ECE4430 Course Syllabus

ECE4430

Analog Integrated Circuits (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
Hasler,Jennifer Olson

Prerequisites
ECE 3050/3400

Corequisites
None

Catalog Description
Analysis and design of analog ICs using analytic techniques and CAD tools. Topics include amplifiers, current sources, output circuits and other analog building blocks.

Textbook(s)
Gray, Hurst, Lewis & Meyer, *Analysis and Design of Analog Integrated Circuits* (5th edition), John Wiley, 2009. ISBN 0072283653 , ISBN 9780470245996 (required)

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

1. Describe IC design capabilities and constraints in an Integrated Circuit (IC) process.
2. Demonstrate a mastery of device and circuit modeling for transistor devices.
3. Analyze analog and mixed-signal circuits employing 1 to 100 transistors found on typical IC processes.
4. Synthesize previous circuit knowledge towards design of IC circuits.
5. Design small to medium scale Analog and Mixed-Signal ICs that includes selecting circuit approaches, as well as simulating and laying out of that design.

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. (M) 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. (M) 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

Introduction, MOS Technology
CMOS and BJT Technologies, Layout and Design Rules
MOS models-Large signal, small signal
MOS models-Capacitive, other regions, measurements
BJT models: Diode, dc, ac, high frequency, measurement
SPICE simulation - MOS and BJT models
Switches and active resistors
Current sinks and sources
Current mirrors and amplifiers
Voltage and current references
MOS inverting amplifiers
BJT inverting amplifiers, cascode amplifiers
Differential amplifiers
Output amplifiers
MOS operational amplifiers
BJT operational amplifiers