

## EE 311 – Electronic Circuit Design II

**Designation:** EE elective course for electrical engineering majors.

**University Bulletin Description:** EE 311: (3) Electronic circuit design with consideration to single and multi-device subcircuits, frequency response characteristics, feedback, stability, efficiency, and IC techniques. Prerequisites: EE 310, EE 350.

### Prerequisites by Topics:

1. Understanding of and the ability to analyze and design basic electronic circuits, particularly with application to op amps, diodes, bipolar junction transistors, and field-effect transistors.
2. Proficiency with computer skills (e.g., Multisim) for the analysis and design of circuits.
3. Understanding of basic concepts of linear systems and how they interact with continuous-time signals.
4. Understanding of and the ability to analyze circuits for the sinusoidal steady-state response and the understanding of both time-domain and frequency-domain views.

**Textbook/Required Materials:** Neamen, Donald A., Microelectronics: Circuit Analysis and Design, 3rd edition, McGraw Hill, 2007, ISBN 978-0-07-252362-1—ISBN 0-07-252362-X.

### Learning Outcomes:

This course extends and builds upon the fundamentals of electronics learned in EE 310. Completing this course will provide learning opportunities that should enable you to analyze and design transistor amplifier circuits, with a consideration of the following concepts and principles:

1. Develop an appreciation for different device properties and their use (and limitations) in circuit applications;
2. Understand the properties of different circuit and sub-circuit topologies and their appropriate use in amplifier design;
3. Understand the bandwidth constraints imposed by device and circuit capacitances, and the appropriate use of amplifier topologies to mitigate frequency response limitations;
4. Develop an appreciation for the analysis and design of different amplifiers such as basic one-transistor amplifiers, differential pairs, multistage amplifiers, and operational amplifiers;
5. Understand feedback terminology and concepts as they apply to amplifier analysis and design; develop an appreciation for the design tradeoffs introduced by negative feedback.

### Topics:

1. Frequency Response, Poles, Zeroes, and Bode Plots, and Amplifier Transfer Function (8 classes)
2. Output Stages and Power Amplifiers, Class A, B, and AB, Biasing in Class AB (7 classes)
3. Current Sources, Advanced Current Sources, Active loads (7 classes)
4. Analysis and design of Differential and Multistage Amplifiers (8 classes)
5. Properties of Negative Feedback, Four Basic Feedback Topologies, Stability Analysis, Frequency Compensation Techniques(14 classes)

**Class/Laboratory Schedule:** Three 50-minute lectures per week

**Computer Usage:** Multisim is used to facilitate analysis of circuits in class and on assignments.

### Contribution to Meeting the Requirements of Criterion 5. Curriculum:

This course contributes to both the engineering topics and design components. The course provides a specialized design emphasis in the area of electronic circuits. It is a prerequisite to senior-level electronic design courses. Topics pertaining to manufacturability are considered in the context of advanced 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.2.3. Graduates will understand the basic concepts of linear systems and how they interact with continuous-time signals.
- O.3.1. Graduates will have in-depth technical knowledge in one or more areas of specialization.
- O.3.2. Graduates will have practical understanding of the major electrical engineering concepts and demonstrate application of their theoretical knowledge of the concepts.
- O.4.1. Graduates will interact with industry both within and outside of a classroom setting.
- O.4.2. Graduates will develop an appreciation of continuing educational and professional development.

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