector calculus; series of orthogonal functions; integral transforms; treatment of some elementary partial differential equations arising in applications. Prerequisites: MATH 2450
 and MATH 2550 or MATH 2560
, all with minimum grades of C, or Department Head approval.

MATH 4720 - Introduction to Graph Theory

(3) Credit Hours

An overview of graph theory and its applications including trees, planar graphs and graphical invariants such as domination, coloring, and matchings. Prerequisites: MATH 2030

or [MATH 3000](#)

with a minimum grade of C or Department Head approval.

MATH 4750 - Research Seminar

(1) Credit Hours

Investigation of special topics in mathematics using the directed research technique. On demand. Prerequisites: Department Head approval. Satisfactory/No Credit.

MATH 4995R - Departmental Thesis

(1-3) Credit Hours

A two-semester research or creative project resulting in a thesis under the supervision of a faculty member and with the approval of the Honors College. On demand. Prerequisites: Student must coordinate with Honors College to submit a Thesis Contract to get registered for this course. Restricted to Sophomore standing or higher.

MATH 4997R - Research

(1-9) Credit Hours

Enables students to conduct independent research. On demand. Prerequisites: Student must coordinate with a specific faculty member to complete the Research contract to get registered for the course. Restricted to Sophomore standing or higher.

MATH 4998R - Individual Studies

(1-9) Credit Hours

Enables students to study selected topics in depth. On demand. Prerequisites: Student must coordinate with a specific faculty member to complete the Individual Studies contract to get registered for the course. Restricted to Sophomore standing or higher.

MATH 4999R - Group Studies

(1-9) Credit Hours

Department may have additional prerequisite requirements. On demand.

Mechanical Engineering

ENME 1011 - Introduction to Two- and Three-Dimensional Modeling

(1) Credit Hours

Introduction to computer aided design (CAD) using two and three dimensional modeling software for both technical and non-technical individuals. Emphasis on two and three dimensional thinking and the importance of modeling and visualization to various engineering disciplines. Sketching, dimensioning, geometric relations, assembly modeling, drawing construction and solid prototype production applications are covered for the various engineering disciplines. Fall and Spring semesters. Laboratory 3 hours. Laboratory/studio course fee will be assessed. Differential course fee will be assessed.

ENME 1030 - Basic Engineering Science

(3) Credit Hours

Introduction to basic concepts of engineering. Physical quantities, units, dimensions, vectors; formulation of engineering problems. Calculus-based analysis of fundamental dynamics; motion along a straight line and in a plane. Newton's 1st, 2nd, and 3rd Laws of Motion plus applications. Work and energy. Impulse and momentum. Rotational motion. Fall and Spring semesters. Lecture 3 hours. Pre or Corequisites: ENME 1030L
; MATH 1910 or MATH 1950
 or Department Head approval. Differential course fee will be assessed.

ENME 1030L - Freshman Engineering Laboratory

(1) Credit Hours

Laboratory experiments to support and enhance the topics listed from Engineering 1030. Introduction to professional aspects of engineering, including ethics and observation of engineering practice. Written and oral presentations included. Fall and Spring semesters. Laboratory 3 hours. Pre or Corequisites: ENME 1030
 or Department Head approval. Laboratory/studio course fee will be assessed. Differential course fee will be assessed.

ENME 1850 - Introduction to Engineering Design

(2) Credit Hours

Introduction to the design process in engineering including: historical perspective, problem definition, idea generation, project planning and management, and simple decision-making. Design exercises culminate in a group designed prototype. Three and two dimensional thinking and the importance of modeling and visualization to the engineering design process discussed. Use of 3D and 2D modeling and prototyping. Written and oral reports included.Fall and Spring semesters. Lecture 1 hour, laboratory 2 hours. Pre or Corequisites: ENME 1011
 and MATH 1720
 or MATH 1910 or MATH 1950
; or Department Head approval. Laboratory/studio course fee will be assessed. Differential course fee will be assessed.

ENME 1999R - Special Projects

(1-9) Credit Hours

Individual or group projects. On demand. Prerequisites: Department Head approval. Differential course fee will be assessed.

