

# Electrical and Computer Engineering Courses

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## Courses

### **ECE 1100. Lab for ECE 1300.**

Laboratory course to support hands-on activities associated with ECE 1300 introduction to Electrical and Computer Engineering.

**1 Credit Hour**

#### **3 Total Contact Hours**

3 Lab Hours

0 Lecture Hours

0 Other Hours

**Corequisite(s):** ECE 1300

### **ECE 1300. Intro to Electr/Comp Eng.**

This course provides an introduction to electrical and computer engineering, taught using substantial hands-on experiences.

**3 Credit Hours**

#### **3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (MATH 1508 w/C or better ) OR (MATH 1310 w/C or better)

**Corequisite(s):** ECE 1100

### **ECE 2102. Lab for ECE 2302.**

Use of oscilloscopes, function generators, and power supplies to test and study electrical networks and their behavior. Technical writing and computer aided design.

**1 Credit Hour**

#### **3 Total Contact Hours**

3 Lab Hours

0 Lecture Hours

0 Other Hours

**Prerequisite(s):** (ECE 1100 w/C or better)

**Corequisite(s):** ECE 2302

### **ECE 2103. Lab for ECE 2303.**

Implementation and testing of basic combinational and sequential digital systems.

**1 Credit Hour**

#### **3 Total Contact Hours**

3 Lab Hours

0 Lecture Hours

0 Other Hours

**Prerequisite(s):** (ECE 1100 w/C or better AND ECE 1300 w/C or better ) OR (CS 1101 w/C or better AND CS 1301 w/C or better ) OR (CS 1401 w/C or better)

**Corequisite(s):** ECE 2303

### **ECE 2104. Lab for ECE 2304.**

Assembly language programming of microcomputer systems.

**1 Credit Hour**

#### **3 Total Contact Hours**

3 Lab Hours

0 Lecture Hours

0 Other Hours

**Prerequisite(s):** (ECE 2103 w/C or better AND ECE 2300 w/C or better AND ECE 2303 w/C or better)

**Corequisite(s):** ECE 2304

**ECE 2300. Software Design I.**

Foundations of data structures and algorithms. These foundations include: space and time complexity analysis, the use of data structures such as linked lists and binary trees, basic sorting and searching algorithms, and foundations of software testing/verification/validation.

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (CS 1320 w/C or better)

**ECE 2301. Electric Circuits I.**

Introduction to systematic methodologies for the analysis of electrical circuits in DC and AC steady state. Use of simulation tools for steady state circuits analysis.

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (ECE 1300 w/C or better AND MATH 1312 w/C or better ) AND (PHYS 2120 w/C or better AND PHYS 2320 w/C or better ) OR (PHYS 2420 w/C or better)

**ECE 2302. Electric Circuits II.**

Analysis of transient behavior in first-order and second order circuits. Circuit analysis using the Laplace transforms. Network functions and frequency response representation of circuits. Frequency selective circuits. Resonance in electric circuits. Steady-state analysis of circuits fed by non-sinusoidal periodic signals using Fourier series. Two-port networks. Computer-aided analysis of circuits.

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (ECE 2301 w/C or better AND MATH 2326 w/C or better AND PHYS 2121 w/C or better AND PHYS 2321 w/C or better ) OR (PHYS 2421 w/C or better)

**Corequisite(s):** ECE 2102

**ECE 2303. Digital Systems Design I.**

Design and synthesis of digital systems using both combinational and sequential circuits. Includes laboratory projects implemented with standard ICs.

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (ECE 1100 w/C or better AND ECE 1300 w/C or better ) OR (CS 1101 w/C or better AND CS 1301 w/C or better ) OR (CS 1401 w/C or better)

**Corequisite(s):** ECE 2103

**ECE 2304. Microprocessor Systems I.**

Study of microprocessor programming models, assembly language, macro assembles, and an introduction to system integration and interfacing.

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (ECE 2300 w/C or better AND ECE 2301 w/C or better AND ECE 2303 w/C or better)

**Corequisite(s):** ECE 2104

**ECE 2331. Cont. Time Signals & Systems.**

Representation and analysis of continuous time signals; time and frequency analysis of linear time-invariant systems; convolution, differential equations, Laplace systems; convolution, differential equations, Laplace

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (ECE 2302 w/C or better ) AND (MATH 1312 w/C or better AND MATH 2326 w/C or better)

**ECE 3100. Junior Prof. Orientation.**

Professional Orientation for Junior Electrical/Computer Engineering Students. Introduction to the engineering profession with emphasis on systems engineering, job placement, and professional and ethical conduct in the engineering workplace. Required of all students prior to graduation.

