### Courses

**ELEC 102 | INTRODUCTION TO ELECTRO-TECHNOLOGY PRACTICE**  
Units: 3  
Introduction to the underlying scientific principles of electrical and electronic technologies encountered in our daily lives. This course answers how and why for the student with minimal background in physical science. Foundations of both historic and emerging technologies, and how they affect our environment and society are presented. This course fulfills a non-laboratory core curriculum Physical Science requirement for non-majors. Three hours lecture-recitation-demonstration per week.

**ELEC 201 | ELECTRICAL CIRCUITS**  
Units: 4  
Prerequisites: PHYS 271 (Can be taken Concurrently)  
Electrical element physical behavior and component models; network laws and analysis techniques; time and frequency domain techniques for the analysis of linear networks; computer-aided analysis using SPICE or approved equivalent; introduction to AC power; laboratory circuit design, testing, and verification. Three hours lecture and one three-hour laboratory weekly. Fall and spring semesters.

**ELEC 201L | ELECTRICAL CIRCUITS LAB**  
Units: 0  
Prerequisites: ELEC 201 (Can be taken Concurrently)  
Laboratory for ELEC 201.

**ELEC 301 | ELECTRONICS I**  
Units: 4  
Prerequisites: ELEC 201  
Analysis and design of analog and digital electronic devices, circuits and systems including single and multiple transistor amplifiers, logic gates and other digital logic building block elements; low frequency models of bipolar junction transistors and field effect transistors; design features and characteristics of integrated circuit operational amplifiers; computer-aided analysis and design using SPICE; laboratory design, testing and verification. Three hours lecture and one three-hour laboratory weekly. Fall semester.

**ELEC 302 | ELECTRONICS II**  
Units: 4  
Prerequisites: ELEC 301 and ELEC 350 (Can be taken Concurrently)  
Electronic circuit design including integrated circuit realizations; computer-aided design using SPICE; power amplifiers and output stages; design of feedback amplifiers and active filters; frequency response including high frequency models of electronic devices; laboratory design, testing and verification. Three hours lecture and one three-hour laboratory weekly. Spring semester.

**ELEC 310 | EMBEDDED SYSTEMS DESIGN**  
Units: 4  
Prerequisites: (ENGR 121 or COMP 150) and ELEC 340  
Introduction to a basic microprocessor and its applications; microcomputer systems organization; memory and I/O device interfacing; assembly language programming of a basic microprocessor; use of assemblers and other development tools. Three hours lecture and one three-hour laboratory weekly. Spring semester.

**ELEC 310L | INTRODUCTION TO MICROCOMPUTERS**  
Units: 1

**ELEC 320 | PRINCIPLES OF ELECTRICAL POWER**  
Units: 3  
Prerequisites: ELEC 201  
Fundamentals of electrical power circuits and devices; electromechanical energy conversion; theory and analysis of magnetic circuits and transformers; theory and analysis of DC and AC electric machines including steady-state and dynamic characteristics. Three hours lecture weekly. Fall semester.

**ELEC 330 | DIGITAL DESIGN**  
Units: 4  
Prerequisites: (ENGR 121 or COMP 150) and ELEC 201  
Analysis and design of combinational and sequential digital circuits; digital circuit design using MSI, LSI, and VLSI; digital systems design using programmable logic devices; design and simulation using a hardware description language; asynchronous sequential logic; digital electronics. Three hours lecture and one three-hour laboratory weekly. Fall semester.

**ELEC 350 | SIGNALS AND SYSTEMS**  
Units: 3  
Prerequisites: (COMP 150 or ENGR 121) and MATH 310 and ELEC 201 and MATH 311 (Can be taken Concurrently)  
Methods of analysis for linear, time-invariant systems; time and frequency domain analysis; Fourier series; Laplace and Fourier Transform methods of analysis; state variable representation; sampling theorem; simulation diagrams and system realization; introduction to discrete-time approximations and analysis; computer-aided analysis and simulation using MATLAB or equivalent. Three hours lecture weekly. Spring semester.

**ELEC 403 | ADVANCED ELECTRONIC CIRCUIT DESIGN**  
Units: 3  
Prerequisites: ELEC 302  
Analysis and design of analog and digital electronic circuits and systems including: oscillators, waveform generation, communication circuits, power electronics, and digital gates; computer-aided analysis and design; lecture/ recitation and occasional lab/demonstration.

**ELEC 410 | MICROCOMPUTER-BASED SYSTEMS DESIGN**  
Units: 4  
Prerequisites: ELEC 310  
Use of microcomputer as an engineering system component in design; systems characteristics and programming of microprocessors, microcontrollers and related architectures; data acquisition, control, timing, I/O, and interfacing; use of computer-aided tools for design and evaluation of microcomputer-based systems; design projects.

**ELEC 430 | APPLIED ELECTROMAGNETICS**  
Units: 4  
Prerequisites: MATH 311 and PHYS 271 and ELEC 350  
Principles of electromagnetic fields, propagation, and transmission; Maxwell’s equations and classical solutions using boundary conditions; microwave transmission line principles and applications; waveguides; introduction to antennas. Computer-aided analysis and design. Fall semester.

