

ELECTRICAL & COMPUTER ENGINEERING (ECE)

Course numbers with the # symbol included (e.g. #400) have not been taught in the last 3 years.

ECE 804 - Electromagnetic Fields and Waves II

Credits: 4

Provides an overview of electromagnetics modeling by covering commonly-used numerical solutions to electromagnetics problems. Computational approaches to be covered include the Method of Moments (MoM) for both static and dynamic fields, iterative solutions to Laplace's equations, Finite Element Methods, high-frequency solutions, and the Finite-Difference, Time-Domain techniques (FDTD).

Equivalent(s): EE 804

Grade Mode: Letter Grade

ECE #811 - Digital Systems

Credits: 4

Principles and procedures and tools related to the design, implementation and testing of microprocessor-based embedded systems. Students prototype a complete embedded system using CAD tools, application specific integrated circuits, printed circuit board technology, and modern diagnostic/testing procedures and tools. Projects are designed to introduce diverse digital technologies. Lab.

Equivalent(s): EE 811

Grade Mode: Letter Grade

ECE 814 - Introduction to Digital Signal Processing

Credits: 4

Introduction to digital signal processing theory and practice, including coverage of discrete time signals and systems, frequency domain transforms and practical spectral analysis, digital filter terminology and design, and sampling and reconstruction of continuous time signals. Laboratory component providing an introduction to DSP design tools and algorithm implementation. Lab.

Equivalent(s): EE 814

Grade Mode: Letter Grade

ECE 815 - Introduction to VLSI

Credits: 4

Principles of VLSI (Very Large Scale Integration) systems at the physical level. CMOS circuit and logic design, CAD tools, CMOS system case studies. Students exercise the whole development cycle of a VLSI chip: design and layout with the up-to-date commercial EDA tools. An IA (continuous grading) grade is given at the end of semester I.

Equivalent(s): EE 815

Grade Mode: Letter Grade

ECE 817 - Introduction to Digital Image Processing

Credits: 4

Digital image representation; elements of digital processing systems; multidimensional sampling and quantization; image perception by humans, image transformations including the Fourier, the Walsh, and the Hough Transforms; image enhancement techniques including image smoothing, sharpening, histogram equalization, and pseudo color processing; image restoration fundamentals; image compression techniques, image segmentation and use of descriptors for image representation and classification. Lab.

Equivalent(s): EE 817

Grade Mode: Letter Grade

ECE 824 - Ubiquitous Computing Fundamentals

Credits: 4

Ubiquitous computing, or ubicomp, explores embedded, interconnected computing devices that are part of everyday objects and activities. This course takes an interdisciplinary look at the foundations of ubiquitous computing. Topics include software and hardware for ubicomp, human-computer interaction in ubicomp, and issues related to privacy and security in ubicomp. Students undertake a research project inspired by the material.

Grade Mode: Letter Grade

ECE 857 - Fundamentals of Communication Systems

Credits: 0 or 4

Spectra of deterministic and random signals, baseband and bandpass digital and analog signaling techniques, transmitter and receiver architectures, performing analysis of digital and analog signaling in additive noise channels, carrier and symbol timing synchronization methods. Lab.

Equivalent(s): EE 857

Grade Mode: Letter Grade

ECE 872 - Control Systems

Credits: 4

Development of advanced control system design concepts such as Nyquist analysis, lead-lag compensation; state feedback; parameter sensitivity; controllability; observability; introduction to non-linear and modern control. Includes interactive computer-aided design and real-time digital control. (Also offered as ME 872.) Lab.

Equivalent(s): EE 872, ME 872

Grade Mode: Letter Grade

ECE 875 - Applications of Integrated Circuits

Credits: 0 or 4

Design and construction of linear and nonlinear electronic circuits using existing integrated circuits. Limitations and use of operational amplifiers. Laboratory course in practical applications of non-digital integrated circuit devices. Lab.