**1 Credit Hour**

**1 Total Contact Hour**

0 Lab Hours

1 Lecture Hour

0 Other Hours

**Classification Restrictions:**

Restricted to class of JR,SR

**ECE 3141. Lab for ECE 3341.**

Introduction to experimental analysis of junction diodes, bipolar junction field effect transistors. Frequency response measurements of operational amplifier circuits. Fourier analysis. PSPICE simulations.

**1 Credit Hour**

**3 Total Contact Hours**

3 Lab Hours

0 Lecture Hours

0 Other Hours

**Prerequisite(s):** (ECE 2102 w/C or better AND ECE 2302 w/C or better)

**Corequisite(s):** ECE 3341

**ECE 3170. Lab for ECE 3370.**

The objective is to apply the theory covered in the lecture to analyze and simulate the behavior of communication technologies.

**1 Credit Hour**

**3 Total Contact Hours**

3 Lab Hours

0 Lecture Hours

0 Other Hours

**Corequisite(s):** ECE 3370

**ECE 3193. Undergraduate Service Learning.**

Undergraduate Service Learning Undergraduate students will engage in projects with a community partner to apply their engineering skills in service-learning activities under the mentorship of a faculty member from the ECE Department. Students are expected to devote the equivalent of at least 3 hours of work per week of actual work per credit hour. A report covering the service experience will be submitted by the student to the faculty mentor at the end of each semester. Faculty approval required prior to enrollment.

**1 Credit Hour**

**3 Total Contact Hours**

0 Lab Hours

0 Lecture Hours

3 Other Hours

**Major Restrictions:**

Restricted to majors of CPE, EE, LDCP

**Classification Restrictions:**

Restricted to class of JR,SR

**ECE 3194. Undergraduate Research.**

Undergraduate Research Undergraduate students conduct research work under the mentorship of a faculty member from the ECE Department. Students are expected to devote at minimum 3 hours of work per week of effective research. Faculty approval required prior to enrollment.

**1 Credit Hour**

**3 Total Contact Hours**

0 Lab Hours

0 Lecture Hours

3 Other Hours

**Major Restrictions:**

Restricted to majors of CPE, EE, LDCP, LDEE

**Classification Restrictions:**

Restricted to class of JR,SO

**ECE 3310. Energy Conversion.**

Energy Conversion (3-0) Theory and performance characteristics of electro-mechanical energy conversion equipment to include transformers and both d-c and a-c generators and motors and the control devices employed therewith.

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (ECE 3320 w/C or better ) AND (PHYS 2420 w/C or better ) OR (PHYS 2120 w/C or better AND PHYS 2320 w/C or better)

**ECE 3320. Electromagnetic Field Theory.**

Electromagnetic Field Theory (3-0) Fundamental laws and concepts of static and time- varying electromagnetics, wave propagation in free space and lossy media, wave reflections, transmission lines, basic radiation sources and arrays.

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (ECE 2301 w/C or better ) AND (PHYS 2421 w/C or better ) OR (PHYS 2121 w/C or better AND PHYS 2321 w/C or better ) AND (MATH 2313 w/C or better AND MATH 2326 w/C or better)

**ECE 3331. Discrete Time Signals & Sys.**

Representation and analysis of discrete time signals and systems, digital filtering, sampling, spectrum analysis, Z-transform, DT Fourier transform, and the DFT. Emphasizes computer simulations and some basic applications to communications, control and signal processing.

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (CS 1320 w/C or better AND ECE 2301 w/C or better)

**ECE 3332. Prob with App Elect/Comp Eng.**

An introduction to probability, sets, combinatorics, discrete and continuous random variables, single and multiple random variables, probability and cumulative functions, conditional probability, statistical independence, moments of random variables, and functions of random variables. In addition, the course presents applications of probability in areas such as quantization, data compression, estimation, detection, clustering, and queueing. Computer simulations provide motivation and facilitate understanding of the theory and applications.

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (ECE 2302 w/C or better AND ECE 3331 w/C or better)

**ECE 3341. Electronics I.**

Electronics I is an introduction to electronic devices and circuits: Amplifier concepts, diodes, field effect transistor amplifiers, bipolar junction transistor amplifiers.

