Contents
College of Engineering
Undergraduate Course Descriptions

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: 3.50
College: College of Engineering
Department: Civil, Arch, & Environ Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: TDEC 202 Minimum Grade: D and AE 210 Minimum Grade: D

AE 340 - Arch Illum & Elect Sys
This course covers building electrical systems, including power demand, distribution and control; building illumination techniques, including lighting demand, layout and energy analysis.
Credits: 3.00
College: College of Engineering
Department: Civil, Arch, & Environ Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: AE 210 Minimum Grade: D

AE 380 - Special Topics in Architectural Engineering
Various topics of interest in the field of architectural engineering. See program director for details on topics
Credits: .50 to 12.00
College: College of Engineering
Department: Civil, Arch, & Environ Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman

AE 390 - Architectural Engineering 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: 4.00
College: College of Engineering
Department: Civil, Arch, & Environ Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: AE 220 Minimum Grade: D and AE 340 Minimum Grade: D and ARCH 192 Minimum Grade: D and MEM 202 Minimum Grade: D

AE 391 - Architectural Engineering 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: 4.00
College: College of Engineering
Department: Civil, Arch, & Environ Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: AE 390 Minimum Grade: D

AE 399 - Independent Study in Architectural Engineering
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: 12.00
College: College of Engineering
Department: Civil, Arch, & Environ Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education

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
Restrictions:
Must be enrolled in one of the following Program Level(s):
Undergraduate Quarter
Pre-Requisites: AE 220 Minimum Grade: D or MEM 413 Minimum Grade: D

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: 3.00
College: College of Engineering
Department: Chemical Engineering
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: TDEC 121 Minimum Grade: D or CHEM 102 Minimum Grade: D or CHEM 162 Minimum Grade: D

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: 3.00
College: College of Engineering
Department: Chemical Engineering
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Co-Requisites: TDEC 202
Pre-Requisites: CHE 201 Minimum Grade: D

CHE 206 - Basic Chemical Engineering 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 of nonideality.
Credits: 3.00
College: College of Engineering
Department: Chemical Engineering
Restrictions:
Must be enrolled in one of the following Program Level(s):
Undergraduate Quarter
Must be enrolled in one of the following Major(s):
Chemical Engineering
Co-Requisites: CHE 202
Pre-Requisites: CHE 201 Minimum Grade: D and MATH 200 Minimum Grade: D

CHE 250 - Chemical Engineering 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
Restrictions:
Must be enrolled in one of the following Program Level(s):
Undergraduate Quarter
Co-Requisites: CHE 202
Pre-Requisites: CHE 201 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: TDEC 202 Minimum Grade: D or MEM 210 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: TDEC 221 Minimum Grade: D or MATH 210 Minimum Grade: D or MATH 262 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: CHE 302 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman
Pre-Requisites: CHE 303 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman
Pre-Requisites: CHE 301 Minimum Grade: D and CHE 307 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman
Pre-Requisites: TDEC 221 Minimum Grade: D or MATH 210 Minimum Grade: D or MATH 262 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman
Co-Requisites: CHE 304
Pre-Requisites: CHE 305 Minimum Grade: D and CHE 307 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not be enrolled in one of the following Major(s): Chemical Engineering
May not have the following Classification(s): Freshman
Pre-Requisites: TDEC 202 Minimum Grade: D or MEM 210 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not be enrolled in one of the following Major(s): Chemical Engineering
May not have the following Classification(s): Freshman
Pre-Requisites: TDEC 202 Minimum Grade: D or MEM 210 Minimum Grade: D

CHE 332 - Chemical Engineering Laboratory
Requires students to perform experiments illustrating the fundamentals of chemical engineering process analysis. This is a writing intensive course.
Credits: 2.00
College: College of Engineering
Department: Chemical Engineering
Restrictions:
May not be enrolled in one of the following Program Level(s):

Continuing Education
May not have the following Classification(s):
Freshman
Co-Requisites: CHE 302
Pre-Requisites: CHE 301 Minimum Grade: D

CHE 333 - Chemical Engineering Laboratory II
Offers laboratory experiments illustrating the fundamentals of chemical engineering process analysis. This is a writing intensive course.
Credits: 2.00
College: College of Engineering
Department: Chemical Engineering
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Co-Requisites: CHE 305
Pre-Requisites: CHE 302 Minimum Grade: D

CHE 334 - Chemical Engineering Lab III
Offers laboratory experiments illustrating the fundamentals of chemical engineering process analysis. This is a writing intensive course.
Credits: 2.00
College: College of Engineering
Department: Chemical Engineering
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Co-Requisites: CHE 304
Pre-Requisites: CHE 305 Minimum Grade: D

CHE 335 - Statistics and Design of 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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: MATH 210 Minimum Grade: D or MATH 262 Minimum Grade: D or TDEC 221 Minimum Grade: D or TDEC 221 Minimum Grade: D

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 produces 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
Restrictions:
Must be enrolled in one of the following Program Level(s):
Undergraduate Quarter
Pre-Requisites: CHE 250 Minimum Grade: D and BIO 214 Minimum Grade: D and BIO 215 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman

CHE 400 - Special Tops Chem Engr
Special courses offered in response to particular student and/or faculty interest.
Credits: 3.00
College: College of Engineering
Department: Chemical Engineering
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman

CHE 420 - Process Systems Engineering
Covers the application of automatic control theory to chemical processes within the context of processes previously introduced.
Credits: 3.00
College: College of Engineering
Department: Chemical Engineering
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman

Pre-Requisites: TDEC 221 Minimum Grade: D or MATH 210 Minimum Grade: D or MATH 262 Minimum Grade: D

CHE 424 - Chemical Kinetics and Reactor Design
Covers isothermal and non-isothermal reactor design, series and parallel reactions, and heterogeneous catalysis.
Credits: 4.00
College: College of Engineering
Department: Chemical Engineering
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: CHE 304 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not be enrolled in one of the following Major(s):
May not have the following Classification(s):
Freshman
Pre-Junior
Sophomore

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Must be enrolled in one of the following College(s)/School(s):
College of Engineering
Must have the following Classification(s):
Senior
Pre-Requisites: CHE 482 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Must be enrolled in one of the following College(s)/School(s):
College of Arts and Sciences
College of Engineering
Must have the following Classification(s):
Junior
Senior

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
Restrictions:
Must be enrolled in one of the following Program Level(s):
Undergraduate Quarter
Must be enrolled in one of the following Major(s):
Biomedical Engineering
Chemical Engineering
Must have the following Classification(s):
Junior
Senior

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: 3.00
College: College of Engineering
Department: Chemical Engineering
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Must be enrolled in one of the following Major(s):
Chemical Engineering
Must have the following Classification(s):
Senior
Co-Requisites: CHE 424
Pre-Requisites: CHE 304 Minimum Grade: D and CHE 308 Minimum Grade: D

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: 3.00
College: College of Engineering

Department: Chemical Engineering
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Must have the following Classification(s):
Senior
Pre-Requisites: CHE 481 Minimum Grade: D

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: 3.00
College: College of Engineering
Department: Chemical Engineering
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Must have the following Classification(s):
Senior
Pre-Requisites: CHE 482 Minimum Grade: D

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: 3.00
College: College of Engineering
Department: Civil, Arch, & Environ Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Must have the following Classification(s):
Senior
Pre-Requisites: CIVE 330 Minimum Grade: D and CIVE 371 Minimum Grade: D and (AE 491 Minimum Grade: D or CIVE 310 Minimum Grade: D)

CAE 492 - Senior Design Project II
Continues CAE 491. Requires written and oral progress reports. This is a writing intensive course.
Credits: 3.00
College: College of Engineering
Department: Civil, Arch, & Environ Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Pre-Requisites: CAE 491 Minimum Grade: D

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: 3.00
College: College of Engineering
Department: Civil, Arch, & Environ Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: CAE 492 Minimum Grade: D

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: 3.00
College: College of Engineering
Department: Civil, Arch, & Environ Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman

CIVE 250 - Construction Materials
Construction Materials
Credits: 4.00
College: College of Engineering
Department: Civil, Arch, & Environ Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Pre-Requisites: EGEO 220 Minimum Grade: D and MEM 202 Minimum Grade: D

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: 3.00
College: College of Engineering
Department: Civil, Arch, & Environ Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman

CIVE 261 - Materials and Structural 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
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not be enrolled in one of the following Major(s): Architectural Engineering
Civil Engineering
May not have the following Classification(s): Freshman
Pre-Requisites: PHYS 182 Minimum Grade: D

CIVE 262 - Materials and Structural Behavior II
Continues CIVE 261. Required for architecture and construction management students. Winter.
Credits: 3.00
College: College of Engineering
Department: Civil, Arch, & Environ Engr
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not be enrolled in one of the following Major(s): Architectural Engineering
Civil Engineering
May not have the following Classification(s): Freshman
Pre-Requisites: CIVE 261 Minimum Grade: D

CIVE 263 - Materials and Structural Behavior III
Continues CIVE 262. Required for architecture and construction management students. Spring.
Credits: 3.00
College: College of Engineering
Department: Civil, Arch, & Environ Engr
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not be enrolled in one of the following Major(s): Architectural Engineering
Civil Engineering
May not have the following Classification(s): Freshman
Pre-Requisites: CIVE 262 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman
Pre-Requisites: MEM 202 Minimum Grade: D and CIVE 250 Minimum Grade: D

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: 4.00
College: College of Engineering
Department: Civil, Arch, & Environ Engr
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman
Pre-Requisites: CIVE 300 Minimum Grade: D and MEM 230 Minimum Grade: D

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: 4.00
College: College of Engineering
Department: Civil, Arch, & Environ Engr
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman
Pre-Requisites: EGEO 220 Minimum Grade: D and CIVE 250 Minimum Grade: D

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 similarities and hydraulic models and an introduction to pipe flow and friction.
Credits: 3.00
College: College of Engineering

Department: Civil, Arch, & Environ Engr
Restrictions:
Must be enrolled in one of the following Program Level(s):
Undergraduate Quarter
Must be enrolled in one of the following College(s)/School(s):
College of Engineering
May not have the following Classification(s):
Pre-Requisites: TDEC 202 Minimum Grade: D

