ELECTRICAL ENGINEERING (EE)

Courses

EE 1100. EE Principles and Design. 0 or 2 Credits.
Hands-on introduction to contemporary electrical engineering principles and practice. Basic analog and digital circuit design, construction, operation, measurement. Interfacing sensors and actuators to a microcontroller, programming to interact with the world. Individual and team-based assignments that develop data dexterity and technical communication skills. Exposure to breadth of discipline and ethics in the profession. Design project. Prerequisite: First-Year students only.

EE 1990. Special Topics. 1-18 Credits.
See Schedule of Courses for specific titles. Prerequisite: Department permission.

EE 1991. Internship. 1-3 Credits.
On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

EE 1993. Independent Study. 1-18 Credits.
A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

EE 2125. Circuits I. 0 or 4 Credits.
Fundamental DC circuit analysis course with lab component. Topics: circuit elements and variables, integrated circuits, basic laws of circuits, method of circuit analysis. Elements of design and sensors are introduced. Prerequisite: C- or better in MATH 1248 or MATH 1242.

EE 2135. Circuits II. 0 or 4 Credits.
AC circuit analysis and advanced circuit topics with lab component. Topics: AC steady state circuit analysis using phasors, AC power and efficiency, active and passive filters, generalized circuit analysis using the Laplace transform, Fourier series decomposition. Elements of design and sensors. Prerequisite: EE 2125, EE 2175, or EE 2145.

EE 2145. Electrical Engr Concepts. 0 or 4 Credits.
Fundamentals of electrical engineering; DC and AC linear circuit analysis; laboratory component. No credit for more than one of EE 003, EE 2125, EE 2145 and EE 2175. Prerequisites: MATH 1248 or MATH 1242.

EE 2155. Electricity & Optics. 4 Credits.
Introduces the principles of electric circuits and optical systems, starting with electric charge and Coulomb's Law. Explore concepts like Gauss's Law, electric fields, and resistive networks, along with applications in device characteristics and sensor analysis. Advanced topics include AC circuits, operational amplifiers, and filter design, focusing on sensing technologies. Provides a solid understanding of electrical and optical phenomena for real-world applications in engineering. Prerequisites: MATH 1248 or MATH 1242.

EE 2175. Electrical Circuits & Sensors. 0 or 4 Credits.
Fundamentals of electrical circuits with applications to the use of sensors. DC and AC circuits. Sensors utilized for civil engineering and environmental engineering applications. Demonstrations, hands-on exercises. No credit for more than one of EE 003, EE 2125, EE 2175, EE 2145. Prerequisites: MATH 1248 or MATH 1242.

EE 2185. Circuits Design Project. 0 or 2 Credits.
Project-based course focused on the design of circuits for analog-to-digital and digital-to-analog conversion, analog computing with operational amplifiers, and filtering of signals. Advanced instrumentation, fabrication methods, and printed circuit board (PCB) layout. Prerequisite: EE 2125 or EE 2175 or EE 2145.

EE 2820. Virtual Instrument Engineering. 1-3 Credits.
Introduces logical and electrical circuit modeling using computer-based virtualization tools in a graphical format. Includes circuit simulation; scripting, interfacing; signal processing; control of instruments and data acquisition. Prerequisite: CS 1210, or Instructor permission. Cross-listed with: ENGR 2160.

EE 2845. Digital Control w/Embedded Sys. 0 or 4 Credits.
Applications of single-chip microcontrollers as embedded systems for data acquisition/real time control. C language; parallel and serial ports; timers; counters; A/D and D/A. Simple sensors and actuators. Laboratory. Prerequisites: EE 2145 or EE 2175 or EE 2125; CS 1210.

EE 2990. Special Topics. 1-18 Credits.
See Schedule of Courses for specific titles. Prerequisite: Department permission.

EE 2991. Internship. 1-18 Credits.
On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

EE 2993. Independent Study. 1-18 Credits.
A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

EE 2994. Teaching Assistantship. 1-3 Credits.
Undergraduate student service as a teaching assistant, usually in an introductory-level course in the discipline, for which credit is awarded. Offered at department discretion.