ENME 2240 - Introduction to Engineering Computations

(3) Credit Hours

Engineering computations using a modern programming language (Python preferred). Data transfer, variable types, loops, decisions, arrays, subprograms. Applications to engineering problems. Solution of linear and non-linear equations, integration, ordinary differential equations, curve fitting, numerical relaxation techniques. Fall and Spring semesters. Pre or Corequisites: MATH 2450
 or Department Head approval. Differential course fee will be assessed.

ENME 2460 - Mechanics of Materials

(3) Credit Hours

Stress-strain concepts and relations. Bending, shear, torsion, and deflections. Euler columns, repeated loading and connections. Fall and Spring semesters. Prerequisites: ENCE 1040
 with a minimum grade of C and MATH 1960
 or Department Head approval. ENCE 2460L
 or Department Head approval. May be registered as ENCE 2460 or ENME 2460.Credit allowed in only one of the two courses. Differential course fee will be assessed.

ENME 2460L - Mechanics of Materials Laboratory

(1) Credit Hours

Principles applied in various lab activities include the stress and deformation of solid bodies subjected to uniaxial, bending and torsional loads. Individual and team projects include designing, building, testing, and evaluating structures. Written engineering communications, engineering ethics and professional responsibility. Fall and Spring semesters. Laboratory 3 hours. Prerequisites: ENGL 1020
 or Department Head approval. Pre or Corequisites: ENCE 2460
 or ENME 2460
 or Department Head approval. May be registered as ENME 2460L. No credit in both ENCE 2460L
 and ENME 2460L. Differential course fee. Laboratory/studio course fee will be assessed.

ENME 2480 - Dynamics

(3) Credit Hours

Rectilinear, curvilinear, and rotary motion. D'Alembert's principles of work and energy. Impulse and momentum, impact. Three-dimensional kinematics and dynamics. Fall and Spring semesters. Lecture 3 hours. Prerequisites: ENCE

1040
with a minimum grade of C and MATH 1920 or MATH 1960
or Department Head approval. Differential course fee will be assessed.

ENME 2999R - Group Studies

(1-9) Credit Hours

On demand. Pre or Corequisites: Department Head approval. Department may have additional prerequisite
requirements. Differential course fee will be assessed.

ENME 3030 - Thermodynamics

(3) Credit Hours

Classical thermodynamics with emphasis on first and second laws of thermodynamics. Property relationships, chemical
equilibrium, and cycle analysis. Fall and Summer semesters. Lecture 3 hours. Prerequisites: ENCE 1040
 with a minimum grade of C and MATH 1920 or MATH 1960
 or Department Head approval. May be registered as ENCH 3030
. No credit in both ENME 3030 and ENCH 3030
. Differential course fee will be assessed.

ENME 3040 - Mechanical Engineering Thermodynamics

(3) Credit Hours

A continuation of ENCH 3030
/ENME 3030
 (Thermodynamics) with an emphasis on mechanical engineering applications that involve power and refrigeration
cycles, gas-vapor mixtures (psychometrics), and chemically reacting gases (combustion). Fall and Spring semesters.
Prerequisites: ENCH 3030
/ENME 3030
 with minimum grade of C or Department Head approval. Differential course fee will be assessed.

ENME 3050 - Thermo-Fluids

(3) Credit Hours

Integrated introduction to classical thermodynamics and basic fluid mechanics. Coverage of thermodynamic properties;
the first and second laws of thermodynamics; pressure and flow measurement; fluid statics and kinematics; Bernoulli's
equation; laminar and turbulent flow; and flow in pipes. Spring semester. Lecture 3 hours. Prerequisites: ENCE 1040
 with a minimum grade of C and MATH 1920 or MATH 1960
 or Department Head approval. Differential course fee will be assessed.

ENME 3070 - Fluid Mechanics

(3) Credit Hours

Fluid statics and kinematics; fluid dynamics including Bernoulli, continuity and momentum equations; fluid measurements; viscosity; compressible and incompressible flow; laminar and turbulent flow; flow in pipes and open channels; model studies; lift and drag. Fall and Spring semesters. Prerequisites: ENCE 1040
 with a minimum grade of C and MATH 2560
 or Department Head approval. Pre or Corequisites: ENME 3070L
 and ENME 2240
 or Department Head approval. Differential course fee will be assessed.

