ELECTRICAL ENGINEERING (ELCT)

ELCT 101 - Electrical and Electronics Engineering (3 Credits)
Introductions to: the profession of electrical engineering; the wide range of sub-disciplines that make electrical engineering so valuable in improving the human condition; the role of electrical engineers in society; and the role of electrical engineering students in the university.

ELCT 102 - Electrical Science (3 Credits)
Fundamentals of electrical and electronic components. Basic network laws. Mathematical and computer tools for network analysis. Cannot earn credit for ELCT 102 after earning credit for either ELCT 220 or ELCT 221.
Prerequisite or Corequisite: MATH 141.

ELCT 201 - Introductory Electrical Engineering Laboratory (3 Credits)
Laboratory procedures, instrumentation and measurements, report writing, computer use in system design, testing, and troubleshooting. Integrative project-based learning environment including passive, active, electronic and electromechanical systems.
Prerequisites: C or better in ENGL 102 and C or better in CSCE 211.

Prerequisite or Corequisite: ELCT 222.

ELCT 220 - Electrical Engineering for Non-Majors (3 Credits)
Fundamentals of electrical engineering for mechanical, chemical, or other engineering disciplines, including electric circuits, measurements, data acquisition, sensors, motors, and controllers.
Prerequisites: MATH 142.

ELCT 221 - Circuits (3 Credits)
Analysis of linear ac circuits using complex variables. Nodal and mesh analysis, Thevenin and Norton transformations, linearity, superposition, use of math solvers, circuit simulators, and computer-interfaced instrumentation.
Prerequisites: C or better in MATH 142; C or better in ELCT 102; or C or better in AESP 265; or D or better in ELCT 220.

ELCT 222 - Signals and Systems (3 Credits)
Analysis of continuous-time signals and systems in time and frequency domains, Fourier series and transforms, Laplace transforms; introduction to discrete-time signals.
Prerequisites: C or better in ELCT 221 and in MATH 242.

ELCT 301 - Electronics Laboratory (3 Credits)
Design and implementation of analog and digital electronic circuits, with emphasis on developing deep individual understanding of curriculum-spanning concepts.
Prerequisites: D or better in ELCT 201.

Prerequisite or Corequisite: D or better in ELCT 371.

ELCT 302 - Real Time Systems Laboratory (3 Credits)
Real-time design and development on an unmanned ground vehicle platform.
Prerequisites: ELCT 301.

Prerequisite or Corequisite: ELCT 331.

ELCT 321 - Digital Signal Processing (3 Credits)
An introduction to analysis, design and applications of discrete time systems; z- and discrete Fourier transforms; frequency and impulse responses, FIR and IIR filters.
Prerequisites: C or better in ELCT 222.

ELCT 331 - Control Systems (3 Credits)
Fundamentals of control systems. Analysis and design of control systems using physical system models. State variables, steady-state error, time- and frequency-responses, control system stability. Root locus analysis and controller design – PI, PD, PID, lead-lag compensator. Nyquist stability criterion.
Prerequisites: C or better in ELCT 222.

ELCT 332 - Fundamentals of Communication Systems (3 Credits)
Introduction to communication systems, sampling theorem, modulation theory, multiplexing, phase-lock loops, and related topics.
Prerequisite or Corequisite: ELCT 321 and STAT 509.

ELCT 350 - Computer Modeling of Electrical Systems (3 Credits)
Formulation of physics-based dynamic models of electrical or electromechanical systems. Solving dynamic equations of electrical systems in discrete time. Use of object oriented programming language (e.g., C++) and computer tools (e.g, MATLAB, virtual test bed) for solving dynamic equations of electrical systems.
Prerequisites: C or better in ELCT 222, C or better in CSCE 145.

ELCT 361 - Electromagnetics (3 Credits)
Basic concepts of electric and magnetic fields, including electrostatics, magnetostatics, and quasi-statics with computer applications.
Prerequisites: PHYS 212 and MATH 241.

ELCT 363 - Introduction to Microelectronics (3 Credits)
Properties and characteristics of semiconductor materials, p-n and semiconductor-metal junctions. Basic properties, characteristics and operation of diodes and transistors.
Prerequisites: C or better in CHEM 111, C or better in PHYS 212, C or better in MATH 241.

ELCT 371 - Electronics (3 Credits)
Introduction to design and analysis of electronic circuits and systems. Applications of amplifiers, op-amps, diodes, bipolar and field-effect transistors in analog and digital circuits.
Prerequisites: C or better in ELCT 222.

ELCT 403 - Capstone Design Project I (3 Credits)
Planning, preliminary design, and prototyping. Analysis and specification of system and subsystem requirements, measures of performance, analysis of alternatives, effective team work. Project management and scheduling. Prototype implementation and characterization. This course should be taken during student's penultimate semester.
Prerequisites: D or better in ELCT 302.

