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Architectural Engineering Courses

AE 220 Introduction to HVAC

This course includes a review of thermodynamics, moist air properties and processes, basic heat transfer, solar radiation, heating and cooling losses and load calculation, types of air conditioning systems, infiltration and ventilation, air motion and distribution.

Credits: 0.00 to 3.50

College: College of Engineering

Department: Civil, Arch, & Environ Engr

AE 380 Special Topics Arch Engr

Various topics of interest in the field of architectural engineering. See program director for details on topics.

Credits: 0.50 to 12.00

College: College of Engineering

Department: Civil, Arch, & Environ Engr

AE 390 Arch Engr Design I

Establishes a base of building systems design concepts, knowledge and performance criteria, with emphasis on the thermal, electrical, illumination and structural aspects of buildings.

Credits: 0.00 to 4.00

College: College of Engineering

Department: Civil, Arch, & Environ Engr

AE 391 Arch Engr Design II

Emphasizes the development of insight into the solution of building system design problems, development of in-depth understanding of building systems design synthesis, and integration in a single building of modest scale and complexity.

Credits: 0.00 to 4.00

College: College of Engineering

Department: Civil, Arch, & Environ Engr

AE 399 Independent Study in Arch Eng

Independent study on a topic selected by the student. Independent study is supervised by a faculty member and guided by a plan of study.

Credits: 0.00 to 12.00

College: College of Engineering

Department: Civil, Arch, & Environ Engr

AE 430 Control Systems for HVAC

This course introduces basic control concepts with applications to HVAC systems; direct digital control, control loops; system modeling; transfer functions; selecting and locating sensors and actuators; design and tuning control algorithms; design and programming of HVAC control systems.

Credits: 3.00

College: College of Engineering

Department: Civil, Arch, & Environ Engr

Chemical Engineering Courses

CHE 201 Process Material Balances

Covers elementary principles of chemical engineering, use of stoichiometry and material balances to analyze chemical processing operations, and application to specific commercial processes.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Chemical Engineering

CHE 202 Process Energy Balances

Covers use of first law to analyze chemical processing operations, energy balances for non-reactive and reactive processes, chemical reaction equilibria, and application to specific commercial processes.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Chemical Engineering

CHE 206 Basic Chem Eng Thermodynamics

First and second laws of thermodynamics, use of state functions to solve macroscopic problems, distinction between solving ideal gas and real fluid problems. An introduction to phase equilibrium and mixtures. Concepts of fugacity and activity as measures

Credits: 3.00

College: College of Engineering

Department: Chemical Engineering

CHE 250 Chem Engr Process Principles

Applies heuristics to the art process synthesis and analysis. Identify key parameters in reaction and separation in processes. Examine common and divergent elements of major chemical processes.

Credits: 3.00

College: College of Engineering

Department: Chemical Engineering

CHE 301 Process Thermodynamics

Within the context of processes previously introduced, covers application of first and second laws to engineering processes, thermodynamic analysis of processes, and behavior of reacting and non-reacting homogeneous and heterogeneous mixtures.

Credits: 3.00

College: College of Engineering

Department: Chemical Engineering

CHE 302 Process Fluid Mechanics

Within the context of processes previously introduced, introduces fluid flow of gases, liquids, and particulates; momentum transport; skin friction; drag; piping networks; filtration; and fluidization.

Credits: 4.00

College: College of Engineering

Department: Chemical Engineering

CHE 303 Process Heat Transfer

Covers, within the context of processes previously introduced, transfer of energy by conduction, convection, and radiation; continuation of transport phenomena; design of heat exchangers; and applications in industry and in nature.

Credits: 3.00

College: College of Engineering

Department: Chemical Engineering

CHE 304 Process Mass Transfer

Covers, within the context of processes previously introduced, mass transfer in mixtures; diffusion, convection, and continuation of transport phenomena; component separation in continuous contractors; gas absorption; liquid-liquid extraction; and simultaneous heat and mass transfer.

Credits: 4.00

College: College of Engineering

Department: Chemical Engineering

CHE 305 Process Separations

Covers, within the context of processes previously introduced, the application of thermodynamics and equilibrium stage concepts to the unit operations involved in chemical processing.

Credits: 4.00

College: College of Engineering

Department: Chemical Engineering

CHE 307 Process Modeling I

Models simple chemical and biochemical processes such as heating, cooling, and separation systems. Covers analytical and numerical methods for solving algebraic and ordinary differential equations.

Credits: 4.00

College: College of Engineering

Department: Chemical Engineering

CHE 308 Process Modeling II

Covers mathematical modeling of chemical and biochemical processes such as chemical and biochemical reactors and heating and cooling systems, analytical methods for solving algebraic and ordinary-differential equations.

Credits: 4.00

College: College of Engineering

Department: Chemical Engineering

CHE 310 Transport Phenomena

Non-chemical engineering students only. Examines mass, momentum, and energy transport in processes applied to electrical and materials engineering.

Credits: 4.00

College: College of Engineering

Department: Chemical Engineering

CHE 311 Fluid Flow and Transport

Non-chemical engineering students only. Examines fluid flow and heat and mass transfer in processes associated with civil, environmental, and materials engineering disciplines.

Credits: 3.00

College: College of Engineering

Department: Chemical Engineering

CHE 332 Chem Engr Lab I

Requires students to perform experiments illustrating the fundamentals of chemical engineering process analysis. This is a writing intensive course.

Credits: 0.00 to 2.00

College: College of Engineering

Department: Chemical Engineering

CHE 333 Chemical Engineering Lab II

Offers laboratory experiments illustrating the fundamentals of chemical engineering process analysis. This is a writing intensive course.

Credits: 0.00 to 2.00

College: College of Engineering

Department: Chemical Engineering

CHE 334 Chemical Engineering Lab III

Offers laboratory experiments illustrating the fundamentals of chemical engineering process analysis. This is a writing intensive course.

Credits: 0.00 to 2.00

College: College of Engineering

Department: Chemical Engineering

CHE 335 Statistics & Design Experiments

Provides statistical treatment of engineering data, including application of statistical techniques to process model formulation, statistical designs of engineering experiments, and analysis of probabilistic systems.

Credits: 3.00

College: College of Engineering

Department: Chemical Engineering

CHE 360 BioProcess Principles

This course is concerned with manufacturing processes involving biological substances. Students gain detailed knowledge in the design and operation of bioreactors and learn about biomolecules produced therein. Specific topics covered include: Cells (type, organization, function and growth); Protein and Enzymes; Bioreactor Process Principles (active vs. passive immobilization, fermentation and scale-up, recovery and purification); Special consideration for animal and plant cell cultures.

Credits: 3.00

College: College of Engineering

Department: Chemical Engineering

CHE 399 Special Probs Chem Engr

Covers individual research problems of a non-routine nature. Requires report.

Credits: 1.00 to 12.00

College: College of Engineering

Department: Chemical Engineering

CHE 400 Special Tops Chem Engr

Special courses offered in response to particular student and/or faculty interest.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Chemical Engineering

CHE 420 Process Systems Engineering

Covers the application of automatic control theory to chemical processes within the context of processes previously introduced.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Chemical Engineering

CHE 424 Chem Kinetics & Reactor Design

Covers isothermal and non-isothermal reactor design, series and parallel reactions, and heterogeneous catalysis.

Credits: 0.00 to 4.00

College: College of Engineering

Department: Chemical Engineering

CHE 450 Chemical Process Industries

Chemical engineering juniors and seniors. Combines process heuristics and design strategies with case studies of the industrial manufacture of a variety of materials, including petrochemicals, polymers, and ammonia. Discusses operational and design problems as well as the interactions of process principles.

Credits: 3.00

College: College of Engineering

Department: Chemical Engineering

CHE 451 Safety Engineering

Covers selected topics such as safeguarding systems, fault trees, risk analysis, explosions, fires, and building safety.

Credits: 3.00

College: College of Engineering

Department: Chemical Engineering

CHE 452 Polymer Process Technology

Covers chemistry of chain and stepwise polymerization, industrial reactor systems, polymer melt rheology, processing of thermoplastic resins, and plastics properties.

Credits: 3.00

College: College of Engineering

Department: Chemical Engineering

CHE 460 Biochemical Engineering

Introduces underlying biological and engineering principles in an integrate fashion for biopharmaceutical production systems.

Credits: 3.00

College: College of Engineering

Department: Chemical Engineering

CHE 481 Process Design I

Within the context of previously introduced processes, covers economic feasibility of projects and optimization of equipment and production in the design of process plants. This is a writing intensive course.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Chemical Engineering

CHE 482 Process Design II

Within the context of previously introduced processes, covers execution of feasibility study and preliminary design of process plants. This is a writing intensive course.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Chemical Engineering

CHE 483 Process Design III

Within the context of previously introduced processes, covers completion of feasibility study and preliminary design of process plants. This is a writing intensive course.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Chemical Engineering

Civil & Architectural Engineering Courses

CAE 491 Senior Design Project I

Introduces the design process, including information retrieval, problem definition, proposal writing, patents, and design notebooks. Includes presentations on problem areas by experts from industry, government, and education. This is a writing intensive course.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Civil, Arch, & Environ Engr

CAE 492 Senior Design Project II

Continues CAE 491. Requires written and oral progress reports. This is a writing intensive course.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Civil, Arch, & Environ Engr

CAE 493 Senior Design Project III

Continues CAE 492. Requires written and oral final reports, including oral presentations by each design team at a formal Design Conference open to the public and conducted in the style of a professional conference. This is a writing intensive course.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Civil, Arch, & Environ Engr

Civil, Architectural and Environmental Engineering Courses

CAEE 210 Measurements in CAE Engr I

This course introduces student to various technical specialties within Civil, Architectural and Environmental engineering through hands-on experience of conducting field and laboratory measurements that are typical to three engineering fields.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Civil, Arch, & Environ Engr

CAEE 211 Measurements in CAE Engr II

This course is a continuation of CAEE 210. There are two main modules in the course: fundamental geological principles and relationships to engineering properties and fundamental surveying principles and measurements using modern surveying equipment.

Credits: 0.00 to 4.00

College: College of Engineering

Department: Civil, Arch, & Environ Engr

Civil Engineering Courses

CIVE 240 Engineering Economic Analysis

Techniques for project decisions: benefit cost and present worth analysis, rate of return, capital budgeting, risk analysis, environmental impact, and depreciation. This is a writing intensive course.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Civil, Arch, & Environ Engr

CIVE 250 Construction Materials

Construction Materials.

Credits: 0.00 to 4.00

College: College of Engineering

Department: Civil, Arch, & Environ Engr

CIVE 251 Engineering Surveying

Covers the theory and use of surveying instruments and principles of plane and topographic surveying. Introduces computer programs for surveying computations and plotting.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Civil, Arch, & Environ Engr

CIVE 261 Mater & Struct Behavior I

Introduces the basic materials of construction (timber, masonry, steel, and concrete). Covers their behavior as ingredients of the structural system. Required for architecture and construction management students. Fall.

Credits: 3.00

College: College of Engineering

Department: Civil, Arch, & Environ Engr

CIVE 262 Materls & Struct Behvr II

Continues CIVE 261. Required for architecture and construction management students. Winter.

Credits: 3.00

College: College of Engineering

Department: Civil, Arch, & Environ Engr

CIVE 263 Materls & Struc Behav III

Continues CIVE 262. Required for architecture and construction management students. Spring.

Credits: 3.00

College: College of Engineering

Department: Civil, Arch, & Environ Engr

CIVE 300 Theory of Structures I

Covers analysis of statically determinate structures: equilibrium, compatibility, boundary conditions, complimentary and virtual work, energy theorems, reactions, member forces and deflection of trusses, beams and frames, and influence lines.

Credits: 3.00

College: College of Engineering

Department: Civil, Arch, & Environ Engr

CIVE 301 Theory of Structures II

Covers analysis of statically indeterminate structures: force methods for trusses, beams and frames, slope-deflection and equilibrium methods, moment distribution, stiffness matrices of truss and beam elements, and stiffness matrix method of analysis.

Credits: 0.00 to 4.00

College: College of Engineering

Department: Civil, Arch, & Environ Engr

CIVE 310 Soil Mechanics I

Gives an overview of types of problems encountered in geotechnical engineering: index, mechanical, hydraulic and environmental properties of soils; earth mass stability, deformation, and groundwater seepage; laboratory measurements.

Credits: 0.00 to 4.00

College: College of Engineering

Department: Civil, Arch, & Environ Engr

CIVE 320 Introduction to Fluid Flow

Covers fundamentals of fluid flow, fluid properties, hydrostatic forces, kinematics of flow, the Bernoulli equation, linear momentum, dimensional analysis, Froude and Reynolds similarity and hydraulic models and an introduction to pipe flows and friction.

