Electrical Engineering (EE)

Courses

EE 200 Engineering Programming 3 Cr.
Introduction to a high level programming language such as C/C++. Topics include structure and organization of a computer program, variables and basic data types, flow of control, functions, file I/O, arrays and strings, computer memory, CPU and pointers, user defined structures, computer algortithms, modular design and documentation. Introduction to object oriented programming concepts. This course is offered once a year.

EE 204 Electrical Circuits I 3 Cr.
A study of principles and methods of analysis of electric circuits with both direct and time varying sources in the steady state. KCL, KVL, mesh and nodal techniques. Network theorems are developed and applied to the analysis of networks. Energy storage elements. First order and second order circuits with forced and natural responses. Sinusoidal analysis, complex numbers, phasor diagrams. Power; average effective, and complex power in single phase systems. Classroom: 3 hours. Corequisite: MA 122.

EE 215 Fundamentals of Digital Design 4 Cr.
An introductory course on formal design techniques for combinational and sequential logic circuits. Topics include combinational logic networks, minimization techniques, registers, synchronous sequential neworks, and control units. Applications of the concept developed in the classroom will be implemented in the laboratory. Classroom 3 hours, laboratory 2 hours.

EE 240 Electrical Concepts and Applications 3 Cr.
A course on the theory and application of electrical devices and circuits. Discussions include magnetic circuits, transformers, electric machines, diodes, bipolar transistors, and field effect transistors. Integrated circuits are introduced. Digital switching circuits are treated, including logic gates, flip-flops, and counters. Operational amplifiers and their major applications are studied. Offered to qualified students not majoring in Electrical Engineering. Classroom 2 hours, laboratory 3 hours. Prerequisite: EE 204.

EE 242 Digital Systems Design 4 Cr.
Topics are hierarchical design methods, design and debugging of digital hardware, determination of circuit behavior, control and timing, machine organization, control unit implementation, and interface design. A hardware design language will be used and students will acquire design experience implementing digital hard ware. Classroom 3 hours, laboratory 2 hours. Prerequisite: EE 215.

EE 303 Electromagnetic Field Theory I 3 Cr.
Maxwell's Equations are developed from the experimental laws of electric and magnetic fields. Topics involving electric fields include Gauss's Law, divergence, energy, potential, conductors, dielectrics, and capacitance. Topics involving magnetic fields include the Biot-Savart Law, Ampere's Law, magnetic forces, magnetic materials, and inductance. Maxwell's Equations are used to describe wave motion in free space and in dielectric media. Classroom 3 hours. Prerequisites: MA 223, EE 204.

EE 315 Electrical Energy Systems 3 Cr.
A course on the design and implementation of electrical energy systems. Topics include thermal, wind, solar, and hydro renewable electrical energy facilities, electric transmission and distribution systems, and electrical substations. Introductory topics include basic circuit analysis, transformers, motors and drive systems, and instrumentation. Includes hands-on demonstrations and experiments. Offered to qualified students not majoring in Electrical Engineering. Classroom 3 hours. Prerequisite: MA 122.

EE 321 Embedded Systems 4 Cr.
The use of computing devices in embedded applications is introduced. Computer organization topics include the arithmetic logic unit, timing and control, memory, serial and parallel I/O ports, and the bus system. Programs are written and run in assembly language and higher-level languages. Additional topics include peripheral interface control, interrupts, cross assembly and applications. Classroom 3 hours, laboratory 2 hours. Prerequisite: EG 110 or IS 130.

EE 323 Computer Architecture 3 Cr.
Compare different machine architectures – analyze machine performance relationships, do computer classifications, and compare different computer description languages. Consider alternative machine architectures and the software influences on computer design. Topics include digital logic, microarchitecture level, instruction set level, operating system level, assembly language level, parallel computer architectures. Examples are drawn from the Core i7, OMAP4430 and ATmega168, hardware as well as ARM and AVR instruction sets. Classroom 3 hours. Prerequiste: None.

EE 325 Computer Architecture and Operating Systems 3 Cr.
Machine architecture - machine performance relationships, computer classification, and computer description languages. Consideration of alternative machine architectures. Software influences on computer design. Topics include digital logic, VLSI components, instruction sets, addressing schemes, memory hierarchy ache and virtual memories, integer and floating point arithmetic, control structures, , buses, RISC vs. CISC, multiprocessor and vector processing (pipelining) organizations. Examples are drawn from Pentium and Sparc microcomputers. The primary focus is on the attributes of a system visible to an assembly level programmer. This course also introduces the fundamentals of operating systems. Topics include concurrency, scheduing, memory and device management, file system structure, security, and system performance evaluation. Lecture 3 hours. Offered once per year.

EE 350 Linear Systems 3 Cr.
This course provides the foundations of signal and system analysis. Linear, time-invariant, causal, and BIBO stable analog and digital systems are discussed. System input-output descriptions, convolution and the impulse response are covered. Additional topics include singularity functions, Fourier and Laplace circuit analysis, circuit transfer functions, Bode plots, ideal filters, and real filters including Butterworth, Chebyschev, and Elliptic. Discrete topics include the transform, difference equations, FIR and IIR filters, the bilinear transformation, the DTFT, the DFT, and the FFT. Classroom 3 hours. Prerequisite EE 356.

EE 356 Electrical Circuits II 3 Cr.
This course is a continuation of Electric Circuits I (EE 204). The complete solutions of linear circuits by Laplace transforms are developed. The concepts of frequency response, resonance, network functions, two port networks including hybrid parameters are studied in depth. The concepts of transformers, power, coupled circuits, multi-phase circuits, and Fourier series are introduced. Computer-based circuit simulation is used throughout. Classroom 3 hours. Prerequisite: EE 204.

