

Electrical Comp Engineering (ECE)

ECE 1000

Introduction to Electrical and Computer Engineering

3:3:0 **Fall, Spring**

* Prerequisite(s): MATH 1060 or higher

Introduces engineering-problem-solving techniques, design processes, modeling and analysis of simple electrical and computer circuits using MATLAB and LabVIEW software packages. Emphasizes engineering design procedures by incorporating group projects and presentations. Lab access fee of \$45 for computers applies.

ECE 1020

Computer Engineering Problem Solving with MATLAB and LabVIEW

1:1:0 **Fall, Spring**

* Prerequisite(s): MATH 1050 or higher

Introduces the field of Computer Engineering through programming in the MATLAB and LabVIEW languages. Teaches the design of various components of a prototype communication system while learning about the following aspects of MATLAB: scripts and function files, math functions, commands for array construction and manipulation, string expressions, logic operators, control flow, and graphics. No prior knowledge of computer engineering is assumed. Software fee of \$10 applies. Lab access fee of \$45 for computers applies.

ECE 2210

Fundamentals of Electric Circuit Analysis

3:3:0 **Spring**

* Prerequisite(s): MATH 1210, PHYS 2210

Studies fundamental electric circuit analysis techniques. Develops analysis techniques using Kirchoff's laws, Thevenin and Norton equivalents, superposition, and phasors. Covers transient and steady-state time-domain analysis, and frequency analysis. Lab access fee of \$45 for computers applies.

ECE 2215

Fundamentals of Electric Circuit Analysis Lab

1:0:3 **On Sufficient Demand**

* Prerequisite(s): MATH 1210, PHYS 2210

Covers fundamental electric circuit analysis techniques. Develops analysis techniques using Kirchoff's laws, Thevenin and Norton equivalents, superposition, and phasors. Covers transient and steady-state time-domain analysis, and frequency analysis. Software fee of \$10 applies. Lab access fee of \$45 for computers applies.

ECE 2250

Circuit Theory

3:3:0 **Fall, Spring**

* Prerequisite(s): MATH 1210, PHYS 2210, ECE 1000

Develops linear circuit theory and its application in the analysis and design of RLC active circuits. Covers DC, AC, and transient analysis utilizing node and mesh analysis. Introduces the use of CAD tools. Integrates a laboratory. Lab access fee of \$45 for computers applies.

ECE 2255

Circuit Theory Lab

1:0:2 **Fall, Spring**

* Prerequisite(s): MATH 1210, PHYS 2210

Laboratory for EENG 2250 develops linear circuit theory and its application in the analysis and design of RLC active circuits. Covers DC, AC, and transient analysis utilizing node and mesh analysis. Introduces the use of CAD tools. Software fee of \$10 applies. Lab access fee of \$45 for computers applies.

ECE 2700

Digital Design I

3:3:0 **Fall**

* Prerequisite(s): MATH 1050 or MATH 1055

* Corequisite(s): ECE 2705

Studies the design and application of combinational and sequential logic circuits with discrete and programmable logic devices. Lab access fee of \$45 for computers applies.

ECE 2705

Digital Design I Lab

1:0:2 **Fall, Spring**

* Prerequisite(s): MATH 1050 or MATH 1055

* Corequisite(s): ECE 2700

Designed to accompany ECE 2700. Covers design of digital systems with discrete and programmable logic devices. Includes the use of CAD tools for system design and verification. Software fee of \$10 applies. Lab access fee of \$45 for computers applies.

ECE 2760

Introduction to Semiconductor Theory and Nanotechnology

3:3:0 **Fall, Spring**

* Prerequisite(s): MATH 1060 or higher (MATH 1090 not included)

Introduces the theory of semiconductor materials and devices. Provides an understanding of Nano/microfabrication technology and the physics of semiconductor devices. Covers design principles for the fabrication of newly developed devices and applications. Lab access fee of \$45 for computers applies.

ECE 3250

Energy Conversion

3:3:0 **Spring**

* Prerequisite(s): ECE 2250, University Advanced Standing, and (Formal Acceptance into the Electrical Engineering Program, or Departmental Approval)

Presents fundamental concepts of energy conversion including torque and power in singly/doubly excited electromagnetic systems, single and three-phase transformers, single and three-phase induction motors including speed control, three-phase synchronous generators and DC machines. Lab access fee of \$45 for computers applies.