Credits: 3.00

College: College of Engineering

Department: Civil, Arch, & Environ Engr

CIVE 330 Hydraulics

Covers pipe flow, friction losses, multiple pipe systems, water demand and distribution network design, pumps and pumping systems, air flow in ducts and fans, open channel flows, hydraulic jumps and energy

dissipation, gravity pipe networks and the design of storm and sanitary sewer systems.

Credits: 0.00 to 4.00

College: College of Engineering

Department: Civil, Arch, & Environ Engr

CIVE 341 Municipal Water Facilities

Covers analysis and design of municipal water supply systems, including collection, transmission and distribution facilities; public health considerations in water supply; and maintenance of water supply infrastructure.

Credits: 3.00

College: College of Engineering

Department: Civil, Arch, & Environ Engr

CIVE 370 Intro To Struc Analysis

Covers equilibrium, virtual work, reactions, and member forces in trusses, beams, and frames. Introduces analysis of statically indeterminate structures and the stiffness matrix method of analysis.

Credits: 3.00

College: College of Engineering

Department: Civil, Arch, & Environ Engr

CIVE 371 Intro Structural Design

Covers the design process, with topics including structural systems, loads and load path, structural safety, and design methods. Offers introduction to steel, reinforced concrete, wood, and masonry design.

Credits: 3.00

College: College of Engineering

Department: Civil, Arch, & Environ Engr

CIVE 372 Structural Laboratory

Course use of structural analysis computer programs to construct analytical models of various structural systems. Calculate reactions and deflections of statically determinate and determinate structures and check reliability of results.

Credits: 1.00

College: College of Engineering

Department: Civil, Arch, & Environ Engr

CIVE 375 Structural Material Behavior

Study of deformation, fracture and fatigue of structural materials used in infrastructure. Includes basic failure modes, yielding and plasticity, and fracture mechanics. Emphasis on analytical and predictive methods that designers use to avoid failure.

Credits: 3.00

College: College of Engineering

Department: Civil, Arch, & Environ Engr

CIVE 399 Independent Study in Civil Eng

Independent study on a topic selected by the student. Independent study is supervised by a faculty member and guided by a plan of study.

Credits: 0.00 to 12.00

College: College of Engineering

Department: Civil, Arch, & Environ Engr

CIVE 400 Structural Design I

Covers principles of design of structural members and systems, including loads on structures, structural safety, and structural members and their behavior. Introduces elastic and limit design procedures.

Credits: 3.00

College: College of Engineering

Department: Civil, Arch, & Environ Engr

CIVE 401 Structural Design II

Covers principles of design of reinforced concrete structural systems, including beams, slabs, columns, and footings.

Credits: 3.00

College: College of Engineering

Department: Civil, Arch, & Environ Engr

CIVE 402 Structural Design III

Covers elastic and plastic design of structural steel members, including beams, columns, tension members, beam columns, and plate girders; design of welded and high-strength bolted connections; and design of steel trusses, bridges, and buildings.

Credits: 3.00

College: College of Engineering

Department: Civil, Arch, & Environ Engr

CIVE 410 Foundation Engineering

Covers shear strength, bearing capacity, and lateral earth pressure; design of shallow foundations (footings, mats) and deep foundations (piles, drilled shafts); and excavation and slope stability.

Credits: 3.00

College: College of Engineering

Department: Civil, Arch, & Environ Engr

CIVE 420 Water and Waste Treatment I

Covers water supply chemistry, including corrosion in water distribution systems, microbiology of water and wastes, biodegradation of toxic materials, and growth and metabolism in wastewater treatment processes.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Civil, Arch, & Environ Engr

CIVE 431 Hydrology-Ground Water

Covers geologic and hydrologic occurrence of groundwater, underground flow, and groundwater supply. Winter.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Civil, Arch, & Environ Engr

CIVE 432 Water Resources Design

Covers planning and design of basin and developments for requirements of various water use purposes. Spring.

Credits: 3.00

College: College of Engineering

Department: Civil, Arch, & Environ Engr

CIVE 477 Seminar

Covers professional development and ethics. Requires preparation of a technical paper. This is a writing intensive course.

Credits: 2.00

College: College of Engineering

Department: Civil, Arch, & Environ Engr

CIVE 478 Seminar

Requires preparation and presentation of a technical paper. This is a writing intensive course.

Credits: 1.00

College: College of Engineering

Department: Civil, Arch, & Environ Engr

Computer Science Courses

CS 121 Computation Lab I

Introduces computation and programming through the use of a symbolic mathematical computation system. Programming techniques and algorithmic problem solving are introduced in the context of the differential calculus. Illustrates the power and limitations of the computer in solving mathematical, engineering and scientific problems. Some or all pre-requisites may be taken as either a pre-requisite or co-requisite. Please see the department for more information.

Credits: 1.00

College: College of Engineering

Department: Computer Science

CS 122 Computation Lab II

Introduces computation and programming through the use of a symbolic mathematical computation system. Programming techniques and algorithmic problem solving are introduced in the context of the integral calculus. Illustrates the power and limitations of the computer in solving mathematical, engineering and scientific problems. Some or all pre-requisites may be taken as either a pre-requisite or co-requisite. Please see the department for more information.

Credits: 1.00

College: College of Engineering

Department: Computer Science

CS 123 Computation Lab III

Introduces computation and programming through the use of a symbolic mathematical computation system. Programming techniques and algorithmic problem solving are introduced in the context of the multivariate calculus and series. Illustrates the power and limitations of the computer in solving mathematical, engineering and scientific problems. Some or all pre-requisites may be taken as either a pre-requisite or co-requisite. Please see the department for more information.

Credits: 1.00

College: College of Engineering

Department: Computer Science

CS 130 Prog Concepts 3D Animation

Introduction to elementary programming concepts within a 3D animation learning environment. Programming concepts include: planning tools (storyboards, pseudocode), control structures, expressions, conditionals, repetition, functions, parameter passing, events and event handlers, classes, objects, methods, inheritance. Stresses good programming style, documentation, debugging, and testing.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Computer Science

CS 131 Computer Programming A

Introduction to structured computer programming in the language of instruction (e.g. C++). Topics include: variables, input and output, expressions, assignment statements, conditionals and branching, files, repetition, functions and parameter passing.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Computer Science

CS 132 Computer Programming B

Introduction to structured computer programming in the language of instruction (e.g. C++). Topics include: random numbers, recursion, vectors, searching and sorting, classes, information hiding principles. Stresses good programming style, documentation, debugging, and testing.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Computer Science

CS 133 Computer Programming C

Advanced principles of computer programming in the language of instruction (e.g. C++: Classes, inheritance, information hiding principles, recursion, quicksort, multidimensional arrays, pointers, and dynamic memory. Stresses good programming style, documentation, debugging, and testing.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Computer Science

CS 161 Introduction to Computing

Introduction to the computer as a tool for productivity and communications. Provides fluency in the use of industry-standard software for professional communications and presentations, data analysis, and telecommunication. Introduce automation and programming to enhance the effective use of computers and computer applications.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Computer Science

CS 164 Intro to Computer Science

An introduction to the field of computer science. Exposure to core areas (selected from algorithms, artificial intelligence, computer architecture, databases, graphics, human-computer interaction, programming languages, scientific computation, software engineering) while introducing and reinforcing the importance of programming.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Computer Science

CS 171 Computer Programming I

Covers fundamentals of structured computer programming in the language of instruction (e.g., C++): variables, input and output, expressions, assignment statements, conditionals and branching, subprograms, parameter passing, repetition, arrays, top-down design, testing, and debugging.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Computer Science

CS 172 Computer Programming II

Covers object-oriented design, inheritance hierarchies, information hiding principles, string processing, recursion, good programming style, documentation, debugging, and testing.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Computer Science

CS 190 Selected Computer Language

Focuses on programming in a selected language of interest. Course content, language, and prerequisites may vary according to instructor, with emphasis on applications for which the language is designed. May be repeated for credit.

Credits: 3.00

College: College of Engineering

Department: Computer Science

CS 203 Programming for Engineers

Fundamentals of computer organization; rudiments of programming including data types, arithmetic and logical expressions, conditional statements, control structures; problem solving techniques for engineers using programming; object-oriented programming.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Computer Science

CS 204 Adv Programming for Engineers

An advanced introduction to classes and objects; inheritance and polymorphism; abstract classes and interfaces; exception handling; files and streams; garbage collection and dynamic memory allocation; recursion; using linked lists, stacks, queues, and trees; search and sorting algorithms; generic methods and classes; a comparative introduction to dominant programming languages; engineering examples.

Credits: 3.00

College: College of Engineering

Department: Electrical & Computer Engr

CS 260 Data Structures

Covers stacks, queues, linked allocation, binary trees, internal searching and sorting, hashing, and applications.

Credits: 3.00

College: College of Engineering

Department: Computer Science

CS 265 Adv Programing Techniques

Introduction to the basic principles of programming practice: testing, debugging, portability, performance, design alternatives, and style. Application in a variety of programming languages programming environments, and operating systems. Introduction to tools used in the software development process for improving program functionality, performance, and robustness.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Computer Science

CS 270 Math Foundations of Comp Sci

Emphasizes analytic problem-solving and introduction of mathematical material necessary for later courses in algorithms, compiler theory, and artificial intelligence. Includes topics such as logic, theorem-proving, language operations, context-free grammars and languages, recurrence relations, and analysis of algorithms.

Credits: 3.00

College: College of Engineering

Department: Computer Science

CS 280 Special Topics in Comp Sci

Covers topics in modern computer science. Different topics may be considered in different quarters.

Credits: 0.00 to 12.00

College: College of Engineering

Department: Computer Science

CS 281 Systems Architecture I

Covers internal function and organization of digital computers, including instruction sets, addressing methods, input-output architectures, central processor organization, machine language, and assembly language.

Credits: 0.00 to 4.00

College: College of Engineering

Department: Computer Science

CS 282 Systems Architecture II

Covers computer system operations, assembly language programming techniques, operating system interfacing, and organization of assemblers and loaders.

Credits: 0.00 to 4.00

College: College of Engineering

Department: Computer Science

CS 300 Applied Symbolic Computation

This course covers the fundamentals of symbolic mathematical methods as embodied in symbolic mathematics software systems, including: fundamental techniques, simplification of expressions, solution of applications problems, intermediate expressions swell, basic economics of symbolic manipulation, efficient solution methods for large problems, hybrid symbolic/numeric techniques.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Computer Science

CS 303 Alg Number Theory & Crypto

Covers fundamental algorithms for integer arithmetic, greatest common divisor calculation, modular arithmetic, and other number theoretic computations. Algorithms are derived, implemented and analyzed for primality testing and integer factorization.

Credits: 3.00

College: College of Engineering

Department: Computer Science

CS 337 Human-Computer Interaction

Applies cognitive and experimental psychology to the understanding of human-computer interaction.

Credits: 3.00

College: College of Engineering

Department: Computer Science

CS 338 Graphical User Interfaces

This course covers the design and implementation of graphical user interfaces. Topics include: event-driven programming, application programmer interfaces, widgets, callback functions, windowing systems and desktops, rapid prototyping languages, multithreaded GUI's. A term project involving implementation of a complex application will be undertaken.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Computer Science

CS 345 Computer Game Design & Develop

This course introduces students to the computer game design process. Students also learn how the individual skills of modeling, animation, scripting, interface design and story telling are coordinated to produce

interactive media experiences for various markets, devices and purposes.

Credits: 3.00

College: College of Engineering

Department: Computer Science

CS 350 Software Design

Covers software design methods and implementation. Good design and implementation approached will be motivated through software examples and reinforced through programming projects. Topics include architectural styles, code reuse, modularity and information hiding principles, object-oriented design patterns, design specification and formal methods, good coding and documentation practices. This is a writing intensive course. Credits: 3.00

College: College of Engineering

Department: Computer Science

CS 360 Programming Language Concepts

Introduces the design and implementation of modern programming languages: formal theory underlying language implementation; concerns in naming, binding, storage allocation and typing; semantics of expressions and operators, control flow, and subprograms; procedural and data abstraction; functional, logic, and object-oriented languages. Students will construct an interpreter for a nontrivial language.

Credits: 3.00

College: College of Engineering

Department: Computer Science

CS 361 Concurrent Programming

Covers programming of concurrent, cooperating sequential processes. Studies race conditions, critical sections, mutual exclusion, process synchronization, semaphores, monitors, message passing, the rendezvous, deadlock, and starvation.

Credits: 3.00

College: College of Engineering

Department: Computer Science

CS 365 System Administration

Fundamentals of system administration featuring hands-on practice with an industry standard operating system. Focus on installation, maintenance and management of several systems for multi-user environments.

