

ECEN 220 Signal and Systems I (3:3:0)
3 Semester Credit Hours - Pre-requisite(s): MATH 113
Co-requisite(s): ECEN 221

Introduction to methods of representing continuous-time signals and systems, and interaction between signals and systems. Analysis of signals and systems through differential equations and transform methods; Laplace and Fourier transforms; frequency response of systems; stability in time and frequency domains. Presents application examples from communications, circuits, control, and signal processing.

ECEN 221 Signal and Systems I Lab (1:0:3)
1 Semester Credit Hour - Co-requisite(s): ECEN 220

Laboratory course to accompany ECEN 220. In this course, the student will acquire hands-on experience with programming in MATLAB. Topics include representation of different signals, system linearity and time invariance, analysis of a first - order system, implementing matched filter for Barker codes, response of second - order systems and damping ratio, synthesis periodic signals.

ECEN 280 Electric Circuit Analysis I (3:3:0)
3 Semester Credit Hours - Pre-requisite(s): PHYS 220

Basic circuit concepts and DC analysis, circuit analysis techniques, circuit theories, fundamental operation of operational amplifiers and their applications, transient and steady state analysis of RL, RC, and RLC circuits and basic AC analysis.

ECEN 281 Electric Circuit Analysis I Lab (1:0:3)
1 Semester Credit Hour - Co-requisite(s): ECEN 280 or MENG 231

Laboratory course to accompany ECEN 280. In this course, students will experimentally verify circuit analysis concepts under DC excitation and transient response. They will use different measurement instruments and build DC electric circuits.

ECEN 282 Electric Circuit Analysis II (3:3:0)
3 Semester Credit Hours - Pre-requisite(s): ECEN 280

Review of AC sinusoidal circuit analysis with active and reactive power. Covers magnetically coupled inductors and ideal transformers, three phase circuits, Laplace transform, application of Laplace transform in circuit analysis, passive and active filter analysis and design, two port networks.

ECEN 283 Electric Circuit Analysis II Lab (1:0:3)
1 Semester Credit Hour - Pre-requisite(s): ECEN 281
Co-requisite(s): ECEN 282

Laboratory course to accompany ECEN 282. In this course, students will experimentally verify circuit analysis concepts under steady state AC excitation. They will use different measurement instruments and build AC electric circuits.

ECEN 305 Electromagnetic Theory (3:3:0)
3 Semester Credit Hours - Pre-requisite(s): PHYS 220 and MATH 214

Course uses vector algebra and vector calculus. Covers topics related to electrostatic and magnetostatic fields, electric and magnetic properties of media, electric boundary value problems, Maxwell's equations, electromagnetic waves and plane wave propagation, Poynting theorem and transmission line theory.

- ECEN 320 Signal and Systems II** **(3:3:0)**
3 Semester Credit Hours - Pre-requisite(s): ECEN 220 and MATH 203.
Co-requisite(s): ECEN 321
Methods of representing and analyzing discrete-time signals and systems. Studies effects of converting from continuous-time to discrete time, and presents Z-transform as convenient analysis tool. Emphasizes powerful concept of frequency response of systems developed in first semester. Studies random signals in continuous and discrete time. Presents application examples from communications, circuits, control, and signal processing.
- ECEN 321 Signal and Systems II Lab** **(1:0:3)**
1 Semester Credit Hour - Co-requisite(s): ECEN 320
Laboratory course to accompany ECEN 320. In this course, the student will acquire hands-on experience with programming in MATLAB. The experiments cover sound signals processing using MATLAB, smoothing data, difference equations, and discrete time Fourier transform.
- ECEN 331 Digital System Design** **(3:3:0)**
3 Semester Credit Hours - Pre-requisite(s): PHYS 220
Co-requisite(s): ECEN 332
This course covers principles of digital logic and digital system design. Topics include number systems; Boolean algebra; analysis, design, and minimization of combinational logic circuits; analysis and design of synchronous and asynchronous finite state machines; and an introduction to VHDL and behavioral modeling of combinational and sequential circuits.
- ECEN 332 Digital Systems Design Lab** **(1:0:3)**
1 Semester Credit Hour - Pre-requisite(s): PHYS 220
Co-requisite(s): ECEN 331
Laboratory course to accompany ECEN 331. In this course, the student will acquire hands-on experience with basic logic components, combinational and sequential logic circuits and the use of VHDL.
- ECEN 333 Linear Electronics I** **(3:3:0)**
3 Semester Credit Hours - Pre-requisite(s): ECEN 280
Principles of operation and application of electron devices and linear circuits. Topics include semiconductor properties, diodes, bipolar and field effect transistors, biasing, amplifiers, frequency response, operational amplifiers and analog design.
- ECEN 334 Linear Electronics I Lab** **(1:0:3)**
1 Semester Credit Hour - Pre-requisite(s): ECEN 281
Co-requisite(s): ECEN 333.
Laboratory course to accompany ECEN 333. In this course, the student will acquire hands-on experience with basic Electronic components and circuits. Topics covered include: Semiconductor diodes, rectification, Zener diodes, BJT and FET transistors and Amplifiers.
- ECEN 360 Random Signal and Noise** **(3:3:0)**
3 Semester Credit Hours - Pre-requisite(s): STAT 346 and ECEN 220.
Introduction to set theory, probability, random variables and random processes. Modelling various types of noise encountered in communication systems as random processes. Analyzing the system response in the presence of random noise processes and calculating the power spectral density.

