ECE 425 – Analysis & Design of Integrated Circuits

Credits: 3, **Contact Hours:** Two 75 minute lecture session per week.

Coordinator: Y. Xu, Associate Professor of ECE

Textbook: by Gray, Hurst, Lewis, and Meyer, *Analysis and Design of Analog Integrated Circuits*, 4th edition John Wiley and Sons, 2001, ISBN 0-471-32168-0.

2019 Catalog Data: ECE 425: Analysis & Design of Integrated Circuits. Credit 3.
Contemporary analog and digital integrated circuit analysis and design techniques. Bipolar, CMOS and BICMOS IC fabrication technologies, IC Devices and Modeling, Analog ICs including multiple-transistor amplifiers, biasing circuits, active loads, reference circuits, output buffers; their frequency response, stability and feedback consideration. Digital ICs covering inverters, combinational logic gates, high-performance logic gates, sequential logics, memory and array structures.
Lecture: 2 Credits: 3 Satisfies: Electronics (E)

Prerequisites or co-requisites by topic: [(ECE 311)]

Enrollment: Elective course for CPE and EE majors

Specific outcomes of instruction:
After completing this course, the student should be able to do the following:

1. Identify the functional blocks for a integrated circuit and system and specify their performance requirements.
2. Apply circuit analysis principles to the design of analog and digital circuits.
3. Understand active and passive device modeling.
4. Be familiar with device fabrication processes and technologies.
5. Design single stage amplifiers.
6. Design two-stage amplifiers.
7. Analyze and design current mirror and active loads.
8. Analyze and design amplifier output stages.
9. Analyze operational amplifiers.
10. Apply feedback knowledge in integrated circuit analysis.

Relationship of ECE 425 specific outcomes of instruction to student outcomes:

	Student Outcomes	Course Goals
1	An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	1, 2, 5, 6, 7, 8, 9, 10
2	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	2, 5, 6, 7, 8, 9
3	An ability to communicate effectively with a range of audiences	
4	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	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	An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	
7	An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	

Topics:

- Active and Passive Device Modeling (1 week)
- Device Fabrication Process and Technologies (1 week)
- One and Two Stage Amplifier Analysis and Design (2 weeks)
- Current Mirrors and Active Loads (2 weeks)
- Output Stages (2 weeks)
- Operational Amplifiers (2 week)
- Amplifier Frequency Response (2 weeks)
- Feedback Techniques (2 weeks)
- Tests (1 week)

Prepared by: Y. Xu **Date:** February 26, 2020