Credits: 3.00

College: College of Engineering

Department: Computer Science

CS 370 Operating Systems

Explores the internal algorithms and structures of operating systems: CPU scheduling, memory management, files systems, and device management. Considers the operating system as a collection of cooperating sequential processes (servers) providing an extended or virtual machine that is easier to program than the underlying hardware. Topics include virtual memory, input/output devices, disk request scheduling, deadlocks, file allocation, and security and protection.

Credits: 3.00

College: College of Engineering

Department: Computer Science

CS 380 Artificial Intelligence

Explores the foundations of artificial intelligence: production systems, heuristic programming, knowledge representation, and search

algorithms. Also covers programming in an AI language. Additional topics chosen from game theory, decision support systems, pattern matching and recognition, image understanding, natural language, fuzzy and non-monotonic logic, machine learning, theorem proving, and common sense reasoning.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Computer Science

CS 430 Computer Graphics

The course presents the fundamental geometric representations and drawing algorithms of computer graphics through lectures and programming assignments. The representations include lines, curves, splines, polygons, meshes, parametric surfaces and solids.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Computer Science

CS 431 Advanced Rendering Techniques

The creation of realistic images from 3D models is central to the development of computer graphics. The ray tracing algorithm has become one of the most popular and powerful techniques from creating photo-realistic images. This class explores the algorithmic components of ray tracing. Students implement many of these components in their class programming projects.

Credits: 3.00

College: College of Engineering

Department: Computer Science

CS 432 Interactive Computer Graphics

This is a project-oriented class that covers the concepts and programming details of interactive computer graphics. These include graphics primitives, display lists, picking, shading, rendering buffers and transformations. Students will learn and industry-standard graphics system by implementing weekly programming assignments. The course culminates with a student-defined project.

Credits: 3.00

College: College of Engineering

Department: Computer Science

CS 435 Computational Photography

Fundamentals of computational photography, an interdisciplinary field at the intersection of computer vision, graphics, and photography. Covered topics include fundamentals of cameras, novel camera designs, image manipulation, single-view modeling, and image-based rendering with an emphasis on learning the computational methods and their underlying mathematical concepts through hands-on assignments.

Credits: 3.00

College: College of Engineering

Department: Computer Science

CS 440 Theory of Computation

Finite automata, regular sets, and regular expressions; pushdown automata, context-free languages, and normal forms for grammars; Turing machines and recursively enumerable sets; Chomsky hierarchy; computability theory.

Credits: 3.00

College: College of Engineering

Department: Computer Science

CS 441 Compiler Workshop I

Design and implementation of compiler for specified language. Practical application and in-depth study of parsing, scanning, run-time storage management, type analysis, code generation, and error recovery.

Credits: 3.00

College: College of Engineering

Department: Computer Science

CS 442 Compiler Workshop II

Continuation of CS 441. Advanced topics in compilation, code generation, and optimization for various programming languages and paradigms.

Credits: 3.00

College: College of Engineering

Department: Computer Science

CS 445 Topics in Computer Gaming

Contemporary topics in the design and implementation of computer games. Topics may include game genres, psychological and sociological aspects of games, software tools and game development engines, character and behavior modeling, physical models and realism, virtual reality, graphics and animation, network-based, performance analysis and efficiency.

Credits: 3.00

College: College of Engineering

Department: Computer Science

CS 451 Software Engineering

Covers requirements specification, system modeling, formal methods, architectural design, object-oriented design, programming for reliability, user interface design, functional and structural testing, software reuse, and configuration management.

Credits: 3.00

College: College of Engineering

Department: Computer Science

CS 457 Data Structures & Algorithms I

This course covers techniques for analyzing algorithms, including: elementary combinatorics, recurrence relations, and asymptotic analysis; data structures such as hash tables, red-black trees, B-trees, binomial and Fibonacci heaps, union-find trees; sorting algorithms and elementary graph algorithms.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Computer Science

CS 458 Data Structures & Algorithms II

This course presents algorithm design techniques such as dynamic programming, greedy methods, divide and conquer, amortized algorithms; more graph algorithms for minimum spanning trees, shortest paths, and network flows; string matching algorithms; algorithms for finding convex hull of a discrete set of points; NP-Completeness and approximation algorithms.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Computer Science

CS 461 Database Systems

Covers topics including structure and function of database systems, normal form theory, data models (relational, network, and hierarchical), query processing (ISBL), relational algebra and calculus, and file structures. Includes programming project using DBMS.

Credits: 3.00
College: College of Engineering
Department: Computer Science

CS 470 Operating Systems Workshop

Studies a modern multitasking operating system in detail, including device drivers, CPU scheduling, memory management, and file systems. Includes programming assignments that modify or enhance the operating system.

Credits: 0.00 to 3.00
College: College of Engineering
Department: Computer Science

CS 472 Computer Networks

Introduction to computer networking theory, applications and programming, focusing on large heterogeneous networks. Broad topdown introductions to computer networking concepts including distributed applications, socket programming, operation system and router support, router algorithms, and sending bits over congested, noisy and unreliable communication links.

Credits: 0.00 to 3.00
College: College of Engineering
Department: Computer Science

CS 475 Computer and Network Security

The key objective of this work is to provide a thorough understanding of technologies and methodologies with which computer networks can be protected. Topics that are covered include: Key Management Credentials, Steganography and Watermarking, Networking Security (VPNs, Firewalls, Intrusion Detection) and System Security Policies.

Credits: 3.00
College: College of Engineering
Department: Computer Science

CS 480 Special Topics in Comp Science

Covers topics in computer science of interest to students or faculty. Different topics may be considered during different quarters.

Credits: 0.00 to 12.00
College: College of Engineering
Department: Computer Science

CS 481 Adv Artificial Intelligence

This course covers topics in representation, reasoning, and decision-making under uncertainty; learning; solving problems with time-varying properties. Assignments applying AI techniques toward building intelligent machines that interact with dynamic, uncertain worlds will be given.

Credits: 0.00 to 3.00
College: College of Engineering
Department: Computer Science

CS 485 Special Topics in AI

A variety of special topics are offered in artificial intelligence (AI) including: intelligent time-critical reasoning, knowledge-based agents, machine learning, natural language processing, and geometric reasoning. This course may be repeated for credit.

Credits: 0.00 to 3.00
College: College of Engineering
Department: Computer Science

CS 491 Software Eng Workshop I

Offers in-depth study and application of software engineering practice. Students work in teams to develop a significant software system. Course is intended to serve as a capstone experience for students in the senior year. The project involves the specification and review of software requirements and designs, implementation and code inspections, functional testing, and documentation. This is a writing intensive course.

Credits: 3.00
College: College of Engineering
Department: Computer Science

CS 492 Software Eng Workshop II

Continues CS 491 team project. This is a writing intensive course.

Credits: 3.00
College: College of Engineering
Department: Computer Science

CS 493 Software Eng Workshop III

Continues CS 492 team project. This is a writing intensive course.

Credits: 3.00
College: College of Engineering
Department: Computer Science

CS 498 Indep Study in Comp Science

Provides supervised study of selected topics in computer science.

Credits: 0.00 to 12.00
College: College of Engineering
Department: Computer Science

Electrical and Computer Engineering Courses

ECE 200 Digital Logic Design

Number systems and representation, two's complement arithmetic, digital logic devices, switching algebra, truth tables, minimization of Boolean functions, combinational logic design and analysis, sequential circuit analysis and design.

Credits: 0.00 to 3.00
College: College of Engineering
Department: Electrical & Computer Engr

ECE 201 Electric Circuits

Covers basic electric circuit concepts and laws; circuit theorems; mesh and node methods; analysis of first-and second-order electric circuits; force and natural response; sinusoidal steady state analysis; complex frequency.

Credits: 0.00 to 3.00
College: College of Engineering
Department: Electrical & Computer Engr

ECE 203 Programming for Engineers

Fundamentals of computer organization; rudiments of programming including data types, arithmetic and logical expressions, conditional statements, control structures; problem solving techniques for engineers using programming; object-oriented programming; arrays; simulation of engineering systems; principles of good programming practice.

Credits: 0.00 to 3.00
College: College of Engineering
Department: Electrical & Computer Engr

ECE 211 Electrical Engr Principles

Not open to electrical or mechanical engineering students. Covers basic techniques of electric circuit analysis, electronic devices, amplifiers, operational amplifier, and fundamentals of instrumentation.
Credits: 0.00 to 3.00
College: College of Engineering
Department: Electrical & Computer Engr

ECE 212 Electrical Engr Princ Lab
Not open to electrical or mechanical engineering students. Includes experiments involving concepts discussed in ECE 211.
Credits: 1.00
College: College of Engineering
Department: Electrical & Computer Engr

ECE 491 Senior Design Project I
Introduces the design process, including information retrieval, problem definition, proposal writing, patents, and design notebooks. Includes presentations on problem areas by experts from industry, government, and education. This is a writing intensive course.
Credits: 0.00 to 2.00
College: College of Engineering
Department: Electrical & Computer Engr

ECE 492 Senior Design Project II
Continues ECE 491. Requires written and oral progress reports. This is a writing intensive course.
Credits: 0.00 to 2.00
College: College of Engineering
Department: Electrical & Computer Engr

ECE 493 Senior Design Project III
Continues ECE 492. Requires written and oral final reports, including oral presentations by each design team at a formal Design Conference open to the public and conducted in the style of a professional conference.
Credits: 0.00 to 4.00
College: College of Engineering
Department: Electrical & Computer Engr

Electrical & Computer Engineering Courses – Computers Courses

ECEC 301 Adv Programming for Engineers
An advanced introduction to classes and objects; inheritance and polymorphism; abstract classes and interfaces; exception handling; files and streams; garbage collection and dynamic memory allocation; recursion; using linked lists, stacks, queues, and trees; search and sorting algorithms; generic methods and classes; a comparative introduction to dominant programming languages; engineering examples.
Credits: 0.00 to 3.00
College: College of Engineering
Department: Electrical & Computer Engr

ECEC 302 Digital Systems Projects
Offers hands-on experiences in digital system design with automation tools. Uses field programmable gate arrays in the projects.
Credits: 0.00 to 4.00
College: College of Engineering
Department: Electrical & Computer Engr

ECEC 304 Design with Microcontrollers
Offers hands-on experience in the design of controllers that incorporate microcontrollers as an embedded component in a larger system. The microcomputer topics to be studied will include architecture, software, programming and interfaces.
Credits: 0.00 to 4.00
College: College of Engineering
Department: Electrical & Computer Engr

ECEC 352 Secure Comput Sys: Desn Conc
Covers concepts of secure computation, including economics vs. faults, errors, and hidden messages; mathematical foundations of secure computing; design issues in fault-tolerant computing; and testability and cryptography.
Credits: 0.00 to 4.00
College: College of Engineering
Department: Electrical & Computer Engr

ECEC 355 Computer Structures
This is a course on the organization of computers, covering number representations, microprocessor machine instructions, storing of numbers and memory, computer arithmetic, the arithmetic logic unit (ALU), and input/output organization.
Credits: 0.00 to 4.00
College: College of Engineering
Department: Electrical & Computer Engr

ECEC 356 Embedded Systems
Offers hands-on experience with the Motorola 6812 Microcontroller. Involves embedded software development in C and assembly languages. The course covers timer, pulse width modulation and serial communication subsystems.
Credits: 0.00 to 4.00
College: College of Engineering
Department: Electrical & Computer Engr

ECEC 411 Computer Hardware
Covers the design and performance of computer hardware devices, including direct memory access, priority arbitration, double buffering, and bus standards. Fall.
Credits: 0.00 to 3.00
College: College of Engineering
Department: Electrical & Computer Engr

ECEC 421 Intro Operating Sys I
Covers basic concepts of computer operating systems, including multiprocessing and multiprogramming systems, lock operations, synchronization, and file structures. Winter.
Credits: 0.00 to 3.00
College: College of Engineering
Department: Electrical & Computer Engr

ECEC 422 Intro Operating Sys II
Further develops the topics of ECEC 421. Spring.
Credits: 0.00 to 3.00
College: College of Engineering
Department: Electrical & Computer Engr

ECEC 431 Intro Computer Networks
Covers topics in computer and telecommunications network design.
Credits: 0.00 to 3.00
College: College of Engineering

Department: Electrical & Computer Engr

ECEC 432 Internet Arch and Protocols

Covers architecture, protocols, and services of the Internet with an analytical approach focused on design principles; Internet architecture and topology; architecture of web and mail servers; router architectures; routing protocols; multicasting; multimedia over IP and associated protocols; Quality-of-Service issues in the Internet.

Credits: 3.00

College: College of Engineering

Department: Electrical & Computer Engr

ECEC 433 Network Programming

Covers application layer protocol and how applications use the transport layer; principles and practice of network programming; the client-server model; concurrent processing; introduction to sockets and related functions client and server software design with examples; principles, issues and challenges in e-mail and web application protocols; security protocols; and network life system concepts.