⌀ENME 3070L - Fluid Mechanics Laboratory

(1) Credit Hours

Laboratories that include pressure, quantity and property measurements; impulse, momentum and energy concepts; hydrostatic and buoyancy forces; pump and turbine applications; open channel flow; wind tunnel studies. Design experience. Application of statistics. Fall and Spring semesters. Prerequisites: ENCE 2220
 or Department Head approval. Pre or Corequisites: ENME 3070
 or Department Head approval. Laboratory/studio course fee will be assessed. Differential course fee will be assessed.

⌀ENME 3090 - Heat and Mass Transfer

(3) Credit Hours

Fundamental principles of heat, mass, and momentum transfer; application to macroscopic systems. Special emphasis on heat transfer by conduction and convection; analogy between heat and mass transfer. Fall semester. Lecture 3 hours. Prerequisites: ENCH 3030
 or ENME 3030
, and ENME 3070
 with minimum grades of C or Department Head approval. Differential course fee will be assessed.

⌀ENME 3280 - Control Systems

(3) Credit Hours

Classical feedback control systems for continuous time systems. Block diagrams and performance criteria. Root locus, frequency methods and state space approach. Fall and Spring semesters. Prerequisites: ENME 2240
 or ENEE 2250
 with a minimum grade of C; and ENCH 3030
 or ENME 3030
 with a minimum grade of C; and MATH 2450
 or Department Head approval. Pre or Corequisites: ENCH 3280L
 or ENME 3280L or Department Head approval. May be registered as ENCH 3280
. No credit allowed in both ENME 3280 and ENCH 3280
. Differential course fee will be assessed.

⌀ENME 3400 - Engineering Materials Science

(3) Credit Hours

Study of the science of solid materials, including metals, ceramics, plastics, and semiconductors. Nature and fundamental characteristics stressed. Atomic and macroscopic perspectives. Fall and Summer semesters. Lecture 3 hours. Prerequisites: CHEM 1110
 and CHEM 1110L
 and PHYS 2310
 or Department Head approval. Differential course fee will be assessed.

ENME 3470 - Mechanical Engineering Experimentation

(2) Credit Hours

A course in the study of general characteristics of mechanical measurement systems; the study of electrical signals, computerized data acquisition systems, discrete sampling and time-varying signal analysis, statistical and uncertainty analysis of data; and the study of various sensing devices for solid-mechanical quantities, pressure, temperature, humidity, and flow. Fall semester. Lecture 2 hours. Prerequisites: ENCE 2220
 with a minimum grade of C or Department Head approval. Pre or Corequisites: ENCH 3030
/ENME 3030
, ENME 3070
, ENME 3070L
 or Department Head approval. Differential course fee will be assessed.

ENME 3480 - Kinematics and Dynamics of Machinery I

(3) Credit Hours

Mobility analysis of planar mechanisms, the study of displacement, velocity and acceleration of planar mechanisms; the analysis and synthesis of various followers and plate cams; the analysis of spur, helical, bevel and worm gear systems with an introduction to simple and compound gear trains. Fall semester. Lecture 3 hours. Prerequisites: ENME 2480
 with minimum grade of C or Department Head approval. Differential course fee will be assessed.

ENME 3580 - Manufacturing Processes

(3) Credit Hours

Introduction to the analytical tools of machine science such as heat treatment, metalworking, welding, vibrations, control theory, thermal processing, machine operations, and their applications to the solution of manufacturing problems. Introduction to machine operations and capabilities, applications and advanced material forming/processes techniques. Emphasis is on the integration of machine processes and applications to manufacturing problems. Fall and Spring semesters. Prerequisites: ENCE 2460
 and ENCE 2460L
 with minimum grades of C; PHYS 2310
; CHEM 1110
 and CHEM 1110L
 or Department Head approval. Pre or Corequisites: ENME 3400
 or Department Head approval. Differential course fee will be assessed.