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (ECE 2302 w/C or better)

**Corequisite(s):** ECE 3141

**ECE 3342. Electronics II.**

Electronics II (3-0) Analysis and design of linear integrated circuits stressing impedance levels, gains and frequency responses. Complex plane concepts. Active filter and oscillator design. Pulse response and stability analysis.

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (ECE 3341 w/C or better)

**ECE 3343. Applied Quantum Mech for EE.**

An introductory course designed to provide students with a fundamental understanding of electron energy, electron/ photon interaction, and electron energy transitions; electr- omagnetic wave theory and quantization of photon energy; laser theory and operation; and advanced applications such as quantum dots, zener diodes and resonant tunneling diodes. This includes applying boundary conditions to solve the time independent Schrodinger's equation, normalization of the wave function, and applying fundamental solutions such as wave function, and applying fundamental solutions such as potential well to laser, quantum dot and tunneling applicat- ions.

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (EE 2350 w/C or better ) AND (PHYS 2421 w/C or better ) OR (PHYS 2121 w/C or better AND PHYS 2321 w/C or better ) AND (MATH 1312 w/C or better AND MATH 2326 w/C or better)

**ECE 3344. Fund. of Semiconductor Dev.**

Fundamentals of Semiconductor Devices (3-0) Energy band models, electron and hole concentrations and transport, P-N junction, bipolar junction transistors, and field effect devices.

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (ECE 3341 w/C or better AND PHYS 2421 w/C or better ) OR (PHYS 2121 w/C or better AND PHYS 2321 w/C or better)

**ECE 3350. Software Design II.**

Object-oriented software design (including polymorphism), multi-threaded programming techniques, algorithmic complexity analysis, classes of algorithms, heuristic algorithms, and basics of database systems. Utilize the C and C++ programming languages in a Linux development environment using the GNU toolchain.

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (ECE 2300 w/C or better)

**ECE 3351. Computer Architecture.**

Binary representation of characters, integers, floating point numbers and assembly language instructions. Integer arithmetic circuit design. Data path and control path design of a non-pipelined and pipelined microprocessor. Multi-processing architectures. Hierarchical memory design.

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (ECE 2304 w/C or better)

**ECE 3352. Operating System Design.**

Design and implementation of single and multiuser operating systems. Topics include OS structure, process management, interprocess, communication within and between CPUs, memory management, file systems, and I/O. Contemporary operating systems provide design examples.

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (ECE 2300 w/C or better AND ECE 2304 w/C or better)

**ECE 3360. Intro Robotics and Auto Syst.**

Introduction to Robotics and Autonomous Systems: Robotics and autonomous systems are rapidly growing technologies inside of engineering to increase the efficiency of existing processes, as well as to provide new capabilities to benefit humanity. This project based class seeks to provide an introduction to robotics fundamentals including embedded programming, control systems, sensors, motors, navigation, obstacle avoidance, and state machines.

**3 Credit Hours**

**5 Total Contact Hours**

3 Lab Hours

2 Lecture Hours

0 Other Hours

**Prerequisite(s):** (ECE 2303 w/C or better AND ECE 3331 w/C or better)

**ECE 3370. Intro to Communication Netwks.**

Familiarization with communication networks through simulation experiments done with computer software. Topics include Protocol Layers, Link Analysis, Circuit and Packet switches, LANs, and Internet Protocols.

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (ECE 2300 w/C or better AND ECE 2302 w/C or better AND ECE 3331 w/C or better)

**Corequisite(s):** ECE 3170

**ECE 4140. Lab for ECE 4340.**

ECE 4140: Laboratory for ECE 4340 (0-1) Simulation, fabrication, and testing of MOS technology. Includes silicon oxidation, lithography, etching, thin film deposition, and diffusion.

**1 Credit Hour**

**1 Total Contact Hour**

1 Lab Hour

0 Lecture Hours

0 Other Hours

**Prerequisite(s):** (EE 3329 w/C or better)

**Corequisite(s):** EE 4353

**ECE 4145. Biomedical Instrumentation Lab.**

Biomedical Instrumentation Laboratory Research into development, implementation, testing, and validation of wired or wireless biomedical instruments using state-of-the-art mobile technologies.