Credits: 3.00

College: College of Engineering

Department: Electrical & Computer Engr

ECEC 441 Robot/Comp Intf & Cntl I

Covers fundamentals of robotics systems, including mechanics, actuators, sensors, kinematics, and inverse kinematics. Fall.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Electrical & Computer Engr

ECEC 442 Robot/Comp Intf & Cntl II

Covers robot dynamics, Lagrangian and Newton Euler methods, linear control of robots, path planning, and computer implementation. Winter.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Electrical & Computer Engr

ECEC 443 Robot/Comp Intf & Cntl III

Covers robot-computer interface methods, including redundancy, optimal control, robustness, nonlinear control, adaptive control, and multiprocessor control. Spring.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Electrical & Computer Engr

ECEC 451 Computer Arithmetic

This course provides an introduction to number representations used in computer arithmetic, issues of complexity in arithmetic operations, fixed point arithmetic, floating point arithmetic, and residue number systems.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Electrical & Computer Engr

ECEC 453 Image Processing Architecture

This course covers applications of computing techniques and hardware in image (still and video) processing. Methods of compression (lossless, lossy), video compression, JPEG standards, MPEG standards, processing requirements, and implementations for multimedia.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Electrical & Computer Engr

ECEC 455 Intelligent Sys Architectures

This course outlines the principles of designing the architectures for intelligent systems. Methods of knowledge representation are compared for a variety of engineering problems. Methods of sensing and behavior generation are demonstrated for applications in large engineering and information systems including autonomous robots. Principles of goal-oriented computers are discussed, and modules of intelligent systems architectures are described. Theoretical fundamentals and practical techniques for learning are also covered.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Electrical & Computer Engr

ECEC 457 Security in Computing

The course introduces ideas from Cryptography and Fault Tolerant Computing. Cryptography studies how to artificially create distortions that being interwoven with computations mask them from eavesdropping. Fault Tolerance studies techniques of effects of natural noises that operate in computation channels. The course deals with both some introductory issues in Public Key Cryptography and some important aspects of designing Fault Tolerant Systems.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Electrical & Computer Engr

ECEC 459 Testing of Hardware

Testing has become the largest expense item in the semiconductor industry. There is rapidly being developed new techniques in testing, design for test and built-in self-test because no existing set of techniques can satisfy the existing and future needs.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Electrical & Computer Engr

ECEC 490 Special Tops Comp Engr

Provides special courses offered because of particular student or faculty interest.

Credits: 0.00 to 12.00

College: College of Engineering

Department: Electrical & Computer Engr

ECEC 497 Research In Computer Engr

Computer engineering students only. Requires independent research in a field approved by the faculty.

Credits: 0.50 to 12.00

College: College of Engineering

Department: Electrical & Computer Engr

ECEC 499 Ind Study Computer Engr

Computer engineering students only. Requires independent study or research in a field approved by the faculty.

Credits: 0.50 to 12.00

College: College of Engineering

Department: Electrical & Computer Engr

Electrical & Computer Engineering Courses – Electrophysics Courses

ECEE 302 Electronic Devices

Covers principles of operation of semiconductor devices, including PN diodes, bipolar transistors, and field effect transistors (JFET, MOSFET, MESFET). Applications of PN junctions, including solar cells, led, laser diodes. Laboratories reinforce lecture material by allowing students to build, measure and analyze data from simple devices.

Credits: 0.00 to 4.00

College: College of Engineering

Department: Electrical & Computer Engr

ECEE 304 Electromag Fields & Waves

Covers vector calculus, Coulomb's Law, Gauss' Law, Ampere's Law, Maxwell's equations, Electromagnetic (EM) fields in devices, EM fields in circuits, EM fields in machinery, EM waves, biological effects.

Credits: 0.00 to 4.00

College: College of Engineering

Department: Electrical & Computer Engr

ECEE 352 Analog Electronics

Teaches the fundamentals of electronic circuit analysis and design by means of practical projects, such as a dc power supply and an audio amplifier. Covers design with discrete components as well as integrated circuit design.

Credits: 0.00 to 4.00

College: College of Engineering

Department: Electrical & Computer Engr

ECEE 354 Intro Wireless/Optical Elect

Covers propagation of waves in various media as it relates to wireless communications: reflection, transmission, polarization, wave packets, dispersion, radiation and antennas, microwave electronic devices, optical wave guides, and fiber optics.

Credits: 0.00 to 4.00

College: College of Engineering

Department: Electrical & Computer Engr

ECEE 421 Advanced Electronics I

Application-and design-focused course. Analyzes feedback in electronic circuits such as operational amplifiers. Covers design and applications of active filters and other typical electronic circuitry. Includes experiments in the design of multistage transistor circuits, feedback loops, operational amplifiers, and active filters.

Credits: 0.00 to 4.00

College: College of Engineering

Department: Electrical & Computer Engr

ECEE 422 Advanced Electronic Circuits I

Application-and design-focused course. Covers analysis and design of communication circuits and non-linear active circuits; oscillators, mixers, IF and RF amplifiers; and AM and FM modulators.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Electrical & Computer Engr

ECEE 423 Adv Electronic Circts II

Application-and design-focused course. Covers non-linear circuits; function and wave form generators; log-amp, multipliers, dividers, power amp, and phase-lock loops; and design of electronics needed to implement different logic circuit families.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Electrical & Computer Engr

ECEE 434 Digital Electronics

Covers basic digital integrated circuit building blocks (inverters, nor and nand logic), CMOS logic gates (dc and transient behavior), drivers, and digital circuits and systems (PLA, gate array, memory). Experiments in semiconductor material characterization, device characterization, circuit and device simulations.

Credits: 0.00 to 4.00

College: College of Engineering

Department: Electrical & Computer Engr

ECEE 441 Lightwave Engineering I

Covers fundamentals of wave propagation, including propagation in various fiber wave guides and field distributions, diffraction, attenuation, dispersion, information capacity, and other analytic and design considerations in fiber systems. Fall.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Electrical & Computer Engr

ECEE 442 Lightwave Engineering II

Covers operating principles, construction, and characteristics of sources, couplers, and detectors used in optical systems. Includes equivalent circuit models and principles of generation, transmission, and reception. Winter.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Electrical & Computer Engr

ECEE 443 Lightwave Engineering III

Covers applications of devices and systems in such areas as data, voice, and image trans-mission; industrial automation; process control; medicine; and computers. Includes basic measurement systems. Spring.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Electrical & Computer Engr

ECEE 451 Electroacoustics

Applications-oriented course. Covers fundamentals of vibrating systems; equations of motion; acoustical, electrical, and mechanical analogs; properties of waves in fluids; acoustic impedance and plane wave transmission; application to design of transducers; and application of acoustic waves in medical imaging, non-destructive testing, and the biomedical field.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Electrical & Computer Engr

ECEE 471 RF Components and Techniques

This course covers microwave networks (Z, Y, S, T ABCD Paramters), signal flowgraph, impedance matching techniques (lumped and distributed, quarter wave transformers), circulators and isolators, directional couplers (branch line, Wilkinson, Lange, slot waveguide), and filters (lowpass, bandpass, bandstop, highpass). CAD laboratory and design projects are an integral part of this course.

Credits: 0.00 to 4.00

College: College of Engineering

Department: Electrical & Computer Engr

ECEE 472 RF Electronics

This course covers static and dynamic characteristics of transistors, unipolar (MOSFET, MESFET, HEMT), bipolar (BJT, HBT), LNA design and realization, power amplifiers, distributed amplifiers, switches, limiters,

phase shifters, detectors, mixers, oscillators (Colpitts, YIG turned, reflection, transmission, DRO). CAD laboratory and design projects are an integral part of this course.

Credits: 0.00 to 4.00

College: College of Engineering

Department: Electrical & Computer Engr

ECEE 473 Antennas and Radiating Systms

This course covers short and magnetic dipole, radiation pattern, radiation resistance, directivity and gain, line antennas (dipoles, monopoles, V and inverted V antennas), helix, Yagi-Uda, log-periodic, aperture antennas (slot, horn and reflector), printed circuit antennas (patch and spiral), and phased antennas. CAD laboratory and design projects are an integral part of this course.

Credits: 0.00 to 4.00

College: College of Engineering

Department: Electrical & Computer Engr

ECEE 490 Spec Topics Electrophysic

Provides special courses offered because of particular student or faculty interest.

Credits: 0.00 to 12.00

College: College of Engineering

Department: Electrical & Computer Engr

ECEE 497 Research in Electrophysics

Requires independent research in a topic approved by the faculty.

Credits: 0.50 to 12.00

College: College of Engineering

Department: Electrical & Computer Engr

ECEE 499 Ind Study In Electrophys

Requires independent study in a topic approved by the faculty.

Credits: 0.50 to 12.00

College: College of Engineering

Department: Electrical & Computer Engr

Electrical & Computer Engineering Courses – Power Engineering Courses

ECEP 352 Elec Motor Control Principles

Introduces machinery principles, magnetic circuits, three-phase circuits, the electrical and economic structure of the power industry, ac and dc machine fundamentals, and power electronic converters and their interfaces with electric motors.

Credits: 0.00 to 4.00

College: College of Engineering

Department: Electrical & Computer Engr

ECEP 354 Energy Management Principles

Covers principles of power engineering, including the electrical and economic structure of the power industry (distribution, subtransmission, and bulk transmission levels; environmental issues; the electrical system analysis; the thermal system analysis; links between electromechanics and thermodynamics; and safety issues). Some or all pre-requisites may be taken as either a pre-requisite or co-requisite. Please see the department for more information.

Credits: 0.00 to 4.00

College: College of Engineering

Department: Electrical & Computer Engr

ECEP 411 Power Systems I

Covers elements of engineering theory and practice for the transmission of electric energy in a power system network. Includes transmission line parameters and their evaluation; models of short, medium, and long transmission lines; steady-state load-flow studies; real power/frequency control, and reactive power/voltage controls.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Electrical & Computer Engr

ECEP 412 Power Systems II

Covers power system transients, symmetrical components, economic loading of power systems, faults on synchronous machines, short-circuit studies, and transient stability analysis.

Credits: 0.00 to 4.00

College: College of Engineering

Department: Electrical & Computer Engr

ECEP 413 Power Systems III

Covers details of planning and design of major electrical power systems, with emphasis on economic, statistical, and technical considerations.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Electrical & Computer Engr

ECEP 421 Model Analy Elec Pwr Dist Sys

Introduction to power distribution systems; balanced and unbalanced systems, component and load modeling, radial and weekly meshed topologies; algorithms for unbalanced power studies including radial and general structure solver.

Credits: 3.00

College: College of Engineering

Department: Electrical & Computer Engr

ECEP 422 Pwr Distr Automation & Control

Focuses on distribution management systems and their application: including optimizing network operation - capacitor placement and control, network reconfiguration, service restoration. Modern solution technologies are addressed.

Credits: 3.00

College: College of Engineering

Department: Electrical & Computer Engr

ECEP 423 Service/Pwr Quality Distr Sys

Focus on power distribution systems: service and power quality assessment including stat estimation, voltage quality, trouble call analysis, service restoration, component and system reliability assessment.

Credits: 3.00

College: College of Engineering

Department: Electrical & Computer Engr

ECEP 431 Adv Electromag Energy Conv I

Covers theory and operation of alternating current machinery, with emphasis on design alternatives and the effects of design on performance. Includes construction of machine models from laboratory measurements.

Credits: 0.00 to 4.00

College: College of Engineering

Department: Electrical & Computer Engr

ECEP 432 Adv Electromag Energy Conv II

Covers dynamic behavior and transient phenomena of rotating machines and the mathematical models used to describe them, generalized machine theory, measurement of parameters for the mathematical models, and measurement of dynamic and transient behavior.

Credits: 0.00 to 4.00

College: College of Engineering

Department: Electrical & Computer Engr

ECEP 441 Protective Relaying

Covers operating principles of electromechanical and static relays, fault clearance, and protection of individual parts of a power system.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Electrical & Computer Engr

ECEP 451 Pwr Electronic Converter Fund

Fundamentals of power electronics that include waveforms, basic power switch properties and magnetic circuits. Introduction to basic power electronic converter circuits: diode and phase-controlled rectifies and inverters; switch-mode converters. Applications to DC and AC power supply systems.

