ELECTRICAL ENGINEERING (ELE)

ELE 200 Selected Topics (1-6 Credits)
Engineering & Comp Sci
Exploration of a topic (to be determined) not covered by the standard curriculum but of interest to faculty and students in a particular semester.
Repeatable

ELE 231 Electrical Engineering Fundamentals (3 Credits)
Engineering & Comp Sci
Analysis of electric circuits. Resistive, reactive circuits. Independent, dependent sources. Network theorems, circuit reduction, op amps. Elements of transient and steady state circuit analysis. Power and energy considerations.
Prereq: MAT 295
Shared Competencies: Critical and Creative Thinking (https://coursecatalog.syracuse.edu/shared-competencies/critical-and-creative-thinking/); Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

ELE 251 Fundamentals of Linear Systems (3 Credits)
Engineering & Comp Sci
Linear time invariant analogous systems. Step, Impulse, response in both time and frequency domain using the Laplace transform. The s-plane. Steady state AC response. Discrete time sampling, Nyquist limits, z-transform, z-plane. Simple digital filters.
Advisory recommendation Prereq: MAT 295 Coreq: PHY 211 or PHY 215
Shared Competencies: Critical and Creative Thinking (https://coursecatalog.syracuse.edu/shared-competencies/critical-and-creative-thinking/); Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

ELE 270 Experience Credit (1-6 Credits)
Engineering & Comp Sci
Participation in a discipline or subject related experience. Student must be evaluated by written or oral reports or an examination. Permission in advance with the consent of the department chairperson, instructor, and dean. Limited to those in good academic standing.
Repeatable

ELE 280 International Course (1-12 Credits)
Engineering & Comp Sci
Offered through SUAbroad by educational institution outside the United States. Student registers for the course at the foreign institution and is graded according to that institution's practice. SUAbroad works with the S.U. academic department to assign the appropriate course level, title, and grade for the student's transcript.
Repeatable

ELE 290 Independent Study (1-6 Credits)
Engineering & Comp Sci
Exploration of a problem, or problems, in depth. Individual independent study upon a plan submitted by the student. Admission by consent of supervising instructor(s) and the department.
Repeatable

ELE 291 Electrical Engineering Laboratory I (1 Credit)
Engineering & Comp Sci
Electrical-instrumentation and measurement. Experimental methods in linear and nonlinear devices and circuits. One hour of recitation and one three hour laboratory a week.
Coreq: ELE 231
Shared Competencies: Critical and Creative Thinking (https://coursecatalog.syracuse.edu/shared-competencies/critical-and-creative-thinking/); Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

ELE 292 Linear Systems Laboratory (1 Credit)
Engineering & Comp Sci
Electrical-instrumentation, measurement and data-logging. Experimental methods in linear systems. Computer computations for analysis and modelling. One three hour laboratory per week.
Coreq: ELE 251
Shared Competencies: Critical and Creative Thinking (https://coursecatalog.syracuse.edu/shared-competencies/critical-and-creative-thinking/); Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

ELE 300 Selected Topics (1-6 Credits)
Engineering & Comp Sci
Exploration of a topic (to be determined) not covered by the standard curriculum but of interest to faculty and students in a particular semester.
Repeatable

ELE 314 Power Engineering (3 Credits)
Engineering & Comp Sci
Phasors; complex power; single phase systems; three-phase systems; electromagnetic fundamentals of power systems; transformers; transmission line parameters; power flow analysis.
Prereq: ELE 231
Shared Competencies: Information Literacy and Technological Agility (https://coursecatalog.syracuse.edu/shared-competencies/information-literacy-and-technological-agility/)

ELE 324 Electromagnetics I (3 Credits)
Engineering & Comp Sci
Vector analysis, electrostatics, LaPlace's equation, dielectrics, magnetostatics, magnetic materials.
Prereq: MAT 397 and (PHY 212 or PHY 216)
Shared Competencies: Information Literacy and Technological Agility (https://coursecatalog.syracuse.edu/shared-competencies/information-literacy-and-technological-agility/)

ELE 325 Electromagnetics II (3 Credits)
Engineering & Comp Sci
Faraday's Law, displacement current, Maxwell's equations, plane waves, power flow in waves, reflection and transmission of waves, wave-guides, radiation, and antennas.
Advisory recommendation Prereq: ELE 324