**1 Credit Hour**

**3 Total Contact Hours**

3 Lab Hours

0 Lecture Hours

0 Other Hours

**Prerequisite(s):** (EE 3340 w/C or better)

**ECE 4153. Lab for ECE 4353.**

Design and verification of digital systems using simulation. Laboratory implementation using standard, integrated circuits and programmable logic devices.

**1 Credit Hour**

**3 Total Contact Hours**

3 Lab Hours

0 Lecture Hours

0 Other Hours

**Prerequisite(s):** (ECE 2104 w/C or better AND ECE 2304 w/C or better)

**Corequisite(s):** ECE 4353

**ECE 4154. Lab for ECE 4354.**

Use of development tools in the design and implementation of microprocessor-based systems.

**1 Credit Hour**

**3 Total Contact Hours**

3 Lab Hours

0 Lecture Hours

0 Other Hours

**Prerequisite(s):** (ECE 2104 w/C or better AND ECE 2304 w/C or better)

**Corequisite(s):** ECE 4354

**ECE 4181. Co-op Work Experiences.**

Work experience in business, industrial, governmental, professional, service, or other organizations to provide on-the-job training and professional preparation in the student's area of interest. A report covering the work experience must be submitted by the student to the departmental Co-op Coordinator at the end of each work period. Upon completion of his or her third work period and submission of a report summarizing the total work experience, a student can use three hours of Co-op Work Experience in his or her degree plan in place of a technical elective or elective in the major.

**1 Credit Hour**

**1 Total Contact Hour**

0 Lab Hours

0 Lecture Hours

1 Other Hour

**Major Restrictions:**

Restricted to majors of CPE, EE, LDCP

**Classification Restrictions:**

Restricted to class of JR,SR

**ECE 4182. Co-op Work Experiences.**

Work experience in business, industrial, governmental, professional, service, or other organizations to provide on-the-job training and professional preparation in the student's area of interest. A report covering the work experience must be submitted by the student to the departmental co-op coordinator at the end of each work period. Upon completion of his or her third work period and submission of a report summarizing the total work experience, a student can use three hours of Co-op Work Experience in his or her degree plan in place of a technical elective or elective in the major.

**1 Credit Hour**

**1 Total Contact Hour**

0 Lab Hours

0 Lecture Hours

1 Other Hour

**Major Restrictions:**

Restricted to majors of CPE, EE, LDCP

**Classification Restrictions:**

Restricted to class of JR,SR

**ECE 4183. Co-op Work Experiences.**

Work experiences in business, industrial, governmental, professional, service, or other organizations to provide on-the-job training and professional preparation in the student's area of interest. A report covering the work experience must be submitted by the student to the departmental Co-op Coordinator at the end of each work period. Upon completion of his or her third work period and submission of a report summarizing the total work experience, a student can use three hours of Co-op Work Experience in his or her degree plan in place of a technical elective or elective in the major.

**1 Credit Hour**

**1 Total Contact Hour**

0 Lab Hours

0 Lecture Hours

1 Other Hour

**ECE 4190. Special Topics Lab in ECE.**

Co-op Work Experiences (0-0-1) Work experience in business, industrial, governmental, professional, service, or other organizations to provide on-the-job training and professional preparation in the student's area of interest. A report covering the work experience must be submitted by the student to the departmental Co-op Coordinator at the end of each work period. Upon completion of his or her third work period and submission of a report summarizing the total work experience, a student can use three hours of Co-op Work Experience in his or her degree plan in place of a technical elective or elective in the major.

**1 Credit Hour**

**1 Total Contact Hour**

0 Lab Hours

0 Lecture Hours

1 Other Hour

**ECE 4191. Engineering Problems.**

Engineering Problems (0-0-1) Original investigation of special problems in the student's field, the problem to be selected by the student with the approval of the head of the department. A maximum of three credit hours of Engineering Problems may be applied toward the BS Degree.

**1 Credit Hour**

**1 Total Contact Hour**

0 Lab Hours

0 Lecture Hours

1 Other Hour

**ECE 4193. Undergrad Services Learning.**

Undergraduate Services Learning Undergraduate students will engage in projects with a community partner to apply their engineering skills in service-learning activities under the mentorship of a faculty member from the ECE Department. Students are expected to devote the equivalent of at least 3 hours of work per week of actual work per credit hour. A report covering the service experience will be submitted by the student to the faculty mentor at the end of each semester. Faculty approval required prior to enrollment.