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: 4.00
College: College of Engineering
Department: Civil, Arch, & Environ Engr
Restrictions:
Must be enrolled in one of the following Program Level(s):
Undergraduate Quarter
Must be enrolled in one of the following College(s)/School(s):
College of Engineering
Pre-Requisites: CIVE 320 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: CIVE 330 Minimum Grade: D and CIVE 430 Minimum Grade: D

CIVE 370 - Introduction to Structural 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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: MEM 202 Minimum Grade: D and CIVE 250 Minimum Grade: D

CIVE 371 - Introduction to 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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: MEM 230 Minimum Grade: D and CIVE 300 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Sophomore
Co-Requisites: CIVE 370
Pre-Requisites: MEM 202 Minimum Grade: D and MEM 230 Minimum Grade: D

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. Metals, ceramic and composites are considered, as is time-dependent behavior.
Credits: 3.00
College: College of Engineering
Department: Civil, Arch, & Environ Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: MEM 230 Minimum Grade: D and CIVE 250 Minimum Grade: D and MATH 201 Minimum Grade: D

CIVE 380 - Special Topics Civil Engr
Covers selected topics in civil engineering.
Credits: 12.00
College: College of Engineering
Department: Civil, Arch, & Environ Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman

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: 12.00
College: College of Engineering
Department: Civil, Arch, & Environ Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Must have the following Classification(s):
Senior
Pre-Requisites: CIVE 301 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: CIVE 400 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: CIVE 401 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Must have the following Classification(s):
Senior
Pre-Requisites: CIVE 310 Minimum Grade: D

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: 3.00
College: College of Engineering
Department: Civil, Arch, & Environ Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Must have the following Classification(s):
Senior
Pre-Requisites: CIVE 330 Minimum Grade: D and CIVE 340 Minimum Grade: D

CIVE 430 - Hydrology
Covers the relationship between precipitation and runoff, unit hydrographs, flood routing, and water supply principles and applications.
Credits: 3.00
College: College of Engineering
Department: Civil, Arch, & Environ Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):

Freshman
Pre-Requisites: EGEO 220 Minimum Grade: D

CIVE 431 - Hydrology-Ground Water
Covers geologic and hydrologic occurrence of groundwater, underground flow, and groundwater supply. Winter.
Credits: 3.00
College: College of Engineering
Department: Civil, Arch, & Environ Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: CIVE 330 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: CIVE 430 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Must have the following Classification(s):
Senior

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Must have the following Classification(s):
Senior
Co-Requisites: CAE 491

Civil, Architectural and Environmental Engineering Courses

CAEE 201 - Introduction to Infrastructure Engineering
This course presents case studies to introduce the design, construction, operation and maintenance of infrastructure projects. Key engineering elements within civil, architectural and environmental engineering are presented. The concept of an "infrastructure system" along with interrelationships among three disciplines are illustrated using specific case studies which changes annually as various local infrastructure projects move from design through construction. On or two field trips are part of the course.
Credits: 3.00
College: College of Engineering
Department: Civil, Arch, & Environ Engr
Restrictions:
Must be enrolled in one of the following Program Level(s):
Undergraduate Quarter
Must be enrolled in one of the following College(s)/School(s):
College of Arts and Sciences
College of Engineering
Must have the following Classification(s):
Pre-Junior
Sophomore

CAEE 210 - Measurements in Civil, Architectural and Environmental Engineering 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. The course emphasizes graphical presentation of data using EXCEL, SKETCHUP and other software. Students collect data from lab or field sites.
Credits: 3.00
College: College of Engineering
Department: Civil, Arch, & Environ Engr
Restrictions:
Must be enrolled in one of the following Program Level(s):
Undergraduate Quarter
Must be enrolled in one of the following College(s)/School(s):
College of Arts and Sciences
College of Engineering

CAEE 211 - Measurements in Civil, Architectural and Environmental Engineering 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 including GPS.
Credits: 4.00
College: College of Engineering
Department: Civil, Arch, & Environ Engr
Restrictions:

Must be enrolled in one of the following Program Level(s):
Undergraduate Quarter
Must be enrolled in one of the following College(s)/School(s):
College of Arts and Sciences
College of Engineering

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.
Credits: 1.00
College: College of Engineering
Department: Computer Science
Co-Requisites: MATH 121

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.
Credits: 1.00
College: College of Engineering
Department: Computer Science
Restrictions:
Must be enrolled in one of the following Program Level(s):
Undergraduate Quarter
Co-Requisites: MATH 122

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.
Credits: 1.00
College: College of Engineering
Department: Computer Science
Restrictions:
Must be enrolled in one of the following Program Level(s):
Undergraduate Quarter
Co-Requisites: MATH 200

CS 131 - Computer Programming A
Introduction to structured computer programming in the language of instruction (e.g. C++): variables, input and output, expressions, assignment statements, conditionals and branching, files, repetition, subprograms and parameter passing. Stresses good programming style, documentation, debugging, and testing.
Credits: 3.00
College: College of Engineering
Department: Computer Science
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Co-Requisites: EXAM 080

CS 132 - Computer Programming B
Fundamental of computer programming in the language of instruction (e.g. C++): Object-oriented design, classes, polymorphism, operator and method overloading, templates, inheritance hierarchies, information hiding principles, container classes. Stresses good programming style, documentation, debugging, and testing.
Credits: 3.00
College: College of Engineering
Department: Computer Science
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Co-Requisites: EXAM 080
Pre-Requisites: CS 131 Minimum Grade: D or CS 171 Minimum Grade: D

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: 3.00
College: College of Engineering
Department: Computer Science
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Co-Requisites: EXAM 080
Pre-Requisites: CS 132 Minimum Grade: D

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: 3.00
College: College of Engineering
Department: Computer Science

Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not be enrolled in one of the following
College(s)/School(s):
College of Engineering
Co-Requisites: EXAM 080

CS 164 - Introduction 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: 3.00
College: College of Engineering
Department: Computer Science
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Must be enrolled in one of the following Major(s):
Computer Science
Mathematics
Must have the following Classification(s):
Freshman
Co-Requisites: EXAM 080

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: 3.00
College: College of Engineering
Department: Computer Science
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Co-Requisites: EXAM 080

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: 3.00
College: College of Engineering
Department: Computer Science
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Co-Requisites: EXAM 080
Pre-Requisites: CS 171 Minimum Grade: D or CS 132 Minimum Grade: D

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; arrays; simulation of engineering systems; principles of good programming practice.
Credits: 3.00
College: College of Engineering
Department: Computer Science
Restrictions:
Must be enrolled in one of the following Program Level(s):
Undergraduate Quarter
Must be enrolled in one of the following College(s)/School(s):
College of Engineering
May not have the following Classification(s):
Freshman

CS 204 - Advanced 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
Restrictions:
Must be enrolled in one of the following Program Level(s):
Graduate Quarter
Undergraduate Quarter
Pre-Requisites: ECE 203 Minimum Grade: D or CS 203 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Pre-Requisites: CS 265 Minimum Grade: D

CS 265 - Advanced Programming Tools and 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: 3.00
College: College of Engineering
Department: Computer Science
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman
Pre-Requisites: CS 172 Minimum Grade: D or CS 133 Minimum Grade: D or SE 103 Minimum Grade: D

CS 270 - Mathematical Foundations of Computer Science
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
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman
Pre-Requisites: CS 172 Minimum Grade: D or CS 265 Minimum Grade: D or SE 103 Minimum Grade: D

CS 280 - Special Topics in Comp Sci
Covers topics in modern computer science. Different topics may be considered in different quarters.
Credits: 12.00
College: College of Engineering
Department: Computer Science
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman

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: 4.00
College: College of Engineering
Department: Computer Science
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman
Pre-Requisites: (ECE 200 Minimum Grade: D or CS 270 Minimum Grade: D) and (CS 172 Minimum Grade: D or SE 103 Minimum Grade: S)

CS 282 - Systems Architecture II
Covers computer system operations, assembly language programming techniques, operating system interfacing, and organization of assemblers and loaders.
Credits: 4.00
College: College of Engineering
Department: Computer Science
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman
Pre-Requisites: CS 281 Minimum Grade: D

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: 3.00
College: College of Engineering
Department: Computer Science
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
Pre-Requisites: CS 260 Minimum Grade: D and CS 270 Minimum Grade: D and MATH 200 Minimum Grade: D and MATH 201 Minimum Grade: D

CS 303 - Algorithmic Number Theory & Cryptography
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. Applications to cryptography are explored including symmetric and public-key cryptosystems. A cryptosystem will be implemented and methods of attack investigated.
Credits: 3.00
College: College of Engineering
Department: Computer Science
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education

Pre-Requisites: CS 260 Minimum Grade: D and CS 270 Minimum Grade: D and MATH 201 Minimum Grade: D and MATH 221 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: PSY 101 Minimum Grade: D and CS 171 Minimum Grade: D

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: 3.00
College: College of Engineering
Department: Computer Science
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Pre-Requisites: CS 350 Minimum Grade: D

CS 345 - Computer Game Design
Students develop an understanding of an appreciation for psychology of play and fundamentals of game design through lectures, readings, and class activities. In addition, students work in a team to complete a game design project.
Credits: 3.00
College: College of Engineering
Department: Computer Science
Restrictions:
Must be enrolled in one of the following Program Level(s):
Undergraduate Quarter
Pre-Requisites: (CS 172 Minimum Grade: B or CS 133 Minimum Grade: B) and PSY 101 Minimum Grade: B

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Sophomore
Pre-Requisites: CS 260 Minimum Grade: D and CS 265 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: CS 260 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: CS 260 Minimum Grade: D and CS 281 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Pre-Requisites: CS 260 Minimum Grade: D and CS 265 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: CS 282 Minimum Grade: D and CS 361 Minimum Grade: D

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: 3.00
College: College of Engineering
Department: Computer Science
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: CS 260 Minimum Grade: D and CS 270 Minimum Grade: D

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. The algorithms include line drawing, curve and surface evaluation, polygon filling, clipping, 3D-to-2D projection and hidden surface removal.
Credits: 3.00
College: College of Engineering
Department: Computer Science
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Pre-Requisites: MATH 200 Minimum Grade: D and MATH 201 Minimum Grade: D and CS 350 Minimum Grade: D