ENME 3720 - Energy Conversion and Storage

(3) Credit Hours

Broad based energy conversion systems including thermal, nuclear, and electromechanical processes in power systems. Analysis in energy conversion and storage with emphasis on efficiency, performance and environmental impact. Topics include fossil and nuclear power systems, solar energy, wind energy, biomass energy, fuel cell systems, DC machines, synchronous machines, and motors. Fall semesters. Prerequisites: ENME 3040
 and ENME 3090
 with a minimum grades of C or Department Head approval. Differential course fee will be assessed.

ENME 3850 - Interdisciplinary Design Project I

(3) Credit Hours

First semester of the capstone interdisciplinary group design project in which students use their discipline-based knowledge in an interdisciplinary environment. Projects are expected to complete through preliminary design. The team design experience includes design methodology, concept generation, decision making, technical project management, quality and reliability engineering, concurrent engineering, teamwork, written and oral communication, and introduction to engineering ethics and professional responsibility. The projects incorporate technical activities applicable to the engineering disciplines of the College. Faculty from the disciplines support the course and students as technical advisors and aid in project selection. Fall and Spring semesters. Lecture 2 hours and Project 2 hours. Prerequisites: ENCE 3520
 with a minimum grade of C and ENME 1850
 or Department Head approval. Pre or Corequisites: ENME 3040
 with a minimum grade of C or Department Head approval. Student must be within three semesters of graduation. Differential course fee will be assessed.

ENME 3950 - Mechanical Engineering Design Project I (CZ)

(3) Credit Hours

First semester of the mechanical engineering interdisciplinary group design project in which students use their discipline-based knowledge in an interdisciplinary environment. Projects are expected to complete through Conceptual Design/Design Proposal stage. The team design experience includes design methodology, assessment/reassessment of problem statement, user needs assessment/analysis, function development/analysis, Objective development/analysis, intellectual property, morphological process, initial business proposal, project planning techniques (WPS/OBS, CPM, PERT), alternative solution generation/assessment, decision rational, conceptual design generation and selection, concurrent engineering, teamwork, reflective response, written and oral communication, and introduction to engineering ethics and professional responsibility. Faculty and staff from the department and from other disciplines support the course and students as technical advisors and aid in project offerings. Fall and Spring semesters.Lecture 2 hours, project 1 hour. Prerequisites: ENCE 3520
 with a minimum grade of C and ENME 1850
 or Department Head approval. Pre or Corequisites: ENME 3040
 with a minimum grade of C and ENME 3090
 with a minimum grade of C or Department Head approval. Differential course fee will be assessed.
General Education Category: Individual and Global Citizenship

ENME 3999R - Group Studies

(1-9) Credit Hours

On demand. Pre or Corequisites: Department Head approval. Department may have additional prerequisite requirements. Differential course fee will be assessed.

ENME 4010 - Mechanical Engineering Fluid Mechanics

(3) Credit Hours

Differential analysis of fluid flow including potential flow and Navier-Stokes equations, introduction to boundary layer theory, flow in pipes, flow over immersed bodies, radial and axial flow turbomachines, pumps in series and parallel. The class will include a lab component where various experiments of interest to the subject material being covered in the class will be carried out (demonstrations and or students performing experiments). Fall semester. Prerequisites: ENME 3070
 with a grade of C or better or Department Head approval. Differential course fee will be assessed.

ENME 4070 - Gas Dynamics

(3) Credit Hours

In this course students will become familiar with the applications of compressible gas dynamics in the area of high-speed flight, jet engines, rockets, ramjets, pipe flow, and heat transfer at high speeds. Treatment of the course material is be based on a combination of physical reasoning, theoretical analysis, and empirical results. Topics covered include flow in nozzles and diffusers, normal shocks, frictional flows, flows with heat transfer or energy release, and an introduction to oblique shocks. Fall semester. Lecture 3 hours. Prerequisites: ENCH 3030
/ENME 3030
, ENME 3070
 with minimum grades of C or Department Head approval. Differential course fee will be assessed.