**1 Credit Hour**

**3 Total Contact Hours**

0 Lab Hours

0 Lecture Hours

3 Other Hours

**Major Restrictions:**

Restricted to majors of CPE, EE, LDCP

**Classification Restrictions:**

Restricted to class of JR,SR



**ECE 4194. Undergraduate Research.**

Undergraduate Research Undergraduate students conduct research work under the mentorship of a faculty member from the ECE Department. Students are expected to devote at minimum 3 hours of work per week of effective research. Faculty approval required prior to enrollment.

**1 Credit Hour**

**3 Total Contact Hours**

0 Lab Hours

0 Lecture Hours

3 Other Hours

**Major Restrictions:**

Restricted to majors of CPE, EE, LDCP

**Classification Restrictions:**

Restricted to class of JR,SR

**ECE 4201. CpE Capstone Project Lab I.**

Research & Analysis leading to a preliminary design for an approved engineering project. Includes formal project proposal and work plan; specification of functional, performance and cost goals; generation of computer-aided design documents and simulation or modeling results. Design process is concluded in ECE 4202 through prototyping, testing and revisions.

**2 Credit Hours**

**4 Total Contact Hours**

3 Lab Hours

1 Lecture Hour

0 Other Hours

**Prerequisite(s):** (CE 2326 w/C or better AND ECE 2104 w/C or better AND ECE 2303 w/C or better AND ECE 2304 w/C or better AND ECE 3100 w/C or better AND ECE 3141 w/C or better AND ECE 3331 w/C or better AND ECE 3341 w/C or better AND ECE 3350 w/C or better AND ECE 3351 w/C or better AND ECE 3352 w/C or better)

**ECE 4202. CpE Capstone Project Lab II.**

Design revisions, implementation and testing of a prototype of a design project started in ECE 4201.

**2 Credit Hours**

**4 Total Contact Hours**

3 Lab Hours

1 Lecture Hour

0 Other Hours

**Prerequisite(s):** (ECE 4201 w/C or better)

**ECE 4203. EE Capstone Project Lab I.**

Research and analysis leading to a preliminary design for an engineering project. Includes formal project proposal and work plan; specification of functional, performance and cost goals; generation of computer-aided design documents; simulation, modeling, or prototyping results. Design process is concluded in ECE 4204 through prototyping, testing and revisions. Can be taken concurrently with no more than two of the following courses ECE 3100, ECE 3320, ECE 3331, ECE 3342 or ECE 3343.

**2 Credit Hours**

**6 Total Contact Hours**

4 Lab Hours

2 Lecture Hours

0 Other Hours

**Major Restrictions:**

Restricted to majors of EE

**Prerequisite(s):** (ECE 3100 w/C or better ) AND (ECE 2104 w/C or better ) AND (ECE 3320 w/C or better ) AND (ECE 3343 w/C or better ) AND (ECE 3342 w/C or better ) AND (ECE 3331 w/C or better ) AND (ECE 2304 w/C or better ) AND (ECE 3141 w/C or better ) AND (CE 2326 w/C or better)

**ECE 4204. EE Capstone Project Lab II.**

Design revisions, implementation and testing of a prototype of a design project started in ECE 4203.

**2 Credit Hours**

**3 Total Contact Hours**

2 Lab Hours

1 Lecture Hour

0 Other Hours

**Major Restrictions:**

Restricted to majors of EE

**Prerequisite(s):** (ECE 4203 w/C or better)

**ECE 4301. Computational Methods In EE.**

Computational Methods in Electrical Engineering (3-0) A presentation of the fundamental numerical techniques used in engineering, including solution of systems of linear and nonlinear equations, interpolation and curve-fitting, solution of ordinary and partial differential equations.

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (ECE 3320 w/C or better)

**ECE 4310. Applied Photovoltaics.**

Applied Photovoltaics Semiconductors have emerged as the most promising material class of materials that can convert sunlight directly into electrical energy. This course presents the fundamental principles of the solar energy conversion process and the most common cell technologies are discussed. This course will also cover a range of fundamental problems and the relationship between the physics, material science, and technology aspects of solar cell development.

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (EE 3329 w/C or better ) OR (MME 3309 w/C or better)

**ECE 4312. Transmission Power Flow Cont..**

This course introduces the students to basic optimization problems in transmission-level power system operations and planning, including basic knowledge about linear optimization, optimal power flow, unit commitment, and an introduction to the applications of power flow control technologies in power systems, such as transmission switching and flexible AC transmission systems (FACTS).