Graduation with Leadership Distinction: GLD: Professional and Civic Engagement Internships, GLD: Research

ELCT 404 - Capstone Design Project II (3 Credits)
Continuation of Capstone Design Project I. Final design and implementation including design iteration, design for reliability, system integration and characterization, business case development.
Prerequisites: D or better in ELCT 403.

Graduation with Leadership Distinction: GLD: Professional and Civic Engagement Internships, GLD: Research
Experiential Learning: Experiential Learning Opportunity

ELCT 499 - Special Problems (1-3 Credits)
Individual investigation or studies of special topics. A maximum of 3 credits total may be applied toward a degree. Advanced approval of project proposal by instructor and department advisor.
Graduation with Leadership Distinction: GLD: Professional and Civic Engagement Internships, GLD: Research

ELCT 510 - Photovoltaic Materials and Devices (3 Credits)
Fundamentals of photovoltaic solar cell technologies. Design and operation of solar cells, including efficiency analysis and cost benefit. Applications to green and sustainable energy systems.
Prerequisites: C or better in ELCT 363.

ELCT 521 - Introduction to Microwaves (3 Credits)
Introduction to plane electromagnetic wave propagation, transmission lines, transmission line equations, input impedance, waveguides and cavities, antennas and antenna arrays, microwave modeling.
Prerequisites: ELCT 361 or PHYS 504.

ELCT 530 - Industrial Controls (3 Credits)
The embedded electronics and software used in data acquisition, and process and instrument control in an industrial or manufacturing environment.
Prerequisites: ELCT 331.

ELCT 531 - Digital Control Systems (3 Credits)
Analysis and design of discrete-time control systems, implementation of control systems using digital electronic systems. Applications to electrical systems.
Prerequisites: ELCT 331.

ELCT 533 - System Health Management (3 Credits)
Sensing, data acquisition, and data processing for evaluation of performance and system health. Integration and implementation of health management systems.
Prerequisites: ELCT 321 or equivalent.

ELCT 541 - Sensors for Biomedicine (3 Credits)
Operating principles and design of bioelectric sensors and sensor systems for medical applications.
Prerequisites: C or better in ELCT 361, ELCT 363 and ELCT 371.

ELCT 551 - Power Systems Design and Analysis (3 Credits)
Transmission line design, load flow, and short circuit analysis of power systems.
Prerequisites: ELCT 331.

ELCT 553 - Electromechanical Energy Conversion (3 Credits)
Analysis and design of electromechanical energy conversion systems, including electrical machines and electronic drives.
Prerequisites: ELCT 331, ELCT 361.

ELCT 554 - Integration of Photovoltaics in Modern Power Systems (3 Credits)
Analysis and design of power systems in presence of photovoltaic generation with focus on protection systems, control, power quality.
Prerequisites: ELCT 551.

ELCT 559 - Special Topics in Distributed Energy Resources for Electric Energy Systems (3 Credits)
Special topics in distributed energy resources for modern electrical energy systems. Course content varies and will be announced in the schedule of classes by title. May be repeated as topics vary.
Prerequisite or Corequisite: ELCT 551.

ELCT 562 - Wireless Communications (3 Credits)
Fourier techniques and stochastic processes review, multiple access & cellular techniques, signal space representations for signals and noise, baseband modulations and optimal receivers in additive white Gaussian noise, bandpass and higher-order modulations, mobile & wireless propagation channel characteristics, effects of bandlimiting & distortion mitigation, diversity techniques.
Prerequisites: ELCT 332, ELCT 361.

ELCT 563 - Semiconductor Electronic Devices (3 Credits)
Basic semiconductor material properties. Principles and characteristics of semiconductor p-n junction and Schottky diodes, field-effect transistors (JFETs, MESFETs, and MOSFETs), and bipolar junction transistors.
Prerequisites: ELCT 363 or equivalent.

ELCT 564 - RF Circuit Design for Wireless Communications (3 Credits)
RF design fundamentals, lumped elements, transmission line theory, transmission lines and waveguides, S-parameters, impedance matching, microwave resonators.
Prerequisites: ELCT 361.

ELCT 566 - Semiconductor Optoelectronics (3 Credits)
Basic semiconductor material optical properties. Principles and structures of semiconductor lasers, Light Emitting Diodes, and photodetectors.
Prerequisites: ELCT 363 or equivalent.

ELCT 572 - Power Electronics (3 Credits)
Basic analysis and design of solid-state power electronic devices and circuitry.
Prerequisites: ELCT 371, ELCT 331.

ELCT 574 - Semiconductor Materials and Device Characterization (3 Credits)
Semiconductor material and device characterization; resistivity, carrier and doping density, contact resistance, Schottky barriers, series resistance, defects, trapped charges, and carrier lifetime.
Prerequisites: ELCT 363 or equivalent.

ELCT 582 - Semiconductor Laboratory (3 Credits)
Prerequisite: ELCT 363.