

ECE3400 Course Syllabus

ECE3400

Analog Electronics (3-0-0-3)

CMPE Degree

This course is Elective for the CMPE degree.

EE Degree

This course is Elective for the EE degree.

Lab Hours

0 supervised lab hours and 0 unsupervised lab hours

Course Coordinator

Wang,Hua

Prerequisites

ECE 3040 [min C]

Corequisites

None

Catalog Description

Analysis and design of electronic circuits and systems. Biasing, small-signal analysis, frequency response, feedback amplifiers, active filters, non-linear op-amp applications, and oscillators.

Textbook(s)

Jaeger & Blalock, *Microelectronic Circuit Design* (5th edition), McGraw-Hill, 2015. ISBN 9780073529608 (required)

Course Outcomes

Upon successful completion of this course, students should be able to:

1. Analyze single-stage amplifiers with BJTs and MOSFETs.
2. Identify and analyze negative-feedback circuits.
3. Analyze single- and second-order passive filters.
4. Analyze single-, second-, and higher-order active filters.
5. Analyze rectifiers, peak detectors, and oscillators.
6. Use SPICE to simulate circuits.

Student Outcomes

In the parentheses for each Student Outcome:

"P" for primary indicates the outcome is a major focus of the entire course.

"M" for moderate indicates the outcome is the focus of at least one component of the course, but not majority of course material.

"LN" for "little to none" indicates that the course does not contribute significantly to this outcome.

1. (P) An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics

2. (LN) An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. (LN) An ability to communicate effectively with a range of audiences
4. (LN) An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. (LN) An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. (P) An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. (P) An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Topical Outline

1. Review of Microelectronic Devices
 - a. Diode, BJT, JFET, and MOSFET
 - b. Large-signal behavior
 - c. Small-signal models
2. Single-Transistor Amplifiers
 - a. Common-emitter/source, -base/gate, and -collector/drain
 - b. Biasing, small-signal gain, input resistance, and output resistance
 - c. SPICE
3. Multi-Transistor Amplifiers
 - a. Cascode, differential, and cascade
 - b. Biasing, small-signal gain, input resistance, and output resistance
4. Frequency Response
 - a. Gain?phase plots
 - b. Analysis
5. Negative Feedback
 - a. Series?shunt, series?series, shunt?series, and shunt?shunt
 - b. Effects on gain, input resistance, output resistance, noise, distortion
 - c. Inverting and non-inverting op amps
6. Passive Filters
 - a. First-order low-pass, high-pass, and shelf
 - b. Second-order low-pass, high-pass, band-reject, and bi-quadratic
 - c. Resonant second-order circuits
7. Active Filters
 - a. Low-pass, high-pass, band-pass, and band-reject
 - b. First-, second-, and higher-order
8. Non-linear Circuits
 - a. Rectifiers and peak detectors
 - b. Sinusoidal oscillators
 - c. Mono and bi-stable multivibrators
 - d. Waveform generators

