Electrical Engineering (EE)

Courses

EE A203 Fundamentals of Electrical Engineering I **3 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.

EE A203L Fundamentals of Electrical Engineering I Laboratory **1 Credit**
Introduces laboratory techniques to measure and analyze DC and AC circuits, including transient analysis, steady state analysis, three phase circuits and ideal amplifiers.
Prerequisites: EE A203 with a minimum grade of C or concurrent enrollment.

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 CSE 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 or MATH A251F 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.
Registration Restrictions: Admission to the Bachelor of Science in Mechanical Engineering
Crosslisted With: ME A306
Prerequisites: EE A203 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.
Registration Restrictions: Admission to the Bachelor of Science in Electrical Engineering or the Bachelor of Science in Mechanical Engineering
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 **3 Credits**
Introduces 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 A333L Electronic Devices Laboratory **1 Credit**
Introduces laboratory practices for design of semiconductors and 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.
Corequisites: EE A333.

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 with a minimum grade of D.

EE A415 Energy Data Analytics **3 Credits**
Covers analysis and principles of energy system data. Discusses major classes of renewable energy data as well as tools and techniques used for energy data analytics. Major focuses are on data sources from the electricity grid, heat systems, and gas networks. Discussions of economic and environmental social policy are integral components of the course. Includes application of data dimensionality reduction to energy data.
Special Note: Not available for credit to students who have completed EE A615.
May Be Stacked With: EE A615
Prerequisites: EE A307 with a minimum grade of C.

EE A417 Green Electrical Energy Systems **3 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.
May Be Stacked With: EE A617
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. Emphasizes design of smart grids to ensure adaptability as well as interoperability with renewable energy, distributed generation and smart loads.
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: Senior standing, admission to the College of Engineering, admission to the Bachelor of Science in Electrical Engineering, completion of GER Tier 1 (basic college-level skills) courses or instructor approval
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 with a minimum grade of D and EE A353 with a minimum grade of D.

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 or (STAT A307 with a minimum grade of C and MATH A261 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 A467 Real-Time Embedded Systems **3 Credits**
Covers the design and programming of microcontroller-based embedded systems, emphasizing low-level hardware interaction using standard C and assembly language. Students will learn to develop real-time embedded applications and integrate hardware and software efficiently. Details strategies for power-efficient computing in embedded environments.
Crosslisted With: CSCE A467
Prerequisites: CSCE A248 with a minimum grade of C.

EE A471 Automatic Control **3 Credits**
Linear system representation by transfer functions, signal flow graphics and state equations. Feedback, time and frequency response of linear systems. Stability analysis by Routh-Hurwitz criterion and frequency domain methods. Specifications of higher order linear systems. System design and compensation.
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 A475 Communication Networks **3 Credits**
Provides an in-depth study of telecommunications networks, focusing on the design, implementation, and operation of local area networks (LANs), wireless LANs, wide area networks (WANs), and cellular wireless networks. Covers key topics on Internet Protocol (IP), transport protocols (TCP/UDP), routing, and internetworking. Emphasizes real-world telecom applications and performance analysis of fiber-optic, microwave, cellular, and satellite systems.
May Be Stacked With: EE A675
Prerequisites: EE A354 with a minimum grade of C.

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 A615 Energy Data Analytics **3 Credits**
Analyzes the principles of energy system data. Discusses major classes of renewable energy data as well as tools and techniques used for energy data analytics. Focuses on data sources from the electricity grid, heat systems, and gas networks. Discusses economic and environmental social policy as integral components of the course. Applies data dimensionality reduction to real-world energy data.
Special Note: Not available for credit to students who have completed EE A415.
Registration Restrictions: Graduate standing
May Be Stacked With: EE A415

EE A617 Advanced Green Electrical Energy Systems **3 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 focus is on power electronics and grid integration of renewable energy systems. Discussions of economic and environmental social policy are integral components of the course.
Special Note: Not available for credit to students who have completed EE A417.
Registration Restrictions: Graduate Standing
May Be Stacked With: EE A417

EE A627 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. Emphasizes design of smart grids to ensure adaptability as well as interoperability with renewable energy, distributed generation and smart loads. Focuses on conducting a comprehensive literature review and simulating a project at the intersection of communication network and energy grid real-time operation.
Special Note: Not available for credit to students who have completed EE A427.
Registration Restrictions: Graduate standing
May Be Stacked With: EE A427

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

EE A675 Communication Networks **3 Credits**
Provides an in-depth study of telecommunications networks, focusing on the design, implementation, and operation of local area networks (LANs), wireless LANs, wide area networks (WANs), and cellular wireless networks. Covers key topics on Internet Protocol (IP), transport protocols (TCP/UDP), routing, and internetworking. Emphasizes real-world telecom applications and performance analysis of fiber-optic, microwave, cellular, and satellite systems.
Registration Restrictions: Graduate standing
May Be Stacked With: EE A475

EE A690 Selected Topics in Data Science and Engineering **1-3 Credits**
Examines advanced topics in data science and engineering.
Special Note: May be repeated for a maximum of 6 credits with a change of subtitle.
Registration Restrictions: Graduate standing or instructor approval
Crosslisted With: GIS A690

EE A695 Professional Internship **3 Credits**
Applies data science and/or data engineering skills in a professional work setting. Arranges assignments and projects with cooperating organizations and agencies.
Registration Restrictions: Graduate standing and instructor approval
Crosslisted With: CSCE A695 and GIS A695

EE A698 Individual Research **3 Credits**
Engages students in independent research projects under the supervision of a faculty member. Results in a research paper prepared to publication standards of a refereed journal or conference.
Special Note: May be repeated once for credit.
Registration Restrictions: Graduate standing and instructor approval

EE A698A Project **3 Credits**
Arranges an individualized project in an area of electrical engineering as related to the profession. The graduate committee must approve the project topic.
Special Note: May be repeated once for credit.
Registration Restrictions: Graduate standing and instructor approval

EE A699 Thesis **1-6 Credits**
Engages student in individual research of an advanced electrical engineering problem resulting in a thesis.
Special Note: May be repeated for a maximum of 6 credits.
Registration Restrictions: Graduate standing and instructor approval