

ELECTRICAL AND COMPUTER ENGINEERING

ECE

Department of Electrical and Computer Engineering College of Engineering

- 201 Circuits and Systems I**
Fall, Spring, Summer. 3(3-0) P:M: (CSE 131 or concurrently or CSE 231 or concurrently) and (MTH 234 or concurrently or MTH 254H or concurrently or LBS 119 or concurrently) SA: ECE 200
Resistive circuits. Loop and modal analysis. Network theorems, dependent sources. Capacitor and inductor circuits. Transient analysis. Introduction to computer-aided design.
- 202 Circuits and Systems II**
Fall, Spring, Summer. 3(3-0) P:M: (ECE 201) and (MTH 235 or concurrently or LBS 119 or concurrently or MTH 255H or concurrently) SA: ECE 360
Sinusoidal steady-state response. Laplace transforms. S-Domain circuit analysis. Frequency response. Fourier series. Mutual inductance. Power in sinusoidal steady state.
- 230 Digital Logic Fundamentals**
Fall, Spring, Summer. 3(3-0) P:M: (CSE 131 or CSE 231) SA: ECE 330
Binary information. Switching algebra, combinational logic, minimization. Programmable logic devices. Sequential system fundamentals and state machines. Arithmetic operations and circuits. Memory elements and systems. Design tools. Design problems.
- 291 Circuits and Systems**
Fall, Spring. 2(2-0) P:M: (MTH 235 or concurrently and LBS 119 or concurrently and MTH 255H or concurrently) R: Approval of department. SA: ECE 360
Sinusoidal steady-state response. Laplace transforms. S-Domain circuits analysis. Fourier series.
- 302 Electronic Circuits**
Fall, Spring. 3(3-0) P:M: (ECE 202) R: Open only to students in the Department of Electrical and Computer Engineering or Department of Computer Science and Engineering. SA: EE 302
Volt-ampere characteristics of diodes and transistors. SPICE modeling. Differential, multistage and integrated circuit amplifiers. High frequency effects.
- 303 Electronics Laboratory**
Fall, Spring. 1(0-3) P:M: (ECE 202) R: Open only to students in the Department of Electrical and Computer Engineering or Department of Computer Science and Engineering. SA: EE 303 C: ECE 302 concurrently.
Electronic test equipment and measurement fundamentals.
- 305 Electromagnetic Fields and Waves I**
Fall, Spring, Summer. 4(4-0) P:M: (MTH 235 or concurrently or LBS 119 or concurrently or MTH 255H or concurrently) and (PHY 184 or PHY 184B or PHY 234B) R: Open only to students in the Department of Electrical and Computer Engineering. SA: EE 305
Transient and time-harmonic transmission lines. Smith charts. Two-port networks. Maxwell's equations. Force, energy and power. Plane electromagnetic waves. Guided waves.
- 313 Control Systems**
Fall, Spring. 3(3-0) P:M: (ECE 202 and ECE 345) R: Open only to juniors or seniors or graduate students in the Department of Electrical and Computer Engineering and Department of Computer Science and Engineering. SA: EE 413, ECE 413
Analysis and design of control systems using transfer functions and state variable methods.
- 320 Energy Conversion and Power Electronics**
Fall, Spring. 3(3-0) P:M: (ECE 302 and ECE 303 and ECE 305) SA: EE 320
Power and energy. Magnetics and transformers. Elementary and induction machines. Power semiconductor. Controlled rectifiers and inverters. Power supplies and motor drives.
- 331 Microprocessors and Digital Systems**
Fall, Spring. 4(3-3) P:M: (CSE 231 and ECE 230) R: Open only to juniors or seniors or graduate students in the Department of Electrical and Computer Engineering. SA: EE 331
Microcomputers. Microprocessor architecture. Addressing modes. Assembly language programming. Parallel and serial input and output. Interfacing. Interrupts. Peripheral device controllers. Applications, design.
- 345 Electronic Instrumentation and Systems**
Fall, Spring, Summer. 3(2-3) P:M: (MTH 235 or MTH 255H or LBS 119) and (PHY 184 or PHY 184B or PHY 234B) and completion of Tier I writing requirement. R: Open only to students in the College of Engineering with the exception of students in the Department of Electrical and Computer Engineering. SA: EE 345
Electrical and electronic components, circuits and instruments. Circuit laws and applications, frequency response, operational amplifiers, semi-conductor devices, digital logic, counting circuits.
- 366 Introduction to Signal Processing**
Spring, Summer. 3(3-0) P:M: (ECE 202) R: Open only to students in the Department of Electrical and Computer Engineering. SA: ECE 360
Continuous- and discrete-time signal analysis fundamental to modern signal processing and communications technologies. Fourier and spectral analysis of signals. Elementary modulation techniques. Filtering and channel models. The z-transform. Introduction to random processes and noise in discrete time. Application examples.
- 405 Electromagnetic Fields and Waves II**
Fall. 4(3-3) P:M: (ECE 305) R: Open only to juniors or seniors or graduate students in the Electrical Engineering major and to juniors or seniors in the Computer Engineering major. SA: ECE 435
Microwave networks. Scattering parameters. Solutions to Coulomb's law, Gauss' Law and the wave equation. Planar transmission lines. Antennas. Waveguides and cavities. Measurement of the properties of antennas and microwave networks.
- 407 Electromagnetic Compatibility**
Spring. 4(3-3) P:M: (ECE 202 and ECE 305 and ECE 366) R: Open only to juniors or seniors or graduate students in the Electrical Engineering major and juniors or seniors in the Computer Engineering major.
Electromagnetics for electrical systems. Signals and spectra. Regulations. Radiated and conducted emissions. Conducted and radiated immunity. Mitigation techniques.
- 410 VLSI Design**
Fall, Spring. 4(3-3) P:M: (ECE 302 and ECE 303 and ECE 230) R: Open only to juniors or seniors or graduate students in the Department of Electrical and Computer Engineering or Department of Computer Science and Engineering. SA: EE 410
Digital integrated circuit design fundamentals. Design specifications: functionality, performance, reliability, manufacturability, testability, cost. Standards, silicon compilers, foundries. Design layout rules, rule checking. Circuit extraction, simulation, verification. Team-based design.
- 411 Electronic Design Automation**
Fall, Spring. 4(3-3) P:M: (CSE 320 or ECE 331) R: Open only to juniors or seniors or graduate students in the Department of Electrical and Computer Engineering or Department of Computer Science and Engineering. SA: EE 411
Electronic circuit design hierarchy and the role of methodology. Application specific integrated circuits. Hardware description languages. Behavioral and structural circuit modeling. Design algorithms and design tools. Design projects.
- 415 Computer Aided Manufacturing**
Fall. 3(2-3) P:M: (ECE 313 or ME 451) R: Open only to juniors or seniors in the Manufacturing Engineering major. SA: EE 415
CAD/CAM fundamentals, programmable controllers, numerical control, NC part programming, sensors, data acquisition systems.
- 418 Algorithms of Circuit Design**
Fall. 3(3-0) P:M: (ECE 302 and ECE 303 and ECE 366) R: Open only to juniors or seniors or graduate students in the Department of Electrical and Computer Engineering. SA: EE 418
Design of analog electrical circuits, filter functions, ladder synthesis, inductor simulation. Vector Newton-Raphson method. Lossy inductance and capacitance. Statistical tolerance analysis. Optimization by multi-dimensional search. Software algorithms.
- 421 Power System Analysis**
Spring. 4(3-3) P:M: (ECE 320) SA: EE 421
Synchronous machines: models and measurements of power components. Symmetrical components. Short circuit analysis and equipment protection. Load flow. Voltage and frequency control. Operation and planning of power systems.