ENME 4240 - Computational Simulation for Engineering

(3) Credit Hours

Introduction to computational simulation for solving various engineering problems. These include fundamental problems from structural mechanics, fluid mechanics, and heat transfer. Application of simulation techniques to solve multi-physics problems, i.e., conjugate heat transfer, aeroelasticity, etc. Simulations will be performed using commercial software (ANSYS or SolidWorks). Spring semester. Prerequisites: ENME 3070
 with a grade of C or better or Department Head approval. Pre or Corequisites: ENME 3090
 with a grade of C or better or Department Head approval. Differential course fee will be assessed.

ENME 4420 - Machine Design

(3) Credit Hours

The analysis of design of machine elements including fatigue-failure analysis of shafts, springs, screws, brakes, clutches, chains, belts, welds, and rivets, lubrication of journals, ball and roller bearings, and spur, helical, bevel, and worm gears. Design experience included. Fall semester. Lecture 3 hours. Prerequisites: ENCE 2460
, ENME 2480

with minimum grades of C or Department Head approval. Differential course fee will be assessed.

ENME 4430 - Thermal Component Design

(3) Credit Hours

Design of individual components of thermal systems. Design and analysis of components such as pumps, fans, compressors, turbines, heat exchangers, piping and duct design networks. Modern innovative thermal and refrigeration concepts involving economic tradeoffs in sizing and/or choice of materials. Global and societal impacts of engineering decisions. Design experience included. Fall semester. Lecture 3 hours. Prerequisites: ENME 3070
, ENME 3040
, ENME 3090
 or ENCH 3320
 with minimum grades of C, or Department Head approval. Differential course fee will be assessed.

ENME 4450 - Mechanical Vibrations

(3) Credit Hours

Free and forced vibrations of damped and undamped systems; single and multiple degrees of freedom using lumped parameter analysis. Matrix methods. Spring semester. Lecture 3 hours. Prerequisites: ENME 2480
 with a minimum grade of C, MATH 2450
, or Department Head approval. Differential course fee will be assessed.

ENME 4460 - Advanced Mechanics of Materials

(3) Credit Hours

Statically indeterminate structures; introduction to theory of elasticity; topics in mechanics of composite materials. Fall semester. Lecture 3 hours. Prerequisites: ENCE 2460
 with minimum grade of C, MATH 2450
, or Department Head approval. Differential course fee will be assessed.

ENME 4470 - Mechanical Engineering Experimentation Laboratory

(2) Credit Hours

The laboratory will provide experiences with instrumentation and data acquisition required for measuring temperature, pressure, liquid and gas flow rates, rotational speed, strain, displacement, velocity, acceleration, and combustion products. Design project is included. Application of statistics.   Fall and Spring semesters. Laboratory 2 hours. Prerequisites: ENME 3070
, ENME 3070L
, ENME 3040
, ENME 3090
 or ENCH 3320
, ENME 3470
 with minimum grades of C or Department Head approval. Laboratory/studio course fee will be assessed. Differential course fee will be assessed.

ENME 4480 - Kinematics and Dynamics of Machinery II

(3) Credit Hours

The study of compound and planetary gear trains and transmissions; static force analysis of mechanisms, dynamic force analysis of mechanisms, balancing of rotating systems; dynamics of reciprocating engines, cam dynamics and vibrations; analytic synthesis of linkage and introduction to robotics. Spring semester. Lecture 3 hours. Prerequisites: ENME 3480
 with minimum grade of C or Department Head approval. Differential course fee will be assessed.

ENME 4500 - Mechanical Engineering Design Project

(3) Credit Hours

Capstone mechanical engineering design experience; design of a thermal and/or mechanical system; consideration of engineering standards and realistic constraints that include most of the following considerations: economic, environmental, sustainability, manufacturability, ethical, health and safety, social, and political; application of the design process; oral presentations and written design report required. Spring semester. Lecture 2 hours, design lab 2 hours. Prerequisites: CPEN 3850
, ENCE 3850
, ENEE 3850
 or ENME 3850
; ENME 4420
, ENME 4430
 or Department Head approval. Pre or Corequisites: ENME 4470
 or Department Head approval. Differential course fee will be assessed.

