‹ Back to Home

ECE Course Descriptions

Electrical and Computer Engineering (ECE) Course Descriptions

EGPP-101 - Introduction to Engineering, 2 Credits
Provides information on engineering education, the engineering profession, and basic concepts and tools. Introduces the engineering design process and provides opportunity for students to complete engineering design projects.
Prerequisite: None
Course Offering: Fall Semester

EECE-102 - Intro to Elec & Comp Eng, 1 Credit
Continuation of EGPP-101 as related to the electrical and computer engineering profession. Organized in to five Blocks: Descriptive, Environment, Technical, Practical (Hands on), and Projects, students are introduced to various engineering issues related to the profession of electrical and computer engineering. Historical perspectives and Electrical Engineering Education/Profession and Design are reviewed. Ethics, social/environmental/cultural/religious issues facing electrical engineers in a global work environment are discussed. An overview of electrical engineering discipline and five major classifications of electrical systems in communication, computer, control, power, and signal processing are presented. Technical aspects and safety considerations of a typical electrical engineering laboratory are introduced. A capstone term project requires assembling an electrical system (e.g., a robot kit) and its study and presentation from a systems point of view.
Prerequisite: EGPP-101
Course Offering: Spring Semester

EECE-156 - Math I Lab, 1 Credit
The purpose of this course is to develop students' problem solving skills, and improve their understanding of the calculus techniques and concepts they learn in Math 156 (Calculus I). Topics include: Algebra Review, Limits, Continuity, Derivative: definition, rules: sum, quotient, product, power, chain, Implicit Differentiation, Applications of the Derivative: related rates, max/min problems, L'Hospital's Rule, Anti-derivative, Integration.
Corequisite: MATH-156
Course Offering: Fall Semester, Spring Semester

EECE-157 - Math Lab II, 1 Credit
The purpose of this course is to further develop students' problem solving skills, improve their understanding of the calculus techniques and concepts they learn in Math 157 (Calculus II), and help them see how calculus can be used to solve engineering problems. Topics include: integration techniques, applications of integration, polar functions and parametric functions, sequences and series.
Prerequisite: MATH-156
Corequisite: MATH-157
Course Offering: Fall Semester, Spring Semester

EECE-158 - Math Lab III, 1 Credit
The purpose of this course is to further develop students' problem solving skills, improve their understanding of the calculus techniques and concepts they learn in Math 158 (Calculus III), and help them see how calculus can be used to solve engineering problems. Topics include: Vectors and scalars, Dot and Cross Product, Vector Differentiation, Gradient, Divergence, and Curl, Vector Integration, Divergence Theorem, and Stokes' Theorem.
Prerequisite: MATH-157
Corequisite: MATH-158
Course Offering: Fall Semester

EECE-160 - Engineering Math, 3 Credits
Course introduction; history and importance of engineering Mathematics, trigonometry in engineering, 2-D vectors in engineering, complex numbers in engineering, 3-D vectors in engineering, systems of equations in engineering, application of derivatives in engineering, application of integrals in engineering, solving differential equation, applications of differential equations in engineering, Laplace transforms and applications, Interdisciplinary Applications.
Prerequisite: MATH-157
Course Offering: Spring Semester

EECE-203 - Fundamentals of Circuit Theory, 4 Credits
Understanding of basic circuit theory, circuit theorems, dc, ac circuits, magnetic circuits, transients, Laplace and Fourier transforms, Fourier series, electric devices, 2-port network, basic filters and op-amps.
Prerequisites: PHYS-014, PHYS-024
Corequisite: EECE-209
Course Offering: Spring Semester

EECE-209 - Fundamentals of Circuit Theory Lab, 1 Credit
Understanding of hands-on labs associated basic circuit theory, circuit theorems, dc, ac circuits, operational amplifiers (op-amps), electric devices network, basic filters and op-amps.
Prerequisites: PHYS-014, PHYS-024
Co-requisite: EECE-203
Course Offering: Spring Semester

EECE-212 - Fundamentals of Digital Systems, 3 Credits
Introduction to hardware building blocks used in digital computers and systems. Introduces number systems (including binary, octal and hexadecimal), Boolean algebra, two-level/multilevel logic minimization/simplification using K-Maps and Quine-McCluskey methods, combinational logic circuit design and implementation with available SSI, MSI, and programmable logic devices (PAL, PLA, multiplexers, encoders, ROMS). Practical considerations such as hazard and glitches are treated. Basics of sequential logic design including latches, flip-flops, registers, counters, finite state machines design, minimization, and implementation are presented.
Prerequisite: Sophomore Standing
Corequisite: EECE-217
Course Offering: Spring Semester