ECEN 431 Digital Circuit Design (3:3:0)

3 Semester Credit Hours - Pre-requisite(s): ECEN 331 and ECEN 333

Analysis and design of discrete and integrated switching circuits. Topics include transient characteristics of diodes, bipolar, and field-effect transistors; MOS and bipolar inverters; non-regenerative and regenerative circuits; TTL, ECL, IIL, NMOS, and CMOS technologies; semiconductor memories; VLSI design principles; and SPICE circuit analysis.

ECEN 432 Nanotechnology Fundamentals & Applications (3:3:0)

3 Semester Credit Hours - Pre-requisite(s): Senior Standing

Students will be provided an introduction to the basic principles of the subject of nanotechnology with minimum mathematics involved. The applications of nanotechnology to various fields such as environment, health, alternative energy and electronics/optics will be addressed and explained. Students will be required to do search projects and present in class.

ECEN 433 Linear Electronics II (3:3:0)

3 Semester Credit Hours - Pre-requisite(s): ECEN 333.

Differential amplifiers, feedback circuits, power amplifiers, feedback amplifier frequency response, analog integrated circuits, operational amplifier systems, oscillators, wide band and microwave amplifiers, and computer-aided design.

ECEN 434 Linear Electronics II Lab (1:0:3)

1 Semester Credit Hour - Pre-requisite(s): ECEN 334.

Co-requisite: ECEN 433

Laboratory course to accompany ECEN 433. In this course, the student will acquire hands-on experience with Electronic Amplifiers, active filters and oscillators. Topics covered include: Cascade amplifiers, differential amplifier, active filters, oscillators, and feedback amplifier concepts. **(Writing Intensive Course)**

ECEN 435 Introduction to Optical Electronics (3:3:0)

3 Semester Credit Hours - Pre-requisite(s): ECEN 305

Co-requisite: ECEN 333

Introduces optoelectronic devices for generation, detection, and modulation of light. Topics include electro-optic modulators, gas, solid state and semiconductor lasers, photo-detectors, and detector arrays.

ECEN 437 Power Electronics (3:3:0)

3 Semester Credit Hours - Pre-requisite(s): ECEN 333

Course examines the application of electronics to energy conversion and control. The subject covers modern power semiconductor devices e.g., diodes, thyristors, MOSFETS, and other insulated gate devices; Static and switching characteristics, gate drive and protection techniques; Various DC-DC, AC-DC and DC-AC converter circuit topologies, their characteristics and control techniques; Analysis of input and output waveforms of these circuits; and their applications. Utility interference and Harmonic issues for power electronics Circuits.

ECEN 460 Communications Systems (3:3:0)

3 Semester Credit Hours - Pre-requisite(s): ECEN 220 and STAT 346

Introduction to analog and digital communications. Topics include review of important concepts from signals and systems theory and probability theory; Gaussian processes and power spectral density; digital transmission through additive white Gaussian channels; sampling and pulse code modulation; analog signal transmission and reception using amplitude, frequency and phase modulation; and effects of noise on analog communication systems.

ECEN 461 Communication Systems Lab (3:3:0)

1 Semester Credit Hour - Pre-requisite(s): ECEN 460

Co-requisite(s): ECEN 464.

Laboratory course to follow ECEN 460 and accompany ECEN 464. In this course, the student will acquire hands-on experience with fundamental blocks of Analog and Digital communication systems. Topics covered include: Amplitude and Angle Modulation and demodulation, sampling and reconstruction, PCM Encoding & PCM Decoding and digital modulation and demodulation.

ECEN 462 Data and Computer Communications (3:3:0)

3 Semester Credit Hours - Pre-requisite(s): ECEN 220 and STAT 346

Introduction to modern data communications and computer networks. Topics include point-to-point communication links and transmission of digital information, modems, and codecs; packet switching, multiplexing, and concentrator design; multi-access and broadcasting; local area and wide area networks; ISDN; architectures and protocols for computer networks; OSI reference model and seven layers; physical interfaces and protocols; and data link control layer and network layer.