ELE 333 Analog Electronics (3 Credits)
Engineering & Comp Sci
Introductory semi-conductors; non-linear electronic circuits and devices including operational amplifiers, diodes and MOSFETs; Integrated electronics.
Prereq: ELE 231
Shared Competencies: Information Literacy and Technological Agility (https://coursecatalog.syracuse.edu/shared-competencies/information-literacy-and-technological-agility/)

ELE 346 Semiconductor Devices (3 Credits)
Engineering & Comp Sci
Physics of semiconductor devices. Energy bands. Electrons and holes. PN and metal semiconductor diodes. Characteristics, operation, properties and limitations of bipolar transistors, JFETS and MOSFETS. PNPN devices. Optoelectronic devices.
Prereq: PHY 212 or 216
Shared Competencies: Information Literacy and Technological Agility (https://coursecatalog.syracuse.edu/shared-competencies/information-literacy-and-technological-agility/)

ELE 351 System and Signal Analysis (3 Credits)
Engineering & Comp Sci
Signal and system analysis in continuous-time, discrete-time, and frequency domains. Fourier series, continuous and discrete Fourier transforms, z-transform, LaPlace transform. Engineering applications.
Prereq: ELE 251
Shared Competencies: Information Literacy and Technological Agility (https://coursecatalog.syracuse.edu/shared-competencies/information-literacy-and-technological-agility/)

ELE 352 Digital Signal Processing (3 Credits)
Engineering & Comp Sci
Discrete time sequences and systems. Sampling. Discrete Fourier transform. z-transform. Finite impulse response (FIR) filters. Infinite impulse response (IIR) filters.
Prereq: ELE 351
Shared Competencies: Information Literacy and Technological Agility (https://coursecatalog.syracuse.edu/shared-competencies/information-literacy-and-technological-agility/)

ELE 354 Communication Systems (3 Credits)
Engineering & Comp Sci
Time and frequency domain representation of signals, LTI systems, analog modulation and demodulation, random processes, digital modulation schemes, geometric representation of signal waveforms, optimal receiver design.
Prerequisite: ELE 351 and CIS 321
Shared Competencies: Critical and Creative Thinking (https://coursecatalog.syracuse.edu/shared-competencies/critical-and-creative-thinking/); Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

ELE 380 International Course (1-12 Credits)
Engineering & Comp Sci
Offered through SUAbroad by educational institution outside the United States. Student registers for the course at the foreign institution and is graded according to that institution's practice. SUAbroad works with the S.U. academic department to assign the appropriate course level, title, and grade for the student's transcript.
Repeatable

ELE 392 Digital Signal Processing and Control Systems Laboratory (3 Credits)
Engineering & Comp Sci
A hands-on introduction to basics and applications of digital signal processing and feedback control. Simulations using MATLAB/Simulink and experiments using microcontrollers will cover structured lab exercises that lead to a final multi-week design project.
Prereq: ELE 251
Shared Competencies: Critical and Creative Thinking (https://coursecatalog.syracuse.edu/shared-competencies/critical-and-creative-thinking/)

ELE 400 Selected Topics (1-6 Credits)
Engineering & Comp Sci
Exploration of a topic (to be determined) not covered by the standard curriculum but of interest to faculty and students in a particular semester.
Repeatable

ELE 412 Control Systems (3 Credits)
Engineering & Comp Sci
Review of Laplace transforms and z-transforms. System modeling, transfer functions, feedback, stability. Analysis and design using computer tools. Applications of controls to engineering systems.
Prerequisite: ELE 351
Shared Competencies: Critical and Creative Thinking (https://coursecatalog.syracuse.edu/shared-competencies/critical-and-creative-thinking/)

ELE 414 Power System Analysis and Control (3 Credits)
Engineering & Comp Sci
Double-numbered with ELE 614
Three phase power systems, Power flow analysis, Symmetrical components, Fault analysis, Power system stability, Power system controls, Fundamentals of economic dispatch. Additional work required for graduate students.
Prereq: ELE 314
Shared Competencies: Critical and Creative Thinking (https://coursecatalog.syracuse.edu/shared-competencies/critical-and-creative-thinking/); Information Literacy and Technological Agility (https://coursecatalog.syracuse.edu/shared-competencies/information-literacy-and-technological-agility/); Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

