ELC 251/Electronics   **1 course unit**
(spring semester)
Prerequisite: ENG 212
Introduction to electronic devices and related circuits. Topics include diodes, bipolar junction and field-effect transistors, operational amplifiers, and related integrated circuit components.

ELC 321/Signals and Systems   **1 course unit**
(spring semester)
Prerequisite: ENG 272
Continuous and discrete signals and systems. Convolution, impulse response, system classifications, differential and difference equations. Fourier series, Fourier transform, Laplace transform, and z-transform. Transfer functions and stability.

ELC 333/Electrical Engineering Lab I   **.5 course unit**
(laboratory)
(spring semester)
Corequisite: ELC 251
A practical laboratory experience designing, simulating, breadboarding, and testing electronic circuits to complement the theory in ELC 251.

ELC 341/Communication Systems   **1 course unit**
(fall semester)
Prerequisites: ELC 251, ELC 321
Digital and analog communication systems including baseband, pulse, AM, FM, and digital modulated systems.

ELC 343/Microcomputer Systems   **1 course unit**
(fall semester)
Prerequisite: ENG 312
An introductory course in microcontrollers, microprocessors, embedded control architecture, and assembly language programming. Interfacing of external devices with microcontrollers is emphasized.

ELC 361/Engineering Electromagnetics   **1 course unit**
(spring semester)
Prerequisites: ENG 342, PHY 202
An integration of theory and practical applications in electromagnetics, transmission lines, and electromagnetic fields and waves. Includes impedance matching, Smith Chart, CAD tools, and waveguides.

ELC 363/Computer Engineering Lab I   **.5 course unit**
(laboratory hours)
(spring semester)
Corequisite: ELC 451
Hands on laboratory experience to reinforce the concepts covered in ELC 451. Students will do at least three projects involving computer data-path design, micro-code and finite state machine control, and memory and I/O subsystem analysis and design.

ELC 373/Electrical Engineering Lab II   **.5 course unit**
(with design hour)
(spring semester)
Corequisite: ELC 361
Design issues and modeling techniques in communication transmission systems. Experiments include linear, nonlinear, and digital modulation/demodulation and computer-aided design.

ELC 383/Electronics II   **1 course unit**
(with design hour)
(spring semester)
Prerequisite: ELC 251
The continuation of ELC 251 covering the analysis and design of electronic circuits and systems: biasing, small-signal analysis, frequency response, feedback amplifiers, active filters, non-linear op-amp applications, and oscillators.

ELC 391/Independent Study   **.5-1 course unit**
(occasionally)
Prerequisites: Permission of instructor and department, senior status required
For advanced students wishing to pursue a special area of interest. Topic(s) developed in consultation with a faculty advisor.

ELC 411/Embedded Systems   **1 course unit**
(with design hour)
(fall semester)
Prerequisites: ELC 251, ELC 343
This course deals with embedded systems and their interactions with their physical environments. It focuses on embedded system design issues such as limited memory, cost, performance guarantees, real-time operations, power, and reliability.

ELC 423/Digital Signal Processing   **1 course unit**
(fall semester)
Prerequisites: ENG 312, ELC 321
Sampling data systems, z-transform, DFT, FFT, and digital filter design with applications to digital signal processing.

ELC 431/RF/Microwave Engineering   **1 course unit**
(with design hour)
(occasionally)
Prerequisite: ELC 361
An extension of Engineering Electromagnetics. Topics include RF/microwave active devices, amplifier design using scattering parameters, and modern filter design.

ELC 433/Electrical Engineering Lab III   **.5 course unit**
(laboratory)
(fall semester)
Corequisite: ELC 361
DSP systems will be designed and tested with MATLAB and LabVIEW and implemented with DSP processors.

ELC 441/Digital Engineering Systems   **1 course unit**
(with design hour)
(spring semester)
Prerequisites: ENG 312, ELC 251
Treatment of digital system engineering problems: power, noise, signaling, and timing.

ELC 451/Computer Architecture and Organization   **1 course unit**
(spring semester)
Prerequisite: ENG 312, ELC 343
Microprocessor design philosophy, data typing and addressing modes, multi-processors, multi-tasking, process communications, memory management, and virtual memory.

ELC 453/Digital Control Systems   **1 course unit**
(same as MEC 453)
(occasionally)

Prerequisite: ENG 352
Digital control systems, dynamic response modeling, design, and compensation techniques.

ELC 463/Computer Engineering Lab II .5 course unit
(laboratory hours)
(spring semester)
Prerequisite: ELC 363
A semester-long design experience involving the formal design and simulation of a major microprocessor or microcomputer system or subsystem. Students will do a major project consisting of the design and simulation of a small microprocessor or microcomputer, cache controller, etc.

ELC 471/VLSI Design 1 course unit
(with design hour)
(occasionally)
Prerequisites: ELC 251 ELC 451
Structured design methodologies for VLSI systems. Topics include switching models, device equations, combinational and sequential systems design, simulation, timing, verification and tools for computer-aided design.

ELC 473/Bioinstrumentation 1 course unit
(same as BME 473, MEC 473)
(with laboratory)
(spring semester)
Prerequisites: ENG 212, ENG 214
Theory and design of biomedical instruments used for measurements on humans and animals. Detailed coverage of sensors and transducers that quantify force, pressure, flow, sound, temperature and displacement. Origin of biopotentials (ECG, EMG, EEG) and biological signal processing. Consideration of noise, interference, and electrical safety issues.

ELC 475/Advanced Digital Signal Processing 1 course unit
(with design hour)
(fall semester)
(occasionally)
Prerequisite: ELC 423
Digital filter design, discrete random signals, effects of finite word length arithmetic, fast Fourier transform and applications, power spectrum estimation, and implementation using DSP microprocessors.

ELC 483/Robotics 1 course unit
(same as MEC 483)
(with design hour)
(occasionally)
Prerequisite: ENG 272
Introduction to robotics foundations in kinematics, dynamics, control, trajectory generation, actuation, sensing, and design. Laboratory projects involving building mobile robots and operating manipulators are incorporated to reinforce the basic principles introduced in the lecture.

ELC 495, 496/Senior Project I, II 0, 1 course unit
(every semester)
Prerequisites: Senior standing
Senior project focuses students' previous experience upon a specific technical project. Library research, design, cost analysis, construction, testing, and project management. Students work closely with a faculty advisor.