

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 2020; spring 2021; spring 2022

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 2020; fall 2021; fall 2022

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 2020; fall 2021; fall 2022

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 2020; fall 2020; spring 2021; fall 2021; spring 2022; fall 2022

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 2020; fall 2020; spring 2021; fall 2021; spring 2022; fall 2022

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 2020; spring 2021; spring 2022

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 2020; fall 2021; fall 2022

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 2020; spring 2021; spring 2022

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 2020; fall 2021; fall 2022

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 2020; fall 2021; fall 2022

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 2020; fall 2020; spring 2021; fall 2021; spring 2022; fall 2022

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 2020; spring 2021; spring 2022

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: fall 2020

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 2020; spring 2021

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

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

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 2020; fall 2021; fall 2022

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: spring 2020

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 2020; fall 2021; fall 2022

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: spring 2020

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: spring 2020; 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: summer 2020; 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