ENME 4850 - Interdisciplinary Design Project II

(3) Credit Hours

Second semester of the capstone interdisciplinary group design project in which students use their discipline-based knowledge in an interdisciplinary environment. Completion of the detailed and final design phases of the engineering project initiated in CPEN 3850

/ENCE 3850
/ENEE 3850
/ENME 3850
 including building a model, testing, evaluation, and reporting the design result. Projects require students to illustrate their discipline knowledge in an interdisciplinary environment. Specific discipline aspects of the project are supported by representative faculty acting as technical advisors. Oral and written presentation of progress and results. Ethics and professional responsibility and the global and societal impact of engineering decisions are covered. Fall and Spring semesters. Lecture 1 hour, project 4 hours. Prerequisites: CPEN 3850
/ENCE 3850
/ENEE 3850
/ENME 3850
 with a minimum grade of C; must have been taken in the immediately preceding semester or Department Head approval.   May be registered as CPEN 4850
, ENCE 4850
 or ENEE 4850
. Credit allowed in only one of the four courses. Differential course fee will be assessed.

ΕNME 4950 - Mechanical Engineering Design Project II

(3) Credit Hours

Second semester of the mechanical engineering interdisciplinary group design project in which students use their discipline-based knowledge in an interdisciplinary environment. Completion of the preliminary design phase of the engineering project initiated in ENME 3950 including safety and risk management planning, liability analysis, modeling and simulation, uncertainty analysis, testability, manufacturability, subsystems and interface(s) definition, preliminary design, subsystem iteration, prototyping, construction, testing of subsystems, preliminary evaluation. Projects require students to illustrate their discipline knowledge in an interdisciplinary environment. Specific discipline aspects of the project are supported by representative faculty acting as Technical Advisors. Oral and written presentation of progress and results. Ethics and professional responsibility and the global and societal impact of engineering decisions are covered. Fall and Spring semesters. Lecture 2 hour, project 1 hour. Prerequisites: ENME 3950
 with a minimum grade of CPre or Corequisites: ENCH 3280
/ENME 3280
 with a minimum grade of C and ENCH 3280L
/ENME 3280L with a minimum grade of C or Department Head approval. Differential course fee will be assessed.

ΕNME 4955 - Mechanical Engineering Capstone Design

(3) Credit Hours

Capstone mechanical engineering design experience is the third and final semester of the mechanical engineering interdisciplinary group design project in which students use their discipline-based knowledge in an interdisciplinary environment. Completion of the final design phase and design product documentation for the engineering project initiated in ENME 3950 and carried through ENME 4950 which includes quality analysis and tools (6s certification), reliability, maintainability, manufacturability, competitive analysis, final product design, final product design iteration, testing, final evaluation, systems assurance, final design/product, and final design/product documentation. Projects require students to illustrate their discipline knowledge in an interdisciplinary environment. Specific discipline aspects of the project are supported by representative faculty acting as Technical Advisors. Oral and written presentation of progress and results. Ethics and professional responsibility and the global and societal impact of engineering decisions are covered. Fall and Spring semesters. Lecture 1 hour, project 2 hours. Prerequisites: ENME 4420
, ENME 4430
, and ENME 4950

or Department Head approval. Pre or Corequisites: ENME 4470
or Department Head approval. Must be taken in the last semester. Differential course fee will be assessed.

⚘ENME 4995R - Departmental Thesis

(1-3) Credit Hours

A two-semester research or creative project resulting in a thesis under the supervision of a faculty member and with the approval of the Honors College. On demand. Prerequisites: Student must coordinate with Honors College to submit a Thesis Contract to get registered for this course. Restricted to Sophomore standing or higher. Differential course fee will be assessed.

⚘ENME 4997R - Research

(1-9) Credit Hours

Enables students to conduct independent research. On demand. Prerequisites: Student must coordinate with a specific faculty member to complete the Research contract to get registered for the course. Restricted to Sophomore standing or higher. Differential course fee will be assessed.

⚘ENME 4998R - Individual Studies

(1-9) Credit Hours

Enables students to study selected topics in depth. On demand. Prerequisites: Student must coordinate with a specific faculty member to complete the Individual Studies contract to get registered for the course. Restricted to Sophomore standing or higher. Differential course fee will be assessed.