Equivalent(s): EE 875

Grade Mode: Letter Grade

ECE 884 - Biomedical Instrumentation

Credits: 4

Principles of physiological and biological instrumentation design including transducers, signal conditioning, recording equipment, and patient safety. Laboratory includes the design and use of instrumentation for monitoring of electrocardiogram, electromyogram, electroencephalogram, pulse, and temperature. Current research topics, such as biotelemetry, ultrasonic diagnosis, and computer applications. Lab.

Equivalent(s): EE 884

Grade Mode: Letter Grade

ECE 896 - Special Topics in Electrical or Computer Engineering

Credits: 1-4

New or specialized courses and/or independent study. Some sections may use credit/fail grading.

Equivalent(s): EE 896

Grade Mode: Letter Grade

ECE 899 - Master's Thesis

Credits: 1-6

May be repeated up to a maximum of 6 credits. Cr/F.

Repeat Rule: May be repeated for a maximum of 6 credits.

Equivalent(s): EE 899

Grade Mode:

ECE 900A - Research and Development from Concept to Communication I
Credits: 2

The course will introduce students to the general tools of scientific research and technical development. The course will also introduce students to tools and practices for reading, writing and reviewing documents that describe completed or proposed scientific research and technical development, as well as tools and practices for giving oral presentations about such documents to different types of audiences. Part one of a two course sequence.

Repeat Rule: May be repeated for a maximum of 4 credits.

Equivalent(s): ECE 900

Grade Mode: Letter Grade

ECE 900B - Research and Development from Concept to Communication 2
Credits: 2

The course will introduce students to the general tools of scientific research and technical development. The course will also introduce students to tools and practices for reading, writing and reviewing documents that describe completed or proposed scientific research and technical development, as well as tools and practices for giving oral presentations about such documents to different types of audiences. Part two of a two course sequence.

Repeat Rule: May be repeated for a maximum of 4 credits.

Equivalent(s): ECE 900

Grade Mode: Letter Grade

ECE 901 - Electromagnetic Wave Theory I
Credits: 3

Maxwell's equations; plane wave propagation; reflection and refraction; guided wave propagation; waveguides; simple resonators; elements of microwave circuits, linear and aperture antennas, arrays of dipoles; receiving antennas.

Equivalent(s): EE 901

Grade Mode: Letter Grade

ECE #903 - Antennas
Credits: 3

This course covers the fundamentals of antenna theory, and how to use and understand a contemporary computer modeling tool to analyze and design antennas or other types of microwave devices. Participants in the class are expected to complete a radiation-related project, whether it be a modeling project or a project involving the construction and analysis of an actual antenna (team efforts are encouraged as well).

Grade Mode: Letter Grade

ECE #915 - Advanced Active Circuits
Credits: 3

Investigation of devices and techniques used in advanced circuit design using discrete solid-state devices and integrated circuits. Oscillators, phase-lock systems, low noise techniques, etc.

Equivalent(s): EE 915

Grade Mode: Letter Grade

ECE 920 - Wireless Communication Systems
Credits: 3

Principles of wireless communication systems including analysis of radio wave propagation and modeling, large scale and small scale signal fading, cellular communication architectures, multi-access systems, advanced modulation techniques, signal diversity systems, multiple antenna communications, cognitive radio, and software defined radio.

Grade Mode: Letter Grade

ECE 924 - Ubiquitous Computing
Credits: 3

Ubiquitous computing, or ubicomp, explores embedded, interconnected computing devices that are part of everyday objects and activities. This course takes an interdisciplinary look at the ubiquitous computing through the review of recent research literature. Topics include the visions of ubicomp and some of its applications, software and hardware for ubicomp, human-computer interaction, context awareness, privacy, and security. Students undertake a ubicomp research project inspired by the literature review.

