# ELECTRICAL ENGINEERING (ELECTENG)

**ELECTENG 1020 Electrical Engineering Projects and Tools 1 Credit**
Hands-on electrical-engineering laboratory projects such as audio amplifiers, LEDs, digital logic, and electric-motor measurements.
**Components:** Laboratory

**ELECTENG 1210 Circuit Modeling I 3 Credits**
Voltage, current, resistance, and impedance. Opamps. Phasors. Ohm's law, Kirchhoff's laws, superposition, and Thevenin's and Norton's theorems applied to the modeling of zero-order networks. Complex numbers and algebra.
**Components:** Laboratory, Class
**Prereqs/Coreqs:** P. "C-" or better in MATH 2640 (all majors); P or C: (ELECTENG 1020 or COMPENG 1020) for Electrical Engineering and Computer Engineering majors

**ELECTENG 2210 Circuit Modeling II 4 Credits**
Phasors and sinusoidal steady-state analysis and power. Resonant circuits. Mutual inductance. Transient response of linear networks with Laplace transform.
**Components:** Class, Discussion, Laboratory
**Prereqs/Coreqs:** P. "C-" or better in ELECTENG 1210 and MATH 2740

**ELECTENG 3020 Analog Electronics 4 Credits**
Diode circuits. Biasing of semiconductor devices. Analysis and design of linear amplifiers. Use of opamps.
**Components:** Discussion, Class, Laboratory
**Prereqs/Coreqs:** P. "C-" or better in ELECTENG 2210

**ELECTENG 3130 Solid State Electronic Devices 4 Credits**
Physics of semiconductor devices. Energy band diagrams, Fermi levels, and Fermi-Dirac statistics. Metal-semiconductor and p-n junctions. Functioning of diodes, BJT's, FET's, and thyristors. Small signal equivalent circuits. Nonlinear modeling using computers.
**Components:** Discussion, Laboratory, Class
**Prereqs/Coreqs:** P. "C-" or better in ELECTENG 2210, PHYSICS 3140 and MATH 3630

**ELECTENG 3140 Electric and Magnetic Fields 3 Credits**
Electrostatics, magnetostatics, Maxwell's equations, plane waves, and transmission lines.
**Components:** Class
**Cross Offering:** ENGRPHYS 3640
**Prereqs/Coreqs:** P. "C-" or better in ELECTENG 2210, MATH 2840, MATH 3630 and PHYSICS 2340

**ELECTENG 3210 Engineering Computation 3 Credits**
Introduction to Matlab programming. Applications of Matlab to probabilistic analysis of communication systems, statistical analysis of product yields, matrix and state-space analyses of control systems and power systems, etc.
**Components:** Class
**Prereqs/Coreqs:** P. A grade of C- or better in MATH 3630 and (ELECTENG 2210 or COMPENG 2220)

**ELECTENG 3220 Signals and Systems 4 Credits**
Linear time invariant (LTI) systems. Convolution, differential equations, Fourier Series, Fourier Transforms (with applications, eg. filtering, modulation, sampling), Laplace transforms. Transfer functions, frequency response, and Bode plots.
**Components:** Laboratory, Discussion, Class
**Prereqs/Coreqs:** P. "C-" or better in (ELECTENG 2210 or COMPENG 2220) and MATH 3630

**ELECTENG 3320 Automatic Controls 4 Credits**
Analysis and synthesis of single-input, single output linear time-invariant systems are considered through classical Laplace transform methods such as root-locus and frequency-domain techniques. The computer simulations demonstrate practical application of the concepts.
**Components:** Discussion, Laboratory, Class
**Prereqs/Coreqs:** P. "C-" or better in ELECTENG 3220

**ELECTENG 3410 Introduction to Electrical Machines and Power Systems 4 Credits**
Introduction to electromechanics, generators, transformers, transmission lines, motors and network analysis.
**Components:** Discussion, Class, Laboratory
**Prereqs/Coreqs:** P. ELECTENG 2210 with a "C-" or better or GENENG 2930 with a "B" or better and PHYSICS 2340 with a "B" or better

**ELECTENG 3950 Electrical Engineering Cooperative Education 2 Credits**
Work experience in industry under the direction of the College of Engineering, Mathematics and Science Cooperative Education and Internship Program. During co-op the student is expected to be away from his/her studies at UW-Platteville and work for an industry for a semester and summer. Credits do not fulfill graduation requirements.
**Components:** Field Studies

**ELECTENG 3970 Electrical Engineering Internship 1 Credit**
Work experience in industry under the direction of the department chair and College of Engineering, Mathematics and Science Cooperative Education and Internship Program. NOTE: This program is separate and distinct from the cooperative education program and is principally designed to cover the summer work experience. Internship is designed to provide experiential learning experience to the student during the summer period. Credits do not fulfill graduation requirements.
**Components:** Field Studies
**Prereqs/Coreqs:** P. Junior standing