EE 2995. Undergraduate Research. 1-18 Credits.
Undergraduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

EE 2996. College Honors. 1-6 Credits.
Honors studies leading to thesis. Prerequisite: CEMS 2010.

EE 3000. Engineering Ethics/Leadership. 1 Credit.
Rights and responsibilities in engineering practice and research. Case studies related to engineering ethics. Ethics and professional practice as related to professional licensure. Development of individual leadership abilities. Team-based development of written reports and oral presentations. Prerequisite: Minimum Junior standing.

EE 3100. Electromagnetic Field Theory. 0 or 4 Credits.
Fundamentals of electromagnetic field theory and applications: vector analysis, electric and magnetic fields, potential theory, boundary conditions and boundary value problems, dielectric and magnetic material properties, conductance, capacitance, and inductance, Maxwell-Lorentz theory. Transmission line theory. Prerequisites: PHYS 1550, MATH 2248, and EE 2135.

EE 3110. Electronics I. 4 Credits.
Physical principles of operation of common semiconductor devices. Analog and digital circuits using diodes and transistors. Electronic circuit analysis and simulation. Prerequisite: PHYS 1550; EE 2135.

EE 3115. Electronics Laboratory. 0 or 2 Credits.
Characteristics and applications of semiconductor devices; inverters and logic characterization; linear amplifiers and applications of operational amplifiers in non-linear circuits. Pre/Co-requisite: EE 3110.

EE 3150. Signals & Systems. 0 or 4 Credits.
Discrete- and continuous-time signals and systems. Input/output descriptions and analysis. Convolution, Fourier analysis, sampling and Laplace transforms. Application to electrical engineering design problems. Prerequisite: MATH 3201. Pre/Co-requisite: EE 2135 recommended.

EE 3310. Low Carbon Electric Power. 3 Credits.
Greenhouse gas emission, Global Climate Change, need for low carbon electrical power. Physics and technology of three sources will be covered: photovoltaics, electrochemical systems (batteries and fuel cells) and nuclear systems, (fission and fusion). Prerequisites: PHYS 1550 or PHYS 1650.

EE 3315. Electric Energy Systems. 0 or 4 Credits.
Electrical safety; Electric power (DC, AC, single and multiphase) and transmission lines; Electric transformers; DC and AC generators; DC and AC motors; Related applications (examples: pumped hydro, HVDC transmission lines, drives); Laboratory included. Prerequisite: C- or better in EE 2135 or B- or better in EE 2145 or B- or better in EE 2175.

EE 3320. Power Electronics. 3 Credits.
An introduction to the field of power conversion using power electronics devices. Topics include Energy and Power, AC-to-DC Converters, DC-to-DC Converters, DC-to-AC Converters, Elements of Control and Design of Power Converters, Applications of Power Electronics in Renewable Energy and Microgrids. Simulations and experiments illustrate concepts. Final project related to renewable energy. Prerequisites: EE 3110 or Graduate student standing.

EE 3410. Electronics II. 4 Credits.
Physical principles of operation of common semiconductor devices. Analog and digital circuits using MOS and bipolar junction transistors. Operational amplifier design. Electronic circuit analysis and simulation. Project-based final. Prerequisite: C- or better in EE 3110.

EE 3415. Electronics Design Project. 0 or 3 Credits.
Design, analyze, simulate, build, test and document electronic circuits that meet engineering specifications. Designs follow standard requirements-based design practices. At least one project will require creating a printed wiring board layout. All projects are documented in formal reports. Focuses on building design and written communication competencies necessary for the engineering profession. Prerequisites: EE 3115, EE 3110; WIL1 course. Catamount Core: WIL2.

EE 3420. Integrated Circuit Fabrication. 0 or 4 Credits.
Science and technology of integrated circuit fabrication. Interaction of processing with material properties, electrical performance, economy, and manufacturability. Study of unit processes used to make semiconductor chips. Prerequisite: PHYS 1550 or PHYS 1650. Cross-listed with: PHYS 3165.