Grade Mode: Letter Grade

ECE 939 - Statistical Theory of Communications
Credits: 3

Introduction to probability theory and random waveforms leading to a discussion of optimum receiver principles. Topics include random variables, random processes, correlation, power spectral density, sampling theory, and optimum decision rules.

Equivalent(s): EE 939

Grade Mode: Letter Grade

ECE 941 - Digital Signal Processing
Credits: 3

Discrete-time stochastic signals, signal modeling, parameter estimation, optimal filtering and decision making, with application to adaptive filters, echo cancellation, channel equalization and parametric spectral estimation. Requires prior coursework in discrete-time LTI systems, analysis and design of recursive and non-recursive linear digital filters, and Fournier based spectral estimation.

Equivalent(s): EE 941

Grade Mode: Letter Grade

ECE #944 - Nonlinear Control Systems
Credits: 4

Analysis and design of nonlinear control systems from the classical and modern viewpoints. Liapunov's stability theory, phase space methods, linearization techniques, simulation, frequency response methods, generalized describing functions, transient analysis utilizing functional analysis, and decoupling of multivariable systems. (Also offered as ME 944.)

Equivalent(s): EE 944, ME 944

Grade Mode: Letter Grade

ECE 951 - Advanced Control Systems I
Credits: 3

State-space representation of multivariable systems, analysis using state transition matrix. Controllability and observability, pole placement using state and output feedback, Luenberger observers. Introduction to computer-controlled systems (sampling, discrete state representation, hybrid systems), nonlinear analysis (Liapunov, Popov, describing function). (Also offered as ME 951.)

Equivalent(s): EE 951, ME 951

Grade Mode: Letter Grade

ECE 952 - Advanced Control Systems II
Credits: 3

Special topics in control theory: continuous and discrete systems; optimal control systems, including calculus of variations, maximum principle, dynamic programming, Weiner and Kalman filtering techniques, stochastic systems, and adaptive control systems. (Also offered as ME 952.)

Equivalent(s): EE 952, ME 952

Grade Mode: Letter Grade

ECE 960 - Computer Architecture**Credits:** 3

Advanced topics in computer organization. Parallel and pipeline processing, associative and stack computers, microprogramming, virtual memory, current topics.

Equivalent(s): EE 960**Grade Mode:** Letter Grade**ECE 965 - Introduction to Pattern Recognition****Credits:** 3

Machine classification of data, feature space representation, multispectral feature extraction, Bayes decision theory, linear discrimination functions, parameter estimation, supervised and unsupervised learning, clustering, scene analysis, associative memory techniques, and syntactic methods of recognition.

Equivalent(s): EE 965**Grade Mode:** Letter Grade**ECE 966 - Robust Integrated Circuit Design and Verification****Credits:** 3

This course covers the typical hardware failure causes, error control coding theories and their application in integrated circuit designs, fault tolerance techniques, hardware Trojan detection methods, and the principles of secure chip design. Prereq: Digital Circuits, Computer Organization.

Grade Mode: Letter Grade**ECE 992 - Advanced Topics in Electrical Engineering****Credits:** 1-4

Example of a recent topic: analog VLSI design. May be repeated.

Equivalent(s): EE 992**Grade Mode:** Letter Grade**ECE 993 - Advanced Topics in Computer Engineering****Credits:** 1-4

Example of recent topic: wireless communication networks. May be repeated.

Equivalent(s): EE 993**Grade Mode:** Letter Grade**ECE 994 - Advanced Topics in Systems Engineering****Credits:** 1-4

Examples of recent topics: neural networks, advanced digital telecommunications. May be repeated.

Equivalent(s): EE 994**Grade Mode:** Letter Grade**ECE 998 - Independent Study****Credits:** 1-3

Independent theoretical and/or experimental investigation of an electrical engineering problem under the guidance of a faculty member.

Equivalent(s): EE 998**Grade Mode:** Letter Grade**ECE 999 - Doctoral Research****Credits:** 0

Cr/F.

Equivalent(s): EE 999**Grade Mode:**