Credits: 3.00

College: College of Engineering

Department: Electrical & Computer Engr

ECEP 452 Exp Study Pwr Elect Converters

Experimental study of common power electronic converters: diode rectifiers, phase-controlled rectifies, switch-mode inverters. Both hardware and software studies. Additional lectures on: Study of DC-DC switch-mode converters.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Electrical & Computer Engr

ECEP 453 Appl of Power Elect Converters

Provides a first look at various power electronic applications in residential, commercial and industrial sites. Examples include utility application such as static var compensators (SVC), thyristor switch capacitors (TSC), high voltage direct-current (HVDC) transmission systems among others. In addition, fundamentals of motor drives and their controls are covered. Examples include induction, DC synchronous and specialized motors.

Credits: 3.00

College: College of Engineering

Department: Electrical & Computer Engr

ECEP 461 High Voltage Laboratory

Requires students to perform four basic experiments to become familiar with high-voltage techniques and then do a high-voltage design project of their own choosing.

Credits: 1.00

College: College of Engineering

Department: Electrical & Computer Engr

ECEP 471 Power Seminar I

Discusses current developments in power system operation and research, concentrating on current and future energy sources.

Credits: 0.50

College: College of Engineering

Department: Electrical & Computer Engr

ECEP 472 Power Seminar II

Discusses current developments in power system operation and research, concentrating on generating stations, transmission lines, and substations.

Credits: 0.50

College: College of Engineering

Department: Electrical & Computer Engr

ECEP 473 Power Seminar III

Discusses current developments in power system operation and research, concentrating on distribution, security, and economics.

Credits: 0.50

College: College of Engineering

Department: Electrical & Computer Engr

ECEP 490 Special Topics Power Engr

Provides special courses offered because of particular student or faculty interest.

Credits: 0.50 to 12.00

College: College of Engineering

Department: Electrical & Computer Engr

ECEP 497 Research in Power Systems

Requires independent study in a topic approved by the faculty.

Credits: 0.50 to 12.00

College: College of Engineering

Department: Electrical & Computer Engr

ECEP 499 Ind Study In Power Engr

Requires independent study in a topic approved by the faculty.

Credits: 0.50 to 12.00

College: College of Engineering

Department: Electrical & Computer Engr

Electrical & Computer Engineering Courses – Systems Courses

ECES 302 Transform Methods & Filtering

Covers the Fourier series and the Fourier transform, sinusoidal steady-state analysis and filtering, discrete-time systems and the Z-transform, discrete Fourier transform, network functions and stability, magnitude, phase, poles and zeroes, Nyquist criterion, the Nyquist plot and root loci, stability of one-ports, sensitivity, worst-case design and failure-tolerance.

Credits: 0.00 to 4.00

College: College of Engineering

Department: Electrical & Computer Engr

ECES 304 Dynamic Systems and Stability

Covers linear time-invariant circuits and systems; two-and multi-terminal resistors, operational-amplifier circuits, first-order circuits, linear and nonlinear second-order systems, state equation and state variables, eigenvalues and eigenvectors, zero-input response, qualitative behavior of $x'=Ax$ (stability and equilibria), qualitative behavior of $x'=f(x)$, phase portraits, equilibrium states.

Credits: 0.00 to 4.00

College: College of Engineering

Department: Electrical & Computer Engr

ECES 306 Intro Modulation & Coding

Covers signal sampling and reconstruction; modulation, angle modulation; digital communications systems, digital transmission.
Credits: 0.00 to 4.00
College: College of Engineering
Department: Electrical & Computer Engr

ECES 352 Intro Digital Signal Process
Covers discrete-time signals, analog-digital conversion, time and frequency domain analysis of discrete-time systems, analysis using Z-transform, introduction to digital filters, discrete-time Fourier transform, Discrete Fourier Transform (DFT), and Fast
Credits: 0.00 to 4.00
College: College of Engineering
Department: Electrical & Computer Engr

ECES 354 Wireless, Mob & Cellular Comm
Covers concepts of wireless systems; propagation effects, including loss, dispersion, fading, transmission, and reception; mobile systems, including design of base units and mobile units; micro cells and pico cells; cell division, including frequency use and reuse; concepts of FDMA, TDMA, and CDMA; error rates and outage probability; and circuits and components for wireless and mobile systems.
Credits: 0.00 to 4.00
College: College of Engineering
Department: Electrical & Computer Engr

ECES 356 Theory of Control
Covers the foundations of control theory. Includes experiments and demonstrations during lectures and labs that may be jointly held, taking advantage of multimedia and computer-controlled apparatus.
Credits: 0.00 to 4.00
College: College of Engineering
Department: Electrical & Computer Engr

ECES 358 Computer Control Systems
Reviews principles of applications of computer control systems to a variety of industries and technologies, including manufacturing processes, robotic cells, machine cells, chemical processes, network control, investment portfolio control, and real-time expert and learning systems for diagnostics and quality control.
Credits: 0.00 to 4.00
College: College of Engineering
Department: Electrical & Computer Engr

ECES 421 Communications I
Covers analog communications, including linear modulation methods (AM, DSB, SSB), exponential modulation (FM, PM), and noise effects on analog communication systems.
Credits: 0.00 to 3.00
College: College of Engineering
Department: Electrical & Computer Engr

ECES 422 Communications II
Covers analog (PAM, PPM) and digital (PCM, DM) pulse modulation systems, entropy, source coding, and channel coding.
Credits: 0.00 to 3.00
College: College of Engineering
Department: Electrical & Computer Engr

ECES 423 Communications III
Covers digital transmission systems, baseband and passband, spread-spectrum communications, and basics of wireless and mobile systems.

Credits: 0.00 to 3.00
College: College of Engineering
Department: Electrical & Computer Engr

ECES 434 Deterministic Signal Processg
This course combines the media of speech and image analysis to introduce the most basic elements in digital signal processing. It will introduce students to the interdisciplinary aspect of DSP by using hands-on experiments drawn from diverse disciplines such as medicine, optical character recognition, speech synthesis and recognition; assembly automation and inspection, etc. Matlab-based multimedia programming software for a number of image/speech processing applications will be used to unburden the computational tasks of future course offerings.
Credits: 0.00 to 4.00
College: College of Engineering
Department: Electrical & Computer Engr

ECES 435 Statistical Signal Processing
The representation of a stationary random process by its spectrum can be an efficient and revealing description of the process. Spectral analysis is used to detect periodicities in the data, and is quite powerful in signal processing tasks such as data modeling, forecasting, system identification and signal detection. The course covers state-of-the-art, as well as conventional, power spectrum estimation techniques. Students will have theoretical as well as working knowledge necessary to evaluate and use existing DSP techniques and tools as well as competence to develop novel discrete-time signal processing methods.
Credits: 0.00 to 4.00
College: College of Engineering
Department: Electrical & Computer Engr

ECES 436 Speech and Image Sig Interpret
This course presents speech production modeling material and includes an overview of the anatomy of speech production, a digital model for vowel sounds, short term LPC analysis, cepstral analysis, and an introduction to speech coding. Image modeling and recognition material includes definitions of edges, boundaries, and textures, recognition and shape estimation from contours and textures, recognition and shape estimation from stereo, and motion and object tracking.
Credits: 0.00 to 4.00
College: College of Engineering
Department: Electrical & Computer Engr

ECES 444 Systems and Control I
This course reviews classical control: analysis and design, state space approach to systems analysis and control; Eigenvalue/Eigenvector analysis, model decomposition, state space solutions and Cayley-Hamilton technique and applications.
Credits: 0.00 to 4.00
College: College of Engineering
Department: Electrical & Computer Engr

ECES 445 Systems and Control II
This course covers Eigenvector single-value decomposition and modal decomposition; controllability, observability and Kalman canonical forms; state controllers and observers and the separation principle.
Credits: 0.00 to 4.00
College: College of Engineering
Department: Electrical & Computer Engr

ECES 446 Systems and Control III

This course covers linear quadratic control, non-linear stability and analysis. Current topics in control include Robust, H-infinity, and Fuzzy Control concepts.

Credits: 0.00 to 4.00

College: College of Engineering

Department: Electrical & Computer Engr

ECES 490 Special Tops Systems Engr

Provides special courses offered because of particular student or faculty interest.

Credits: 0.00 to 12.00

College: College of Engineering

Department: Electrical & Computer Engr

ECES 497 Research In Systems Engr

Electrical engineering students only. Requires independent research in a topic approved by the faculty.

Credits: 0.50 to 12.00

College: College of Engineering

Department: Electrical & Computer Engr

ECES 499 Sup Study: Sys Engineering

Requires independent study in a topic approved by the faculty.

Credits: 0.50 to 20.00

College: College of Engineering

Department: Electrical & Computer Engr

Electrical Engineering Lab Courses

ECEL 301 ECE Laboratory I

Offers laboratory experiences in each of the five ECE tracks: computers, controls/robotics, electronics, power and energy, and telecommunications. Each lab consists of a stand-alone module containing: lecture material providing basic theory, references, and laboratory experiments. This is a writing intensive course.

Credits: 0.00 to 2.00

College: College of Engineering

Department: Electrical & Computer Engr

ECEL 302 ECE Laboratory II

Offers laboratory experiences in each of the five ECE tracks: computers, controls/robotics, electronics, power and energy, and telecommunications. Each lab consists of a stand-alone module containing: lecture material providing basic theory, references, and laboratory experiments. Some or all pre-requisites may be taken as either a pre-requisite or co-requisite. Please see the department for more information.

Credits: 0.00 to 2.00

College: College of Engineering

Department: Electrical & Computer Engr

ECEL 303 ECE Laboratory III

Covers basic digital signal processing concepts, an introduction to analog-to-digital and digital-to-analog converters, and power supply design using analog IC devices.

Credits: 0.00 to 2.00

College: College of Engineering

Department: Electrical & Computer Engr

ECEL 304 ECE Laboratory IV

This course offers laboratory experience, using both modeling software and digital and analog hardware relevant to both electrical and computer engineers. Multi-week design projects and design teams are used to prepare students for Senior Design work.

Credits: 0.00 to 2.00

College: College of Engineering

Department: Electrical & Computer Engr

Engineering, General Courses

ENGR 100 Beginning CAD for Design

Introduces students to computer-aided graphics techniques and the use of a state-of-the-art, computer-aided design/drafting package. Students will learn 2-D and 3-D modeling techniques to support the design process. All students will be required to take a competency quiz on 4 of 6 available AutoCAD labs.

Credits: 1.00

College: College of Engineering

Department: Office of Dean of COE

ENGR 101 Engineering Design Lab I

This course introduces students to engineering design and practice. Emphasis is placed on the synthesis of knowledge, skills and the methodologies that are the heart of the profession. The course is designed to integrate core scientific foundations into an engineering perspective through the use of team-based projects, computer tools and technical writing. This is the first part of the three term freshman design experience.

Credits: 0.00 to 2.00

College: College of Engineering

Department: Office of Dean of COE

ENGR 102 Engineering Design Lab II

This course introduces students to engineering design and practice. Emphasis is placed on the synthesis of knowledge, skills and the methodologies that are the heart of the profession. The course is designed to integrate core scientific foundations into an engineering perspective through the use of team-based projects, computer tools and technical writing. This is the second part of the three term freshman design experience.

Credits: 0.00 to 2.00

College: College of Engineering

Department: Office of Dean of COE

ENGR 103 Engineering Design Lab III

This course introduces students to engineering design and practice. Emphasis is placed on the synthesis of knowledge, skills and the methodologies that are the heart of the profession. The course is designed to integrate core scientific foundations into an engineering perspective through the use of team-based projects, computer tools and technical writing. This is the third part of the three term freshman design experience.

Credits: 0.00 to 2.00

College: College of Engineering

Department: Office of Dean of COE

ENGR 104 Engr Design Lab - Transfers

Individualized course specially designed for transfer students. Provides selected educational experiences in engineering design, experimental techniques, and computer skills to round out the student's previous course of study. This is a writing intensive course.