EE 3440. Semiconductor Materials/Devic. 0 or 4 Credits.
Covers Energy band theory, effective mass, band structure and electronic properties of semiconductors. Transport of electrons and holes in bulk materials and across interfaces. MOSFETs, BJTs, pn junctions, and Schottky barriers. Experimental portion of course will cover electronic measurements of semiconductor devices. Credit not awarded for both EE 3440 and EE 5440. Prerequisites: EE 2145, EE 3110, or PHYS 3300. Cross-listed with: PHYS 3675.

EE 3515. Control Systems. 0 or 4 Credits.
Analysis and design of control systems; stability, signal flow, performance criteria, classical methods. Analysis of control systems driven by random noise. Laboratory experiments. Credit not given for more than one of the courses EE 3515, EE 5530, ME 3320. Prerequisite: C- or better in EE 3150 or C- or better in ME 2120. Pre/Co-requisite: STAT 2430 or STAT 2510.

EE 3530. Digital Signal Processing. 3 Credits.
Covers principles and methods for digital signal processing. The analysis and design of discrete-time systems as signal processing devices is provided in the context of filter design and topics on image processing. Topics covered: quantization, reconstruction of signals, z-transform, FIR/IIR, intro to images, pixel and region-based classification and segmentation, among others. Prerequisite: EE 3150.

EE 3610. Communication Systems. 0 or 4 Credits.
Signal analysis; fundamentals of digital communications including PCM, source and channel coding, pulse shaping and modulation; wireless communications, modulation, antennas and link budgets; application of probability; related laboratory experience. Prerequisite: STAT 2510, C- or better in EE 3150.

EE 3710. Biomedical Instrumentation. 3 Credits.
Measurement techniques for biomedical engineering research and industry, and health care institutions. Integrated biomedical monitoring, diagnostic, and therapeutic instrumentation. Prerequisite: EE 2145 or EE 2135 or EE 2175. Co-requisites: EE 3110, ANPS 1200, or Instructor permission. Cross-listed with: BME 3710.

EE 3720. Biosignal Decoding. 3 Credits.
Overview of biomedical measurement techniques; development of Python software to visualize, denoise, and decode biomedical signals. Prerequisites: CS 1210; (BME 3000 or EE 3150) or (ME 2120 and EE 2845) or Instructor permission. Pre/Co-requisite: Beginner knowledge of Python programming is strongly suggested. Cross-listed with: BME 3720.

EE 3990. Special Topics. 1-18 Credits.
Special topics in developing areas of Electrical Engineering. Prerequisite: Senior standing, or Instructor permission.

EE 3991. Internship. 1-18 Credits.
On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

EE 3993. Independent Study. 1-18 Credits.
A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

EE 3994. Teaching Assistantship. 1-3 Credits.
Undergraduate student service as a teaching assistant, usually in an introductory-level course in the discipline, for which credit is awarded. Offered at department discretion.

EE 3995. Undergraduate Research. 1-18 Credits.
Undergraduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

EE 4100. Capstone Design I. 0 or 3 Credits.
Project-based course. Multidisciplinary teams apply their knowledge to design, analyze, build and test a functional prototype that meets client's requirements and solves unique problems. Teams follow engineering design and project management processes such as periodic reports, presentations, meetings, reviews and demonstrations using standard industry tools. Prerequisite: Senior standing in Mechanical or Biomedical Engineering or Instructor permission. Cross-listed with: ME 4010.

EE 4200. Capstone Design II. 0 or 3 Credits.
Project-based course. Multidisciplinary teams apply their knowledge to design, analyze, build and test a functional prototype that meets client's requirements and solves their problems. Teams follow engineering design and project management processes such as periodic reports, presentations, meetings, reviews and demonstrations using standard industry tools. Prerequisite: EE 4100. Cross-listed with: ME 4020.