ELECTRICAL ENGINEERING (EE)

EE 101   Electrical Engineering Design I   1 Hour
The introduction of the design process to electrical engineering students. Includes discussion of problem-solving techniques and teaming skills, an introduction to circuit fabrication techniques, and oral and written communication skills. Multiple hands-on projects.
Prerequisite(s): (MATH 117 (may be taken concurrently) or MA 117C (may be taken concurrently) or MATH 136 (may be taken concurrently) or MATH 137 (may be taken concurrently) or MATH 237 (may be taken concurrently) or MATH 331 (may be taken concurrently))
Course Fee: $50
Recent Term(s) Offered: spring 2021; spring 2022; spring 2023

EE 130   Our Electrical World   3 Hours
An overview of the generation and utilization of electricity in modern society, with emphasis on infrastructure, critical technologies, alternative energy sources, and sustainability.
Recent Term(s) Offered: None

EE 180   Digital Circuits   3 Hours
An introductory course in digital circuit fundamentals. Topics include number systems, Boolean algebra, binary codes, logic gates, flip-flops, counters, and registers.
Prerequisite(s): (MATH 117 (may be taken concurrently) or MA 117C (may be taken concurrently) or MATH 136 (may be taken concurrently) or MATH 137 (may be taken concurrently) or MATH 331 (may be taken concurrently) or MATH 237 (may be taken concurrently))
Recent Term(s) Offered: fall 2021; fall 2022; fall 2023

EE 200   Electrical Engineering Design II   2 Hours
A continuation of the engineering design process including an introduction to circuit and math simulation software tools, printed circuit board software and fabrication techniques. Ethics and professionalism will be addressed.
Prerequisite(s): EE 210 (may be taken concurrently)
Course Fee: $50
Recent Term(s) Offered: fall 2021; fall 2022; fall 2023

EE 210   Circuits & Networks I   3.5 Hours
An introductory course in circuit analysis including Kirchhoff's Laws, independent and dependent sources, power and energy, lumped linear fixed networks, power factor, phasors, and three phase networks. Laboratory included.
Prerequisite(s): MATH 137 with a minimum grade of C and PHYS 265 (may be taken concurrently)
Recent Term(s) Offered: spring 2021; fall 2021; spring 2022; fall 2022; spring 2023; fall 2023

EE 211   Circuits & Networks II   3.5 Hours
A second course in circuit analysis with an emphasis on frequency response techniques. Topics include impedance, transformed networks, Laplace transforms, resonance, two-port parameters, mutual inductance, forced and natural responses, transformers, transient response, and sinusoidal steady-state response. Laboratory included.
Prerequisite(s): EE 210 with a minimum grade of C and MATH 331 (may be taken concurrently)
Recent Term(s) Offered: spring 2021; fall 2021; spring 2022; fall 2022; spring 2023; fall 2023

EE 300   Electrical Engineering Design III   1 Hour
Application of numerical methods, statistics, economics, and production techniques to the engineering design process. Individualized writing and oral presentation tasks and ethical issues. Design project required. Circuit schematic software. Note: Completion of Electrical Engineering pre-major or consent of instructor required.
Prerequisite(s): (EE 101 and EE 180 and EE 200 and CS 239 or CS 180)
Restriction(s): Students with a semester level of Academy Junior, Academy Senior, Freshman or Sophomore may **not** enroll.

Enrollment is limited to students in Electrical Engineering (537) or Electrical Engineering-Prep (537P)
Course Fee: $25
Recent Term(s) Offered: spring 2021; spring 2022; spring 2023

EE 345   Electronics   4 Hours
A first course in electronics. Topics include semiconductor concepts, operational amplifiers, diodes, transistors, biasing, large and small signal analysis. Laboratory included.
Prerequisite(s): EE 211
Recent Term(s) Offered: fall 2021; fall 2022; fall 2023

EE 350   Fundamentals of Electrical Engineering   4 Hours
An introductory course in electrical engineering. Topics include circuit analysis, digital electronics, and energy conversion devices such as magnetic circuits and rotating machinery. Not acceptable as a credit for EE majors.
Prerequisite(s): PHYS 265 and MATH 331 (may be taken concurrently)
Recent Term(s) Offered: None

EE 380   Microprocessors   4 Hours
An introductory course in microprocessors. Topics include assembly language, stack operation, vectored interrupts, memory organization, input/output peripheral devices, and hardware design of a computer system. Laboratory included.
Prerequisite(s): (EE 180 with a minimum grade of C and EE 210 and CS 239 with a minimum grade of C or CS 180 with a minimum grade of C)
Recent Term(s) Offered: spring 2021; spring 2022; spring 2023