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 on 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
Restrictions:
Must be enrolled in one of the following Program Level(s):
Undergraduate Quarter
Pre-Requisites: CS 430 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Pre-Requisites: CS 430 Minimum Grade: D

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
Restrictions:

May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Sophomore
Pre-Requisites: CS 270 Minimum Grade: D and MATH 221 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Sophomore
Pre-Requisites: CS 270 Minimum Grade: D and CS 282 Minimum Grade: D and CS 360 Minimum Grade: D and CS 440 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Sophomore
Pre-Requisites: CS 441 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: CS 270 Minimum Grade: D and MATH 221 Minimum Grade: D and CS 350 Minimum Grade: D

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: 3.00
College: College of Engineering
Department: Computer Science
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Pre-Requisites: CS 260 Minimum Grade: D and CS 270 Minimum Grade: D and MATH 221 Minimum Grade: D

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: 3.00
College: College of Engineering
Department: Computer Science
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Pre-Requisites: CS 457 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: CS 260 Minimum Grade: D

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: 3.00
College: College of Engineering
Department: Computer Science
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: CS 282 Minimum Grade: D and CS 370 Minimum Grade: D

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: 3.00
College: College of Engineering
Department: Computer Science
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Pre-Requisites: CS 361 Minimum Grade: D

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
Restrictions:
Must be enrolled in one of the following Program Level(s):
Undergraduate Quarter
Pre-Requisites: CS 472 Minimum Grade: D

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: 12.00
College: College of Engineering
Department: Computer Science
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education

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: 3.00
College: College of Engineering
Department: Computer Science
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Pre-Requisites: CS 380 Minimum Grade: D and MATH 311 Minimum Grade: D

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 as topics vary.
Credits: 3.00
College: College of Engineering
Department: Computer Science
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Pre-Requisites: CS 260 Minimum Grade: D and CS 380 Minimum Grade: D

CS 491 - Software Engineering Workshop
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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Pre-Requisites: CS 451 Minimum Grade: D

CS 492 - Software Engineering Workshop II
Continues CS 491 team project. This is a writing intensive course.
Credits: 3.00
College: College of Engineering
Department: Computer Science

Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Pre-Requisites: CS 491 Minimum Grade: D

CS 493 - Software Engineering Workshop III
Continues CS 492 team project. This is a writing intensive course.
Credits: 3.00
College: College of Engineering
Department: Computer Science
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Pre-Requisites: CS 492 Minimum Grade: D

CS 498 - Indep Study in Comp Science
Provides supervised study of selected topics in computer science.
Credits: 12.00
College: College of Engineering
Department: Computer Science
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman

Electrical and Computer Engineering - Computers Courses

ECEC 301 - Advanced 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
Restrictions:
Must be enrolled in one of the following Program Level(s):
Graduate Quarter
Undergraduate Quarter
Pre-Requisites: ECE 203 Minimum Grade: D or CS 203 Minimum Grade: D

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: 4.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: (CS 171 Minimum Grade: D or ECE 203 Minimum Grade: D or CS 203 Minimum Grade: D) and ECE 200 Minimum Grade: D

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: 4.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: ECE 200 Minimum Grade: D and (CS 171 Minimum Grade: D or ECE 203 Minimum Grade: D or CS 203 Minimum Grade: D)

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: 4.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: ECEC 302 Minimum Grade: D and MATH 221 Minimum Grade: D

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), input/output organization, and a review of popular microprocessors.
Credits: 4.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):

Continuing Education
Pre-Requisites: ECE 200 Minimum Grade: D and (CS 171 Minimum Grade: D or ECE 203 Minimum Grade: D or CS 203 Minimum Grade: D)

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. Lab projects include generation of precise waveforms with specified duty cycles, precise measurement of pulse width, interconnection of two microcontrollers, etc.
Credits: 4.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
Must be enrolled in one of the following Program Level(s):
Graduate Quarter
Undergraduate Quarter
Pre-Requisites: ECEC 304 Minimum Grade: D

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: 3.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Must have the following Classification(s):
Senior
Pre-Requisites: ECEC 355 Minimum Grade: D

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: 3.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Must have the following Classification(s):
Senior
Pre-Requisites: ECEC 355 Minimum Grade: D and CS 260 Minimum Grade: D

ECEC 422 - Intro Operating Sys II
Further develops the topics of ECEC 421. Spring.
Credits: 3.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: ECEC 421 Minimum Grade: D

ECEC 431 - Intro Computer Networks
Covers topics in computer and telecommunications network design.
Credits: 3.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: ECE 200 Minimum Grade: D and CS 260 Minimum Grade: D

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
Restrictions:
Must be enrolled in one of the following Program Level(s):
Undergraduate Quarter
Pre-Requisites: ECEC 431 Minimum Grade: D or CS 472 Minimum Grade: D

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
Restrictions:
Must be enrolled in one of the following Program Level(s):
Undergraduate Quarter
Pre-Requisites: ECEC 432 Minimum Grade: D

ECEC 441 - Robot/Comp Intf & Cntl I
Covers fundamentals of robotics systems, including mechanics, actuators, sensors, kinematics, and inverse kinematics. Fall.
Credits: 3.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Must have the following Classification(s):
Senior
Pre-Requisites: ECES 356 Minimum Grade: D

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: 3.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: ECEC 441 Minimum Grade: D

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: 3.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: ECEC 442 Minimum Grade: D

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: 3.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Pre-Requisites: ECE 200 Minimum Grade: D and ECEC 355 Minimum Grade: D

ECEC 453 - Image Processing Architecturee
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: 3.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Pre-Requisites: ECE 200 Minimum Grade: D and ECES 302 Minimum Grade: D

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: 3.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Must have the following Classification(s):
Senior
Pre-Requisites: MATH 221 Minimum Grade: D and ECEC 355 Minimum Grade: D

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 suppressing 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: 3.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
Must be enrolled in one of the following Program Level(s):
Undergraduate Quarter

Pre-Requisites: ECEC 451 Minimum Grade: D

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. The course reviews, in a unified way, important issues in testing and diagnosis of hardware. Together with the Security in Computing course, it brings a design engineer student to the state of the art level in the field.
Credits: 3.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
Must be enrolled in one of the following Program Level(s):
Undergraduate Quarter
Pre-Requisites: ECEC 457 Minimum Grade: D

ECEC 490 - Special Tops Comp Engr
Provides special courses offered because of particular student or faculty interest.
Credits: 12.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman

ECEC 497 - Research In Computer Engr
Computer engineering students only. Requires independent research in a field approved by the faculty.
Credits: .50 to 12.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Must be enrolled in one of the following Major(s):
Computer Engineering
May not have the following Classification(s):

ECEC 499 - Ind Study Computer Engr
Computer engineering students only. Requires independent study or research in a field approved by the faculty.
Credits: .50 to 12.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Must be enrolled in one of the following Major(s):
Computer Engineering
May not have the following Classification(s):
Freshman
Sophomore

Electrical and Computer Engineering - 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: 4.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: TDEC 211 Minimum Grade: D

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: 4.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: MATH 291 Minimum Grade: D

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: 4.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: ECES 302 Minimum Grade: D

ECEE 354 - Wireless and Optical Electronics
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: 4.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: ECES 302 Minimum Grade: D and ECEE 304 Minimum Grade: D

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: 4.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: ECEE 352 Minimum Grade: D

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: 3.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: ECEE 421 Minimum Grade: D

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: 3.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: ECEE 421 Minimum Grade: D

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: 4.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: ECEE 302 Minimum Grade: D

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: 3.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: ECEE 304 Minimum Grade: D

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: 3.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):

Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: ECEE 441 Minimum Grade: D

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: 3.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: ECEE 442 Minimum Grade: D

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: 3.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Junior
Pre-Junior
Sophomore

ECEE 471 - RF Components and Techniques
This course covers microwave networks (Z, Y, S, T ABCD Parameters), 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: 4.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Pre-Requisites: ECEE 354 Minimum Grade: D

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: 4.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Pre-Requisites: ECEE 471 Minimum Grade: D

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: 4.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Pre-Requisites: ECEE 471 Minimum Grade: D

ECEE 490 - Spec Topics Electrophysic
Provides special courses offered because of particular student or faculty interest.
Credits: 12.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman

ECEE 497 - Research in Electrophysics
Requires independent research in a topic approved by the faculty.
Credits: .50 to 12.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education

ECEE 499 - Ind Study In Electrophys
Requires independent study in a topic approved by the faculty.
Credits: .50 to 12.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman
Elec & Computer Engr-Electroph 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: 4.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman
Pre-Requisites: TDEC 211 Minimum Grade: D

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: 4.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman
Pre-Requisites: MATH 291 Minimum Grade: D

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: 4.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman
Pre-Requisites: ECES 302 Minimum Grade: D

ECEE 354 - Wireless and Optical Electronics
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: 4.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman
Pre-Requisites: ECES 302 Minimum Grade: D and ECEE 304 Minimum Grade: D

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: 4.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman
Pre-Requisites: ECEE 352 Minimum Grade: D

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: 3.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman
Pre-Requisites: ECEE 421 Minimum Grade: D

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: 3.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: ECEE 421 Minimum Grade: D

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: 4.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: ECEE 302 Minimum Grade: D

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: 3.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: ECEE 304 Minimum Grade: D

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: 3.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: ECEE 441 Minimum Grade: D

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: 3.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: ECEE 442 Minimum Grade: D

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: 3.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Junior
Pre-Junior
Sophomore

ECEE 471 - RF Components and Techniques
This course covers microwave networks (Z, Y, S, T ABCD Parameters), 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: 4.00
College: College of Engineering

Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Pre-Requisites: ECEE 354 Minimum Grade: D

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: 4.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Pre-Requisites: ECEE 471 Minimum Grade: D

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: 4.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Pre-Requisites: ECEE 471 Minimum Grade: D

ECEE 490 - Spec Topics Electrophysic
Provides special courses offered because of particular student or faculty interest.
Credits: 12.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman

ECEE 497 - Research in Electrophysics
Requires independent research in a topic approved by the faculty.
Credits: .50 to 12.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education