⚘ENME 4999R - Group Studies

(1-9) Credit Hours

Department may have additional prerequisite requirements. On demand. Differential course fee will be assessed.

Mechatronics Engineering Technology

⚘ETME 1100 - Electrical and Electronic Circuits

(3) Credit Hours

Analysis of simple electrical circuits with combinations of parallel and series components. Application of Ohm's and Watt's laws to electrical circuits. Use of electronic measurement instruments such as volt meters, ammeters, and ohm meters. Identification of basic electrical and electronic components such as capacitors, diodes, transistors, relays, transformers, and other components and their role in a mechatronic system, and interpretation of electrical circuits with standard symbols of electrical components. Troubleshooting techniques of electrical circuits and following electric safety guidelines. Pre or Corequisites: PHYS 1030

or Department Head approval. Laboratory/studio course fee will be assessed. Differential course fee will be assessed.

ETME 1999R - Special Projects

(1-9) Credit Hours

Individual or group projects. Prerequisites: Department Head approval. Differential course fee will be assessed.

ETME 2100 - Introduction to Mechatronics Engineering Technology

(3) Credit Hours

Integrate the principles of mechanics, electronics and computing to generate simple, economical, and reliable mechatronic systems. The course will then build on theoretical knowledge to understand how mechatronic systems or robots are programmed.Lecture 2 hours, laboratory 2 hours.Prerequisites: ETME 1100
  or Department Head approval. Laboratory/studio course fee will be assessed. Differential course fee will be assessed.

ETME 2110 - Digital Electronics and Microcontrollers

(3) Credit Hours

Study of the operation, application, and troubleshooting of TTL and CMOS electronic logic devices, their use in combinatorial and sequential logic circuits, and the interface between the logic families. It covers the study of Boolean algebra, binary and hexadecimal number systems, binary codes, and the analysis of the basic components and circuits used in semiconductor switching. Additionally, the internal structure and operation of microcontrollers will be studied. The design methodology for software and hardware applications will be developed through the labs and design projectsLecture 2 hours, laboratory 2 hours.Prerequisites: ETME 1100
  or Department Head approval. Laboratory/studio course fee will be assessed. Differential course fee will be assessed.

ETME 2130 - Principles of Mechanical Systems

(3) Credit Hours

Study of fundamental mechanical principles such as force, torque, speed, power, and energy as related to basic mechanical components and drives such as clutches, gears, brakes, belt and chain drives, pulley systems, couplings, springs, and bearings. Prerequisites: PHYS 1030
  or Department Head approval. Laboratory/studio course fee will be assessed. Differential course fee will be assessed.

ETME 2150 - Manufacturing Processes

(3) Credit Hours

Study of manufacturing such as metal forming, casting, forging, bending, and machining. Plastic processes such as forming, joining, extrusion, and molding. Joining and assembly operations such as welding, brazing, soldering, and fastening. Prerequisites: PHYS 1030
, PHYS 1030L
 and ETEM 1320

or Department Head approval. Differential course fee will be assessed.

ETME 2999R - Group Studies

(1-9) Credit Hours

Pre or Corequisites: Department Head approval. Department may have additional prerequisite requirements. Differential course fee will be assessed.

ETME 3010 - Applied Math for Engineering Technology

(3) Credit Hours

Application of mathematics to engineering systems. Covers algebra, vectors, complex numbers, integrals and derivative, and numerical methods as applied to engineering problems. Builds foundation for mechanical, electrical, controls, fluid, and thermal systems. Lecture 3 hours. Prerequisites:
 Pre or Corequisites: MATH 1950
 or Department Head approval. Differential course fee will be assessed.

ETME 3110 - Control Systems Technology

(3) Credit Hours

Classical control system concepts including block diagrams, transfer functions, stability and damping including measurement, actuation, and control elements used in systems. Frequency response analysis, gain, and phase margin. Stability criterion and root locus. Controller assessment and selection using ultimate gain and process reaction. Influence of nonlinearities and lags on system performance. Laboratory experiences will demonstrate real-world applications and usage of software tools for analysis and design. Lecture 2 hours, laboratory 3 hours. Prerequisites: MATH 1950
 or Department Head approval. Laboratory/studio course fee will be assessed. Differential course fee will be assessed.