EE 357 Electronics I 3 Cr.
The basic building blocks used in electronic engineering are studied. Diodes, bipolar transistors, and MOS transistors are modeled and then used to describe the operation of logic gates and amplifiers. Emphasis is placed on the operation and applications of standard integrated circuit chips. Classroom 3 hours. Prerequisite: EE 204.

EE 359 Electrical Engineering Laboratory 1 Cr.
Implementation, analysis, and design of electric and electronic circuits involving resistors, inductors, capacitors, diodes, bipolar transistors, MOS transistors, operational amplifiers and filters. Study and practice in the use of standard electrical engineering laboratory instrumentation. Laboratory 2 hours. Prerequisite: EE 215; corequisites: EE 356, EE 357.

EE 366 Electronics II 4 Cr.
This course is a continuation of Electronics I (EE 357). Analog and digital circuits are discussed. Analog topics include frequency response, real world applications of operational amplifiers, power amplifiers, filters, oscillators and A/D and D/A converters. Digital electronic building blocks are discussed, including flip-flops, counters, coding and decoding circuits and memory. Classroom 3 hours, laboratory 2 hours. Prerequisites: EE 357, EE 359.

EE 373 Electrical Energy Conversion 4 Cr.
A course on principles of energy conversion in electromechanical devices and machines. Analysis of transformers, polyphase synchronous and asynchronous machines, single phase fractional horsepower machines, and DC machines. Classroom 3 hours, laboratory 2 hours. Prerequisite: EE 356; corequisite: MA 224.

EE 399 Electrical Engineering Topics 3 Cr.

EE 3XX Electrical Engineering 4 Cr.

EE 411 Infrastructure Control Systems 4 Cr.
This course deals with organization, operation and design of systems where the microprocessor controls special interfaces to non-standard devices and responds to external events in a timely fashion. Topics include interface of special purpose peripherals, data structures, control structures, program and data organization and real time operating systems. Application to communications, automated measurement, process and servo control are discussed. Classroom 3 hours, laboratory 2 hours.

EE 459 Electric Power Systems 3 Cr.
An introduction to the fundamentals of electric power systems generation, transmission and distribution, with emphasis on current trends, issues and technologies. Topics include a review of ac power fundamentals, per unit quantities, system component models, short-circuit analysis, load flow, smart grid concepts, communications and control, power systems economics, and renewable energy systems. Lecture: 3 hours. Offered once per year.

EE 463 Communication Systems 4 Cr.
Analog transmission of information signals by communication systems is analyzed. The component parts of transmitters and receivers including AM/FM modulators, filters, detectors and decoders are discussed. Mathematical concepts include the Fourier Series, Fourier Transform, dirac delta function and sinc function. Signal classification and digital modulation techniques such as ASK, FSK, PSK, PAM and QAM. Classroom 3 hours, laboratory 2 hours. Prerequisites: EE 356, EE 357, EE 359.

EE 468 Solid State Materials 3 Cr.
Solid state materials, physics of electronic devices and integrated circuit design are studied. Topics include silicon crystal properties, diffusion, implantation, lithography and circuit fabrication. Device models are derived for junction diodes, bipolar and MOS transistors. Classroom 3 hours. Prerequisites: EE 303, EE 357.

EE 478 Control Systems 3 Cr.
Analysis and design of continuous-time and discrete-time control systems using classical and state-space methods. Laplace transforms, transfer functions and block diagrams. Transient-response analysis, Routh-Hurwitz stability criterion, and steady-state error analysis. Analysis of control systems using the root-locus and frequency-response methods. Computer-aided design and analysis. Lecture: 3 hours. Prerequisites: EE 204 and MA 224. Offered once per year.

EE 486 Digital Signal Processing 3 Cr.
An introductory level course that discusses the conversion of analog signals to discrete time signals. Emphasis will be on the processing of discrete signals using both time-domain and frequency-domain analysis. These techniques will be applied to the design of digital filters. Classroom 3 hours. Prerequisite: EE 350 or instructor's permission.

EE 487 Digital Signal Processing Lab 1 Cr.
Implementation analysis and design of digital signal processing functions and techniques. Study and practice in the use of software and hardware platforms used for digital signal processing applications. Laboratory: 3 hours. Prerequisite: EE 350. Co-requisite: EE 486. This course is offered once a year.

EE 490 Advanced Topics 3 Cr.
A course that provides advanced study in an area of the instructor's special competence. Courses that have been offered in the past include Power System Stability, Electrical Communications II, Microwave Theory and Techniques and Digital Systems. Offered as the occasion demands. Classroom 3 hours. Prerequisite: senior standing.

EE 491 Electrical System Design I 3 Cr.
Introduction to design problems. Application of concepts of electrical engineering to a capstone design project. The first of a two-semester sequence, this course focuses on the problem statement, specification, preliminary design, design review and approval stages of the design processes, the design process involves exploring alternate solutions and design optimization and simulation. Economic constraints and human factors are considered in the design process. The course requires nine hours per week of directed reading, research and experimentation. Prerequisite: seventh semester standing and permission of the instructor.

EE 494 Electrical System Design II 3 Cr.
This course is the second in the two-semester capstone design project sequence. It focuses on the final stages of the design process-finalized design, implementation and testing. A written project report and an oral presentation to students and faculty is required. Nine hours per week of directed readings, research, and experimentation. Prerequisite: EE 491.