Credits: 0.00 to 4.00

College: College of Engineering
Department: Office of Dean of COE

ENGR 105 Intro Occupational Hlth
Credits: 3.00
College: College of Engineering
Department: Office of Dean of COE

ENGR 109 Intro Engr & Lab
Credits: 0.50 to 20.00
College: College of Engineering
Department: Office of Dean of COE

ENGR 130 Engr Design & Lab I
A sequence of experiences introduce the "Art of Engineering" emphasizing the synthesis of knowledge, skills methods, and perspectives which is the essence of the profession. Use of computers for control and simulation, and the acquisition, storage, analysis and presentation of data. Use of computer aided drafting software. Developing knowledge of the universal principles and skill in using multipurpose instrumentation.
Credits: 0.00 to 4.00
College: College of Engineering
Department: Office of Dean of COE

ENGR 131 Engr Design & Lab II
A continuation of ENGR 130. Preparation of design proposal, principles of programming and applications in a graphical programming environment. Transducer characterization and selection, signal conditioning and acquisition devices. Career management, the Co-op system at Drexel.
Credits: 0.00 to 4.00
College: College of Engineering
Department: Office of Dean of COE

ENGR 132 Engr Design & Lab III
A continuation of ENGR 131. Completion and presentation of design project. Ethics and professional conduct. Continuation of programming principles and applications in a graphical programming environment. Engineering laboratory applications.
Credits: 0.00 to 4.00
College: College of Engineering
Department: Office of Dean of COE

ENGR 133 Engr Design & Lab-Transfers
A specially-designed individualized course for transfer students that provides selected educational experiences in engineering design, experimental techniques and computer skills to round out the student's previous course of study.
Credits: 0.00 to 4.00
College: College of Engineering
Department: Office of Dean of COE

ENGR 180 Special Topics in Engineering
Topics of special interest to students and faculty in Engineering.
Credits: 0.00 to 12.00
College: College of Engineering
Department: Office of Dean of COE

ENGR 199 Prep For Engr Studies
Preparation for the Engineering Core Curriculum through intensive, coordinated work in three areas: pre-calculus mathematics, effective

study methods, and career evaluation and selection. Topics include: algebra, trigonometry, geometry, note-taking, exam preparation, time management, evaluation of engineering and other career paths. (This course does not count toward graduation requirements)
Credits: 0.00 to 6.00
College: College of Engineering
Department: Office of Dean of COE

ENGR 201 Eval & Pres of Exper Data I
Provide a comprehensive introduction to analysis, presentation, and communication of data collected by the engineer. Requires students to conduct experiments on engineering systems, then process and evaluate the collected data. Required presentation of research, results, conclusions, and conjectures from a technical and ethical viewpoint.
Credits: 0.00 to 3.00
College: College of Engineering
Department: Office of Dean of COE

ENGR 202 Eval & Pres of Exper Data II
A continuation of ENGR 201.
Credits: 0.00 to 3.00
College: College of Engineering
Department: Office of Dean of COE

ENGR 210 Introduction to Thermodynamics
Introduces thermodynamics from a classical point of view. Covers work, heat, entropy, thermodynamic properties, equations of state, and first and second law analysis of closed systems, control volumes, and selected thermodynamic cycles.
Credits: 0.00 to 3.00
College: College of Engineering
Department: Civil, Arch, & Environ Engr

ENGR 211 Materials I
Introduction to materials; processing microstructures and properties, atomic view and architecture of solids, atomic motion of solids, equilibrium and non-equilibrium, degradation, magnetic and electrical behavior of materials.
Credits: 0.00 to 3.00
College: College of Engineering
Department: Office of Dean of COE

ENGR 212 Materials II
This course covers mechanics of materials, materials under load, application to materials testing, rate dependent response to materials, fracture of materials, fatigue behavior, manufacturing and materials processing.
Credits: 0.00 to 3.00
College: College of Engineering
Department: Office of Dean of COE

ENGR 220 Fundamentals of Materials
Introduces materials and their properties; atomic view and architecture of solids; atomic motion in solids, mechanics, magnetic, electrical and optical properties of materials. Corrosion and degradation of solids.
Credits: 0.00 to 4.00
College: College of Engineering
Department: Office of Dean of COE

ENGR 231 Linear Engineering Systems
Provides an overview of systems and modeling; specifically using linear algebra as the model. Specific emphasis will be placed on developing

models of engineering systems and the use of computational tools for solutions of the problems. The focus of the lab will be the use of MATLAB for solution of contemporary engineering problems.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Office of Dean of COE

ENGR 232 Dynamic Engineering Systems

Provides an overview of dynamic systems and modeling; specifically using differential equations as a model. Specific emphasis will be placed on developing models of dynamic systems and the use of computational tools for solutions of the problems. The focus of the lab will be the use of MATLAB for solution of contemporary engineering problems.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Office of Dean of COE

ENGR 361 Stat Analysis of Engr Systems

Probability, random variables, reliability, quality control, design of experiments, regression/correlation, ANOVA and related topics, hypothesis testing.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Office of Dean of COE

ENGR 491 Senior Project Design I

Introduces the design process, including information retrieval, problem definition, proposal writing, patents, and design notebooks. Includes presentations on problem areas by experts from industry, government, and education.

Credits: 0.00 to 2.00

College: College of Engineering

Department: Office of Dean of COE

ENGR 492 Senior Project Design II

Continues ENGR 491. Requires written and oral progress reports.

Credits: 0.00 to 2.00

College: College of Engineering

Department: Office of Dean of COE

ENGR 493 Senior Project Design III

Continues ENGR 492. Requires written and oral final reports, including oral presentations by each design team at a formal Design Conference open to the public and conducted in the style of a professional conference.

Credits: 0.00 to 4.00

College: College of Engineering

Department: Office of Dean of COE

Environmental Engineering Courses

ENVE 302 Envr Trans & Kinetics

Covers applications of mass balances to describing transport environmental systems, diffusive and dispersive processes, and coupling of transport and kinetic models.

Credits: 3.00

College: College of Engineering

Department: Environmental Engineering

ENVE 335 Industrial Safety

Examines safety in the workplace, loss prevention principles, Occupational Safety and Health Act implementation, accident investigation techniques, and basics of loss control and risk management.

Credits: 3.00

College: College of Engineering

Department: Environmental Engineering

ENVE 410 Solid and Hazardous Waste

Provides an overview of municipal and industrial waste management, including design and economic analysis. Discusses options such as landfilling and incineration from engineering, social, and regulatory perspectives. Reviews physical, chemical, and biological treatment of hazardous waste.

Credits: 3.00

College: College of Engineering

Department: Environmental Engineering

ENVE 421 Water and Waste Treatment II

Covers processes used for water purification and waste treatment, containment and immobilization of hazardous wastes, and ultimate disposal of residues and hazardous materials.

Credits: 3.00

College: College of Engineering

Department: Environmental Engineering

ENVE 422 Water/Waste Treatmnt Dsgn

Covers integration of processes into a complete treatment system. Includes detailed design procedures to control wastes, prevent environmental contamination, and protect drinking water quality.

Credits: 3.00

College: College of Engineering

Department: Environmental Engineering

ENVE 435 Groundwater Remediation

Reviews physical, chemical, and biological remediation technologies for contaminated sites and groundwater by in-site and ex-site applications.

Credits: 3.00

College: College of Engineering

Department: Environmental Engineering

ENVE 450 Data-based Engr Modeling

This course covers empirical methods to understand and model engineering systems. Students will learn to develop evaluate statistical models and use three common statistical software packages, Excel, SPSS, and R.

Credits: 3.00

College: College of Engineering

Department: Civil, Arch, & Environ Engr

ENVE 455 Geographic Information Systems

The course provides grounding in fundamental principles of GIS, and achieves understanding through hands on practical laboratories.

Course topics include: spatial reference systems, geographic data theory and structures, spatial analysis tools, functions and algorithms, GIS data sources, compilation and quality, and GIS project design and planning.

Credits: 3.00

College: College of Engineering

Department: Civil, Arch, & Environ Engr

ENVE 460 Fund Air Poll Control

Fundamental topics with regard to the formation and control of air pollutants are studied. This course provides strong foundation for engineers who will be involved in the development of engineering solutions for industrial air pollution prevention and design, development or selection of air pollution control devices and systems.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Environmental Engineering

ENVE 480 Topics in Envr Engineering

Selected topics offered in the area of Environmental Engineering of interest to students or faculty.

Credits: 0.50 to 12.00

College: College of Engineering

Department: Environmental Engineering

ENVE 485 Professional Envr Eng Practice

Professional and ethical considerations in environmental engineering practice. Career management and lifelong learning.

Credits: 0.00 to 1.00

College: College of Engineering

Department: Environmental Engineering

ENVE 486 Envr Engr Process Lab I

Laboratory experiments on common environmental engineering unit processes are performed. Students use data to draw conclusions relevant to design of full-scale systems.

Credits: 0.00 to 2.00

College: College of Engineering

Department: Environmental Engineering

ENVE 487 Envr Engr Process Lab II

Laboratory experiments on common environmental engineering unit processes are performed. Students use data to draw conclusions relevant to design of full-scale systems. Continuation of ENVE 486.

Credits: 0.00 to 2.00

College: College of Engineering

Department: Environmental Engineering

ENVE 491 Senior Project Design I

Introduces the design process. Covers information retrieval, problem definition, proposal writing, patents, and design notebooks. Explores problem areas through presentations by experts from industry, government, and education. This is a writing intensive course.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Environmental Engineering

ENVE 492 Senior Design Project II

Continues the work started in ENVE 491. Requires written and oral progress reports. This is a writing intensive course.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Environmental Engineering

ENVE 493 Senior Design Project III

This course is the final sequence in the design project. It requires written and oral final reports, including oral presentations by each design team at a formal Design Conference open to the public and conducted in the style of a professional conference.

Credits: 0.00 to 4.00

College: College of Engineering

Department: Environmental Engineering

Materials Engineering Courses

MATE 100 Materials for Emerging Tech

Evolution of materials engineering; education and the profession; concepts, tools, and techniques; selection and design using metals, ceramics, polymers, and composites; application of materials in a technological society; and materials of the future.

Credits: 2.00

College: College of Engineering

Department: Materials Engineering

MATE 101 Fundamentals of Materials

Examines principles underlying structure, properties, and behavior of engineering materials, including metals, ceramics, and polymers. Covers topics including bonding; crystal structure; defect structure; alloying; mechanical, electronic, and magnetic properties in relation to structure; phase equilibria; phase transformations; and oxidation and corrosion. All terms.

Credits: 0.00 to 4.00

College: College of Engineering

Department: Materials Engineering

MATE 214 Introduction to Polymers

Covers polymer molecular structure, polymerization methods, semi-crystalline polymers, glass transition, polymer solution in blends, mechanical properties, and characterization methods.

Credits: 4.00

College: College of Engineering

Department: Materials Engineering

MATE 221 Intro Mech Behavior of Mate

Covers mechanics of materials, materials under load, application to materials testing, rate-dependent response to materials, fracture materials, fatigue behavior, manufacturing, and materials processing.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Materials Engineering

MATE 240 Thermodynamics of Materials

Covers the fundamental laws of thermodynamics, statistical meaning of entropy, thermodynamic functions, heat capacity, reactions in gases and condensed phases, phase diagrams, solutions, and reaction equilibria in condensed solutions.

Credits: 0.00 to 4.00

College: College of Engineering

Department: Materials Engineering

MATE 245 Kinetics of Materials

Covers chemical reaction kinetics, thermodynamics and structure of crystal defects, diffusion equations and numerical methods of solution, kinetics in interfacial phenomena, and diffusional transformations.

Credits: 4.00

College: College of Engineering

Department: Materials Engineering

MATE 280 Advanced Materials Laboratory

The goal of the course is to introduce students to state-of-the-art experimental techniques for analysis of structure, composition and

properties of materials. Electron microscopy, Raman spectroscopy, indentation and thermal analysis will be described.

Credits: 0.00 to 4.00

College: College of Engineering

Department: Materials Engineering

MATE 315 Processing Polymers

Covers polymer processing, viscous flow and melt rheology, injection molding, extrusion, mechanical behavior, and applications and design.

Credits: 0.00 to 4.50

College: College of Engineering

Department: Materials Engineering

MATE 340 Fundamentals of Ceramics

Covers bonding; crystalline and glassy structures; equilibria and ceramic reactions; mechanical, electrical, thermal, magnetic, and optical properties; and ceramic processing.

Credits: 4.00

College: College of Engineering

Department: Materials Engineering

MATE 345 Processing of Ceramics

Covers powder production, materials characterization, stability of powder suspensions, rheological and viscoelastic properties of slurries, green-body consolidation, drying, sintering, and structure-property relationships.

Credits: 0.00 to 4.50

College: College of Engineering

Department: Materials Engineering

MATE 362 Micro Metallic Materials

Microstructures of Metallic Materials. Covers crystallography, techniques for observation of microstructure, metallic bonding, dislocation theory, plastic deformation, grain boundaries, annealing of deformed metals and solid solutions.

Credits: 4.00

College: College of Engineering

Department: Materials Engineering

MATE 366 Processing Metallic Materials

Covers solidification processing, casting and welding, heat flow analysis, solid-state transformations, precipitation hardening, transformations in steels, martensite transformations, and industrial case studies. This is a writing intensive course.

Credits: 0.00 to 4.50

College: College of Engineering

Department: Materials Engineering

MATE 370 Mechanical Behavior of Solids

Covers continuum mechanics: three-dimensional stress and strain, hydrostatic and deviatoric components, and isotropic elasticity; Mises yield criterion; fracture criteria; linear elastic fracture mechanics; materials selection; defect-tolerant and defect-free fatigue design; notch effects; and statistics of variation.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Materials Engineering

MATE 410 Case Studies in Materials

Covers interaction of materials processing and design, materials selection, the design-failure interface, cost and capacity in manufacturing. Taught via case studies.