ECEN 464 Digital Communication Systems (3:3:0)

3 Semester Credit Hours - Pre-requisite(s): ECEN 460

Co-requisite(s): ECEN 461

Introduces digital transmission systems. Topics include quantization, digital coding of analog waveforms, PCM, DPCM, DM, base band transmission, digital modulation schemes, ASK, FSK, PSK, MSK, QAM, pulse shaping, inter symbol interference, partial response, voice band and wideband modems, digital cable systems, regenerative repeaters, clock recovery and jitter, multi path fading, digital radio design, optimal receiver design, MAP receiver, and probability of error.

ECEN 466 Digital Signal Processing (3:3:0)

3 Semester Credit Hours - Pre-requisite(s): ECEN 320 and STAT 346

This course provides a thorough treatment of digital signal processing including the fundamental theorems and properties of discrete-time linear systems, filtering, sampling, and discrete-time Fourier Analysis.

ECEN 467 Mobile and Wireless Communications (3:3:0)

3 Semester Credit Hours - Pre-requisite(s): ECEN 460

Cellular systems design fundamentals, fading and multipath channels, Modulation techniques for mobile radio systems, Diversity and combining techniques for mobile radio systems, multiple access techniques for mobile systems, Mobile systems and standards.

ECEN 472 Antenna Theory and Design (3:3:0)

3 Semester Credit Hours - Pre-requisite(s): ECEN 305

Course provides the fundamental knowledge in the theory and design of antennas. The theory of electromagnetic radiation is introduced, and the fundamental antenna properties and parameters are explained. Standard antenna characterization parameters such as impedance, far-field radiation pattern, gain, directivity, bandwidth, beam width, polarization, efficiency, antenna temperatures are studied. The electromagnetic theory behind antenna operation and an overview of different antenna systems such as monopoles, dipoles, wire antennas and loop antennas etc. are discussed. The principles of analysis and design of antenna arrays are discussed.

ECEN 473 Radio Frequency and Microwave Engineering (3:3:0)

3 Semester Credit Hours - Pre-requisite(s): ECEN 305

This course covers a broad range of topics in the field of radio frequency (RF) and microwave engineering. This includes transmission lines, waveguides, impedance matching, microwave resonators, RF filters, RF amplifiers, and passive RF and microwave devices (mixers, diplexers, etc.). Furthermore, RF/microwave communications link design will be provided.

ECEN 474 Advanced Information Theory and Coding (3:3:0)

3 Semester Credit Hours - Pre-requisite(s): ECEN 460

Advanced topics in information theory and coding. The course is divided into two main parts, namely, Source coding and data compression, and channel coding and error detection/correction codes. The first part covers, entropy, amount of information source coding techniques, Shannon Fano, Huffman, and Lempel-Ziv codes. The second part covers binary symmetric channels, Z-channels, and E-channels, channel capacity, mutual information, linear block codes and convolutional codes, Viterbi decoders and cyclic redundancy check codes.

ECEN 481 Concepts of Multimedia Processing and Transmission (3:3:0)

3 Semester Credit Hours - Pre-requisite(s): ECEN 320 or CSCI 462

The course introduces the fundamentals of signal processing and communications for multimedia applications. It covers various topics relating to audio, image and video processing, storage and transmission. It discusses the human visual and hearing systems and relates them to image and sound digitization processes. The course also covers various lossless and lossy methods for audio, image and video compression. In addition, it gives the student hands on experience on applying the presented processing techniques using suitable software packages.

ECEN 491 Engineering Seminar (1:1:0)

1 Semester Credit Hour - Pre-requisite(s): Senior Standing

Engineering ethics, professionalism, the role of engineers in society, current topics, and employment opportunities.

ECEN 492 Senior Design Project I (2:0:6)

2 Semester Credit Hours - Pre-requisite(s): Senior Standing

Conception of senior design project and determine of feasibility of proposed project. Includes development of a preliminary design and implementation plan.

ECEN 493 Senior Design Project II (4:0:12)

4 Semester Credit Hours - Pre-requisite(s): ECEN 492

Implementation of project from ECEN 492. Project includes designing and constructing hardware, writing

required software, conducting experiments or studies, and testing complete system. Requires oral and written reports during project and at completion.

ECEN 499 Special Topics in ECEN

(3:3:0)

3 Semester Credit Hours - Pre-requisite(s): Senior Standing

Advanced and emerging topics in electronics and communication engineering. Topics are announced through the Schedule of Class