EE 405   EE Senior Research Seminar   1 Hour
Contemporary topics in electrical and computer engineering, literature surveys, scientific reporting, peer reviews and intellectual property. Note: Permission of instructor may be required.
Prerequisite(s): EE 400 (may be taken concurrently)
Recent Term(s) Offered: None

EE 410   Computer Design   3 Hours
Topics include a review of logic design and elementary computer organization. Asynchronous and synchronous logic design using VHDL and programmable logic. Design of the central processing unit, memory, control, and input-output portions of a computer. The VHDL hardware design language will be used.
Prerequisite(s): EE 380
Corequisite(s): EE 411
Recent Term(s) Offered: fall 2021; fall 2022; spring 2023; fall 2023

EE 411   Computer Design Lab   1 Hour
This course is a laboratory which illustrates analysis and design principles of EE 410. It includes experiments in the design of the central processing unit, memory, control, and input-output portions of a computer using VHDL and PC based for software simulation.
Prerequisite(s): EE 380
Corequisite(s): EE 410
Recent Term(s) Offered: fall 2021; fall 2022; spring 2023; fall 2023

EE 420   Signals and Linear Systems   3 Hours
Topics include analysis of continuous-time and discrete-time, discrete-parameter, time-invariant, linear systems based upon the convolution integral, Fourier series and transform, Laplace transform, Z-transform, and state-space methods. Topics include impulse response, transfer function, energy spectra, filtering, sampling, and applications to networks, communications, and controls.
Prerequisite(s): EE 211 with a minimum grade of C and MATH 331 and (MATH 307 (may be taken concurrently) or MATH 350 (may be taken concurrently))
Recent Term(s) Offered: spring 2021; fall 2021; spring 2022; fall 2022; spring 2023; fall 2023

EE 431   Introduction to Power Systems   3.5 Hours
Introduction to the principles and concepts of electrical power and analysis of major components of an electric power system. Topics include basic electromechanics, transformers, ac and dc machines, transmission lines, and system analysis. Laboratory included.
Prerequisite(s): EE 211 and (EE 473 or PHYS 440)
Recent Term(s) Offered: spring 2021; spring 2022; spring 2023

EE 432   Power Systems II   3 Hours
Analysis of power systems in the steady state. Includes the development of models and analysis procedures from major power system components and for power networks.
Prerequisite(s): EE 431
Recent Term(s) Offered: None

EE 436   Electric Machines and Drives   3 Hours
Introduction to principles and contemporary applications of electric machines and drive systems as they pertain to electric vehicles, wind turbines, residential appliances, etc. Topics include the principles of electromechanical energy conversion, switch mode power converters, DC and AC machines, designing feedback controller for motor drives, and speed or torque control of both DC and AC motor drives.
Prerequisite(s): EE 473 and EE 345
Recent Term(s) Offered: spring 2022

EE 443   Microfabrication and MEMS   3 Hours
Microfabrication techniques including cleanroom technology, lithography, thermal oxidation, diffusion, ion implantation, film deposition, etching, micromachining, wafer-level bonding/polishing, and packaging yield. Microtechnology measurement and analysis techniques. Process simulation. CAD device-layout. MEMS (Microelectromechanical systems) and microelectric technology and applications. Material issues for MEMS/microelectronics.
Prerequisite(s): EE 420 and (CHEM 116 or CHEM 120)
Recent Term(s) Offered: None

EE 445   Advanced Electronics   3 Hours
Advanced topics in electronics including: power semiconductor devices; converter topologies and their applications; switch-mode dc and uninterruptible power supplies; motor drives; EMI concerns and remedies for interfacing to electric utilities.
Prerequisite(s): EE 345
Recent Term(s) Offered: spring 2021; spring 2023

EE 447   Analog IC Design   3 Hours
Analysis and design of analog integrated circuits. Bipolar, JFET, and MOS-FET devices. The technology of IC fabrication. Transistor connections, current sources, active loads, and output stages. Integrated amplifier and MOS circuit design.
Prerequisite(s): EE 345 and EE 448 (may be taken concurrently)
Recent Term(s) Offered: None

EE 448   Analog IC Design Laboratory   1 Hour
Laboratory to illustrate design principles in ANALOG IC DESIGN
Prerequisite(s): EE 447 (may be taken concurrently)
Recent Term(s) Offered: None

