Course number and name ECE 372 - Electronic Circuits II

Credits, contact hours 4 credits, 5 contact hours

Name of instructor or coordinator Mohammed Feknous

Instructional materials R. C. Jaeger – T. N. Blalock, Microelectronic Circuit Design, ISBN 978-0-07-338045-2 (main text)
Reference Book: Sergio Franco, Design with Operational Amplifiers and Analog Integrated Circuits, ISBN 0-07-232084-2

Specific course information
brief description of the content of the course (catalog description)

Principles of FET and BJT small signal amplifiers: Q point design, input and output impedance, gain, and signal range limitations for the six different single stage configurations. Design of analog integrated circuits including current sources, differential amplifiers, noise sources, active loads, and CMOS circuits. Transistor high frequency models, Miller effect, and frequency response of multistage amplifiers. Feedback with multistage amplifiers and two-port network theory.

Prerequisites: ECE 232, ECE 271 Corequisite: none

Educational objectives for the course (e.g. The student will be able to explain the significance of current research about a particular topic.)

Students will be able to

1. analyze and obtain relevant characteristics of the most popular single stage configurations involving BJTs and MOSFETs
2. learn to design these single stage amplifiers, select the appropriate configuration that would fit the specifications of a more complex circuit.
3. evaluate the effect that capacitors (coupling and bypass capacitors at low frequencies, and internal capacitances affecting the response at high frequencies) have on the frequency responses of these amplifiers.
4. analyze and design differential pairs and understand the importance of this configuration not only in the case of simple amplifiers but also as a basic block in the design of operational amplifiers.
5. determine the characteristics of multistage amplifiers, current sources, active loads, and the blocks that form the backbone of an operational amplifier.
6. understand and evaluate the effect of feedback on the characteristics of amplifiers.
7. investigate and design comparator-based circuits including Schmitt triggers, sine wave generators, and timers.
8. reverse engineer a design, reconfigure it based on different specifications, and present it in front of peers.

Brief list of topics to be covered:

- Two-port networks, operational amplifiers
- Small-signal modeling
- Single and multistage amplifiers
- Nonlinear Circuits
- Filters and Signal Generators
- Differential amplifier
- Current Sources and Feedback
- Amplifier frequency response
- Group project presentation
- A laboratory with experiments directly related to the lecture topics will be dispensed to benefit the students from implementations to complete the steps involved: Calculations, Simulations, Implementations. Design is part of many experiments.