EECE-218 - Fund of Digital Systems Lab, 1 Credit
Laboratory experiments and (mini) projects in design and implementation of simplex to moderately complex combinational and sequential logic circuits provide a practical understanding of concepts covered

in EECE-212. Project(s) introduce students to design with programmable logic devices and logic design/simulation software such as Electronics Workbench.
Prerequisite: Sophomore Standing
Corequisite: EECE-212
Course Offering: Spring Semester

EECE-260 - Eng. Programming & Application, 3 Credits
Use basic applications in engineering to bring up the major concepts, methods and techniques needed to perform successful computation. The course includes complexity, testing and debugging, binary search, divide and conquer, dynamic programming, application to statistics and Monte Carlo simulations.
Prerequisite: CSCI-135
Course Offering: Spring Semester

EECE-305 - Fund: Electromagnetics, 3 Credits
Electric fields, flux and potential; Coulomb's Poisson's and Gauss's laws; permittivity and conductivity, magnetostatics, magnetic materials, magnetic materials and forces, Biot-Savart law and time varying fields, Maxwell's equations in integral and differential forms, time-domain analysis of waves. Application of electromagnetic theory to transmission lines.
Prerequisite: MATH-158, PHYS-014
Course Offering: Fall Semester

EECE-306 - Fund: Electromagnetics Lab, 1 Credits
To provide ECE majors with a firm basis for an understanding of the electrical circuits, the radiation, propagation, and transmission of electric power, as well as the electromagnetic storage systems.
Prerequisite:
Corequisite: EECE-305
Course Offering: Fall Semester

EECE-309 - Fundamentals of Electronics & SS Devices, 3 Credits
Understanding of basic semiconductors devices, characteristics, switching and basic amplifiers, operational amplifiers, frequency response, filters, wave generation, introduction to power electronics, team work.
Prerequisite: EECE-203
Corequisite: EECE-312
Course Offering: Fall Semester

EECE-310 - Principles of Electronics, 2 Credits
This course is open to non-EE and non-CpE students only. The course covers theoretical and practical fundamental principles of electronic devices, circuits and instruments.
Prerequisites: MATH-159, PHYS-014
Course Offering: Fall Semester, Spring Semester

EECE-312 - Fundamentals: Elec & SS Devices Lab, 1 Credit
Understanding of basic semiconductors devices, characteristics, switching and basic amplifiers, operational amplifiers, frequency response, filters, wave generation, introduction to power electronics, team work
Prerequisite: EECE-209
Corequisite: EECE-309
Course Offering: Fall Semester

EECE-320 - Research in Undergraduate Exp, 1 Credit
Research in Undergraduate Experience makes undergraduate students familiar with basics of research. Students practice research on a specific subject under supervision of a faculty member. Students perform literature review on their selected subject and discuss about it to the class. Through this effort, students become exposed to various subjects and understand the importance of and the need for research. The course teaches students how to present their work to others. It also emphasizes on long life learning. Further, students become familiar with LaTeX as a high-quality typesetting system used for the communication and publication of scientific documents.
Prerequisite: Junior Standing
Corequisite:
Course Offering: Spring Semester

EECE-325 - Fundamentals of Energy Systems, 3 Credits
This course focuses on the fundamentals of energy systems centered around electric power generation. Starting with the traditional system of large, central power stations connected to their customers by hundreds or thousands of miles of transmission lines, this course covers distributed, renewable, cleaner, smaller generation systems located closer to their loads. In that regard, while other generation sources such as Biomass and Fuel Cells are covered, wind power generation systems and photovoltaic (PV) power generation systems are highlighted in the course.
Prerequisite: EECE-203
Corequisite: EECE-326
Course Offering: Fall Semester

EECE-326 - Fundamentals of Energy Systems Lab, 1 Credits
This course focuses on the laboratory experiments of fundamentals of energy systems dealing with poly-phase power measurements, synchronous machines, transmission line, renewable electricity systems of induction motor/generator. Also emphasized is renewable energy system modeling tools and system development using the modeling tools.
Prerequisite:
Corequisite: EECE-325
Course Offering: Fall Semester

