Electrical Engineering (EE)

Courses

EE A203 Fundamentals of Electrical Engineering 4 Credits
Introduces DC and AC circuit analysis techniques including transient analysis, steady state analysis, three phase circuits and ideal amplifiers. Prerequisites: MATH A253 with a minimum grade of C or concurrent enrollment. Corequisites: EE A203L.

EE A241 Computer Hardware Concepts 4 Credits
Analysis and design of electronic devices used as building blocks for construction of simple combinational and sequential digital systems. Presents formats for data storage, number systems and alphanumeric codes, and methods of implementing logical and arithmetic operations within computers. Relates hardware components' capabilities and limitations to design requirements for computer processing, memory and control functions. Registration Restrictions: Students must register concurrently for lab section. Crosslisted With: CSCE A241. Prerequisites: CSCE A201 with a minimum grade of C or CSCE A205 with a minimum grade of C. Corequisites: EE A241L.

EE A261 MATLAB for Electrical Engineers 3 Credits
Introduces programming skills and MATLAB to solve problems in various electrical engineering focus areas, including circuit analysis, signal analysis and communication. Prerequisites: CSE A205 with a minimum grade of C and MATH A251 with a minimum grade of C. EE A306 Dynamics of Systems 3 Credits
Modeling of mechanical, electrical, fluid and thermal elements and systems. Study of free and forced response by the Laplace transform, transfer function and state space models. Time domain and frequency domain responses. Coupled systems, system analogy, sensing and actuation principles. Crosslisted With: ME A306 Prerequisites: (EE A203 with a minimum grade of C or concurrent enrollment or ES A309 with a minimum grade of C or concurrent enrollment) and ES A210 with a minimum grade of C and MATH A302 with a minimum grade of C.

EE A307 Introduction to Power Systems 3 Credits
An analysis of electric power systems, including topologies, ideal power transformers, balanced three-phase systems, symmetrical components, transmission line parameter calculation and power flow. Prerequisites: EE A353 with a minimum grade of C.

EE A308 Instrumentation and Measurement 3 Credits
Principles of measurement, instrumentation, Laplace transform, Fourier series, transfer function, steady-state response, calibration, and errors. Signal filtering and amplification, data acquisition, recording, and processing. Methods and devices for measuring strain, force, torque, displacement, velocity, acceleration, pressure, fluid flow properties, and temperature. Crosslisted With: ME A308. Prerequisites: MATH A302 with a minimum grade of C and (EE A306 with a minimum grade of C or ME A306 with a minimum grade of C or EE A353 with a minimum grade of C). EE A314 Electromagnetics 3 Credits
Electromagnetic theory and applications. Static electric fields in free space and material media; steady current systems and associated magnetic effects. Includes electrostatics, magnetostatics, Maxwell's equations, electromagnetic wave propagation and transmission lines. Application of Maxwell's equations to engineering systems. Crosslisted With: PHYS A314. Prerequisites: PHYS A212 with a minimum grade of C and PHYS A212L with a minimum grade of C and MATH A302 with a minimum grade of C.

EE A324 Electromagnetics II 3 Credits
Use of Maxwell's equations in analysis of plane wave propagation, wave reflection, radiation and antennas, waveguides, cavity resonators, transmission lines, and radio propagation. Crosslisted With: PHYS A324. Prerequisites: EE A314 with a minimum grade of C or PHYS A314 with a minimum grade of C. EE A324L Electromagnetics Laboratory II 1 Credit
Laboratory experiments using Maxwell's equations in analysis of plane wave propagation, wave reflection, radiation and antennas, waveguides, cavity resonators, transmission lines, and radio propagation. Corequisites: EE A324.

EE A333 Electronic Devices 4 Credits
An introduction to the properties of semiconductors and the analysis of electronics and electrical devices including diodes, field effect transistors (FETs) and bipolar junction transistors (BJTs). Covers large signal and small signal analysis techniques and common electrical circuit topologies. Prerequisites: EE A353 with a minimum grade of C or concurrent enrollment. Corequisites: EE A333L.

EE A353 Circuit Theory 3 Credits
Analysis of transfer functions, passive and active filters, Laplace transforms and applications. Introduction to Fourier series and transforms and two port networks. Prerequisites: EE A203 with a minimum grade of C and MATH A302 with a minimum grade of C or concurrent enrollment.

EE A353L Circuit Theory Lab 1 Credit
Analysis of circuit behavior for passive and active filters. Application of Laplace and Fourier techniques to circuit characterization. This course serves as a laboratory component to EE A353. Corequisites: EE A353.
**EE A354** Engineering Signal Analysis 3 Credits
An introduction to signal analysis using the Fourier Series and Fourier Transform, for both continuous (analog) and discrete (digital) signals.
**Prerequisites:** EE A353 with a minimum grade of C and MATH A302 with a minimum grade of C.

**EE A407** Power Distribution 3 Credits
Analysis of electrical power distribution and control systems, power flow control, symmetrical faults, power interruption, voltage variations, distributed generation, and economic dispatch with computer-aided analysis.
**Prerequisites:** EE A353.

**EE A417** Green Electrical Energy Systems 4 Credits
Presents major renewable energy sources and methods used to assess, harness and operate them. Discusses the application of power electronics, control and the use of demand-side management, and the effects of market forces on renewable energy and power systems. Major focuses are on power electronics and grid integration of renewable energy systems. Discussions of economic and environmental social policy are integral components of the course.
**Prerequisites:** EE A353 with a minimum grade of C.