ECE 3350

Control Systems

3:3:0 **Spring**

* Prerequisite(s): ECE 2250, University Advanced Standing, and (Formal Acceptance into the Electrical Engineering Program, or Departmental Approval)

Introduces the theory and practice of control systems engineering. Covers modeling in the frequency and time domains, analog and discrete transfer function models, reduction of multiple subsystems, system response specifications, control system characteristics, root locus analysis and design, frequency response analysis and design. Emphasizes computer-aided analysis. Lab access fee of \$45 for computers applies.

ECE 3450

Electromagnetics and Transmission Lines

3:3:0 **Spring**

* Prerequisite(s): PHYS 2220, ECE 2250, University Advanced Standing, and (Formal Acceptance into the Electrical Engineering Program, or Departmental Approval)

Introduces the fundamentals of electromagnetic field theory and application: vector analysis, electric and magnetic fields, potential theory, dielectric and magnetic material properties, conductance, capacitance, and inductance, Maxwell's equations and circuit concepts. Explains transmission lines as a bridge to understanding electromagnetic field theory. Covers basic principles of radiation and propagation in waveguides and antennas. Lab access fee of \$45 for computers applies.

ECE 3710

Applied Probability and Statistics for Engineers and Scientists

3:3:0 **Fall, Spring, Summer**

* Prerequisite(s): MATH 1210 and University Advanced Standing

Studies probability and statistical theory with an emphasis on engineering and computer science applications. Covers descriptive statistics, discrete and continuous random variables, probability distributions, hypothesis testing, expectation, estimation, ANOVA testing, and regression analysis. Includes computer analysis of data and simulation. Software fee of \$10 applies. Lab access fee of \$45 for computers applies.

Course Descriptions

ECE 3730

Embedded Systems I

3:3:0 **Fall, Spring**

* Prerequisite(s): ECE 2700, University Advanced Standing, and (Formal Acceptance into the Electrical or Computer Engineering Program, or Departmental Approval)

Presents an introduction to the basic building-blocks and the underlying scientific principles of embedded systems. Covers both the hardware and software aspects of embedded processor architectures and assembly language programming. Develops the theory and technology necessary for the interconnection of devices and systems to microcontrollers by using hardware and software examples and students' projects. Software fee of \$10 applies. Lab access fee of \$45 for computers applies.

ECE 3740

Digital Design II

3:3:0 **Fall, Spring**

* Prerequisite(s): ECE 2700, University Advanced Standing, and (Formal Acceptance into the Electrical Engineering Program or Computer Engineering program, or Departmental Approval)

Covers the design and verification of digital systems. Emphasizes hierarchical design principles and the use of programmable logic devices (PLDs). Utilizes modern CAD tools and design languages (VERILOG). Lab access fee of \$45 for computers applies.

ECE 3750

Engineering Analysis

3:3:0 **Fall**

* Prerequisite(s): MATH 1220, ECE 1000, and University Advanced Standing

Studies Linear systems, abstract vector spaces, matrices through eigenvalues and eigenvectors, solution of ordinary differential equations, Laplace transforms, first order systems, and complex numbers. Software fee of \$10 applies. Lab access fee of \$45 for computers applies.

ECE 3760

Electronic Systems

3:3:0 **Fall, Spring**

* Prerequisite(s): ECE 2250, PHYS 2220, University Advanced Standing, and (Formal Acceptance into the Electrical Engineering Program or Computer Engineering program, or Departmental Approval)
* Corequisite(s): ECE 3765

Introduces semiconductor theory and the fundamentals of diode and transistor operation. Covers the use of discrete and integrated active devices in linear amplifier and switching applications. Software fee of \$10 applies. Lab access fee of \$45 for computers applies.

ECE 3765

Electronic Systems Lab

1:0:2 **Fall, Spring**

* Prerequisite(s): ECE 2255, PHYS 2220, and University Advanced Standing
* Corequisite(s): ECE 3760

Designed to accompany ECE 3760. Covers electronic analog circuit design, simulation, construction, debugging and measurement of circuit performance quantities using advanced instrumentation techniques. Software fee of \$10 applies. Lab access fee of \$45 for computers applies.