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (ECE 2300 w/C or better AND ECE 2302 w/C or better)

**ECE 4315. Intro to Power Electronics.**

Introduction to the architecture and operating principles of electronic power converters. Modeling, simulation, and design of electronic power converters. Applications in areas such as power supplies, aerospace and vehicular power systems, and renewable energy will be discussed.

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (ECE 3310 w/C or better AND ECE 3341 w/C or better)

**ECE 4320. Applied Electromagnetics.**

Applied Electromagnetics (3-0) The study of static and time-varying electromagnetic principles and laws in their application to modern technology, natural phenomena, as well as to scientific and industrial devices and systems from dc to microwave frequencies.

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (ECE 3310 w/C or better AND ECE 3341 w/C or better)

**ECE 4321. Microwave Engineering.**

Microwave Engineering (3-0) Primarily a senior level undergraduate course concerning distributed-elements analysis and design of electric circuits at microwave frequencies. Topics include transmission lines, waveguides, two-port microwave circuits, matching, tuning, resonators, dividers, and directional couplers.

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (EE 3321 w/C or better)

**ECE 4322. Antenna Engineering.**

Antenna Engineering (3-0) Introductory antenna theory and design. Fundamentals and definitions, simple radiating systems, arrays, line sources, wire antennas, broadband antennas, and antenna measurements.

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (ECE 3320 w/C or better)

**ECE 4323. High Resolution Radar.**

High Resolution Radar (3-0) Basic theory for design and analysis of radar systems that perform target and surface imaging. Concepts and definitions, the radar range equation, modern radar design, wideband waveforms and signal processing, synthetic high resolution radar, synthetic aperture concepts.

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (EE 3321 w/C or better AND EE 3353 w/C or better)

**ECE 4330. Digital Signal Processing.**

Digital Signal Processing (3-0) An introduction to basic one-dimensional processing methods including: sampling and quantization; discrete-time Fourier and z-domain LTI systems analysis, theory of operation and computational aspects of FIR and IIR digital filters; the discrete Fourier transform and its application to spectral analysis.

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (ECE 3331 w/C or better)

**ECE 4332. Real-Time Digital Signal Proc.**

Real-Time Digital Signal Processing: Programming-intensive project- based course emphasizing practical application of Digital Signal Processing (DSP) algorithms implemented on a DSP development system. Topics covered include sampling and reconstruction, digital filtering, fast Fourier transform, spectrum analysis, and modulation.

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (EE 3353 w/C or better AND EE 3376 w/C or better ) OR (CS 3432 w/C or better)

**ECE 4335. Digital Communications.**

Digital Communications (3-0) Techniques of sampling; digital basedband transmission; digital modulation schemes; introduction to coding and fundamental limits on system performance.

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (EE 3353 w/C or better AND EE 3384 w/C or better)

**ECE 4336. Fiber Optic Communication.**

Fiber Optic Communication (3-0) Light propagation using ray and electromagnetic mode theories, dielectric slab waveguides, optical fibers attenuation and dispersion in optical fibers, optical fiber transmitters and receivers, electro-optical devices, and optical fiber measurement techniques.

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (ECE 3320 w/C or better AND ECE 3341 w/C or better)

**ECE 4338. Systems and Controls.**

Systems and Controls (3-0) Analysis and design of discrete and continuous time linear systems. Relationships between frequency and time domain design. Analysis of system stability and performance using root locus, lead lag compensation, and other techniques. Applications to practical systems.

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (EE 2351 w/C or better AND EE 2353 w/C or better)

**ECE 4340. VLSI Nanotechnology.**

Introduction to the science and technology of integrated device/circuit fabrication. Includes silicon oxidation, lithography, etching, thin film deposition, diffusion and ion implantation.

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (EE 3329 w/C or better)

**ECE 4341. Theory & Appl Contemp Devices.**

Theory and Application of Contemporary Devices: Theory and application of contemporary devices based on electronic, optoelectronic, electromechanical, and other operating principles for analog, digital and quantum applications. May be repeated once for credit with departmental approval.

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (EE 3325 w/C or better AND EE 3329 w/C or better)

**ECE 4345. Biomedical Instrumentation.**

Biomedical Instrumentation (3-0) An introduction to basic concepts in biomedical instrumentation, blood flow measurement, biopotential amplifiers and electrodes as well as electrical safety of medical equipment.