ECEE 499 - Ind Study In Electrophys
Requires independent study in a topic approved by the faculty.
Credits: .50 to 12.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):

Electrical and Computer Engineering – Power Engineering Courses

ECEP 352 - Electric 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: 4.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: (ECE 201 Minimum Grade: D or ECES 211 Minimum Grade: D) and ECEE 302 Minimum Grade: D

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).
Credits: 4.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: (ECE 201 Minimum Grade: D or ECES 211 Minimum Grade: D) and ECEE 302 Minimum Grade: D

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: 3.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: ECEP 352 Minimum Grade: D

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: 4.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: ECEP 411 Minimum Grade: D

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: 3.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: ECEP 412 Minimum Grade: D

ECEP 421 - Modeling and Analysis of Electric Power
Distribution Systems
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
Restrictions:
Must be enrolled in one of the following Program Level(s):
Undergraduate Quarter
Must have the following Classification(s):
Senior
Co-Requisites: ECEP 411

ECEP 422 - Power Distribution Automation and 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
Restrictions:
Must be enrolled in one of the following Program Level(s):
Undergraduate Quarter
Pre-Requisites: ECEP 421 Minimum Grade: D

ECEP 423 - Service and Power Quality Distribution Systems
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
Restrictions:
Must be enrolled in one of the following Program Level(s):
Undergraduate Quarter
Pre-Requisites: ECEP 422 Minimum Grade: D

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: 4.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: ECEP 352 Minimum Grade: D

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: 4.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman
Pre-Requisites: ECEP 431 Minimum Grade: D

ECEP 441 - Protective Relaying
Covers operating principles of electromechanical and static relays, fault clearance, and protection of individual parts of a power system.
Credits: 3.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman
Pre-Requisites: ECEP 352 Minimum Grade: D and ECEP 411 Minimum Grade: D

ECEP 451 - Power Electronic Converter Fundamentals
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
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman
Pre-Requisites: ECEP 352 Minimum Grade: D

ECEP 452 - Experimental Study of Power Electronic 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: 3.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
Must be enrolled in one of the following Program Level(s): Undergraduate Quarter
Pre-Requisites: ECEP 451 Minimum Grade: D

ECEP 453 - Applications of Power Electronic 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
Restrictions:
Must be enrolled in one of the following Program Level(s): Undergraduate Quarter
Pre-Requisites: ECEP 451 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman
Pre-Requisites: ECEP 352 Minimum Grade: D

ECEP 471 - Power Seminar I
Discusses current developments in power system operation and research, concentrating on current and future energy sources.
Credits: .50
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman

ECEP 472 - Power Seminar II
Discusses current developments in power system operation and research, concentrating on generating stations, transmission lines, and substations.
Credits: .50
College: College of Engineering
Department: Electrical & Computer Engr

Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman

ECEP 473 - Power Seminar III
Discusses current developments in power system operation and research, concentrating on distribution, security, and economics.
Credits: .50
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman

ECEP 490 - Special Topics Power Engr
Provides special courses offered because of particular student or faculty interest.
Credits: .50 to 12.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman

ECEP 497 - Research in Power Systems
Requires independent study in a topic approved by the faculty.
Credits: .50 to 12.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education

ECEP 499 - Ind Study In Power Engr
Requires independent study in a topic approved by the faculty.
Credits: .50 to 12.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman

Electrical and Computer Engineering - Systems Courses

ECES 302 - Transform Methods and 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: 4.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: TDEC 221 Minimum Grade: D and TDEC 222 Minimum Grade: D and ECE 201 Minimum Grade: D

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: 4.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: ECES 302 Minimum Grade: D

ECES 306 - Intro Modulation & Coding
Covers signal sampling and reconstruction; modulation, angle modulation; digital communications systems, digital transmission.
Credits: 4.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: ECES 302 Minimum Grade: D

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 Fourier Transform (FFT).
Credits: 4.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman
Pre-Requisites: ECES 302 Minimum Grade: D

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: 4.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman
Pre-Requisites: ECES 306 Minimum Grade: D

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: 4.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman
Pre-Requisites: ECES 304 Minimum Grade: D

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: 4.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman
Pre-Requisites: ECES 356 Minimum Grade: D

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: 3.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman
Pre-Requisites: ECES 306 Minimum Grade: D

ECES 422 - Communications II
Covers analog (PAM, PPM) and digital (PCM, DM) pulse modulation systems, entropy, source coding, and channel coding.
Credits: 3.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman
Pre-Requisites: ECES 421 Minimum Grade: D

ECES 423 - Communications III
Covers digital transmission systems, baseband and passband, spread-spectrum communications, and basics of wireless and mobile systems.
Credits: 3.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman
Pre-Requisites: ECES 422 Minimum Grade: D

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: 4.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
Pre-Requisites: ECES 352 Minimum Grade: D

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: 4.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
Pre-Requisites: ECES 434 Minimum Grade: D

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: 4.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
Pre-Requisites: ECES 435 Minimum Grade: D

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: 4.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
Pre-Requisites: ECES 356 Minimum Grade: D

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: 4.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
Pre-Requisites: ECES 444 Minimum Grade: D

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: 4.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
Pre-Requisites: ECES 445 Minimum Grade: D

ECES 490 - Special Tops Systems Engr
Provides special courses offered because of particular student or faculty interest.
Credits: 12.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman
Pre-Requisites: ECES 302 Minimum Grade: D and ECE 201 Minimum Grade: D

ECES 497 - Research In Systems Engr
Electrical engineering students only. Requires independent research in a topic approved by the faculty.
Credits: .50 to 12.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman

ECES 499 - Sup Study: Sys Engineering
Requires independent study in a topic approved by the faculty.
Credits: .50 to 20.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman

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: 3.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: CS 170 Minimum Grade: D or TDEC 132 Minimum Grade: D or CS 171 Minimum Grade: D

ECE 201 - Foundations of 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: 3.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not be enrolled in one of the following Major(s):
Commerce and Engineering
May not have the following Classification(s):
Freshman
Pre-Requisites: PHYS 211 Minimum Grade: D or TDEC 115 Minimum Grade: D

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: 3.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
Must be enrolled in one of the following Program Level(s):
Undergraduate Quarter
Must be enrolled in one of the following College(s)/School(s):
College of Engineering
May not have the following Classification(s):
Freshman

ECE 211 - Electrical Engr Principls
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: 3.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not be enrolled in one of the following Major(s):
Electrical Engineering
Mechanical Engineering
May not have the following Classification(s):
Freshman
Co-Requisites: ECE 212
Pre-Requisites: MATH 201 Minimum Grade: D and PHYS 211 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not be enrolled in one of the following Major(s):

Electrical Engineering
Mechanical Engineering
May not have the following Classification(s):
Freshman
Co-Requisites: ECE 211

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: 2.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Must have the following Classification(s):
Senior

ECE 492 - Senior Design Project II
Continues ECE 491. Requires written and oral progress reports. This is a writing intensive course.
Credits: 2.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Must have the following Classification(s):
Senior
Pre-Requisites: ECE 491 Minimum Grade: D

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: 4.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Must have the following Classification(s):
Senior
Pre-Requisites: ECE 492 Minimum Grade: D

Electrical Engineering Lab Courses

ECEL 301 - Electrical Engineering Laboratory
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: 2.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: ECE 200 Minimum Grade: D and ECE 201 Minimum Grade: D and (TDEC 132 Minimum Grade: D or TDEC 133 Minimum Grade: D)

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.
Credits: 2.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: ECEL 301 Minimum Grade: D and ECES 302 Minimum Grade: D

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: 2.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: ECEL 301 Minimum Grade: D

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: 2.00
College: College of Engineering

Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Pre-Requisites: ECEL 303 Minimum Grade: D
Electrical Engineering Lab Courses

ECEL 301 - Electrical Engineering Laboratory
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: 2.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: ECE 200 Minimum Grade: D and ECE 201 Minimum Grade: D and (TDEC 132 Minimum Grade: D or TDEC 133 Minimum Grade: D)

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.
Credits: 2.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: ECEL 301 Minimum Grade: D and ECES 302 Minimum Grade: D

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: 2.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: ECEL 301 Minimum Grade: D

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: 2.00
College: College of Engineering
Department: Electrical & Computer Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Pre-Requisites: ECEL 303 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education

ENGR 101 - Engineering Design Laboratory 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: 2.00
College: College of Engineering
Department: Office of Dean of COE

ENGR 102 - Engineering Design Laboratory 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: 2.00
College: College of Engineering

Department: Office of Dean of COE
Restrictions:
Must be enrolled in one of the following Program Level(s):
Undergraduate Quarter
May not have the following Classification(s):

ENGR 103 - Engineering Design Laboratory 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: 2.00
College: College of Engineering
Department: Office of Dean of COE
Restrictions:
Must be enrolled in one of the following Program Level(s):
Undergraduate Quarter
May not have the following Classification(s):

ENGR 104 - Engineering 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: 4.00
College: College of Engineering
Department: Office of Dean of COE
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Must be enrolled in one of the following College(s)/School(s):
College of Engineering

ENGR 105 - Intro Occupational Hlth
Credits: 3.00
College: College of Engineering
Department: Office of Dean of COE
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman

ENGR 109 - Intro Engr & Lab
Credits: .50 to 20.00
College: College of Engineering
Department: Office of Dean of COE
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman

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: 4.00
College: College of Engineering
Department: Office of Dean of COE
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education

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: 4.00
College: College of Engineering
Department: Office of Dean of COE
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education

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. Job search techniques. Interview preparation. Employer expectations
Credits: 4.00
College: College of Engineering
Department: Office of Dean of COE
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education

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: 4.00
College: College of Engineering

Department: Office of Dean of COE
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education

ENGR 180 - Special Topics in Engineering
Topics of special interest to students and faculty in Engineering.
Credits: 12.00
College: College of Engineering
Department: Office of Dean of COE
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education

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: 6.00
College: College of Engineering
Department: Office of Dean of COE
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman

ENGR 201 - Evaluation & Presentation of Experimental 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: 3.00
College: College of Engineering
Department: Office of Dean of COE
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Must be enrolled in one of the following College(s)/School(s):
College of Engineering
Sch.of Biomed Engr,Sci & Hlth
May not have the following Classification(s):
Freshman
Pre-Requisites: (MATH 122 Minimum Grade: D and PHYS 101 Minimum Grade: D and ENGR 103 Minimum Grade: D) or (TDEC 112 Minimum Grade: D and TDEC 113 Minimum Grade: D and TDEC 132 Minimum Grade: D)

ENGR 202 - Evaluation & Presentation of Experimental Data II
A continuation of ENGR 201
Credits: 3.00
College: College of Engineering
Department: Office of Dean of COE
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Must be enrolled in one of the following College(s)/School(s):
College of Engineering
Sch.of Biomed Engr,Sci & Hlth
May not have the following Classification(s):
Freshman
Pre-Requisites: ENGR 201 Minimum Grade: D or TDEC 231 Minimum Grade: D

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: 3.00
College: College of Engineering
Department: Civil, Arch, & Environ Engr
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: (TDEC 112 Minimum Grade: D and TDEC 113 Minimum Grade: D) or (MATH 122 Minimum Grade: D and PHYS 101 Minimum Grade: D)

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: 3.00
College: College of Engineering
Department: Office of Dean of COE
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman

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: 3.00
College: College of Engineering
Department: Office of Dean of COE
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman

ENGR 220 - Fundamentals of Materials
Introduces materials and their properties; atomic view and architecture of solids; atomic motion in solids, mechanical, magnetic, electrical and optical properties of materials. Corrosion and degradation of solids.
Credits: 4.00
College: College of Engineering
Department: Office of Dean of COE
Restrictions:
Must have the following Classification(s):
Sophomore
Pre-Requisites: (CHEM 102 Minimum Grade: D and MATH 122 Minimum Grade: D and PHYS 102 Minimum Grade: D) or (TDEC 121 Minimum Grade: D and TDEC 112 Minimum Grade: D and TDEC 113 Minimum Grade: D)

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: 3.00
College: College of Engineering
Department: Office of Dean of COE
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: MATH 122 Minimum Grade: D or TDEC 112 Minimum Grade: D

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: 3.00
College: College of Engineering
Department: Office of Dean of COE
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: ENGR 231 Minimum Grade: D or MATH 261 Minimum Grade: D or MATH 201 Minimum Grade: D

ENGR 361 - Statistical Analysis of Engineering Systems
Probability, random variables, reliability, quality control, design of experiments, regression/correlation, ANOVA and related topics, hypothesis testing.
Credits: 3.00
College: College of Engineering
Department: Office of Dean of COE
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Must be enrolled in one of the following College(s)/School(s):
College of Engineering
May not have the following Classification(s):
Freshman
Sophomore

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: 2.00
College: College of Engineering
Department: Office of Dean of COE
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman

ENGR 492 - Senior Project Design II
Continues ENGR 491. Requires written and oral progress reports.
Credits: 2.00
College: College of Engineering
Department: Office of Dean of COE
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: CIVE 491 Minimum Grade: D

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: 4.00
College: College of Engineering
Department: Office of Dean of COE
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman

Environmental Engineering Courses

ENVE 300 - Introduction to Environmental Engineering
Overview of environmental engineering practice: water resources, water and waste control, solid waste, air pollution, risk management and environmental health. Population and resource demand forecasting, chemistry and microbiology necessary to solve basic problems is included.
Credits: 3.00
College: College of Engineering
Department: Environmental Engineering
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: ENVE 152 Minimum Grade: D or EGEO 220 Minimum Grade: D

ENVE 302 - Environmental Transport and 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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: CHE 201 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Must have the following Classification(s):
Senior

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: ENVE 421 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman

ENVE 450 - Data-based Engineering 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
Restrictions:
May not have the following Classification(s):
Freshman
Junior
Pre-Junior
Sophomore
Pre-Requisites: ENGR 361 Minimum Grade: D or CHE 335 Minimum Grade: D or MEM 361 Minimum Grade: D or MATH 311 Minimum Grade: D

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: 3.00
College: College of Engineering
Department: Environmental Engineering
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education

ENVE 480 - Topics in Envr Engineering
Selected topics offered in the area of Environmental Engineering of interest to students or faculty.
Credits: .50 to 12.00
College: College of Engineering
Department: Environmental Engineering
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education

ENVE 485 - Professional Environmental Engineering Practice
Professional and ethical considerations in environmental engineering practice. Career management and lifelong learning.
Credits: 1.00
College: College of Engineering
Department: Environmental Engineering
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Must be enrolled in one of the following Major(s):
Environmental Engineering
Must have the following Classification(s):
Senior

ENVE 486 - Environmental Engineering Processes Laboratory 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: 2.00
College: College of Engineering
Department: Environmental Engineering
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Must be enrolled in one of the following Major(s):
Environmental Engineering
Must have the following Classification(s):
Senior
Pre-Requisites: ENVE 302 Minimum Grade: D and ENVE 401 Minimum Grade: D

ENVE 487 - Environmental Engineering Processes Laboratory 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: 2.00
College: College of Engineering
Department: Environmental Engineering
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Must be enrolled in one of the following Major(s):
Environmental Engineering
Must have the following Classification(s):
Senior
Pre-Requisites: ENVE 486 Minimum Grade: D

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: 3.00
College: College of Engineering
Department: Environmental Engineering

Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not be enrolled in one of the following
College(s)/School(s):
May not have the following Classification(s):
Senior
Pre-Requisites: ENVE 302 Minimum Grade: D

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: 3.00
College: College of Engineering
Department: Environmental Engineering
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not be enrolled in one of the following
College(s)/School(s):
May not have the following Classification(s):
Senior
Pre-Requisites: ENVE 491 Minimum Grade: D

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. This is a writing intensive course.
Credits: 4.00
College: College of Engineering
Department: Environmental Engineering
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not be enrolled in one of the following
College(s)/School(s):
Must have the following Classification(s):
Senior
Pre-Requisites: ENVE 492 Minimum Grade: D

Environmental Engineering and Science Courses

ENVR 169 - Environmental Science
This course provides an introduction to environmental problems and their causes, cultural changes, world views, ethics and environment. It covers such topics as science, matter and energy, ecosystems and how they work, air and air pollution, climate, global warming, and ozone loss, waste minerals and soil, solid, toxic and hazardous wastes, protecting food sources and energy resources.
Credits: 3.00
College: College of Arts and Sciences
Department: Environmental Science & Policy
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Pre-Requisites: BIO 123 Minimum Grade: D or BIO 114 Minimum Grade: D

ENVR 230 - General Ecology
This course examines how organisms interact with the biological and psychical world and bridges the natural sciences with the social sciences. Using evolutionary theory as its basis, this course will cover topics spanning multiple levels of organization within the science of ecology.
Credits: 3.00
College: College of Arts and Sciences
Department: Bioscience & Biotechnology
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: BIO 106 Minimum Grade: D or BIO 141 Minimum Grade: D or BIO 123 Minimum Grade: D

ENVR 245 - Sociology of the Environment
Examines acts of nature vs. acts of man, food and health, environmental politics, social movements and environmental issues, environmental and development policies and environmental and global change.
Credits: 3.00
College: College of Arts and Sciences
Department: Environmental Science & Policy
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education

ENVR 260 - Environmental Science & Society I
This course is a multidisciplinary introduction to the range of disciplines that make up the environmental sciences. The aim of this course is to provide an understanding of basic physical, ecological and social sciences that focus on the study of the natural environment and its interaction with human society.
Credits: 3.00
College: College of Arts and Sciences
Department: Environmental Science & Policy
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman

ENVR 262 - Environmental Science & Society II
This course is a continuation of ENVR 260 and ENVR 261. This sequence of courses provides a multidisciplinary introduction to the range of disciplines that make up the environmental

sciences. The aim of this course is to provide an understanding of basic physical, ecological and social sciences that focus on the study of the natural environment and its interaction with human society. This is a writing intensive course.
Credits: 3.00
College: College of Arts and Sciences
Department: Environmental Science & Policy
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education

ENVR 270 - History of Life on Earth
The origin and evolution of life on Earth is examined. Topics include the origins of life and the natural histories of plants and animals. The role of natural selection and contingency are emphasized. Lab exercises include hands-on fossil identification and may include fossil collecting trips.
Credits: 4.00
College: College of Arts and Sciences
Department: Environmental Science & Policy
Restrictions:
Must be enrolled in one of the following Program Level(s): Undergraduate Quarter

ENVR 271 - Dinosaurs and Their World
An introduction to dinosaur paleontology, this course focuses on the scientific method as applied to dinosaur studies. Topics include dinosaur evolution, the history of dinosaur research, an overview of dinosaurs, and birds as living dinosaurs. This course is suitable for all majors.
Credits: 3.00
College: College of Arts and Sciences
Department: Bioscience & Biotechnology
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education

ENVR 272 - Physical Geology
This course is an introduction to geology emphasizing the role of plate tectonics. Topics include formation of minerals, igneous, sedimentary, and metamorphic rocks, volcanoes, earthquakes, depositional environments, and geological hazards. Labs focus on mineral and rock identification, map skills, and 3D visualization.
Credits: 4.00
College: College of Arts and Sciences
Department: Environmental Science & Policy
Restrictions:
Must be enrolled in one of the following Program Level(s): Undergraduate Quarter

ENVR 284 - Physiological and Population Ecology
Examines the role of physiological adaptation in the ecology of plants and animals and the principles of population biology as applied to biological systems. Laboratory concentrates on experimental approaches to ecology. This is a writing intensive course.
Credits: 5.00
College: College of Arts and Sciences
Department: Environmental Science & Policy
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman
Pre-Requisites: ENVR 230 Minimum Grade: D

ENVR 286 - Community and Ecosystem Ecology
Introduces the principles of community and ecosystem ecology. Emphasizes the role of community structure and ecosystem organization in the ecology of plants and animals. Laboratory emphasizes experimental approaches to answering ecological questions. This is a writing intensive course.
Credits: 5.00
College: College of Arts and Sciences
Department: Environmental Science & Policy
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman
Pre-Requisites: ENVR 230 Minimum Grade: D