**ELEC 432 | RADIO FREQUENCY AND MICROWAVE ENGINEERING**  
Units: 3  
Prerequisites: MATH 311 and ELEC 302 and ELEC 430 (Can be taken Concurrently)  
An introduction to the design and analysis of active and passive radio frequency and microwave circuits. Topics include radio frequency and microwave circuit analysis, measurement methods, transmission line structures, matching networks, oscillators, and mixers. Computer-aided analysis and design.
### ELEC 450 | DIGITAL SIGNAL PROCESSING AND APPLICATIONS
- **Units:** 3
- **Prerequisites:** ELEC 350 and (ISYE 330 (Can be taken Concurrently) or MATH 315 (Can be taken Concurrently))
  - Analysis and design of sampled-data and discrete-time systems; z-transform and state-space techniques; introduction to hardware implementation; principles of digital signal processing and control including noise considerations; computer-aided analysis and design.

### ELEC 456 | BIOMEDICAL INSTRUMENTATION
- **Units:** 3
- **Prerequisites:** ELEC 302
  - Techniques and equipment used by engineers in biomedical signal acquisition, biomedical signal analysis, and medical environment. Theory and application of biomedical technology. Basics of and requirements for biosignal transducing, amplification, and processing. Topics include current biomedical imaging technology, biomedical safety, and biomedical ethics.

### ELEC 460 | CONTROL SYSTEMS ENGINEERING
- **Units:** 4
- **Prerequisites:** ELEC 320 and ELEC 350 and MATH 311
  - Analysis and design of linear feedback systems; control components; time, frequency, and transform domain representations and design techniques; systems specifications, performance indices, evaluation and testing; controller and compensator design; complex frequency and state-variable techniques. Introduction to sampled-data systems. Computer-aided design and simulation. Three hours lecture and one three-hour laboratory weekly. Spring semester.

### ELEC 470 | COMMUNICATION PRINCIPLES AND CIRCUITS
- **Units:** 4
- **Prerequisites:** ELEC 302 and ELEC 350 and MATH 311 and (ISYE 330 (Can be taken Concurrently) or MATH 315 (Can be taken Concurrently))
  - Signal analysis; analog and digital modulation and detection techniques; modern communication circuits and devices. Application of probability theory and random processes to communication systems. Three hours lecture and one three-hour laboratory weekly. Fall semester.

### ELEC 472 | WIRELESS AND DIGITAL COMMUNICATIONS
- **Units:** 3
- **Prerequisites:** ELEC 470
  - Digital and wireless communication systems and modulation techniques. Schemes for multiplexing and multiple access in wireless networks. Propagation and channel coding issues. Practical issues in the design and development of cellular, satellite-based, and other wireless communication systems.

### ELEC 472L | WIRELESS AND DIGITAL COMMUNICATIONS LAB
- **Units:** 1
- **Prerequisites:** ELEC 470 and ELEC 472 (Can be taken Concurrently)

### ELEC 480 | OPTOELECTRONIC MATERIALS AND DEVICES
- **Units:** 3
- **Prerequisites:** ENGR 311 and ELEC 301
  - Introduction to the operation and design of optoelectronic materials and devices including compound semiconductors, fabrication, crystal growth, and devices such as lasers, LEDs, and detectors.

### ELEC 491W | ELECTRICAL ENGINEERING DESIGN AND PRACTICE I
- **Units:** 4
  - **Repeatability:** No
- **Prerequisites:** ELEC 302 and ELEC 310 and ELEC 350
  - Proposal and concept design phase of a capstone project culminating in a documented and approved project to be implemented in Electrical Engineering Design and Practice II (ELEC 492). Working as a multidisciplinary team, an iterative design process is applied to a major design experience based on the knowledge and skills acquired in earlier course work. Stages of design include problem identification, formulation of requirements, research and analysis, evaluation of alternatives, use of modern design methods and engineering techniques that incorporate realistic constraints, project planning, testing and proof-of-concept. Societal, ethical, and professional practice considerations are integrated into the design process. Three hours lecture-recitation and one three-hour laboratory weekly. Fall semester.

### ELEC 492 | ELECTRICAL ENGINEERING DESIGN AND PRACTICE II
- **Units:** 3
  - **Repeatability:** No
- **Prerequisites:** ELEC 491W
  - Principles of engineering design culminating in a project that applies and integrates topics in electrical and electronic circuits, signals, and systems; technical and non-technical considerations; research, planning, analysis, detail design, prototyping, implementation, testing, evaluation, and documentation of an engineering design project; design reviews including written reports and oral presentations to multiple audiences. Two hours of lecture and four hours of laboratory weekly. Spring semester.

### ELEC 494 | SPECIAL TOPICS IN ELECTRICAL ENGINEERING
- **Units:** 1-4
  - **Repeatability:** Yes (Can be repeated for Credit)
- **Prerequisites:** ELEC 302 and ELEC 310 and ELEC 350
  - Special topics seminar in areas of special interest to current engineering practice in electrical/electronics/computer engineering. May be repeated for credit.

### ELEC 496 | UNDERGRADUATE RESEARCH
- **Units:** 1-3
  - **Repeatability:** Yes (Can be repeated for Credit)
- **Prerequisites:** ELEC 498 and ELEC 491W
  - Faculty-directed undergraduate research in engineering. Problem proposal must be submitted and approved prior to enrollment. Written report required. Upper division standing in the EE major. Prior approval by the department chair is required.

### ELEC 498 | INTERNSHIP/CO-OP EXPERIENCE
- **Units:** 1-3
- **Prerequisites:** Upper division standing in the EE major. Prior approval by the department chair is required.

### ELEC 499 | INDEPENDENT STUDY
- **Units:** 1-3
- Individual project in creative design and synthesis under the general supervision of a participating professor. Project proposal must be submitted and approved prior to enrollment.