ETME 3120 - Maintenance of Mechatronic Systems

(3) Credit Hours

Fundamental maintenance principles from multidisciplinary engineering fields. Applied machine design, material selection, equipment reliability and predictive / preventive maintenance technologies are of special emphasis. Application of troubleshooting techniques to systems having combined mechanical and electrical actuation and sensing technologies. Lecture 2 hours, laboratory 3 hours. Prerequisites: ETME 3010
 or Department Head approval. Laboratory/studio course fee will be assessed. Differential course fee will be assessed.

ETME 3210 - Automation Systems

(3) Credit Hours

Basics of conveyor systems design, industrial robots, and conventional rack systems. Topics include production flow, storage systems, and overhead monorails. Emphasis placed on total system integration, from receipt of order to

transport completion. Applications of barcoding, RFID, vision systems, and AGVs are covered.Lecture 3 hours. Pre or Corequisites: ETME 3110
 or Department Head approval. Differential course fee will be assessed.

ETME 3230 - Industrial Programming & Networking

(3) Credit Hours

Introduction to programmable logic controllers for transferring data between industrial devices across a network; networking of industrial devices including servers, computers, smart sensors, controllers, and input/output devices for use in industrial applications. Lecture 2 hours, laboratory 3 hours. Pre or Corequisites: ETME 3010
 or Department Head approval. Laboratory/studio course fee will be assessed. Differential course fee will be assessed.

ETME 3999R - Group Studies

(1-9) Credit Hours

Pre or Corequisites: Department Head approval. Department may have additional prerequisite requirements. Differential course fee will be assessed.

ETME 4110 - Integrated Mechatronics Systems I

(3) Credit Hours

This course is the first part of a two-semester senior design course that provides a comprehensive, team-oriented design experience to integrate the engineering, technology, science, and humanities learnings toward the solution of an actual problem faced by a community, agency, or corporation . It covers the conceptualization, design, analysis, material selection, computer modeling, and economic analysis of a system. Lecture 2 hours, laboratory 3 hours.Prerequisites: ETME 3110
 or Department Head approval. Laboratory/studio course fee will be assessed. Differential course fee will be assessed.

ETME 4120 - Applications of Thermal & Fluid Systems

(3) Credit Hours

Application of fluid power in engineering system design. Flow properties, frictional flow, valving systems, and electrical control of hydraulic/pneumatic systems will be covered. Thermal heat engines and refrigeration cylces and their industrial applications will be discussed. Industrial heat transfer processes including modes of heat transfer: conduction, free and forced convection, and radiation. Lecture 2 hours, laboratory 2 hours. Prerequisites: ETME 3010
 or Department Head approval. Laboratory/studio course fee will be assessed. Differential course fee will be assessed.

ETME 4130 - Applied Electric Power & Machinery

(3) Credit Hours

Principles and application of electric machinery and equipment including generators, motors, switchgear, protective relaying, overloads, and fuses. Electric power generation, transmission, and distribution with emphasis on components

and measuring instruments associated with single and three-phase AC and DC electricity. Methods of operation and control of common motors and generators. Application of protective relays, overloads, and fuses for protection of motors, generators, buses, and transformers. Methods of power factor correction. Circuit and single-line diagrams; extensive use of software for simulation. Lecture 2 hours, laboratory 2 hours. Prerequisites: ETME 3110
 or Department Head approval. Laboratory/studio course fee will be assessed. Differential course fee will be assessed.

ETME 4210 - Integrated Mechatronics Systems II

(3) Credit Hours

This course is the second of a two-course sequence senior design project in which students apply theoretical knowledge and integrate the engineering, technology, science, and humanities learnings toward the solution of an actual problem faced by a community, agency, or corporation . This courses focuses on fabrication, testing, and documentation of the design project. Lecture 2 hours, laboratory 3 hours. Prerequisites: ETME 4110
 or Department Head approval. Laboratory/studio course fee will be assessed. Differential course fee will be assessed.

Contract All Courses |