ENVR 316 - Sanitary Microbiology
Covers microscopic life forms of sanitary significance, with emphasis on bacteria. Includes thorough coverage of principles of metabolic biochemistry, the kinetics of microbial growth, and substrate assimilation. Emphasizes microbial aspects of environmental pollution control.
Credits: 3.00
College: College of Arts and Sciences
Department: Environmental Science & Policy
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman
Pre-Requisites: BIO 121 Minimum Grade: D or BIO 141 Minimum Grade: D

ENVR 321 - Environmental Health
Covers evaluation of environmental hazards and design of environmental controls for the health and well-being of humans. Accompanying seminar on current problems.
Credits: 3.00
College: College of Arts and Sciences

Department: Environmental Science & Policy
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman
Pre-Requisites: BIO 121 Minimum Grade: D or BIO 141 Minimum Grade: D

ENVR 322 - Tropical Ecology
This is a course in the ecology of tropical rain forests and dry forests. Tropical ecology will explore the physical and biological factors that result in the formation of the forests, the effect of human impact, the effectiveness of management, and the future of these forests.
Credits: 3.00
College: College of Arts and Sciences
Department: Bioscience & Biotechnology
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman
Pre-Requisites: ENVR 284 Minimum Grade: D or ENVR 286 Minimum Grade: D

ENVR 324 - Microbial Ecology
Studies the relationships of microbes with plants, animals, and the environment, both biotic and abiotic components. Examines the key role of microbes in the functioning of ecosystems affecting decomposition, disease, nutrient cycling, and energy flow. Studies these processes and the role of microbes in the natural function of ecosystems.
Credits: 4.50
College: College of Arts and Sciences
Department: Environmental Science & Policy
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman
Pre-Requisites: BIO 221 Minimum Grade: D or ENVR 316 Minimum Grade: D

ENVR 330 - Aquatic Ecology
Studies the relationships between aquatic plants and animals and their environment. Introduces the study of the ecology of lakes, rivers, ponds, and streams.
Credits: 3.00
College: College of Arts and Sciences
Department: Environmental Science & Policy
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman
Pre-Requisites: ENVR 284 Minimum Grade: D or ENVR 286 Minimum Grade: D

ENVR 331 - Industrial Hygiene I
Covers general principles of industrial hygiene, including historical background and development as an interdisciplinary profession. Includes identification of, evaluation of, and methods of controlling occupational exposures to biological and chemical agents in the form of aerosols, gases, vapors, liquids, and solids. Examines implications of toxicity and health effects for the workplace and relation to total environment.
Credits: 3.00
College: College of Arts and Sciences
Department: Environmental Science & Policy
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman
Pre-Requisites: BIO 121 Minimum Grade: D or BIO 141 Minimum Grade: D

ENVR 332 - Industrial Hygiene II
Covers occupational exposure to physical agents including heat, cold, humidity, and ionizing and non-ionizing radiations. Also examines related aspects of safety, ergonomics, legal requirements, formation of government health agencies, and contemporary problems in occupational health.
Credits: 3.00
College: College of Arts and Sciences
Department: Environmental Science & Policy
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman
Pre-Requisites: ENVR 331 Minimum Grade: D

ENVR 335 - Industrial Safety
Study of safety in the workplace. Loss prevention principles Occupational Safety and Health Act Implementation, loss prevention, accident investigation techniques, and basics of loss control and risk management.
Credits: 3.00
College: College of Arts and Sciences
Department: Environmental Science & Policy
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman

ENVR 336 - Terrestrial Ecology
Studies the relationships between terrestrial plants and animals and their environment. Introduces the study of the ecology of local ecosystems, such as the Poconos and the New Jersey Pine Barrens.
Credits: 5.00
College: College of Arts and Sciences
Department: Environmental Science & Policy
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: ENVR 284 Minimum Grade: D or ENVR 286 Minimum Grade: D

ENVR 338 - Biodiversity and Conservation
Provides clear and detailed treatment of the problem of the ongoing reduction in biological diversity around the world. Develops through class discussion insight into the modern theories and practice of conservation.
Credits: 3.00
College: College of Arts and Sciences
Department: Environmental Science & Policy
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: BIO 123 Minimum Grade: D

ENVR 342 - Bioclimatology
Covers the structure of atmospheric variable near the ground, the impact of the biosphere on the lower atmosphere, the heat and moisture budgets of plants and animals, the effect of radiation of plants and animals, and modification of climates.
Credits: 3.00
College: College of Arts and Sciences
Department: Environmental Science & Policy
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: PHEV 145 Minimum Grade: D

ENVR 351 - Intro Resource Economics
Credits: 3.00
College: College of Arts and Sciences
Department: Environmental Science & Policy
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education

ENVR 360 - Environmental Movements in America
Provides an introduction to the key collective actors and institutions involved in the creation of U.S. environmental policies. Examines, through the use of historical and cultural perspective, the development of the various worldviews, organizations, and practices that define U.S. environmental politics.
Credits: 3.00
College: College of Arts and Sciences
Department: Environmental Science & Policy
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman

ENVR 365 - Intro to ENV Policy
Provides an introduction to the development and implementation of U.S. environmental policy, including historical development, political process methods of analysis and creation of laws, regulations and budgets to realize policy objectives.
Credits: 3.00
College: College of Arts and Sciences
Department: Environmental Science & Policy
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education

ENVR 370 - Practice of Env Econ
The focus of this course is on the real world implications of environmental resources exploitation and economic tools for dealing with them. Areas include air and water pollution, toxic wastes and mineral, water and forestry resource harvesting/extraction.
Credits: 3.00
College: College of Arts and Sciences
Department: Environmental Science & Policy
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education

ENVR 374 - Sedimentary Environments
Students in this course develop an understanding of sedimentary processes and the ability to interpret paleoenvironments based on sedimentological parameters. Topics include current flow, bedforms, siliciclastic and carbonate rocks, fluvial, coastal, and aeolian environments, taphonomy, and paleosols.
Credits: 3.00
College: College of Arts and Sciences
Department: Environmental Science & Policy
Restrictions:
Must be enrolled in one of the following Program Level(s):

Undergraduate Quarter
Pre-Requisites: ENVR 272 Minimum Grade: D

ENVR 375 - Invertebrate Paleontology
This course focuses on the evolution of hard-bodied invertebrates from the Cambrian Period to today. Topics include taxonomy, taphonomy, biostratigraphy, and paleoecology. Natural selection, functional morphology, extinction and adaptation are emphasized. The lab focuses on hands-on fossil identification.
Credits: 4.00
College: College of Arts and Sciences
Department: Environmental Science & Policy
Restrictions:
Must be enrolled in one of the following Program Level(s):
Undergraduate Quarter
Pre-Requisites: ENVR 270 Minimum Grade: D

ENVR 382 - Field Botany: NJ Pine Barrens
This course focuses on plant identification skills that are necessary to conduct scientific botanical surveys. The vascular flora of the New Jersey Pine Barrens, including rare plant species, is emphasized with special reference to habitat and community analyses. Non-vascular species are examined but not emphasized.
Credits: 5.00
College: College of Arts and Sciences
Department: Environmental Science & Policy
Restrictions:
Must be enrolled in one of the following Program Level(s):
Undergraduate Quarter
Pre-Requisites: BIO 260 Minimum Grade: D

ENVR 383 - Ecology of the NJ Pine Barrens
Course focusing on the ecology of the New Jersey Pine Barrens. Students learn field survey methods, identify index species (flora and fauna), perform community analyses, and use equipment for measuring abiotic variables (soil and water). Field exercises focus on key aspects of the regional ecology: fire, soil and water.
Credits: 5.00
College: College of Arts and Sciences
Department: Environmental Science & Policy
Restrictions:
Must be enrolled in one of the following Program Level(s):
Undergraduate Quarter
Pre-Requisites: ENVR 284 Minimum Grade: D

ENVR 388 - Marine Field Methods
Course focus is on the ecology of local marine environments. Students learn marine field survey methods, identification of marine organisms, habitat analyses, and use of equipment for measuring abiotic variables. Students sample fish, plankton and invertebrate species aboard the Drexel 25 foot Research Vessel Peter Kilham.
Credits: 5.00
College: College of Arts and Sciences
Department: Environmental Science & Policy
Restrictions:
Must be enrolled in one of the following Program Level(s):
Undergraduate Quarter
Pre-Requisites: ENVR 284 Minimum Grade: D

ENVR 390 - Marine Ecology
This course studies major processes in the marine environment, especially relationships between organisms and the factors that influence their abundance.
Credits: 3.00
College: College of Arts and Sciences
Department: Environmental Science & Policy
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: ENVR 284 Minimum Grade: D or ENVR 286 Minimum Grade: D

ENVR 399 - Independent Stdy: Envr Science
Credits: 6.00
College: College of Arts and Sciences
Department: Environmental Science & Policy
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Must have the following Classification(s):
Junior
Senior

ENVR 401 - Chemistry of the Environment
Covers principles of physical and organic chemistry applicable to the study and evaluation of environmental conditions, especially the pollution of air, water, and soil (including chemical changes and reactions in the environment).
Credits: 3.00
College: College of Arts and Sciences
Department: Environmental Science & Policy
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: ENVE 302 Minimum Grade: D or CHEM 103 Minimum Grade: D

ENVR 431 - Epidemiology

Covers principles, purposes, and methods of epidemiology, including application of methods for the investigation of problems in the field of human diseases, both infectious and non-infectious, with emphasis on the relationship and equilibrium of host and environmental factors.
Credits: 3.00
College: College of Arts and Sciences
Department: Environmental Science & Policy
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: ENVR 316 Minimum Grade: D or BIO 221 Minimum Grade: D

ENVR 436 - Principles of Toxicology I
This course reviews general human physiology and the acute and chronic effects of toxicants upon physiological mechanism. Basic principles of dose-response relationships, target organ toxicity and exposure characterization are incorporated.
Credits: 3.00
College: College of Arts and Sciences
Department: Environmental Science & Policy
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: BIO 201 Minimum Grade: D