Electrical and Computer Engineering—ECE

- 457 Communication Systems**
Spring. 3(3-0) P:M: (ECE 302 and ECE 366 and STT 351) R: Open only to juniors or seniors or graduate students in the Department of Electrical and Computer Engineering. SA: EE 457

Representation and processing of signals in the presence of noise. System performance. Modulation, detection, and coding of information. System design applications in radar, sonar, radio, television, satellite communications, digital telephony, and wireless systems.

- 458 Communication Systems Laboratory**
Spring. 1(0-3) P:M: (ECE 303 and ECE 457 or concurrently) SA: EE 458

A projects laboratory in communication systems.

- 466 Digital Signal Processing and Filter Design**

Fall. 3(3-0) P:M: (ECE 366) R: Open only to seniors or graduate students in the Department of Electrical and Computer Engineering. SA: EE 466

Discrete Fourier transforms, sampling theorem, circular convolution, Z-transforms. Design of infinite impulse resistance filters using prototypes and algorithmic methods. Design of finite impulse resistance filters by windowing, frequency sampling.

- 474 Principles of Electronic Devices**
Fall, Spring. 3(3-0) P:M: (ECE 302 and ECE 305) SA: EE 474

Energy levels in atoms. Crystal properties, energy bands and charge carriers, semiconductors, transport properties of bulk materials. P-n junction diodes, bipolar transistors, field effect transistors.

- 476 Electro-Optics**
Fall, Summer. 4(3-3) P:M: (ECE 302 and ECE 303 and ECE 305) R: Open only to juniors or seniors or graduate students in the Electrical Engineering major and juniors or seniors in the Computer Engineering major. SA: EE 476

Operational theory, characteristics and applications of optical components, light emitting diodes, lasers, laser diodes, photodetectors, photovoltaics, fiber optics, optical modulators and non-linear optical devices.