**ELECTENG 4060 Electronic Communications 4 Credits**
The overall goal of the course is to present the topics of analog and digital communication. Among the topics covered are: signal spectra, transceiver architecture, output amplifier, oscillators, AM and FM systems, base-band and pass-band digital communication.
**Components:** Discussion, Laboratory, Class
**Prereqs/Coreqs:** P. "C-" or better in ELECTENG 3220 and ELECTENG 3020

**ELECTENG 4260 Measurements and Instrumentation 4 Credits**
The overall goal of the course is to present the topics of sensors and instrumentation, and their use within measurement systems, as an integrated and coherent subject. Among the topics covered are: measurement characteristics, error analysis, noise and interference in instrumentation systems, signal conditioning and filtering, transducers, sensor applications, data acquisition, and digital interfaces.
**Components:** Discussion, Laboratory, Class
**Prereqs/Coreqs:** P. 'C-' or better in (ELECTENG 3020, ELECTENG 3210, ELECTENG 3220) and senior standing

**ELECTENG 4310 Modern Control Systems 4 Credits**
Analysis and synthesis of linear-time invariant (LTI) continuous-time systems are considered using the techniques of matrix theory, linear algebra and Laplace transform. Among topics to be discussed are: Jacobian linearization technique; Concepts of Lyapunov stability; Kalman controllability and observability; Linear quadratic optimal control regulator; Duality; Static state feedback and observer-based compensation techniques.
**Components:** Class, Laboratory
**Prereqs/Coreqs:** P. "C-" or better in (ELECTENG 3210 and ELECTENG 3320)

**ELECTENG 4350 Discrete Time Control Systems 4 Credits**
Analysis and synthesis of discrete-time and sampled-data systems are considered using Z-transform methods, matrix theory, and linear algebra. Among the topics discussed are: Discrete equivalence of continuous-time transfer functions; Stability theory of discrete-time and sampled-data systems; Frequency-domain analysis and design of sampled-data systems; Digital control design using state-space methods.
**Components:** Laboratory, Discussion, Class
**Prereqs/Coreqs:** P. "C-"or better in (ELECTENG 3210, ELECTENG 3320) and Senior Standing

**ELECTENG 4360 Intelligent Control 4 Credits**
This course introduces students to Intelligent Control and its applications. Principles of Artificial Intelligence, which includes Expert System, Fuzzy Logic, and Artificial Neural Networks are covered. The course includes project-based assignments.
**Components:** Class, Laboratory
**Prereqs/Coreqs:** P. "C-" or better in ELECTENG 3320 or MECHENG 4330

**ELECTENG 4430 Power Electronics 4 Credits**
Power electronic switches, converter systems: AC-to-AC, AC-to-DC, DC-to-DC, and DC-to-AC; harmonics; real and complex power in power electronic systems..
**Components:** Laboratory, Class
**Prereqs/Coreqs:** P. "C-" or better in ELECTENG 3020 and ELECTENG 3410

**ELECTENG 4440 Electric Motor Drives 4 Credits**
Theory and operation of modern AC electric motor drives, multiple reference frame theory for three-phase AC system, dynamic modeling of induction machines, operation of the fully controlled three-phase power converters, speed and torque control of induction motors, Voltage/Hertz control, permanent magnet synchronous motor drives, DC motor drives.
**Components:** Laboratory, Class
**Prereqs/Coreqs:** P. "C-" or better in ELECTENG 3020 and ELECTENG 3320 and ELECTENG 3410

**ELECTENG 4450 Power Systems Analysis and Design 4 Credits**
Power systems modeling, load flow, economic dispatch, stability, fault analysis, computer simulation and systems analysis.
**Components:** Discussion, Laboratory, Class
**Prereqs/Coreqs:** P. "C-" or better in (ELECTENG 3410 and ELECTENG 3210) and senior standing

**ELECTENG 4930 Senior Design 3 Credits**
Capstone design is a project-based, team-based course that serves as the culminating experience in the major. The focus of the course is to bring together the skills and knowledge gained throughout the program and apply them to real-world problems. The aim of the capstone project is to familiarize students with the process of designing and implementation of systems as practiced in industry. Design is performed based on client's requirements and design trade-offs are considered. Global, economic, environmental, and societal contexts of the design are considered. Oral and written reports.
**Components:** Laboratory, Class
**Prereqs/Coreqs:** P. 'C-' or better in ELECTENG 3220, INDSTENG 3730, and Senior standing

**ELECTENG 4940 Undergraduate Research 1-3 Credits**
Introduction to research methods in electrical engineering, literature review, data analysis, and design.
**Components:** Research
**Prereqs/Coreqs:** P. Junior standing and permission of department chair

**ELECTENG 4980 Current Topics in Engineering 1-4 Credits**
In depth study of a current topic of interest to the engineering profession. The topic to be covered will be identified in the course title.
**Components:** Class

**ELECTENG 4990 Independent Study 1-3 Credits**
Advanced study in area of specialization selected by student and approved by faculty member.
**Components:** Independent Study