Credits: 3.00

College: College of Engineering

Department: Materials Engineering

MATE 455 Biomedical Materials

Familiarizes students with natural tissues and the implants designed to replace them, treating both components as engineering materials. Includes a review of fundamental topics of materials structure and testing, and case studies.

Credits: 3.00

College: College of Engineering

Department: Materials Engineering

MATE 458 Advanced Biomaterials

Tissue Engineering, matrices, cells, scaffold, engineering properties, constitutive relations, absorbable polymers, cell seeding, cellular isolation, cell-scaffold interaction. May be repeated for credit.

Credits: 3.00

College: College of Engineering

Department: Materials Engineering

MATE 460 Engr Computational Lab

Covers numerical techniques, finite differences and finite elements, convergence, and applications in engineering design.

Credits: 0.00 to 4.00

College: College of Engineering

Department: Materials Engineering

MATE 491 Senior Project Design I

Introduces the design process, including information retrieval, problem definition, proposal writing, patents, and design notebooks. Includes presentations on problem areas by experts from industry, government, and education. This is a writing intensive course.

Credits: 0.00 to 2.00

College: College of Engineering

Department: Materials Engineering

MATE 492 Senior Project Design II

Continues MATE 491. Requires written and oral progress reports.

Credits: 0.00 to 2.00

College: College of Engineering

Department: Materials Engineering

MATE 493 Senior Project Design III

Continues MATE 492. Requires written and oral final reports, including oral presentations by each design team at a formal Design Conference open to the public and conducted in the style of a professional conference. This is a writing intensive course.

Credits: 0.00 to 4.00

College: College of Engineering

Department: Materials Engineering

MATE 495 Special Topics in Materials

By arrangement. Covers selected topics of current interest in materials engineering. May be taken for multiple course credit.

Credits: 0.50 to 12.00

College: College of Engineering

Department: Materials Engineering

MATE 499 Independent Study

Provides independent study and/or research on a topic approved by the department.

Credits: 0.50 to 12.00
College: College of Engineering
Department: Materials Engineering

Mechanical Engineering and Mechanics Courses

MEM 201 Funds Cmptr Aided Design

Covers application of modern, computer-aided graphics techniques and the use of state-of-the-art, computer-aided design/drafting package(s). Includes topics such as principles of computer-aided design/drafting and interactions with computer-aided manufacturing, rapid prototyping, and other modern manufacturing processes; engineering graphics and graphics languages in computer-aided design and/or drafting; creation of a drawing environment; database and file management, editing, modification, displaying, dimensioning, plotting and printing; special editing techniques; 3-D modeling, solid modeling, shading, and rendering; and file transfer. Students must have Sophomore class standing.

Credits: 0.00 to 3.00
College: College of Engineering
Department: Mechanical Engr & Mechanics

MEM 202 Engr Mechanics-Statics

Covers intermediate static mechanics, an extension of the fundamental concepts and methods of static mechanics introduced in the freshman courses TDEC 111, TDEC 113, and TDEC 115. Includes topics such as problem formulation and solution methods; two-and three-dimensional vector representation of forces, moments and couples; static equilibrium of particles, rigid bodies, and engineering structures; analysis of external and internal forces in structures via methods of free body diagrams; and properties of cross-sectional areas.

Credits: 0.00 to 3.00
College: College of Engineering
Department: Mechanical Engr & Mechanics

MEM 220 Basic Fluid Mechanics

Covers general physical properties of a fluid; kinetics of fluid motion; material derivative, vorticity, strain, and dynamics of fluids; and derivation of conservation laws in control volume form with applications.

Credits: 0.00 to 4.00
College: College of Engineering
Department: Mechanical Engr & Mechanics

MEM 230 Mechanics of Materials I

Covers definitions of stress and strain, uniaxial loading, torsion, bending moments and shear forces in beams, bending stresses and shear stress in beams, and stress transformation.

Credits: 0.00 to 4.00
College: College of Engineering
Department: Mechanical Engr & Mechanics

MEM 238 Dynamics

Covers kinematics and kinetics in two and three-dimensional space, force and acceleration, linear and angular momentum, and energy methods.

Credits: 0.00 to 4.00
College: College of Engineering
Department: Mechanical Engr & Mechanics

MEM 255 Introduction to Controls

Introduces the concepts of modeling of mechanical, electrical, electromechanical, thermal, and hydraulic systems; linearization; state-space model; time-domain analysis; transfer functions; frequency-domain analysis; analysis of systems involving automatic control of position, speed, power, flow, pressure, temperature, and other physical quantities; basic concept of feedback; basic concept of stability; computer-aided analysis.

Credits: 0.00 to 4.00
College: College of Engineering
Department: Mechanical Engr & Mechanics

MEM 310 Thermodynamic Analysis I

Reviews first and second laws of thermodynamics as applied to closed systems, control volumes, and thermodynamic cycles; covers thermodynamic relations and properties of real fluids, mixtures, and solutions; introduces phase and chemical equilibrium, power and refrigeration cycles, and combustion.

Credits: 0.00 to 4.00
College: College of Engineering
Department: Mechanical Engr & Mechanics

MEM 311 Thermal & Fluid Sci Lab

Introduces modern laboratory techniques, including statistical analysis of experimental data; thermodynamic properties and equations of state; and dynamic and static temperature measurements with potentiometers, bridge circuits, and oscilloscopes. Fall.

Credits: 0.00 to 2.00
College: College of Engineering
Department: Mechanical Engr & Mechanics

MEM 320 Fluid Dynamics I

Covers equation of motion for compressible flow; static, total, and stagnation concepts; one-dimensional isentropic, normal shock, including Fanno and Rayleigh flows and choked flow; two-dimensional supersonic flow, including Prandtl-Meyer flow and oblique shocks; analysis and design of compressible flow devices, including supersonic nozzles, diffusers, wind tunnels, inlets, and combustors.

Credits: 3.00
College: College of Engineering
Department: Mechanical Engr & Mechanics

MEM 330 Mechanics of Materials II

Reviews mechanics of materials, beam theory, combined loading, stress transformation, shear center, asymmetrical bending, deflection of beams, statically indeterminate beams, energy methods, inelastic bending, and beam column instability.

Credits: 0.00 to 4.00
College: College of Engineering
Department: Mechanical Engr & Mechanics

MEM 331 Experimental Mechanics I

Covers static testing methods, including strain gages, extensometers, photoelasticity, and model analysis; practical applications of experimental stress analysis; and verification of standard materials tests, including tensile, shear, and buckling. Winter

Credits: 0.00 to 2.00
College: College of Engineering
Department: Mechanical Engr & Mechanics

MEM 345 Heat Transfer

Covers fundamentals of conduction, convection, and radiation; steady and unsteady heat conduction; fundamentals of boundary layer flows;

introduction to forced and free convection for external and internal flows; blackbody radiation; and radiation and surface radiation properties.

Credits: 0.00 to 4.00

College: College of Engineering

Department: Mechanical Engr & Mechanics

MEM 351 Dynamic Systems Laboratory I

Includes experiments involving modeling and simulation of linear and non-linear dynamic systems, including feedback controls. Spring.

Credits: 0.00 to 2.00

College: College of Engineering

Department: Mechanical Engr & Mechanics

MEM 355 Perf Enhancemt Dyn Systems

This course introduces measures of performance of dynamical systems, means of computing/evaluation-of such measures, and how to design controllers to improve performance.

Credits: 0.00 to 4.00

College: College of Engineering

Department: Mechanical Engr & Mechanics

MEM 361 Engineering Reliability

Reviews probability concepts and modeling of random phenomena, including parameter estimation, empirical determination of distribution models, catastrophic failure models, material strength and fatigue life distribution, and reliability improvement.

Credits: 3.00

College: College of Engineering

Department: Mechanical Engr & Mechanics

MEM 380 Special Topics Mech Engr

Selected topics that meet student interests and faculty capabilities. May be taken more than one time when the topics vary. Students may enroll in more than one section of this course in any one term when different topics are covered in each section. This is a writing intensive course.

Credits: 0.00 to 12.00

College: College of Engineering

Department: Mechanical Engr & Mechanics

MEM 395 Hess UG Scholars Research

A change for undergraduates to experience independent research as part of the MEM Hess Honors Program. Weekly group meetings to discuss the details of the research endeavor are coupled with independent student in a research laboratory. May be repeated for credit.

Credits: 0.50 to 3.00

College: College of Engineering

Department: Mechanical Engr & Mechanics

MEM 399 Independ Study Mech Engr

Provides independent study or research on a topic approved by the department.

Credits: 0.50 to 12.00

College: College of Engineering

Department: Mechanical Engr & Mechanics

MEM 400 Internal Combustion Engines

Covers engine types and trends, thermodynamics of engines and engine processes, ideal and actual engine processes and cycles,

combustion and emissions, fuel chemistry and properties, detonation and knock, and engine testing and performance.

Credits: 3.00

College: College of Engineering

Department: Mechanical Engr & Mechanics

MEM 402 Power Plant Design

Covers heat cycle arrangement, equipment selection, analysis of cost demands, and diversity factors. Includes economic studies of plant and cycle arrangements.

Credits: 3.00

College: College of Engineering

Department: Mechanical Engr & Mechanics

MEM 403 Gas Turbines & Jet Propulsion

Covers fundamentals of thermodynamics and aerothermodynamics, and application to propulsion engines; thermodynamic cycles and performance analysis of gas turbines and air-breathing propulsion systems, turbojet, turboprop, ducted fan, ramjet, and ducted rocket; theory and design of ramjets, liquid and solid rockets, air-augmented rockets, and hybrid rockets; aerodynamics of flames, including the thermodynamics and kinetics of combustion reactions; supersonic combustion technology and zero-g propulsion problems; and propulsion systems comparison and evaluation for space missions.

Credits: 3.00

College: College of Engineering

Department: Mechanical Engr & Mechanics

MEM 405 Principles of Combustion I

Covers thermochemistry, the relationship between heats of formation and bond energies, heat capacity and heats of reaction, chemical equilibrium, calculation of flame temperature, and composition of burned gas.

Credits: 3.00

College: College of Engineering

Department: Mechanical Engr & Mechanics

MEM 406 Principles of Combustion II

Covers laminar flame propagation in premixed gases, detonation and deflagration, burning of liquid and solid fuels, and diffusion flames.

Credits: 3.00

College: College of Engineering

Department: Mechanical Engr & Mechanics

MEM 410 Thermodynamic Analysis II

Covers thermodynamic analysis of ideal and real mixtures and gas phase reacting systems. Introduces equilibrium analysis.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Mechanical Engr & Mechanics

MEM 413 HVAC Loads

Human comfort and associated models; state-of-the-art methods of calculating building peak heating and cooling loads; analysis of different psychrometric processes; different types of secondary systems: description, operating principles, modeling, simulation and sizing of secondary systems.

Credits: 3.00

College: College of Engineering

Department: Mechanical Engr & Mechanics

MEM 414 HVAC Equipment

Standard and real, single-stage multistage refrigeration cycles; vapor compression components (compressor, expansion devices, condensers, and evaporators); heat pumps; absorption systems; boilers; heat exchangers; cooling coils, cooling towers; part-load energy performance; annual energy; annual energy estimation methods (degree-day, bin method, modified degree-day).

Credits: 3.00

College: College of Engineering

Department: Mechanical Engr & Mechanics

MEM 417 Intro to Microfabrication

This course focuses on the fundamentals of microfabrication technologies. The materials, principles, and applications of silicon-based microfabrication technologies such as photolithography, wet/dry etching, deposition techniques, surface micromachining,

Credits: 3.00

College: College of Engineering

Department: Mechanical Engr & Mechanics

MEM 419 Microfluidics & Lab-on-a-Chip

This course focuses on design, manufacturing, and application of lab-on-a-chip systems as well as understanding microfluidic phenomena. The lecture covers novel microfluidic phenomena, microsensors, microactuators, and case studies. This course also includes two lab sessions through which student have hands-on experiences in lab-on-a-chip technology.

Credits: 3.00

College: College of Engineering

Department: Mechanical Engr & Mechanics

MEM 420 Aerodynamics

Covers steady and unsteady flow, flow around a body, wing theory, thin airfoil theory, fundamental equation of finite-wing theory, and aerodynamic characteristics of wings. Introduces potential theory and boundary layer phenomena.

Credits: 3.00

College: College of Engineering

Department: Mechanical Engr & Mechanics

MEM 423 Mechanics of Vibration

Covers free and forced vibrations of one-, two-, and multiple-degree-of-freedom systems; continuous systems; and transient and random vibration problems. Includes use of digital computer for homework and special class problems.