EECE-331 - Probability & Random Variables for Engineers, 3 Credits
Examines fundamentals of discrete and continuous probability: conditional probability, independence, random variables, density and distribution functions, expected value and variance, common discrete and continuous distributions, joint distributions, and introduction to simple stochastic processes. Applications to electrical and computer engineering; reliability of series and parallel circuits, models for waiting time phenomena.
Prerequisite: MATH-159 Course Offering: Fall Semester

EECE-333 - Fundamentals of Signals & Systems, 3 Credits
Design-based course introduces comprehensive treatment of basic signal theory in time and frequency domains. Discrete and continuous time cases are treated simultaneously, covers concepts of signals and systems, convolution of difference and differential systems, block diagrams, state-space realizations and solution, matrix theory, Fourier series, transform techniques (Fourier, FFT, Z and Laplace), frequency response and stability. Exercises include traditional homework problems, computer applications such as MATLAB, C and SIGSYS and hardware design (laboratory generation of various signals and application to

systems response) and design projects (Demonstration is required).
Prerequisite: EECE-331
Course Offering: Spring Semester

EECE-350 - Operating Systems for Engineers, 3 Credits

Fuses the history and evolution of operating systems, concepts of process management, memory addressing and allocation, files and protection, deadlocks and distributed systems.
Prerequisite: CSCI-135 or SYCS-135
Course Offering: Spring Semester

EECE-401 - Senior Design I, 3 Credits

Fundamentals of design principles, and engineering applications, design methodologies with emphasis on synthesis and evaluation, design process, reliability, the impact of engineering economy, report writing, ethics and alternative solutions will be discussed. During this course, students must identify a topic and an advisor for their Thesis Design Project. The project must be approved by the advisor and the course instructor.
Prerequisite:
Course Offering: Fall Semester, Spring Semester

EECE-404 - Senior Design II, 3 Credits

Enhances knowledge of engineering design principles to solve real world problems, project planning, analysis, simulation and presentation, economic impact, ethics synthesis. Design areas are selected from solid-state electronics, digital systems, communications (signal processing), power/energy systems and controls, power electronics, antennas and microwave and others. Oral presentation (with poster session) as well as written report required. Most of the semester will be devoted to the design and implementation of the Senior Thesis Project selected by student and approved by his/her advisor at the conclusion of EECE-401.
Prerequisite: EECE-401
Course Offering: Fall Semester, Spring Semester

EECE-405 - Energy Conversion II, 3 Credits

Deals with advanced steady state and transient analysis of electronic machines stability and control, and static converters and inverters.
Prerequisite: ELEG-403
Course Offering: TBA

EECE-406 - Advanced Digital Systems Design, 3 Credits

Consists of design, analysis, optimization, and implementation of complex sequential digital systems and finite state machines (FSM). Hardware description languages (HDL), VHDL and/or Verilog, are introduced and will be used to design and implement digital systems. The structure of a computer and its organization will be reviewed. Finite state machine of a Simple CPU will be developed and various implementation alternatives (FSM, time state, jump counters, and microprogramming) of its controller will be studied.
Prerequisite: EECE-212
Corequisite: EECE-412
Course Offering: Fall Semester

EECE-408 - Linear Control Systems, 3 Credits

Deals with analysis of time and frequency response of closed loop systems, block diagrams, signal flow

graphs, Mason gain, Routh-Hurwitz and Nyquist criteria for stability, root-locus method and system specifications, compensators, state variable methods, introduction to digital control.
Prerequisite: EECE-332
Corequisite:
Course Offering: Fall Semester

EECE-410 - Introduction to Computer Networks, 3 Credits
Presents basic concepts of data communication networking and computer communications architectures, including packet switching, local area networks, OSI (Open System Interconnection Architectures), TCP/IP, X.25/X.75, and SNA (System Network Architecture).
Prerequisite:
Course Offering: Spring Semester

EECE-412 - Advanced Digital Systems Design Laboratory, 1 Credit
Laboratory projects will use a PC-based Computer-Aided Design Tool environment that supports hardware description languages (HDL) such as VHDL and Verilog for design, simulation, and synthesis of logic systems. Early lab exercises (mini projects) will use SSI/MSI chips; then HDL-based design tools and associated methodologies will be introduced to design, simulate, and synthesize complex digital systems for implementation with Programmable Logic Devices and Field Programmable Gate Arrays (FPGA). Teams of two or three students will select and undertake design projects.
Prerequisite:
Co-requisite: EECE-406
Course Offering: Spring Semester