- 477 Microelectronic Fabrication**
Fall. 3(2-3) P:M: (ECE 474 or concurrently) R: Open only to juniors or seniors in the Department of Electrical and Computer Engineering. SA: ECE 483

Microelectronic processing fundamentals and simulations. Comparison of current microfabrication technologies and their limitations.

- 480 Senior Design**
Fall, Spring. 5(3-6) P:M: (ECE 303 and ECE 313 and ECE 320 and ECE 331 and ECE 366) or (CSE 410 and CSE 420) and completion of Tier I writing requirement. R: Open only to seniors in the Department of Electrical and Computer Engineering. SA: ECE 481, ECE 482, ECE 483

Electrical engineering and computer engineering senior design experience involving contemporary design tools and practices, engineering standards, ethics, cross-functional teaming, oral and written technical communication, lifelong learning.

- 484 Applications of Analog Integrated Circuits**
Spring. 4(3-3) P:M: (ECE 302 and ECE 303) R: Open only to juniors or seniors or graduate students in the Department of Electrical and Computer Engineering. SA: EE 484

Circuit design using analog integrated circuits. SPICE macromodeling. Operational amplifiers, comparators, timers, regulators, multipliers and converters. Design project with hardware and software verification.

- 485 Digital Control and Robotics**
Spring. 4(3-3) P:M: (ECE 331 and ECE 313) R: Open only to juniors or seniors or graduate students in the Department of Electrical and Computer Engineering. SA: EE 485

Robot classifications, kinematics, trajectory planning, digital controller design. Design and implementation of sensor-based robots.

- 490 Independent Study**
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 3 credits in all enrollments for this course. R: Approval of department. SA: EE 490

Independent study of a topic in electrical engineering or computer engineering.

- 491 Special Topics**
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open only to students in the Department of Electrical and Computer Engineering. SA: EE 491

Investigation of special topics in electrical engineering or computer engineering.

- 499 Undergraduate Research**
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 4 credits in all enrollments for this course. R: Approval of department. SA: EE 499

Independent undergraduate research in contemporary areas of electrical engineering or computer engineering.

- 150 Engineers and the Engineering Profession**
Spring. 2(2-0) R: Open only to freshmen or sophomores.

Overview of the engineering profession. Historical background. Engineering specialties. Engineers at work. Professionalism and ethics. Communication skills. Future trends and challenges.

- 160 Diversity and Engineering**
Fall, Spring. 2(2-0) P:M: (MTH 116 or concurrently or MTH 132 or concurrently) R: Open only to freshmen or sophomores in the College of Engineering.

Diversity and engineering. Transitional problems. Career options. Communication skills.

- 192 Environmental Issues Seminar**
Fall, Spring. 1 credit. A student may earn a maximum of 4 credits in all enrollments for this course. Interdepartmental with Natural Science; Agriculture and Natural Resources; Social Science; Communication Arts and Sciences. Administered by College of Natural Science. R: Open only to students in the College of Agriculture and Natural Resources or College of Engineering or College of Natural Science or College of Communication Arts and Sciences or College of Social Science. Approval of college.

Environmental issues and problems explored from a variety of perspectives, including legal, scientific, historical, political, socio-economic, and technical points of view.

- 290 Independent Study**
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 4 credits in all enrollments for this course. R: Open only to students in the College of Engineering, approval of college.

Independent undergraduate research in engineering.

- 291 Selected Topics**
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 4 credits in all enrollments for this course. R: Open only to freshmen or sophomores.

Experimental course development or special topics appropriate for freshmen and sophomores.

- 300 Technology, Society and Public Policy**
Fall. 2(2-0) P:M: Completion of Tier I writing requirement. RB: Two courses in mathematics or engineering or science. SA: EGR 200, MSM 300

Defining, describing and analyzing technology. Impact of technology on society. Public policy and technology. Short history of technology. Development and use of assessment tools to measure impact and consequences of technology.

- 393 Engineering Cooperative Education**
Fall, Spring, Summer. 1(1-0) A student may earn a maximum of 6 credits in all enrollments for this course. R: Open only to students in the College of Engineering.

Pre-professional educational employment experiences in industry and government related to student's major. Educational employment assignment approved by College of Engineering.

ENGINEERING EGR

College of Engineering

- 101 Preview of Science**
Fall. 1 credit. Interdepartmental with Natural Science; Agriculture and Natural Resources; Social Science. Administered by College of Natural Science. R: Approval of college.

Overview of natural sciences. Transitional problems. Communications and computer skills. Problem-solving skills. Diversity and ethics problems in science. Science and society.

- 124 Internet and Technology**
Fall, Spring, Summer. 2(2-0)
The Internet from a user perspective and from a technical perspective. History and social impact of the Internet. Internet tools.