ECE 4382: Digital IC Analysis and Design

Credit / Contact hours: 3 / 3

Course coordinator: Dr. Tooraj Nikoubin

Textbook(s) and/or other required material: CMOS Digital Integrated Circuits Analysis & Design (Third Edition), by Sung-Mo Kang, Yusuf Leblebici - McGraw-Hill Education - (2003)

Catalog description: Design of VLSI digital integrated circuits including basic device theory and processing technologies.

Pre-requisite(s): 2.5 TTU GPA; C or better in ECE 3312 and 3362

Co-requisites (if any): None

Designation: Required

Course learning outcomes: Upon completion of this course, students should be able to do the following:

- Analysis and design of digital ICs for Very Large Scale Integration (VLSI) based on both theoretical and practical knowledge
- Analysis and design of the circuits in different technologies like MOS, CMOS, BiCMOS, and FinFET
- Determination of the static and dynamic characteristics of the MOS circuits
- Analysis and Design of combinational and sequential CMOS logic circuits
- Use hardware description language and/or logic circuit simulation tools like HSPICE and other standard CAD tools for semicustom design flow

ABET Student Outcomes addressed in course: a, b, c, e, and k.

Topics covered:

Topics	Lectures
• Introduction	1L
• Logic Gate Characteristics	1L
• TTL and MCML technologies	1L
• MOS Transistor, Fabrication and Layout	1L
• MOS Transistor Theory	0.5L
• FinFET Technology	1L
• MOS inverters: Static Characteristics	3L
• MOS inverters: Dynamic Characteristics	2L
• Power and Delay in MOS Circuits	1L
• Project guide (Verilog, Hspice, Cadence)	2L
• Combinational MOS Logic Circuits	2L
• Sequential CMOS Logic Circuits	2L
• Dynamic CMOS logic Circuits	2L
• Semicustom design flow with standard cell library	1.5L
• BiCMOS Logic Circuits	1L
• A/D and D/A convertors	1L
• Power Grid, Clock Design and Chip input and output	1L
• Final Project	1L
• Review, Midterm and Final Exam	3L
Total	28L