EECE-416 - Microcomputer Design, 3 Credits
Examines microprocessors, support architectures, and hardware/software. Also presents microprocessors' software model and programming, assembly language programming, microprocessor applications, microprocessor-based systems, and microcomputers. Projects will be used to introduce microprocessor applications.
Prerequisite: EECE-212
Course Offering: Fall Semester

EECE-420 - Introduction to VLSI Design, 3 Credits
Introduces CMOS technology and theory; CMOS circuit and digital logic design; layout rules and techniques; circuit characterization and performance estimation; CMOS subsystem design; VLSI systems design methods; VLSI CAD tools; laboratory experience in custom VLSI chip design on workstations using concepts in cell hierarchy; final project involving specification, design and evaluation of a VLSI chip or VLSI CAD program. Written report and oral presentation of the final project are required.
Prerequisites: EECE-211, EECE-308
Course Offering: Fall Semester

EECE-421 - Power Systems Analysis, 3 Credits
Covers one-line diagram per unit quantity, power generation and synchronous machines, transmission line theory, analysis of interconnected systems using load flow studies and computation techniques. Economic operation of power system. Design projects.
Prerequisite: EECE-325
Course Offering: Fall Semester

EECE-422 - Power Communications & Control, 3 Credits

Continuation of EECE-421. Introduction to telecommunication, fundamentals of communications, data representation and communication, power system and fault analysis, protection and controls, power system stability, communication protocol concepts and security and standards.
Prerequisite: EECE- 421
Course Offering: Spring Semester

EECE-453 - Communications Theory, 3 Credits

Includes probability theory, hypothesis testing, channel capacity, coding, detection and system performance analysis.
Prerequisite: EECE-331 or EECE-332
Course Offering: Fall Semester

EECE-456 - Embedded Systems Design Lab, 3 Credits

Project based course for design and system integration of embedded systems using microprocessor boards and I/O devices.
Prerequisite: EECE-416
Course Offering: Spring Semester

EECE-460 - Wireless Communication, 3 Credits

Presents the physical layer of wireless communication systems, implementation of speech coding, error control, modulation/demodulation and filtering schemes for wireless links using digital signal processors for base band functions.
Prerequisite: EECE-453
Course Offering: Spring Semester

EECE-479 - Cybersecurity for Net CPS/IoT, 3 Credits

This course is designed to introduce emerging topics related to cybersecurity challenges and practical cyber-defense/countermeasures in networked Cyber-Physical Systems (CPS) and Internet-of-Things (IoT). The course will cover fundamental concepts, technologies, theoretical understanding and practical basis for cybersecurity of networked CPS/IoT. Graduate students will complete an independent research project which involves a written and oral presentation not required at the undergraduate level.
Prerequisite:
Course Offering: Fall Semester

EECE-487 - Telecommunications, 3 Credits

Consists of telecommunications systems design for point-to-point and mass data distribution, modulation techniques, propagation modes and control methods.
Prerequisite: EECE-453
Course Offering: Spring Semester

EECE-495 - Signal Processing, 3 Credits

Presents sampling as a modulation process; aliasing; the sampling theorem; the Z-transform and discrete-time system analysis; direct and computer-aided design of recursive and non recursive digital filters; the Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT); digital filtering using the FFT; analog-to-digital and digital-to-analog conversion; effects of quantization and finite-word-length arithmetic, and design and implementation of these algorithms on Motorola family of Digital Signal Processor chips and/or other similar DSP chips.

Prerequisite: EECE-333
Course Offering: Fall Semester

EECE-496 - Integrated Circuits Tech Lab, 3 Credits

This laboratory course is to serve as a hands-on introduction to the environment, processes, and procedures that can be used in the processing of semiconductor materials, and fabrication of nanostructures. Processes that will be performed include lithography, metallization, materials characterization, etc. The evaluation procedures associated with each process will also be examined. Students will process semiconductor wafers resulting in the formation of actual device structures.
Prerequisite:
Corequisite:
Course Offering: Spring Semester

EECE-498 - Independent Project, 3 Credits

Study performed by individual student under faculty supervision.
Prerequisite: Departmental Approval
Course Offering: Fall Semester, Spring Semester

EECE-499 - Special Topics in Electrical Engineering, 3 Credits

Special courses not offered on a regular basis.
Prerequisite: Departmental approval
Course Offering: Fall Semester, Spring Semester