ENVR 437 - Principles of Toxicology II
This course expands upon knowledge gained in ENVR 436 Principles of Toxicology I by focusing on the absorption, distribution, biotransformation, and excretion of toxic substances. Current advances in the student of carcinogenesis and mutagenesis are also discussed as well as toxicological research methods, animal and plant toxins, food toxicology and pesticides.
Credits: 3.00
College: College of Arts and Sciences
Department: Environmental Science & Policy
Restrictions:
Must be enrolled in one of the following Program Level(s):
Undergraduate Quarter
Pre-Requisites: ENVR 436 Minimum Grade: D

ENVR 441 - Issues Global Change I: Sem
Discusses and evaluates topics such as records of climate change, atmospheric chemistry and global warming, the greenhouse effect, ozone depletion, acid rain, decreased biodiversity, desertification, deforestation, and sea-level rise. This is a writing intensive course.
Credits: 2.00
College: College of Arts and Sciences
Department: Environmental Science & Policy
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Must have the following Classification(s):
Senior

ENVR 442 - Issues in Global Change II: Rearch
Requires students to focus on a particular global change topic or issue in order to analyze it, prepare a research report, and present a final seminar.
Credits: 2.00
College: College of Arts and Sciences
Department: Environmental Science & Policy
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: ENVR 441 Minimum Grade: D

ENVR 451 - Atmospheric Environment
Provides an understanding of the physical and chemical workings of the atmosphere. Addresses the evolution of the atmosphere, the history of climate, concepts of budgets and cycles, and the building of environmental models to predict future global change.
Credits: 3.00
College: College of Arts and Sciences
Department: Environmental Science & Policy
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: ENVR 401 Minimum Grade: D

ENVR 460 - Evolution
Examines historical evidence for and principal mechanisms of organic evolution, the origin of life and new groups in the past and present, and the genetic basis for evolution. Discusses current research in evolutionary biology and paleontology.
Credits: 3.00
College: College of Arts and Sciences
Department: Environmental Science & Policy
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: ENVR 284 Minimum Grade: D or ENVR 286 Minimum Grade: D

ENVR 476 - Paleobotany
Covers the evolution of photosynthetic organism from algae to flowering plants. Topics include origins of plants, invasion of the land, evolution of ferns, gymnosperms, and angiosperms. Emphasis on natural selection, cladistics, functional morphology, adaptive radiation, mass extinction, plant taphonomy, and paleoecology.
Credits: 3.00
College: College of Arts and Sciences
Department: Environmental Science & Policy
Restrictions:
Must be enrolled in one of the following Program Level(s):
Undergraduate Quarter
Pre-Requisites: ENVR 270 Minimum Grade: D

ENVR 477 - Vertebrate Paleontology
This course focuses on the evolution of vertebrates from the Cambrian Period to today. Topics include cartilaginous and bony fishes, amphibians, turtles, crocodiles, pterosaurs, birds, and mammals. Natural selection, cladistics, functional morphology, adaptation and extinction are emphasized.
Credits: 3.00
College: College of Arts and Sciences
Department: Environmental Science & Policy
Restrictions:
Must be enrolled in one of the following Program Level(s):
Undergraduate Quarter
Pre-Requisites: ENVR 270 Minimum Grade: D

ENVR 480 - Sp Topics Envr Studies
Special topics offered in environmental studies. Topics include recent multidisciplinary areas of environmental concern.
Credits: .50 to 12.00
College: College of Arts and Sciences
Department: Environmental Science & Policy
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman

Materials Engineering Courses

MATE 100 - Materials for Emerging Technologies
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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education

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: 4.00
College: College of Engineering
Department: Materials Engineering
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Pre-Requisites: CHEM 163 Minimum Grade: D and CHEM 162 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Pre-Requisites: MATE 221 Minimum Grade: D and MATH 201 Minimum Grade: D

MATE 221 - Introduction to Mechanical Behavior of Materials
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: 3.00
College: College of Engineering
Department: Materials Engineering
Restrictions:
Must be enrolled in one of the following Program Level(s):
Undergraduate Quarter
Pre-Requisites: TDEC 211 Minimum Grade: D

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: 4.00

College: College of Engineering
Department: Materials Engineering
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman
Pre-Requisites: MATE 221 Minimum Grade: D and TDEC 202 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman
Pre-Requisites: MATE 240 Minimum Grade: D

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: 4.00
College: College of Engineering
Department: Materials Engineering
Restrictions:
Must be enrolled in one of the following Program Level(s): Undergraduate Quarter
Pre-Requisites: TDEC 212 Minimum Grade: D and TDEC 232 Minimum Grade: D

MATE 315 - Processing Polymers
Covers polymer processing, viscous flow and melt rheology, injection molding, extrusion, mechanical behavior, and applications and design.
Credits: 4.50
College: College of Engineering
Department: Materials Engineering
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman
Pre-Requisites: MATE 214 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman
Pre-Requisites: TDEC 212 Minimum Grade: D

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: 4.50
College: College of Engineering
Department: Materials Engineering
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman
Pre-Requisites: MATE 340 Minimum Grade: D

MATE 362 - Microstructures of 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
Pre-Requisites: MATE 211 Minimum Grade: D and MATE 221 Minimum Grade: D

MATE 366 - Processing of 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: 4.50
College: College of Engineering
Department: Materials Engineering
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman

Pre-Requisites: MATE 245 Minimum Grade: D and MATE 360 Minimum Grade: D

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: 3.00
College: College of Engineering
Department: Materials Engineering
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: MATE 221 Minimum Grade: D and MATH 201 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: MATE 400 Minimum Grade: D

MATE 440 - Degradation of Materials
Covers galvanic corrosion of metals, degradation of polymers, failure of ceramics by spalling and thermal shock, prevention of degradation, and design and applications.
Credits: 3.00
College: College of Engineering
Department: Materials Engineering
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: TDEC 212 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Must have the following Classification(s):
Senior

MATE 460 - Engineering Computational Laboratory
Covers numerical techniques, finite differences and finite elements, convergence, and applications in engineering design.
Credits: 4.00
College: College of Engineering
Department: Materials Engineering
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: MATE 221 Minimum Grade: D and TDEC 222 Minimum Grade: D and TDEC 114 Minimum Grade: D

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: 2.00
College: College of Engineering
Department: Materials Engineering
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Must have the following Classification(s):
Senior

MATE 492 - Senior Project Design II

Continues MATE 491. Requires written and oral progress reports.
Credits: 2.00
College: College of Engineering
Department: Materials Engineering
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: MATE 491 Minimum Grade: D

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: 4.00
College: College of Engineering
Department: Materials Engineering
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: MATE 492 Minimum Grade: D

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: .50 to 12.00
College: College of Engineering
Department: Materials Engineering
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman

MATE 499 - Independent Study
Provides independent study and/or research on a topic approved by the department.
Credits: .50 to 12.00
College: College of Engineering
Department: Materials Engineering
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman

Mechanical Engineering and Mechanics Courses

MEM 201 - Foundations of Computer 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: 3.00
College: College of Engineering
Department: Mechanical Engr & Mechanics
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman

MEM 202 - Engineering 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: 3.00
College: College of Engineering
Department: Mechanical Engr & Mechanics
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: TDEC 113 Minimum Grade: D or PHYS 185 Minimum Grade: D or PHYS 111 Minimum Grade: D

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: 4.00
College: College of Engineering
Department: Mechanical Engr & Mechanics
Restrictions:
May not be enrolled in one of the following Program Level(s):

Continuing Education
Pre-Requisites: TDEC 114 Minimum Grade: D or MATH 189 Minimum Grade: D or MATH 200 Minimum Grade: D

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: 4.00
College: College of Engineering
Department: Mechanical Engr & Mechanics
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman
Pre-Requisites: MEM 202 Minimum Grade: D

MEM 238 - Dynamics
Covers kinematics and kinetics in two and three-dimensional space, force and acceleration, linear and angular momentum, and energy methods.
Credits: 4.00
College: College of Engineering
Department: Mechanical Engr & Mechanics
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman
Pre-Requisites: (TDEC 114 Minimum Grade: D or MATH 189 Minimum Grade: D or MATH 200 Minimum Grade: D) and (TDEC 113 Minimum Grade: D or PHYS 111 Minimum Grade: D or PHYS 185 Minimum Grade: D)

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: 4.00
College: College of Engineering
Department: Mechanical Engr & Mechanics
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman
Pre-Requisites: MATH 201 Minimum Grade: D or MATH 261 Minimum Grade: D or MATH 290 Minimum Grade: D

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: 4.00
College: College of Engineering
Department: Mechanical Engr & Mechanics
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman
Pre-Requisites: TDEC 202 Minimum Grade: D

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: 2.00
College: College of Engineering
Department: Mechanical Engr & Mechanics
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman
Pre-Requisites: MEM 220 Minimum Grade: D and MEM 310 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
May not have the following Classification(s): Freshman
Pre-Requisites: MEM 220 Minimum Grade: D

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: 4.00
College: College of Engineering
Department: Mechanical Engr & Mechanics
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: MEM 230 Minimum Grade: D

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: 2.00
College: College of Engineering
Department: Mechanical Engr & Mechanics
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: MEM 230 Minimum Grade: D and MEM 238 Minimum Grade: D

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: 4.00
College: College of Engineering
Department: Mechanical Engr & Mechanics
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: TDEC 202 Minimum Grade: D and (MEM 220 Minimum Grade: D or CIVE 320 Minimum Grade: D) and (TDEC 222 Minimum Grade: D or MATH 210 Minimum Grade: D or MATH 262 Minimum Grade: D)

MEM 351 - Dynamic Systems Laboratory I
Includes experiments involving modeling and simulation of linear and non-linear dynamic systems, including feedback controls. Spring.
Credits: 2.00
College: College of Engineering
Department: Mechanical Engr & Mechanics
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: MEM 255 Minimum Grade: D

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: 4.00
College: College of Engineering
Department: Mechanical Engr & Mechanics
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Pre-Requisites: MEM 255 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Must have the following Classification(s):
Junior
Senior
Pre-Requisites: MATH 290 Minimum Grade: D

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: 12.00
College: College of Engineering
Department: Mechanical Engr & Mechanics
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education

May not have the following Classification(s):