Credits: 0.00 to 4.00

College: College of Engineering

Department: Mechanical Engr & Mechanics

MEM 424 Biomechanics

Introduces modeling of dynamics of biomechanical systems.

Credits: 3.00

College: College of Engineering

Department: Mechanical Engr & Mechanics

MEM 425 Aircraft Design & Perform

Introduces aerodynamics and airfoils; steady flight; power required and power available curves; range and endurance; takeoff, glide, and landing; stick force and control-free stability; moment coefficients and derivatives; and designing to specification.

Credits: 3.00

College: College of Engineering

Department: Mechanical Engr & Mechanics

MEM 426 Aerospace Structures

Covers properties of wing and fuselage sections, torsion of thin-walled and skin-stringer multiple-cell sections, non-symmetrical bending of wing and fuselage sections, shear in thin-walled and skin-stringer sections, and buckling. Introduces matrix methods.

Credits: 3.00

College: College of Engineering

Department: Mechanical Engr & Mechanics

MEM 427 Finite Element Methods

Introduces the fundamental theory and formulations of finite element method and its application in structural mechanics and thermal/fluid science. Topics include formulation of 1-D and 2-D elements, isoparametric elements, static and dynamic analysis of trusses, beams, and frames, 2-D plane problems, and heat transfer problems.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Mechanical Engr & Mechanics

MEM 428 Introduction to Composites I

Introduces anisotropic elasticity, lamina stiffness and compliance, plane stress and strain, test methods, and failure criteria.

Credits: 3.00

College: College of Engineering

Department: Mechanical Engr & Mechanics

MEM 429 Introduction to Composites II

Covers laminated plate theory, stiffness and compliance of laminated plates, effect of laminated configuration on elastic performance, and strength production.

Credits: 3.00

College: College of Engineering

Department: Mechanical Engr & Mechanics

MEM 430 Advanced Stress Analysis

Examines three-dimensional representation of stress and strain, coordinate transformation, stress strain relationships for anisotropic and isotropic materials, equilibrium equations, boundary value problems, governing equations in plane strain and plane stress problems, Airy's stress function, two-dimensional problems in polar coordinates, and selected applications to stress analysis problems in mechanical engineering.

Credits: 4.00

College: College of Engineering

Department: Mechanical Engr & Mechanics

MEM 431 Machine Design I

Covers static strength and fatigue theories of failure, fasteners, welded joints, springs, roller bearings, and lubricated spur gears.

Credits: 3.00

College: College of Engineering

Department: Mechanical Engr & Mechanics

MEM 435 Intro Comp Aid Desgn/Mfg

Covers fundamental use of CAD/CAM systems for geometry definition, finite element applications, and introductory computer graphics concepts.

Credits: 0.00 to 4.00

College: College of Engineering

Department: Mechanical Engr & Mechanics

MEM 436 Intro To Comp-Aided Mfg

Examination of the basic elements that are used to integrate the design and manufacturing processes. Robotics computerized-numerical controlled machine, and CAD/CAM systems. Manufacturability considerations when integrating unit process elements.

Credits: 3.00

College: College of Engineering

Department: Mechanical Engr & Mechanics

MEM 437 Manufacturing Process I

Examines the basic elements used to integrate the design and manufacturing processes; robotics, computerized-numerical-controlled machines, and CAD/CAM systems; and manufacturability considerations when integrating unit process elements.

Credits: 3.00

College: College of Engineering

Department: Mechanical Engr & Mechanics

MEM 438 Manufacturing Process II

Covers plastics and reinforced plastics processes, theory of polymer and plastic process, simple models of polymer flows, and manufacturability of plastics.

Credits: 3.00

College: College of Engineering

Department: Mechanical Engr & Mechanics

MEM 440 Thermal Systems Analysis

This course covers fundamentals of thermal systems; the role of design in engineering practice; economic analysis of thermal systems; advanced concepts and analysis of heat exchangers and distillation equipment; modeling of thermal systems; simulation of thermal systems; fundamentals of optimization and design of optimized thermal systems.

Credits: 3.00

College: College of Engineering

Department: Mechanical Engr & Mechanics

MEM 444 Biofluid Mechanics

This course introduces flow-related anatomy and pathophysiology, and biomedical flow devices and their design challenges. Analysis methods to solve biological fluid mechanics design problems are introduced and several interdisciplinary team projects are assigned to apply fluid mechanics to practical biological or medical problems.

Credits: 3.00

College: College of Engineering

Department: Mechanical Engr & Mechanics

MEM 446 Fundamentals of Plasmas I

Introduces the fundamentals of plasma science and modern industrial plasma applications in electronics, fuel conversion, environmental control, chemistry, biology, and medicine. Topics include quasi-equilibrium and non-equilibrium thermodynamics, statistics, fluid dynamics and kinetics of plasma and other modern high temperature and high energy systems and processes.

Credits: 3.00

College: College of Engineering

Department: Mechanical Engr & Mechanics

MEM 447 Fundamentals of Plasmas II

Continues the development of the engineering fundamentals of plasma discharges applied in modern industrial plasma applications in electronics, fuel conversion, environmental control, chemistry, biology, and medicine. Topics include quasi-equilibrium and non-equilibrium thermodynamics, statistics, fluid dynamics of major thermal and non-thermal plasma discharges, operating at low, moderate and atmospheric pressures.

Credits: 3.00

College: College of Engineering

Department: Mechanical Engr & Mechanics

MEM 448 Applied Thermal Plasmas

Introduces applications of modern thermal plasma processes focused on synthesis of new materials, material treatment, fuel conversion, environmental control, chemistry, biology, and medicine. Topics Include thermodynamics and fluid dynamics of high temperature plasma processes, engineering organization of specific modern thermal plasma technologies.

Credits: 3.00

College: College of Engineering

Department: Mechanical Engr & Mechanics

MEM 449 Applied Non-Thermal Plasmas

Application of modern non-thermal plasma processes focused on synthesis of new materials, material treatment, fuel conversion, environmental control, chemistry, biology, and medicine. Topics Include non-equilibrium thermodynamics and fluid dynamics of cold temperature plasma processes, engineering organization of specific modern non-thermal plasma technologies.

Credits: 3.00

College: College of Engineering

Department: Mechanical Engr & Mechanics

MEM 453 Aircraft Flight Dynam & Ctrl I

Covers general equations of motion for aircraft; linearization based on small disturbance theory and modal analysis to identify longitudinal open-loop characteristics; review of classical control theory; state space analysis; and autopilot design, including classical, pole placement, and optimal.

Credits: 3.00

College: College of Engineering

Department: Mechanical Engr & Mechanics

MEM 454 Aircraft Flight Dynam& Ctrl II

Covers observers; lateral dynamics; Dutch roll, roll convergence, and spiral modes; autopilot design and evaluations; and inertial cross-coupling computer simulation and analysis.

Credits: 3.00

College: College of Engineering

Department: Mechanical Engr & Mechanics

MEM 455 Introduction to Robotics

Introduces basic concepts in robot operation and structure, including actuators, sensors, mechanical components, robot control and robot programming.

Credits: 0.00 to 4.00

College: College of Engineering

Department: Mechanical Engr & Mechanics

MEM 456 Robotics II

Covers homogeneous kinematics of robots; velocities and accelerations; and static forces in manipulators, including iterative Newton-Euler formulation of manipulator dynamics.
Credits: 3.00
College: College of Engineering
Department: Mechanical Engr & Mechanics

MEM 457 Robotics III
Covers robotic-based automated manufacturing, including robot work cell configurations, applications of robots in manufacturing, material transfer, assembly, and inspection.
Credits: 3.00
College: College of Engineering
Department: Mechanical Engr & Mechanics

MEM 458 Micro-Based Control Sys I
Provides hands-on experience in real-time control and manipulation of hardware dynamic systems, including microcomputer, architecture, software, and device drivers. Emphasizes real-time interfacing of data acquisition and control systems.
Credits: 0.00 to 3.00
College: College of Engineering
Department: Mechanical Engr & Mechanics

MEM 459 Micro-Based Control Sys II
Continues MEM 458. Provides real-time control and manipulation of hardware dynamic systems. Emphasizes real-time interfacing of data acquisition and control systems.
Credits: 3.00
College: College of Engineering
Department: Mechanical Engr & Mechanics

MEM 462 Intro To Engr Mgmt
Introduces the general theory of management, including the processes of planning, organizing, assembling resources, supervising, and controlling. This is a writing intensive course.
Credits: 3.00
College: College of Engineering
Department: Mechanical Engr & Mechanics

MEM 475 Medical Robotics I
Use of robots in surgery, safety considerations, understanding robot kinematics, analysis of surgeon performance using a robotic devices, inverse kinematics, velocity analysis, acceleration analysis, various types of surgeries case study.
Credits: 3.00
College: College of Engineering
Department: Mechanical Engr & Mechanics

MEM 476 Medical Robotics II
Force and movement for robot arms, robot dynamics, computer vision, vision based control, combining haptics, vision and robot dynamics in a cohesive framework for the development of a medical robotic system.
Credits: 3.00
College: College of Engineering
Department: Mechanical Engr & Mechanics

MEM 477 Haptics for Medical Robotics
Introduction to haptics, physiology of touch, actuators, sensors, non-portable force feedback, portable voice feedback, tactile feedback interfaces, haptic sensing and control.
Credits: 3.00

College: College of Engineering
Department: Mechanical Engr & Mechanics

MEM 478 Computer-Aided Tissue Engr
Introduction to the engineering aspects of tissue reengineering and integrated CAD/CAE/CAM technology applied to tissue engineering with hands-on experience combining CAD, medical image processing, 3-D reconstruction software, and solid freeform fabrication of tissue scaffolding.
Credits: 0.00 to 3.00
College: College of Engineering
Department: Mechanical Engr & Mechanics

MEM 491 Senior Design Project I
Introduces the design process, including information retrieval, problem definition, proposal writing, patents, and design notebooks. Includes presentations on problem areas by experts from industry, government, and education.
Credits: 0.00 to 3.00
College: College of Engineering
Department: Mechanical Engr & Mechanics

MEM 492 Senior Design Project II
Continues MEM 491. Requires written and oral progress reports.
Credits: 0.00 to 3.00
College: College of Engineering
Department: Mechanical Engr & Mechanics

MEM 493 Senior Design Project III
Continues MEM 492. Requires written and oral final reports, including oral presentations by each design team at a formal Design Conference open to the public and conducted in the style of a professional conference.
Credits: 0.00 to 3.00
College: College of Engineering
Department: Mechanical Engr & Mechanics

Software Engineering Courses

SE 101 Foundations of SE I
Teaches students basic programming concepts within a software engineering process that involves specification, documentation, and testing. Programming coverage includes basic programming concepts such as the declaration and assignment of variables, standard data types, constants, conditional statements, loops, introduction to classes and methods, standard and file input/output, arrays, and strings. Process concepts emphasize good internal documentation practices, specifying functional requirements, defect tracking and analysis, and "black-box" testing.
Credits: 0.00 to 3.00
College: College of Engineering
Department: Computer Science

SE 102 Foundations of SE II
Introduces students to additional programming concepts. Teaches students how to design, implement, and test object-oriented software applications using simple reusable components. Introduces basic techniques for creating reusable software components.
Credits: 0.00 to 3.00
College: College of Engineering
Department: Computer Science

SE 103 Foundations of SE III

Introduces students to issues and practices for working with medium-size software systems. Teaches students basic techniques for using application frameworks. Introduces students to software development in teams and provides an overview of the software engineering professional practice.

Credits: 0.00 to 3.00

College: College of Engineering

Department: Computer Science

SE 280 Spec Topics in Software Engr

This course covers topics in software engineering. Different topics may be considered in different quarters.

Credits: 0.00 to 4.00

College: College of Engineering

Department: Computer Science

SE 310 Software Architecture I

Study of macro-level software system architectures with an emphasis on approaches to interconnection and distribution of current and emerging architectural styles.

Credits: 3.00

College: College of Engineering

Department: Computer Science

SE 311 Software Architecture II

Continues discussion of software architecture with a focus on micro-level architecture including patterns, frameworks, and component-based software engineering, and commercial off-the-shelf software.

Credits: 3.00

College: College of Engineering

Department: Computer Science

SE 320 Software Verif and Validation

Presents theory and practice of software testing. Covers structural testing including such topics as path testing, dataflow testing, logic based testing, syntax testing, program slicing, mutation testing, fault injection, program perturbation, and testing.

Credits: 3.00

College: College of Engineering

Department: Computer Science

SE 480 Adv Topics in Software Engr

This course covers topics in Software Engineering selected from advanced topics from research in this field. Different topics may be considered in different quarters.

Credits: 0.00 to 4.00

College: College of Engineering

Department: Computer Science