ECE 3770

Signals and Systems

3:3:0 **Fall, Spring**

* Prerequisite(s): ECE 3750, University Advanced Standing, and (Formal Acceptance into the Electrical Engineering Program or Computer Engineering program, or Departmental Approval)

Studies the time and frequency domain analysis of continuous time systems subjected to periodic and nonperiodic input signals. Introduces signal and transform theory and the application of Laplace and Fourier transforms. Software fee of \$10 applies. Lab access fee of \$45 for computers applies.

ECE 3780

Communication Systems and Circuits

3:3:0 **Spring**

* Prerequisite(s): ECE 3770, University Advanced Standing, and (Formal Acceptance into the Electrical Engineering Program, or Departmental Approval)

Introduces the fundamentals of electronic communication systems and circuits. Covers pulse code modulation, line coding, information rate, equalization, amplitude modulation, angle modulation, and noise in communication systems. Lab access fee of \$45 for computers applies.

ECE 3785

Communication Systems and Circuits Lab

1:0:3 **Spring**

* Prerequisite(s): ECE 3770 and University Advanced Standing

* Corequisite(s): ECE 3780

Covers hands on experiments related to course work, in the area of Communication Systems and Circuits. Includes digital and analog modulation for the base band and band pass communications. Provides appropriate wireless communication techniques for modern circuits and applications using mini projects. Lab access fee of \$45 for computers applies.

ECE 4250

Power Systems Engineering

3:3:0 **On Sufficient Demand**

* Prerequisite(s): ECE 3250, (Formal Acceptance into the Electrical Engineering Program, or Departmental Approval), and University Advanced Standing

Introduces power system analysis and design with the aid of a personal computer. Emphasizes AC power generation, distribution and usage. Covers single-phase and 3-phase power, motors, generators, power distribution and the grid, generation plants, smart grids, and power flow control. Lab access fee of \$45 for computers applies.

ECE 4700

Computer Architecture for Engineering Applications

3:3:0 **Fall, Spring**

* Prerequisite(s): ECE 3740 and University Advanced Standing

Uses register transfer languages and simulation tools to describe and simulate computer operation; central processing unit organization, microprogramming, input/output, pipelining, virtual memory concepts, VLIW, superscalar out of order, ILP, and memory system architectures. Lab access fee of \$45 for computers applies.

ECE 4730

Embedded Systems II

3:3:0 **Spring**

* Prerequisite(s): ECE 3730 and University Advanced Standing

Presents the design of hardware and software required for embedded, real-time systems. Covers types of real-time systems, fuzzy logic, sensors, real-time operating systems, C programming skills, and wireless sensor networks. Lab access fee of \$45 for computers applies.

ECE 4740

Queuing Theory

3:3:0 **Fall, Spring**

* Prerequisite(s): STAT 2040, ECE 3750, and University Advanced Standing

Includes computer systems network modeling using stochastic processes: queuing theory models, performance analysis, resource allocations, large-system response parameters. Software fee of \$10 applies. Lab access fee of \$45 for computers applies.

ECE 4750

Digital Signal Processing

3:3:0 **Fall, Spring**

* Prerequisite(s): ECE 3770, ECE 3710, and University Advanced Standing

Introduces the theory of digital signal processing and its application to practical problems. Covers z-transforms, discrete-time Fourier transforms, FIR (Finite Impulse Response) and IIR (Infinite Impulse Response) digital filter design. Software fee of \$10 applies. Lab access fee of \$45 for computers applies.

ECE 4755
Digital Signal Processing Lab
1:0:3 **Spring**
 * Prerequisite(s): ECE 3770 and University
 Advanced Standing

Performs software and hardware experiments illustrating the basic principles and techniques of digital signal processing. Teaches programming of real-time signal processing algorithms on a concrete DSP chip, and Accelerate the DSP code on the GPU. Lab access fee of \$45 for computers applies.

ECE 4760
VLSI Design
3:3:0 **Fall**
 * Prerequisite(s): ECE 3760 and University
 Advanced Standing

Focuses on theories and techniques of VLSI design on CMOS technology. Studies the fundamental concepts and structures of designing digital VLSI systems, including CMOS devices and circuits, standard CMOS fabrication processes, CMOS design rules, static and dynamic logic structures, interconnect analysis, CMOS chip layout, simulation and testing, low power techniques, design tools and methodologies, VLSI architecture. Software fee of \$10 applies. Lab access fee of \$45 for computers applies.