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 five times for credit.
Credits: .50 to 3.00
College: College of Engineering
Department: Mechanical Engr & Mechanics
Restrictions:
Must be enrolled in one of the following Program Level(s):
Undergraduate Quarter
Pre-Requisites: MEM 310 Minimum Grade: D

MEM 399 - Independ Study Mech Engr
Provides independent study or research on a topic approved by the department.
Credits: .50 to 12.00
College: College of Engineering
Department: Mechanical Engr & Mechanics
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: MEM 310 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: MEM 310 Minimum Grade: D

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
Restrictions:
Must be enrolled in one of the following Program Level(s):
Undergraduate Quarter
Pre-Requisites: MEM 220 Minimum Grade: D and MEM 310 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: MEM 410 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: MEM 405 Minimum Grade: D

MEM 410 - Thermodynamic Analysis II
Covers thermodynamic analysis of ideal and real mixtures and gas phase reacting systems. Introduces equilibrium analysis.
Credits: 3.00
College: College of Engineering
Department: Mechanical Engr & Mechanics
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: MEM 310 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: MEM 345 Minimum Grade: D and (MEM 310 Minimum Grade: D or AE 220 Minimum Grade: D)

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: MEM 345 Minimum Grade: D and (MEM 310 Minimum Grade: D or AE 220 Minimum Grade: D)

MEM 417 - Introduction 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, and polymer micromachining are covered. This course also includes two lab sessions through which students have hands-on experiences in microfabrication.
Credits: 3.00
College: College of Engineering
Department: Mechanical Engr & Mechanics
Restrictions:
Must be enrolled in one of the following Program Level(s):
Undergraduate Quarter
Must be enrolled in one of the following College(s)/School(s):
College of Arts and Sciences
College of Engineering
Must have the following Classification(s):
Junior
Senior

MEM 419 - Microfluidics and 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
Restrictions:
Must be enrolled in one of the following Program Level(s):
Undergraduate Quarter
Must be enrolled in one of the following College(s)/School(s):
College of Arts and Sciences
College of Engineering
Must have the following Classification(s):
Junior
Senior
Pre-Requisites: MEM 417 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: MEM 220 Minimum Grade: D

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: 4.00
College: College of Engineering
Department: Mechanical Engr & Mechanics
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: MEM 238 Minimum Grade: D and TDEC 222 Minimum Grade: D

MEM 424 - Biomechanics
Introduces modeling of dynamics of biomechanical systems.
Credits: 3.00
College: College of Engineering
Department: Mechanical Engr & Mechanics
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: MEM 202 Minimum Grade: D and MEM 238 Minimum Grade: D

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. Students must have Junior class standing.
Credits: 3.00
College: College of Engineering
Department: Mechanical Engr & Mechanics
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Must have the following Classification(s):
Junior
Senior

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: MEM 230 Minimum Grade: D

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: 3.00
College: College of Engineering
Department: Mechanical Engr & Mechanics
Restrictions:
Must be enrolled in one of the following Program Level(s):
Undergraduate Quarter
Pre-Requisites: MEM 230 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: MEM 330 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: MEM 428 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: MEM 330 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Junior
Pre-Junior
Sophomore
Pre-Requisites: MEM 202 Minimum Grade: D and MEM 230 Minimum Grade: D and MEM 238 Minimum Grade: D

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: 4.00
College: College of Engineering
Department: Mechanical Engr & Mechanics
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Must have the following Classification(s):
Junior
Senior
Pre-Requisites: MEM 201 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: MEM 201 Minimum Grade: D and MEM 435 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: MEM 220 Minimum Grade: D and MEM 230 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: MEM 437 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: MEM 345 Minimum Grade: D

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
Restrictions:
Must be enrolled in one of the following Program Level(s):
Undergraduate Quarter
Pre-Requisites: MEM 220 Minimum Grade: D or BMES 451 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Pre-Requisites: PHYS 201 Minimum Grade: D or TDEC 201 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Pre-Requisites: MEM 446 Minimum Grade: D

MEM 448 - Applications of 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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Pre-Requisites: PHYS 201 Minimum Grade: D or TDEC 201 Minimum Grade: D

MEM 449 - Applications of 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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Pre-Requisites: PHYS 201 Minimum Grade: D or TDEC 201 Minimum Grade: D

MEM 453 - Aircrft 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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: MEM 355 Minimum Grade: D

MEM 454 - Aircrft 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
Restrictions:

May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: MEM 453 Minimum Grade: D

MEM 455 - Introduction to Robotics
Introduces basic concepts in robot operation and structure, including actuators, sensors, mechanical components, robot control and robot programming.
Credits: 4.00
College: College of Engineering
Department: Mechanical Engr & Mechanics
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: MEM 238 Minimum Grade: D and MEM 255 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: MEM 455 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Must be enrolled in one of the following College(s)/School(s):
College of Engineering
Must have the following Classification(s):
Senior
Pre-Requisites: MEM 456 Minimum Grade: D

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: 3.00
College: College of Engineering
Department: Mechanical Engr & Mechanics
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: MEM 355 Minimum Grade: D

MEM 459 - Micro-Based Cntrol 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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
May not have the following Classification(s):
Freshman
Pre-Requisites: MEM 458 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Must have the following Classification(s):
Junior
Senior

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
Restrictions:
Must be enrolled in one of the following Program Level(s):
Undergraduate Quarter
Pre-Requisites: MEM 238 Minimum Grade: D

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
Restrictions:
Must be enrolled in one of the following Program Level(s):
Undergraduate Quarter
Pre-Requisites: MEM 475 Minimum Grade: D

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
Restrictions:
Must be enrolled in one of the following Program Level(s):
Undergraduate Quarter
Pre-Requisites: MEM 238 Minimum Grade: D

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 combing CAD, medical image processing, 3-D reconstruction software, and solid freeform fabrication of tissue scaffolding.
Credits: 3.00
College: College of Engineering
Department: Mechanical Engr & Mechanics
Restrictions:
Must be enrolled in one of the following Program Level(s):
Undergraduate Quarter
Must have the following Classification(s):
Senior

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: 3.00
College: College of Engineering
Department: Mechanical Engr & Mechanics
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Must have the following Classification(s):
Senior
Pre-Requisites: MEM 230 Minimum Grade: D and MEM 238 Minimum Grade: D and MEM 355 Minimum Grade: D and MEM 345 Minimum Grade: D

MEM 492 - Senior Design Project II
Continues MEM 491. Requires written and oral progress reports.
Credits: 3.00
College: College of Engineering
Department: Mechanical Engr & Mechanics
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Must have the following Classification(s):
Senior
Pre-Requisites: MEM 491 Minimum Grade: D

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: 3.00
College: College of Engineering
Department: Mechanical Engr & Mechanics
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Must have the following Classification(s):
Senior
Pre-Requisites: MEM 492 Minimum Grade: D

Software Engineering Courses

SE 101 - Foundations of Software Engineering 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: 3.00
College: College of Engineering
Department: Computer Science
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education

SE 102 - Foundations of Software Engineering 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. Provides an overview of the software engineering as a discipline.
Credits: 3.00
College: College of Engineering
Department: Computer Science
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
Pre-Requisites: SE 101 Minimum Grade: D

SE 103 - Foundations of Software Engineering 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 and overview of the software engineering professional practice.
Credits: 3.00
College: College of Engineering
Department: Computer Science
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
Pre-Requisites: SE 102 Minimum Grade: D

SE 210 - Software Specification and Design I
Study of the principles, practices, and techniques used to gather system requirements and document them in a requirements specification. Includes techniques for requirements discovery such as user interviews and prototyping. Introduces approaches for organizing and expressing software requirements in a requirements specification.
Credits: 3.00
College: Information Sci & Technology
Department: College of Info Science & Tech
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
Pre-Requisites: SE 103 Minimum Grade: D or CS 133 Minimum Grade: D or CS 172 Minimum Grade: D

SE 211 - Software Specification and Design II
Continues study of requirements with increasing emphasis on converting requirements into a software system design. Presents alternate approaches, techniques for evaluating specifications, specification and design tools, and use of specifications to develop system-level tests.
Credits: 3.00
College: Information Sci & Technology
Department: College of Info Science & Tech
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
Pre-Requisites: SE 210 Minimum Grade: D

SE 280 - Spec Topics in Software Engr
This course covers topics in software engineering. Different topics may be considered in different quarters.
Credits: 4.00
College: College of Engineering
Department: Computer Science
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education

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
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
Pre-Requisites: SE 211 Minimum Grade: D

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
Restrictions:
May not be enrolled in one of the following Program Level(s): Continuing Education
Pre-Requisites: SE 310 Minimum Grade: D

SE 320 - Software Verification 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 tools. Discusses techniques for test construction and test suite evaluation, and validation against requirements and design models. Also covers methods of inspection and review at various phases of the software lifecycle.
Credits: 3.00
College: College of Engineering
Department: Computer Science
Restrictions:
May not be enrolled in one of the following Program Level(s):

Continuing Education
Pre-Requisites: CS 260 Minimum Grade: D

SE 410 - Software Evolution
Covers issues related to change in software systems. Addresses principles and techniques of corrective software maintenance, software enhancements, and software product family. Introduces students to issues of change in large software systems including configuration control, change and product management.
Credits: 3.00
College: Information Sci & Technology
Department: College of Info Science & Tech
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Pre-Requisites: CS 260 Minimum Grade: D

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: 4.00
College: College of Engineering
Department: Computer Science
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education

SE 491 - Design Project I
An independent project in which student teams design and implement a software system under faculty guidance. Students apply a defined software engineering process for the project including process customization as appropriate.
Credits: 3.00
College: Information Sci & Technology
Department: College of Info Science & Tech
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Must have the following Classification(s):
Senior

SE 492 - Design Project II
Continues Design Project I.
Credits: 3.00
College: Information Sci & Technology
Department: College of Info Science & Tech
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Must have the following Classification(s):
Senior
Pre-Requisites: SE 491 Minimum Grade: D

SE 493 - Design Project III
Continues Design Project II.
Credits: 3.00
College: Information Sci & Technology
Department: College of Info Science & Tech
Restrictions:
May not be enrolled in one of the following Program Level(s):
Continuing Education
Must have the following Classification(s):
Senior
Pre-Requisites: SE 492 Minimum Grade: D