

Course Description:

Multiple-stage operational amplifiers, frequency response, feedback analysis, stability and compensation, Slew rate, advanced amplifier design techniques, analog VLSI building blocks.

*Prerequisite(s):* ELEC 3400

List of Topics:

1. Introduction & Motivation
2. Review & Simulation
3. Frequency Response
4. Feedback Analysis
5. Stability & Compensation
6. Advanced Amplifier Design

Statement of Objectives/Outcomes:

On successful completion of this course, students will be able to:

CO1 - be familiar with the basic building blocks of analog integrated circuits, including current and voltage sources, single-gain-stage amplifier, multi-stage amplifiers and operational amplifier

CO2 - analyze and compute mathematically the behaviors of an operational amplifier, including the voltage gain, response time, unity-gain bandwidth and power consumption

CO3 - understand the stability of an amplifier and how to compensation the amplifier to achieve stability

CO4 - use software tools, such as HSpice, to simulate the behaviors of a multi-stage amplifier

CO5 - design a multi-stage amplifier to meet certain constraints, such as supply voltage, power consumption and response time

Textbook(s) and Reference Books:

1. Paul R. Gray, Paul J. Hurst, Stephen H. Lewis, Robert G. Meyer, *Analysis and Design of Analog Integrated Circuits*, New York, Wiley, 5th ed., 2010.
2. B. Razavi, *Microelectronics*, New York, Wiley, 2nd ed., 2013
3. B. Razavi, *Design of Analog CMOS Integrated Circuits*, Mc-Graw Hill, 2000.
4. T. Carusone, D. Johns, and K. Martin, *Analog Integrated Circuit Design*, New York, Wiley, 2<sup>nd</sup> ed., 2012

Relationship of Course to Program Outcomes:

Please refer to the Report Section 4.3.2 (iii).

Grading Scheme:

Homework	10%
Quizzes	15%
Class Participation	5%
Midterm Exam	20%
Preliminary Project Report	10%
Final Project Report	40%