ECE 4765
VLSI Design Laboratory
1:0:2 **Fall**
 * Prerequisite(s): ECE 3765 and University
 Advanced Standing

Designed to accompany ECE 4760. Teaches students the complete process of building a ready-to-fabricate CMOS integrated circuit using a commercial design software. Lab experiments include the layout design of CMOS transistors, gate level design, design using VHDL, CHIP design and pin configuration, and simulation of the circuit for slack time and power consumption. Software fee of \$10 applies. Lab access fee of \$45 for computers applies.

ECE 4770
Artificial Neural Networks
3:3:0 **Fall**
 * Prerequisite(s): MATH 1210 and University
 Advanced Standing

Introduces a range of topics in the field of artificial neural networks: modeling of brains, applicable algorithms, and related applications. Develops the theory of a number of neural network models such as Perceptron, Multilayer Perceptron, and Hopfield networks. Emphasizes algorithms for implementing simple artificial neural networks and their applications. Software fee of \$10 applies. Lab access fee of \$45 for computers applies.

ECE 4780
Wireless and Mobile Communications
3:3:0 **Spring**
 * Prerequisite(s): MATH 1210, ECE 2250, and
 University Advanced Standing

Covers the fundamentals of analog and digital wireless communications. Includes baseband and bandpass, analog and digital signaling techniques along with appropriate mathematical background in Fourier transforms, probability and random variables. Introduces both software and hardware designs. Lab access fee of \$45 for computers applies.

ECE 4800
Computer Engineering Senior Design Project
3:3:0 **Fall, Spring**
 * Prerequisite(s): ECE 3740 and University
 Advanced Standing

Serves as a project-oriented capstone course for computer engineering majors. Emphasizes major hardware and software design. Includes identification and completion of a suitable design project to be mutually selected by the faculty supervisor and student. Requires weekly written and oral presentations as well as a final written project report and an oral presentation. Requires completion of a program level assessment test. Software fee of \$10 applies. Course fee of \$27 for materials/testing applies. Lab access fee of \$45 for computers applies.

ECE 481R
Electrical and Computer Engineering Internship
1 to 3:1 to 3:0 **Fall, Spring, Summer**
 * Prerequisite(s): Admission to Computer
 Engineering program or Electrical Engineering
 program, Instructor Approval, and University
 Advanced Standing

Provides an opportunity to gain career-related experience while earning academic credit. Credit is determined by the number of hours a student works during the semester. May be Graded Credit/No Credit. May be repeated for a maximum of three credits toward graduation.

ECE 4900
Electrical and Computer Engineering Capstone I
3:3:0 **Fall**
 * Prerequisite(s): ECE 3730 and University
 Advanced Standing

Focuses on team-oriented design projects. Incorporates engineering standards and realistic constraints including economic, environmental, sustainability, manufacturability, ethical, health and safety, social, and political. Emulates the problems encountered by engineers working in commercial, industrial, and governmental entities. Capstone I and II must be taken in consecutive semesters. Lab access fee of \$45 for computers applies.

ECE 490R
Advanced Current Topics in Computer Engineering
1 to 3:1 to 3:0 **On Sufficient Demand**
 * Prerequisite(s): Department Approval and
 University Advanced Standing

Provides exposure to emerging technologies and topics of current interest in computer engineering. Varies each semester depending upon the state of technology. May be repeated for a maximum of 6 credits toward graduation without prior written department approval. Lab access fee of \$45 for computers applies.

ECE 491R
Independent Study
1 to 3:0 to 3:0 to 9 **On Sufficient Demand**
 * Prerequisite(s): Prior written Department
 Chair approval and University Advanced
 Standing.

Offers independent study as directed by a faculty advisor in reading, individual projects, etc. Varies each semester depending upon the state of technology. A maximum of 3 credit hours may be counted towards graduation without prior written Department approval.

ECE 4950
Electrical and Computer Engineering Capstone II
3:3:0 **Spring**
 * Prerequisite(s): ECE 4900 and University
 Advanced Standing

Serves as a second semester of the two-semester design experience from conception to modeling or prototype. Focuses on team-oriented design projects. Incorporates engineering standards and realistic constraints including economic, environmental, sustainability, manufacturability, ethical, health and safety, social, and political. Emulates the problems encountered by engineers working in commercial, industrial, and governmental entities. Capstone I and II must be taken in consecutive semesters. Lab access fee of \$45 for computers applies.