

COURSES FOR ELECTRICAL ENGINEERING AND COMPUTER ENGINEERING

Electrical and Computer Engineering Courses

ECE121 Introduction to Electrical and Computer Engineering

Hours 1

Introduction to electrical and computer engineering disciplines, specializations, the engineering design process, mathematics required for these disciplines, computer-based modeling and simulation tools, and professional responsibilities.

Prerequisite(s): MATH 110

ECE225 Electric Circuits

Hours 4

Physical concepts and mathematical techniques of circuit analysis; DC, transient, and sinusoidal steady-state analysis of circuits; Includes laboratory experiments.

Prerequisite(s): PH 106 and PH 126, MATH 227 and MATH 238

ECE285 Programming for Elec/Comp Eng

Hours 3

Algorithm design, programming, test and debugging skills using the C programming language. Applications to engineering problem solving in electrical and computer engineering.

Prerequisite(s): MATH 125 or MATH 145

Prerequisite(s) with concurrency: CS 150

ECE320 Fundmtl Electrical Engr

Hours 3

Introduction to circuit analysis, methods, resistive circuits, AC circuits, first-order transients, AC power, operational amplifiers and machines. Not open to electrical engineering majors or to students who have earned credit for ECE 225.

Prerequisite(s): PH 106; and MATH 238 or MATH 247

ECE326 Electric Networks

Hours 3

Response of circuits to transient signals, both deterministic and random. Laplace transform solution techniques for circuits and differential equations. Relationship between Laplace and Fourier transforms. Frequency response and representation of circuits and systems. Modeling of uncertainty in circuit elements.

Prerequisite(s): ECE 225 and MATH 238 and MATH 355

ECE330 Intro. to Semiconductor Device

Hours 3

Semiconductor device physics, p-n junction, Schottky diodes, BJT, MOS capacitor, MOSFET and optoelectronic devices. Brief introduction of microelectronic fabrication.

Prerequisite(s): PH 253 and ECE 225

Prerequisite(s) with concurrency: ECE 225

ECE332 Electronics I

W

Hours 0-4

Semiconductor materials and properties, fundamentals of p-n junctions, diodes, diode circuits and operation, signal generators, rectifier and wave-shaping circuits, bipolar and field effect transistors, MOSFET, transistor DC circuit analysis and basic transistor amplifiers. Writing proficiency within this discipline is required for a passing grade in this course.

Prerequisite(s): ECE 225 or ECE 320; and EN 102

Writing

ECE333 Electronics II

W

Hours 4

Operational amplifiers, BJTs, MOSFETs, integrated current biasing and active loads, differential and multistage amplifiers, frequency response, feedback and stability, power amplifiers, and introduction to digital circuits. The lab deals with experiments illustrating concepts in electronics. Writing proficiency within this discipline is required for a passing grade in this course.

Prerequisite(s): ECE 332

Writing

ECE340 Electromagnetics

Hours 4

Electrostatics, magnetostatics, Maxwell's equations, plane waves, guided waves, and radiation.

Prerequisite(s): PH 106 and MATH 227 and MATH 238

ECE350 Electric Power & Machines

Hours 3

Single- and three-phase power system analysis. Theory and operation of electromechanical devices, including magnetic circuits, transformers, as well as DC and AC rotating machines. Fundamentals of power electronics.

Prerequisite(s): ECE 225 or ECE 320

ECE370 Signals And Systems

C

Hours 3

Time domain and frequency domain analysis of continuous and discrete signals and systems; Fourier integral, Fourier series, Z-transform. Numerical implementation using MatLab. Computing proficiency is required for a passing grade in this course.

Prerequisite(s): ECE 225 and ECE 285

Computer Science

ECE380 Digital Logic

Hours 4

Number systems, Boolean algebra, logic functions and gates, design of combinational logic systems, flip-flops, design of synchronous sequential systems, and iterative networks. Includes laboratory experiments.

Prerequisite(s): (CS 150 or CBH 101) and (MATH 125 or MATH 145)

ECE383 Microcomputers

C

Hours 4

Microprocessors, microcontrollers, assembly-language programming, interrupts, polling and hardware interfaces. Computing proficiency is required for a passing grade in this course.

Prerequisite(s): (ECE 285 or CS 250 or CBH 101) and ECE 380

Computer Science

ECE399 Undergraduate Research Fellows

Hours 1-5

The ECE Department offers the opportunity for select undergraduate students to become actively engaged in research and development programs lead by our faculty and graduate students. This opportunity provides undergraduate students with practical research experience, knowledge of modern research practices, and advanced technical skills. Students are evaluated on a pass/fail basis.

Prerequisite(s): Consent of the Instructor.

