FAME	ENSEA	
	Electronic Circuits & Laboratory	
US Credits : 3+3	Lecture : 45h ; Laboratory : 44h	Language : English

Summary

Analysis of integrated amplifiers with bipolar junction transistors and field-effect transistors. Transistors linear equivalent models at high frequencies. Frequency response of transistor amplifiers. Feedback configurations, stability and compensation. Analog integrated circuits: differential-pair, current source, active load, operational amplifier.

To reinforce concepts, laboratory experiments involve work with real components on didactic circuits and PSpice simulations.

Prerequisites

- DC and AC circuit analysis.
- Bipolar and field-effect transistor operating principles, basic biasing techniques.
- Small signal analysis of single-stage transistor amplifiers.

Contents

Course objectives: After completing this course, the student should be able to do the following:

- Determine the frequency response (low, mid, high) of a single and multi-stage transistor amplifier mathematically (transfer function) and graphically (Bode plots).
- Design an amplifier circuit with required frequency response.
- Determine the gain, input and output resistances, bandwidth of a feedback amplifier circuit.
- Identify and analyse the different stages of an operational amplifier.

Topics:

- Low frequency response of single-stage transistor amplifier.
- Design of the coupling and bypass capacitors.
- BJT and FET equivalent models at high frequencies.
- High frequency response of single stage transistor amplifier.
- Cascode configuration, comparison of common-emitter and cascode frequency response.
- Feedback topologies. Properties of negative feedback.
- Stability study using Bode magnitude and phase plots. Frequency compensation.
- Basic microelectronic circuits: differential pairs, current sources, active loads.
- Analysis of the different stages of an operational amplifier.
- Operational amplifier characteristics and operating principles.

Laboratory topics:

- Characteristics and biasing of a BJT, BJT single-stage amplifiers. BJT two-stage amplifier
- FET amplifier, automatic gain control
- Multiple-stage amplifier design. Constant current source. Bipolar differential amplifier
- Amplifiers with negative feedback .Operational amplifier characteristics. Applications of operational amplifiers

Organization

- One 3-hour session of lecture per week during 15 weeks. The group of students is small enough to intertwine formal lecturing and exercises. The marking will be based on written tests and homework.
- One 4-hour session of laboratory experiments per week during 11 weeks. The marking will be based on preparations, work during the sessions and lab reports.

Textbook

1. A. Sedra and K. Smith, Microelectronic Circuits, Oxford University Press, 7th Edition

Similar to the following courses

- IIT Chicago ECE 312
- University at Buffalo EE 311&353
- Univ. of Pittsburgh ECE 1286&1212
- University of Illinois at U-C ECE 342&343
- Mississippi State University ECE 3434
- University of Michigan at AA EECS 311 (4 cr)
- Michigan Tech EE 3131