ELE 415 Microgrids (3 Credits)
Engineering & Comp Sci
Double-numbered with ELE 615
Challenges and opportunities in smart microgrids. Distributed energy resources in microgrids. Grid-connected and islanding mode of microgrid operation. Microgrid monitoring and protection. Control technology requirements and solutions. Additional work required for graduate students.
Shared Competencies: Critical and Creative Thinking (https://coursecatalog.syracuse.edu/shared-competencies/critical-and-creative-thinking/); Information Literacy and Technological Agility (https://coursecatalog.syracuse.edu/shared-competencies/information-literacy-and-technological-agility/)

ELE 416 Electromechanical Devices (3 Credits)
Engineering & Comp Sci
Principles of energy conversion that provide the basis of operation for electrical machinery, meters, and other transducers. Rotating DC and AC machines.
Prereq: ELE 232

ELE 417 Power Electronics (3 Credits)
Engineering & Comp Sci
Double-numbered with ELE 617
Semiconductor devices, switching power poles, switching analysis, topology selection and design, single phase and three phase rectifiers, inverters, and converters, feedback controllers and power supply. Additional work required of graduate students.
Prereq: ELE 314
Shared Competencies: Critical and Creative Thinking (https://coursecatalog.syracuse.edu/shared-competencies/critical-and-creative-thinking/); Information Literacy and Technological Agility (https://coursecatalog.syracuse.edu/shared-competencies/information-literacy-and-technological-agility/)

ELE 418 Sensors & Measurements (3 Credits)
Engineering & Comp Sci
Double-numbered with ELE 618
Sensor signal domains, sensor classifications and architecture, sensor types, data acquisition methods, signal conversion methods, standards, introduction to metrology, measurement result processing, synchrophasor technology and applications. Additional work required of graduate students.

ELE 424 Applied Electromagnetics (3 Credits)
Engineering & Comp Sci
Electromagnetic Waves. Waveguides, coaxial cables, and optical fibers. Resonators, Transmission lines. Antennas and antenna systems.
Prereq: ELE 324
Shared Competencies: Critical and Creative Thinking (https://coursecatalog.syracuse.edu/shared-competencies/critical-and-creative-thinking/); Information Literacy and Technological Agility (https://coursecatalog.syracuse.edu/shared-competencies/information-literacy-and-technological-agility/)

ELE 425 Microwave Engineering (3 Credits)
Engineering & Comp Sci
Microwave engineering including transmission line theory, impedance matching techniques, and microwave network analysis. Applications to coaxial, strip, microstrip, coupled lines and devices. Experimental illustration using network analyzers, spectrum analyzers, and computer based electromagnetic modeling tools.
Prereq: ELE 324

ELE 450 Independent Study (1-6 Credits)
Engineering & Comp Sci
Repeatable

ELE 452 Digital Audio Signal Processing (3 Credits)
Engineering & Comp Sci
Double-numbered with ELE 652
Course combines classroom theory with hands-on lab. Covers digital audio fundamentals, filter-design, DSP architecture, parallel assembly programming, circular buffers, processing music signals. Additional work required of graduate students.

ELE 453 Image and Video Processing (3 Credits)
Engineering & Comp Sci
Double-numbered with ELE 653
Concepts and applications of image and video processing. Principles of image formation, low-level image processing methods, noise filtering, histogram processing, feature detection, face recognition, moving object detection and tracking, multi-camera systems. Significant project for graduate students.
Prereq: CIS 321 AND (CIS 151 or ECS 102)

ELE 454 Introduction to Radar Systems (3 Credits)
Engineering & Comp Sci
Double-numbered with ELE 654
Foundations of radar systems including basic radar measurements and functionality, the radar range equation, and fundamentals of search and detection. Overview of major subsystems including antennas, transmitters, receivers and signal processors. Introduction to radar signal processing techniques. Additional work required for graduate students.
Prereq: ELE 324 and ELE 351

ELE 458 Data Networks: Basic Principles (3 Credits)
Engineering & Comp Sci
Cross-listed with CIS 458, CSE 458
Data communication networks, multilayer network architecture, data transmission fundamentals, network protocols, local and wide area networks, transport and application protocols.