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (EE 3340 w/C or better)

**ECE 4353. Digital Systems Design II.**

Design techniques for complex digital systems, with emphasis on computer hardware design and computer-aided techniques, including hardware description languages and hardware simulation packages. Algorithmic State Machine design is stressed for small systems. Emphasis on problem definition, design, and verification.

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (ECE 2304 w/C or better)

**Corequisite(s):** ECE 4153

**ECE 4354. Microprocessor Systems II.**

A study of a 16/32 bit microprocessor family and companion devices and various design aspects of microprocessor systems.

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (ECE 2304 w/C or better)

**Corequisite(s):** ECE 4154

**ECE 4355. VLSI Design.**

Introduction to CMOS VLSI design and computer-aided VLSI design tools. A term project is required that involves high-level design approaches, layout editing, simulation, logic verification timing analysis, and testing.

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (ECE 3341 w/C or better)

**ECE 4360. Foundations of Deep Learning.**

Concepts and techniques in deep learning in AI. Historical and current paradigms for implementation, and their applications.

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (ECE 2300 w/C or better AND ECE 3331 w/C or better)

**ECE 4361. Fuzzy Logic and Engineering.**

Underlying philosophy of the theory of fuzzy sets and its applications in engineering. Fuzzy logic, fuzzy reasoning and rules, and fuzzy systems. Decision-making in the realm of vague, qualitative and imprecise data. Current models, simulation tools, hardware implementations and their applications will also be covered.

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (ECE 3331 w/C or better AND ECE 3332 w/C or better)

**ECE 4362. Computer Vision.**

Fundamental concepts associated with the construction of meaningful understanding of physical objects from images/video; including basic animal vision structure/operation, image segmentation/understanding, knowledge representation, matching and inference.

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (CS 1320 w/C or better AND ECE 2301 w/C or better)

**ECE 4370. Introduction to Cybersecurity.**

Cryptography is an indispensable tool for protecting information in computer systems. In this course, students will be introduced to cryptographic systems, how they work, and their usage in real-world applications. Students will learn about security issues in computer communications, about cryptographic tools and their implementation on MSP 430/432, Arduino or Rasp Pi. The lessons are primarily aimed at beginners, all mathematical concepts will be covered in detail. Throughout the course, participants will be exposed to many exciting open problems in the field and work on hands on projects.

**3 Credit Hours****3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (ECE 2304 w/C or better AND MATH 2300 w/C or better)**ECE 4383. Biomedical Signal & Image Proc.**

Principles, methods, and algorithms for processing biomedical signals. Application of advanced DSP techniques to a number of problems in biomedical research and clinical medicine. Topics include biomedical data acquisition, filtering, feature extraction, modeling and imaging, with examples from cardiology, neurophysiology, muscular physiology, and medical imaging.

**3 Credit Hours****3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (EE 3353 w/C or better)**ECE 4390. Special Topics.**

Selected topics of current interest in Electrical/Computer Engineering.

**3 Credit Hours****3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Major Restrictions:**

Restricted to majors of EE

**ECE 4391. Engineering Problems Seminar.**

Engineering Problems (0-0-3) Original investigation of special problems in the student's field, the problem to be selected by the student with the approval of the head of the department. A maximum of three credit hours of engineering problems may be applied toward the BS degree.

**3 Credit Hours****3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**ECE 4394. Undergraduate Research.**

Undergraduate Research Undergraduate students conduct research work under the mentorship of a faculty member from the ECE Department. Students are expected to devote at minimum 9 hours of work per week of effective research. Faculty approval required prior enrollment.

**3 Credit Hours****9 Total Contact Hours**

0 Lab Hours

0 Lecture Hours

9 Other Hours

**Major Restrictions:**

Restricted to majors of CPE, EE, LDCP

**Classification Restrictions:**

Restricted to class of JR,SR

**ECE 4396. Practicum in Elect & Comp Eng.**

Practicum in Electrical and Computer Engineering Internship experience in electrical or computer engineering under the supervision of a ECE faculty member and an external technical supervisor. The practicum is designed to provide ECE students with the opportunity to integrate the knowledge and skills developed during their academic program in a structured, supervised, real-world professional setting under the direction of a site supervisor.

Requires a project proposal approved by the faculty member and a final report.

**3 Credit Hours**

**9 Total Contact Hours**

0 Lab Hours

0 Lecture Hours

9 Other Hours