ECE/CS 3110: Engineering Electronics II

Credits and Contact Hours: 4.0 Credit Hours
15 weeks: Two 80-minute lectures + one 3-hour lab per week

Instructor’s Name: Jeffrey Walling

Text Book(s) and/or Required Material:

Catalog Description: Analog- and digital-integrated circuit techniques, filters and tuned amplifiers, signal generator, waveform shaping circuits, power amplifier and power semiconductor devices, computer models and computer simulations of complex devices and circuits.

Prerequisites: C- or better in:
- ECE 2280: Fundamentals of Engineering Electronics; and
- Full major status in Computer Engineering

Designation: Selected Elective

Contribution of Course to Meeting the Requirements of ABET Criterion 5: This course teaches engineering sciences and engineering design.

Specific Outcomes of Instruction: In this course, students will be prepared to:
1. Understand basic concepts in circuit analysis.
2. Analyze complicated circuit schematics by breaking them into smaller pieces for ease of analysis.
3. Design analog circuit building blocks based on a given set of specifications.
4. Use CAD tools (e.g., Multisim, PSPICE, etc.) to aid the analysis and design of electronic circuits.

Relationship of the Course to the Program Outcomes:
(a) An ability to apply knowledge of mathematics, science, and engineering. Students apply fundamental concepts learned earlier, including circuit analysis, small-signal models of nonlinear elements, and Bode plots. Students apply this background knowledge and material learned in the course specifically when solving homework problems.
(b) An ability to design and conduct experiments, to analyze and interpret data, and to debug and analyze software. All labs require that data be collected, interpreted, and presented in a report.
(c) An ability to design a system, component, process or software package to meet desired needs. The labs require students to build circuits that meet particular performance criteria. Additionally, two of the labs are oriented for the students to optimize a design relative to cost, complexity and performance factors.
(e) An ability to identify, formulate, and solve engineering problems. In the labs, students must develop solutions for problems encountered. All of the labs require design inputs from the students. The latter two labs require significant inputs and optimizations that are graded on a competition basis.

(g) An ability to communicate effectively. Results of labs are submitted in written form.

(k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice. Students use the circuit simulation software PSPICE extensively in lab assignments. Students use PCs for data acquisition. In lab assignments, students use digitizing oscilloscopes, power supplies, and function generators.

Topics Covered in the Course:
- Small-signal models
- Transistor amplifier inspection analysis
- Frequency response and analysis
- Load circuits
- Current sources
- Voltage amplifiers and current source matching
- Differential pairs
- Active loaded SCP
- Effects of finite gain and offset voltage in op-amps
- Closed-loop and open-loop/folded cascode gain stage
- Two-stage op-amp
- Stability and Compensation
- Negative feedback
- RLC circuits
- Active inductors