**EE A427** Fundamentals of Smart Grids 3 Credits
Introduces the fundamentals of design, analysis and development of smart grids. Covers elements of control, computing, communication, automation and monitoring techniques needed to ensure smart grid operation. Emphasis is on design of smart grids to ensure adaptability as well as interoperability with renewable energy, distributed generation and smart loads.
**Special Note:** Not available for credit to students who have completed EE A627.

**May Be Stacked With:** EE A627
**Prerequisites:** EE A307 with a minimum grade of C.

**EE A437** Electrical Machines 3 Credits
Covers the analysis and principles of electromechanical systems. Discusses major classes of electric machines, interactions in electromechanics, and tools and techniques used for operation and control.
**May Be Stacked With:** EE A637
**Prerequisites:** EE A307 with a minimum grade of C.

**EE A438** Design of Electrical Engineering Systems 3 Credits
Capstone course in which electrical engineering students design an electrical engineering component or system as a team. Covers the entire electrical engineering process from an initial design specification to implementation and testing. Students apply knowledge and skills learned in their undergraduate curriculum.

**Registration Restrictions:** Student must be in senior year of BSEE degree program or obtain faculty permission. Completion of GER Tier 1 (basic college-level skills) courses.
**Prerequisites:** EE A354 with a minimum grade of C.
**Attributes:** UAA Integrative Capstone GER.

**EE A441** Integrated Circuit Design 3 Credits
Develops the design and fabrication of integrated circuits (ICs) used in computer electronics. Describes the material properties, methods of charge transport, energy exchanges, fundamentals of device fabrication, and fabrication process capabilities and limits. Electrical characteristics, timing considerations, heat and power considerations, and reliability of IC devices.
**Prerequisites:** CHEM A105 and EE A353.

**EE A447** Power Electronics 3 Credits
Applies electronic circuits to energy conversion. Discusses modeling, design, analysis, and control of DC-DC converters, AC-DC rectifiers, DC-AC inverters, AC-AC converters, and switch-mode power supplies. Includes power electronics applications in motor drives, uninterrupted power supplies, and power systems.
**Prerequisites:** EE A307 with a minimum grade of C and EE A333 with a minimum grade of C.

**EE A451** Digital Signal Processing 3 Credits
Develops properties and methods of analysis of discrete-time signals, and the techniques used in creating and processing those signals. Topics include discrete-time linear systems, Z-transforms, the Discrete Fourier Transform and Fast Fourier Transform algorithms, digital filter design, system performance analysis and problem-solving. Methods and effects of signal processing are analyzed and evaluated.

**Prerequisites:** EE A354 with a minimum grade of C.

**EE A458** Antenna Theory 3 Credits
Analysis of dipole, loop, aperture, reflector, and other antennas; array theory, radiation resistance, directivity, and input impedance of antennae.
**Prerequisites:** EE A324 with a minimum grade of C or PHYS A324 with a minimum grade of C.

**EE A462** Communication Systems 3 Credits
Develops the theory behind the design and operation of electronic communication systems. Includes the mathematical representation of signal and system components and their interaction. Covers power spectra, modulation techniques, frequency response of media and components, detection and recovery of information, and the effects of noise.
**Prerequisites:** EE A354 with a minimum grade of C.

**EE A465** Telecommunications 3 Credits
Covers concepts in data transmission, guided and wireless transmission, signal encoding, digital data, multiplexing, and circuit and packet switching. Analyze data communications, networking, protocols and standards.
**Prerequisites:** EE A354 with a minimum grade of C.
EE A471 Automatic Control 3 Credits
**Crosslisted With:** ME A471.
**Prerequisites:** (EE A306 with a minimum grade of C or ME A306 with a minimum grade of C or EE A353 with a minimum grade of C) and ES A210 with a minimum grade of C and MATH A302 with a minimum grade of C.

EE A472 Advanced Linear Systems 3 Credits
Presents a state space linear algebra approach to multiple input and multiple output systems. Explores concepts of controllability and observability that motivate design techniques for optimal open loop and closed loop systems. Presents analysis and design of optimal feedback control systems and design of observers and estimators.
**Special Note:** Not available for credit to students who have completed ME A672.
**May Be Stacked With:** ME A672
**Prerequisites:** EE A471 with a minimum grade of C or ME A471 with a minimum grade of C.

EE A494P Power Systems Analysis 3 Credits
This course provides students with a comprehensive overview of interconnected power system operation. At the completion of the course, students should be able to build appropriate models for an interconnected power system, and know how to perform power flow, economic dispatch, and short circuit analysis.
**Prerequisites:** EE A307 or concurrent enrollment.

EE A495 Electrical Engineering Internship 3 Credits
Application of electrical engineering in a professional work setting. The student will undertake the design, analysis and documentation of an electrical engineering problem under the supervision of a qualified professional who has agreed in advance to undertake this role.
**Special Note:** This course cannot be substituted for EE A438.
**Registration Restrictions:** Instructor approval required.
**Prerequisites:** EE A354 with a minimum grade of C or EE A307 with a minimum grade of C.

EE A637 Electrical Machines 3 Credits
Analysis and principles of electromechanical systems. Discusses major classes of electric machines, interactions in electromechanics, and tools and techniques used for operation and control.
**Special Note:** Not available for credit to students who have completed EE A437.
**Registration Restrictions:** Graduate standing
**May Be Stacked With:** EE A437