ECE404 Sensor Networks

Hours 3

Basic architecture and applications of wireless sensor networks (WSN). Hardware components of WSN, WSN operating systems, transport layer, routing layer, MAC layer and data link layer of WSN.

Prerequisite(s): ECE 383

ECE408 Communications

Hours 3

Analog and digital communication systems, random signals, sampling, filtering, analog-to-digital encoding, advanced digital modulation/demodulation, source encoding/decoding, channel encoding/decoding, multiplexing and system performance analysis.

Prerequisite(s): MATH 355 and ECE 370

ECE409 Communications Lab

Hours 1

Modeling and design of communication systems. Familiarization with specialized communications equipment and techniques. Proper use of laboratory instruments.

Prerequisite(s): ECE 370 and ECE 408

Prerequisite(s) with concurrency: ECE 408

ECE430 Solid State Devices

Hours 3

Solid state physics for semiconductor devices, p-n junction, metal-semiconductor junction, JFET/MESFET, MOSFET, BJT and non-ideal behaviors of solid state devices. Organic thin film devices including organic solar cells, thin film transistors, light emitting diodes and their application for flexible displays.

Prerequisite(s): ECE 330

ECE432 VLSI Design

Hours 3

Digital design issues in the context of VLSI systems. Introduction to CMOS digital design methodology, layout techniques, behavior models, circuit simulation and testing of complex systems.

Prerequisite(s): ECE 332

ECE434 Mixed Signal Circuits

Hours 3

Design and testing issues in the context of mixed-signal embedded systems. Introduction to CMOS mixed-signal design methodology, layout techniques, analog to digital converters, digital to analog converters, circuit simulation, and testing and packaging of complex mixed-signal systems.

Prerequisite(s): ECE 332

ECE438 Intgr Circuit Fabr Prin

Hours 3

Study of the processing tools used in semiconductor device fabrication. Topics include semiconductor fundamentals, semiconductor device fabrication processes, interconnections and contacts, integrated circuit packaging, and chip yield.

Prerequisite(s): ECE 333 or MTE 271

ECE439 Thin Film Technology

Hours 3

Crystal structure and defects, film nucleation and growth models, growth of polycrystalline and epitaxial films, vacuum science technology, physical and chemical vapor deposition, solution based methods and thin film characterization techniques.

Prerequisite(s): ECE 225 or PH 253

ECE440 Electromagnetic Waves

Hours 3

Mathematics and physics of the radiation, propagation and scattering of electromagnetic waves. Boundary value problems involving finite and infinite structures, waveguides, antennas and media.

Prerequisite(s): ECE 340

ECE451 Power Electronics

Hours 3

Detailed study on the theory and operation of power electronics converters and systems. Overview of enabling power semiconductor switching devices. Introduction to feedback control of converters. Machine drive fundamentals.

Prerequisite(s): ECE 332 and ECE 350

ECE452 Power Electronics Laboratory

Hours 1

Laboratory experience in three phase power systems and electric machinery. Laboratory experience on the theory and operation of power electronic converters, systems and machine drives.

Prerequisite(s): ECE 332 and ECE 350

Prerequisite(s) with concurrency: ECE 451

ECE453 Power Systems

Hours 3

Basic power systems concepts and per unit quantities; transmissions line, transformer and rotating machine modeling; power flow; symmetrical component of power systems; faulted power system analysis.

Prerequisite(s): ECE 350

ECE454 Power Systems Laboratory

Hours 1

Test and analysis of power systems and machine devices and the design of systems using devices.

Prerequisite(s): ECE 350 and ECE 453

Prerequisite(s) with concurrency: ECE 453

ECE455 Electromechanical Systems

Hours 3

Static and dynamic modeling, analysis, and simulation of mechanical, electrical, hydraulic and mixed systems. MATLAB and SIMULINK model development and simulation.

Prerequisite(s): ECE 225 and MATH 238

ECE461 Quantum Well Elec & Devices

Hours 3

Energy levels and wave functions of semiconductor microstructures; envelope function approximation; quantum wells, superlattices; excitons; optical and electrical properties; selection rules; quantum confined Stark Effect; Wannier-Stark localization; field-effect transistors, tunneling devices, quantum well lasers, electro-optic modulators and quantum-well intersubband photodetectors.

Prerequisite(s): ECE 330 or PH 253

ECE462 Semiconductor Optoelectronics

Hours 3

Elemental and compound semiconductors; fundamentals of semiconductor physical properties; solid state physics; optical recombination and absorption; light emitting diodes; quantum well lasers; quantum dot lasers; blue lasers; semiconductor modulators; photodetectors; semiconductor solar cells; semiconductor nanostructure devices.

Prerequisite(s): PH 253

ECE463 Magnetic Materials & Devices

Hours 3

Diamagnetism and Paramagnetism, Ferromagnetism, Antiferromagnetism, Ferrimagnetism, magnetic anisotropy, domains and the magnetization process, fine particles and thin films and magnetization dynamics.

