

COURSES FOR ELECTRICAL ENGINEERING AND COMPUTER ENGINEERING

Electrical and Computer Engineering Courses

ECE121 Intro to ECE

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.

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): (ENGR 104 or ENGR 103 or ENGR 123 or MUS 308) and (PH 105 or PH 125) and (PH 106 or PH 126) and (MATH 125 or MATH 145) and (MATH 126 or MATH 146) and (MATH 227 or MATH 247) and MATH 238

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 or computer engineering majors or to students who have earned credit for ECE 225.

Prerequisite(s): (PH 106 or PH 126) and (MATH 227 or MATH 247) and MATH 238

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. Not open to students who earned credit in ECE 327.

Prerequisite(s): ECE 225 and ECE 370

ECE327 Audio Networks and Signals

Hours 3

Response of circuits to transient signals, both deterministic and random. Laplace transform and Fourier methods for the solution and modeling of circuits and audio networks. Frequency response and representation of circuits and systems. Modeling of uncertainty in circuit elements. Specific networks and equipment for audio signal processing. Not open to students who earned credit in ECE 326.

Prerequisite(s): ECE 225 and ECE 370

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 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 is required for a passing grade in this course. A student who does not write with the skill normally required of an upper-division student will not earn a passing grade, no matter how well the student performs in other areas of the course. Includes laboratory experiments.

Prerequisite(s): ECE 225 and (EN 102 or EN 103 or EN 121)

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 is required for a passing grade in this course. A student who does not write with the skill normally required of an upper-division student will not earn a passing grade, no matter how well the student performs in other areas of the course. Includes laboratory experiments.

Prerequisite(s): ECE 332

Writing

ECE341 Electromagnetics

Hours 3

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

Prerequisite(s): (PH 105 or PH 125) and (PH 106 or PH 126) and (MATH 125 or MATH 145) and (MATH 126 or MATH 146) and (MATH 227 or MATH 247) 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 4

Time domain and frequency domain analysis of continuous and discrete signals and systems; Fourier series; Fourier, Laplace and Z-transforms; random signals and their spectrum; sampling, aliasing and signal reconstruction. Numerical implementation using MATLAB. Computing proficiency is required for a passing grade in this course.

Prerequisite(s): ECE 225 and (CS 100 or CS 110) and MATH 355

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): (ENGR 104 or ENGR 103 or ENGR 123 or MUS 308) and (CS 100 or CS 110)

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. Includes laboratory experiments.

Prerequisite(s): ECE 380

Computer Science

ECE394 From U.S. Perspectives to a Global Future: Preparing Electrical and Computer Engineers

USGC, W

Hours 3

This course provides an overview of best practices for future global electrical and computer engineers. It explores engineering economics, technical standards, regulatory compliance, public health and safety considerations, and intellectual property protection. It emphasizes global economic impacts, sustainability, environmental implications, and the cultural and societal effects of engineering decisions. The course also develops communication skills essential for writing technical reports and manuscripts.

Prerequisite(s): ECE 332 and ECE 380

US and Global Citizenship, Writing

ECE399 Undergraduate Research Fellows

EXP

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.

Experiential Learning

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

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

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

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 370

ECE476 Control Systems Lab

Hours 1

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

Prerequisite(s): ECE 370

Prerequisite(s) with concurrency: ECE 475

ECE479 Digital Control Systems

Hours 3

Frequency and time domain methods in discrete time control systems; sampling of continuous-time signals, stability, transform design techniques, 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 and CS 101 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): ECE 383 and CS 101 Corequisite: 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

ECE483 Intro 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

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 and CS 101

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 and CS 101 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

ECE491 Special Problems

EXP, SP

Hours 1-8

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

Experiential Learning, Special Topics Course

ECE492 Capstone Design I

EXP

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 332

Prerequisite(s) with concurrency: 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

Experiential Learning

ECE493 Selected Topics

SP

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.

Special Topics Course

ECE494 Capstone Design II

EXP

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 333 and ECE 383 and ECE 394 and ECE 492

Experiential Learning