ECE 2280: Fundamentals of Engineering Electronics

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

Instructor's Name: Darrin Young

Text Book(s) and/or Required Material:

- B. Razavi, *Fundamentals of Microelectronics*, Second Edition, Wiley, 2013

Catalog Description: Fundamentals of electronic circuit and device concepts needed to understand analog integrated circuits. Device model techniques for amplifiers, diodes, bipolar, and MOS transistors. Basic microelectronic circuit analysis and design. Use of small-signal and large-signal techniques to analyze and design transistor circuits with examples focused on single and multistage amplifiers. Frequency response analysis of microelectronic circuits including magnitude and phase response. Introduction to computer circuit simulation.

Prerequisites: C- or better in:

- ECE 2240: Introduction to Electric Circuits; **and**
- Full major status in Computer Engineering

Corequisites:

- MATH 2250: Differential Equations and Linear Algebra

Designation: Required

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

Specific Outcomes of Instruction:

1. Understanding of signal response in frequency domain (Bode Plots)
2. Characteristics, analysis and design using operational amplifiers
3. Characteristics of diodes, BJTs and MOSFETs
4. Analysis and design of diodes, BJTs and MOSFETs in electronic circuits
5. Efficient at using PSPICE
6. Become a better problem solver

Relationship of the Course to the Program Outcomes:

(a) An ability to apply knowledge of mathematics, science, and engineering. Students use fundamental DC and steady-state AC circuit theory learned earlier and apply this background knowledge with new material learned in the course. They practice these skills by solving homework and exam problems, and when working in the lab.

(b) An ability to design and conduct experiments, as well as to analyze and interpret data, and to debug and analyze software. Students use experimental techniques and basic engineering instruments to observe the workings of circuits and to take data which they record in a

laboratory notebook. They interpret this data and compare it to theory and computer simulations.

(c) An ability to design a system, component, process or software package to meet desired needs. Students are exposed to a wide variety of devices, circuit designs, analysis methods, and design techniques. They learn the characteristics of basic building blocks so that they can later use them to meet desired needs in complex designs.

(d) An ability to function on multidisciplinary teams. Both electrical engineering and computer engineering students take this class; Students are encouraged with work together for problems solving.

(e) An ability to identify, formulate, and solve engineering problems. Students learn about basic building blocks and methods used to solve electrical engineering problems.

(g) An ability to communicate effectively. The results of the labs are submitted in written form. Some exam questions require short answers.

(k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice. Students practice analysis techniques and skills as they learn them. In the labs they make extensive use of modern lab equipment. They are introduced to a SPICE simulation program and use it in conjunction with lab experiments.

Topics Covered in the Course:

- Bode plots
- PSPICE
- Operational amplifiers
- Diodes
- BJT transistors
- MOSFET
- Cascode stages
- Current mirrors