EE 450   Digital Signal Processing   3 Hours
Topics include discrete time signals and systems, discrete Fourier transforms, FFt algorithms, flow graph and the matrix representation of digital filters, FIR and IIR filter design techniques, quantization effects, spectral estimation, current applications of digital signal processing.
Prerequisite(s): EE 420
Corequisite(s): EE 451
Recent Term(s) Offered: spring 2021; spring 2022; spring 2023; fall 2023

EE 451   Digital Signal Processing Lab   1 Hour
This course focuses on the implementation of common digital signal processing function using state-of-the-art DSP devices and software. The fundamentals of discrete-time signal processing and digital signal processor architectures and applications are introduced. Emphasis is on laboratory experience involving generation of deterministic and random signals; digital filter design; quantization effects; FFT computation; linear system analysis; speech processing.
Prerequisite(s): EE 420
Corequisite(s): EE 450
Recent Term(s) Offered: spring 2021; spring 2022; spring 2023; fall 2023

EE 460   Continuous Control Systems   3.5 Hours
A study of continuous control systems that will address the following topics: system modeling, feedback systems, systems stability, root locus plots, Bode plot, state space analysis, and design of controllers. Laboratory included.
Prerequisite(s): (EE 420 with a minimum grade of C or ME 310 with a minimum grade of C) and (MATH 307 or MATH 350 or MATH 370)
Recent Term(s) Offered: fall 2021; fall 2022; fall 2023

EE 461   Discrete Control Systems   3 Hours
An applied state of discrete control systems. Topics include: modeling of discrete-time systems, applications of z-transforms, difference equations, stability analysis, root-locus analysis, and design of discrete controllers.
Prerequisite(s): (EE 420 with a minimum grade of C or ME 310 with a minimum grade of C) and (MATH 307 or MATH 350 or MATH 370)
Recent Term(s) Offered: spring 2022

EE 462   Special Topics in Control Systems   3 Hours
A presentation of current topics of control systems theory that builds on the contents of EE 460.
Prerequisite(s): EE 460
Restriction(s): Students with a semester level of Freshman or Sophomore may **not** enroll.
Recent Term(s) Offered: None

EE 470   Communications and Modulation   3 Hours
Topics include modulations such as AM, FM, PAM, PPM, PDM, single sideband, vestigial sideband. Coherent and non-coherent detection, heterodyne action, performance and distortion, circuits for modulation and demodulation.
Prerequisite(s): EE 420 and STAT 301
Corequisite(s): EE 475
Recent Term(s) Offered: None

EE 473   Electromagnetics I   3 Hours
Topics include electrostatic and magnetostatic fields; Faraday's laws, Maxwell's equations, electromagnetic properties of matter, uniform plane waves, and transmission lines.
Prerequisite(s): MATH 331 and MATH 237 with a minimum grade of C and PHYS 265 with a minimum grade of C
Recent Term(s) Offered: fall 2021; fall 2022; fall 2023

EE 475   Communication Systems Lab   1 Hour
Topics include laboratory exercises involving the design and analysis of electronic communication systems for the transmission of analog and digital data at radio frequencies.
Prerequisite(s): EE 420
Corequisite(s): EE 470
Recent Term(s) Offered: None

EE 477   Numerical Techniques in Electromagnetics   3 Hours
Topics include finite difference and finite element solutions to problems in electromagnetics; absorbing boundaries for wave propagation; convergence and stability; validation with empirical and analytical approaches.
Prerequisite(s): (EE 473 or PHYS 440)
Recent Term(s) Offered: None

EE 479   Optoelectronics   3 Hours
Topics include basic wave optics, Snell's Law, optical storage, LED's, micro-opto-electromechanical systems, optical sensors, fiber optics, solar cells, and fundamentals of lasers.
Prerequisite(s): EE 345 and (EE 473 or PHYS 440)
Recent Term(s) Offered: summer 2022

EE 480   Embedded Systems   3 Hours
A continuation of the study of digital systems and microprocessors focusing on the principles and applications of embedded systems.
Prerequisite(s): EE 380
Recent Term(s) Offered: winter 2021

EE 490   Introduction to Robotics   3 Hours
History and application of robots. Robot configurations including mobile robots. Spatial descriptions and transformations of objects in three-dimensional space. Forward and inverse manipulator kinematics. Task and trajectory planning.
Prerequisite(s): EE 420
Recent Term(s) Offered: None

EE 499   EE Special Topics   3 Hours (repeatable max of 6 hrs)
Exploration of one or more Electrical Engineering topics not covered in the regular course offerings. Note: Permission of instructor required.
Prerequisite(s): permission of instructor
Recent Term(s) Offered: fall 2023