ELE 464 Introduction to VLSI Design (3 Credits)
Engineering & Comp Sci
Cross-listed with CSE 464
MOS VLSI technologies. CMOS digital circuits. Layout design. Simulation. Realization of digital subsystems-adders, memory, etc. Opportunities for chip fabrication and testing.
Prereq: CSE 261
Shared Competencies: Critical and Creative Thinking (https://coursecatalog.syracuse.edu/shared-competencies/critical-and-creative-thinking/); Information Literacy and Technological Agility (https://coursecatalog.syracuse.edu/shared-competencies/information-literacy-and-technological-agility/)

ELE 470 Experience Credit (1-6 Credits)
Engineering & Comp Sci
Participation in a discipline- or subject-related experience. Students must be evaluated by written or oral reports or an examination. Limited to those in good academic standing.
Repeatable

ELE 480 International Course (1-12 Credits)
Engineering & Comp Sci
Offered through SUAbroad by educational institution outside the United States. Student registers for the course at the foreign institution and is graded according to that institution's practice. SUAbroad works with the S.U. academic department to assign the appropriate course level, title, and grade for the student's transcript.
Repeatable

ELE 490 Independent Study (1-6 Credits)
Engineering & Comp Sci
In-depth exploration of a problem or problems. Individual independent study upon a plan submitted by the student. Admission by consent of supervising instructor or instructors and the department.
Repeatable

ELE 491 Senior Design Project I (3 Credits)
Engineering & Comp Sci
Design methodology and presentation techniques for one extensive team project to be completed in the follow-up course. Focus on design processes and associated technical documentation. Must be taken in sequence with ELE 492.
Prerequisite: ELE 392 or CSE 398
Shared Competencies: Information Literacy and Technological Agility (https://coursecatalog.syracuse.edu/shared-competencies/information-literacy-and-technological-agility/)

ELE 492 Senior Design Project II (3 Credits)
Engineering & Comp Sci
Prototyping, construction, and demonstration skills for one extensive project created by a team of students. Must be taken in sequence with ELE 491
Prereq: ELE 491
Shared Competencies: Critical and Creative Thinking (https://coursecatalog.syracuse.edu/shared-competencies/critical-and-creative-thinking/); Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

ELE 499 Honors Capstone Project (1-3 Credits)
Engineering & Comp Sci
Completion of an Honors Capstone Project under the supervision of a faculty member.
Repeatable 3 times for 3 credits maximum

ELE 500 Selected Topics (1-6 Credits)
Engineering & Comp Sci
Exploration of a topic (to be determined) not covered by the standard curriculum but of interest to faculty and students in a particular semester.
Repeatable

ELE 516 Control of Robots (3 Credits)
Engineering & Comp Sci
Cross-listed with CIS 543
Kinematics, dynamics, and control of mobile and/or manipulator robots. Path planning, actuators, sensors, human/machine interface. Two hours lecture and two hours laboratory weekly. Design project.

ELE 524 Introduction to Applied Optics (3 Credits)
Engineering & Comp Sci
Geometrical optics, two-dimensional Fourier transforms and wave propagation, optical fibers, Fresnel and Fraunhofer diffraction, interferometry, imaging and Fourier transforming properties of lenses, image processing, complex filters and holography. Includes laboratory: design and experiment.
Prereq: ELE 324

ELE 551 Communication Systems (3 Credits)
Engineering & Comp Sci
Communications systems. Amplitude modulation techniques. Angle modulation or frequency modulation. Sampling and quantization of analog signals. Basic digital modulation techniques. Introduction to noise. System modeling evaluating performance using industry tools.
Prereq: ELE 351

ELE 580 International Course (1-6 Credits)
Engineering & Comp Sci
Offered through SUAbroad by educational institution outside the United States. Student registers for the course at the foreign institution and is graded according to that institution's practice. SUAbroad works with the S.U. academic department to assign the appropriate course level, title, and grade for the student's transcript.

ELE 590 Independent Study (1-6 Credits)
Engineering & Comp Sci
Exploration of a problem, or problems, in depth. Individual independent study upon a plan submitted by the student. Admission by consent of supervising instructor(s) and the department.
Repeatable

ELE 591 Special Problems in Electrical Engineering (1-4 Credits)
Engineering & Comp Sci
Students work on special projects. Instructors present new or special material.
Repeatable
Shared Competencies: Critical and Creative Thinking (https://coursecatalog.syracuse.edu/shared-competencies/critical-and-creative-thinking/)