Prerequisite(s): ECE 340

ECE466 Fund of Nanotechnology

Hours 3

Nanofabrication with electron beam lithography, focused ion beam, lithography, and nanoimprint; microscopies for nanostructures, including SEM, EDX, TEM, AFM, STM; nanoscale devices based on nanostructured materials (carbon nanotubes and metal oxide nanomaterials).

Prerequisite(s): ECE 330 or PH 253

ECE475 Control Systems Analysis

Hours 3

Classical and modern feedback control system methods; stability; Bode, root locus, state variables and computer analysis.

Prerequisite(s): ECE 326

ECE476 Control Systems Lab

Hours 1

Practical analysis and design of feedback control systems and components; electrical, mechanical and electromechanical systems.

Prerequisite(s): ECE 326

Prerequisite(s) with concurrency: ECE 475

ECE479 Digital Control Systems

Hours 3

Frequency and time methods in discrete time control systems; sampling of continuous-time signals, stability, transform design techniques, and state variable analysis and design techniques.

Prerequisite(s): MATH 237 and ECE 370 and ECE 475

ECE480 Digital Systems Design

Hours 3

Digital systems design with hardware description languages, programmable implementation technologies, electronic design automation design flows, design considerations and constraints, design for test, system-on-a-chip designs, IP cores, reconfigurable computing and digital system design examples and applications.

Prerequisite(s): ECE 383. Corequisite: ECE 481

ECE481 Digital Systems Design Lab

Hours 1

Logic design and simulation via hardware description languages, use of electronic design automation tools, and CPU design.

Prerequisite(s): None. Corequisite: ECE 480

Prerequisite(s) with concurrency: ECE 480

ECE482 Comp Visn Dig Image Proc

Hours 3

Introduction to computer vision and digital image processing with an emphasis on image representation, transforms, filtering, compression, boundary detection and pattern matching.

Prerequisite(s): MATH 355 and ECE 285

ECE483 Introduction to Machine Learning

Hours 3

Machine learning studies methods that allow computers to learn from the data and act without being explicitly programmed. This course provides an introduction to machine learning and covers various supervised and unsupervised learning techniques, methods of dimensionality reduction and assessment of learning algorithms.

Prerequisite(s): MATH 355 or consent of instructor.

ECE484 Computer Architecture

Hours 3

Basic computer organization, computer arithmetic, assembly language, machine language, simple and pipelined central-processor organization, memory system hierarchy, and measuring computer performance.

Prerequisite(s): ECE 383

ECE485 Programmable Logic Controllers

Hours 3

Programmable Logic Controllers, fundamentals of ladder logic programming and PLC systems, advanced PLC operation, and related topics, including networking, control applications and human-machine interface design.

Prerequisite(s): ECE 383

ECE486 Embedded Systems

Hours 3

Integration of microprocessors into digital systems. Includes hardware interfacing, bus protocols and peripheral systems, embedded and real-time operating systems, real-time constraints, networking, and memory system performance.

Prerequisite(s): ECE 383. Corequisite: ECE 487

ECE487 Embedded Systems Laboratory

Hours 1

Projects provide hands-on experience in hardware interfacing, system-level design, real-time concepts and memory system performance.

Prerequisite(s): ECE 383. Corequisite: ECE 486

ECE488 Computational Intelligence

Hours 3

Computational Intelligence is a discipline that relies on biologically inspired computation to solve real-world problems that otherwise are infeasible or impossible to solve using classical engineering approaches. The course will cover the fundamental techniques of computational intelligence and study practical applications in real-world engineering problems.

Prerequisite(s): MATH 355 or consent of instructor.

ECE491 Special Problems

Hours 1-8

Investigation of a problem or problems, usually involving research with a faculty member. Credit is based on the individual assignment.

ECE492 Capstone Design I

Hours 2

First of a two-course sequence to provide design experience through capstone design, a team-based two-semester-long design project. Also, the first-semester course will include instruction in design methodology, engineering ethics, societal impacts, project economics and management tools.

Prerequisite(s): ECE 333 and ECE 408 and ECE 409; or ECE 451 and ECE 452; or ECE 453 and ECE 454; or ECE 475 and ECE 476; or ECE 480 and ECE 481; or ECE 486 and ECE 487

Prerequisite(s) with concurrency: ECE 333

ECE493 Selected Topics

Hours 1-8

Special courses in all areas of electrical or computer engineering, offered as the need arises. Credit is based on the course requirements.

ECE494 Capstone Design II

Hours 2

Second of a two-course sequence to provide design experience through capstone design, a team-based two-semester-long design project.

Prerequisite(s): ECE 492