EE 310 – Electronic Circuit Design I

Designation: Required core course for electrical and computer engineering majors.

University Bulletin Description: EE 310: (4) Properties of fundamental electronic devices, analysis of DC, AC small-signal and nonlinear behavior, analog and digital circuit design applications. Prerequisite: EE 210.

Prerequisites by Topics:
1. Understanding and the ability to use linear algebra and complex variables in the solution of linear circuits.
2. Understanding of basic linear circuit constants and variables.
3. Understanding and the ability to apply network theorems to the analysis of circuits.
4. Proficiency in the use of Multisim or PSpice for circuit analysis.
5. Proficiency in the use of basic test equipment (oscilloscope, function generator, power supply).

Textbook/Required Materials: *Microelectronics*: *Circuit Analysis and Design*, 3rd ed., Neamen, Donald A., McGraw-Hill, 2007.

Learning Outcomes:
This course provides the foundational education in electronic circuit analysis and design. Through lecture, laboratory, and out-of-class assignments, students are provided learning experiences that enable them to:
1. Analyze and design basic electronic circuits, particularly with application to diodes, MOS field-effect transistors, bipolar junction transistors, operational amplifiers;
2. Become proficient with computer skills (e.g., Multisim) for the analysis and design of circuits;
3. Develop technical writing skills important for effective communication;
4. Acquire teamwork skills for working effectively in groups.

Topics:
1. Diode characteristics, models, and behavior in relation to circuit analysis (2 classes)
2. Analysis and design of functional diode circuits (4 classes)
3. Metal-oxide-semiconductor field-effect transistor (MOSFET) characteristics, models, and behavior (2 classes)
4. Analysis and design of basic analog MOSFET amplifier configurations (7 classes)
5. Analysis and design of integrated-circuit (IC) analog MOSFET amplifiers (5 classes)
6. Bipolar junction transistor (BJT) characteristics, models, and behavior (2 classes)
7. Analysis and design of basic analog BJT amplifier configurations (4 classes)
8. BJT operation in saturation and cutoff (1 classes)
9. Analysis and design of linear and nonlinear op-amp circuits (4 classes)
10. Op-amp device parameters and their effects on circuit performance (5 classes)
11. Analysis and design of basic digital MOSFET circuits (8 classes)

Class/Laboratory Schedule: Three 50-minute lectures and one 3-hour laboratory per week.

Computer Usage:
1. Multisim/PSpice is used to facilitate analysis and design of circuits in the laboratory.
2. Three circuit design projects involving formal technical reports require the use of word processing and graphics software for their presentation.

Laboratory Projects/Assignments:

1. Three circuit design projects and at least five additional experiments are required for the laboratory part of this course. Technical writing skills, maintaining a laboratory notebook, working in teams, and development of good circuit layout/design practices are emphasized during the laboratory meetings.
2. Laboratory experiments involve the use of basic test equipment (digital oscilloscope, function generator, power supply) and a personal computer that are part of each laboratory workstation.

Contribution to Meeting the Requirements of Criterion 5. Curriculum:

This course contributes to both the engineering topics and design components. The course provides a design emphasis in the area of electronic circuits. It is a co-rerequisite to the required course on embedded microcontrollers (EE 316 (~~324~~)). Topics pertaining to economics and manufacturability are considered in the context of electronic circuit design and construction.

Relationship to Program Outcomes:

O.1.1. Graduates will possess mathematics skills necessary for electrical engineering.
O.1.3. Graduates will have attained computer proficiency.
O.2.1. Graduates will understand how to analyze and design simple electrical/electronic circuits.
O.2.2. Graduates will understand electronic devices.
O.2.5. Graduates will have knowledge of digital systems.
O.4.2. Graduates will develop an appreciation of continuing educational and professional development.
O.5.1. Graduates will have good teamwork skills.
O.5.2. Graduates will possess good oral and written communication skills.

Prepared by: John D. Mitchell **Date:** February 25, 2008