Philadelphia University

Faculty of Engineering - Department of Communications and Electronics Engineering

Course Information

Title: Microelectronics (650447)

Prerequisite: Digital Electronics (650344)

Credit Hours: 3 credit hours (16 weeks per semester, approximately 48 contact hours)

Textbook: "Introduction to VLSI Circuit and Systems", John P. Uyemura, 2002

References: "Microelectronic Circuits", Adel S. Sedra, 2010

Catalog Description: The course is designed to introduce the student to the fundamental principles and characteristics of digital electronic devices and systems. The course will cover a range of topics such as power and speed calculations of digital electronics, static and dynamic MOS logic designs including NMOS and CMOS as well as MOS modeling. Also, it will cover some important basics of SRAM, DRAM, FLASH, VLSI design and FPGAs technologies. Finally, the fabrication process of integrated circuits will be discussed.

Course Topics

Week	Topic
1	Course Introduction, review of Field Effect Transistors
2 – 4	Digital Electronics Characterization
5, 6	CMOS Logic Design
7 – 9	MOS Modeling and Design
8, 9	Very Large Scale Integration Systems
10 – 12	Integrated Circuit Fabrication
13 – 16	SRAM, DRAM, FLASH, FPGAs

Course Learning Outcomes and Relation to ABET Student Outcomes:

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

1.	Design a digital CMOS circuit using topological design rules.	[a, c, e]
2.	Characterize and analyze MOSFETs and CMOS logic gates	[a, e]
3.	Understand the physical structure of CMOS integrated circuits	[a, e]
4.	Evaluate the effects of parasitics and interconnects in IC design such as sheet resistance, ohmic drop, scaling limits, and propagation delays, as well as low-power design concepts and voltage-frequency scaling	[a, e]
5.	Model and simulate digital CMOS circuits using CAD tools	[c, e, k]
6.	Research and present new advances and issues in the field	[g, i, j]

Assessment Instruments:

Evaluation of students' performance (final grade) will be based on the following categories:

Exams: Two in class written midterm exams will be given. Each will cover about 5-weeks of lectures.

Quizzes: At least 3 ten minute quizzes will be given to the students during the semester. These quizzes will cover material discussed during the previous lectures.

Homework: Weekly problem sets will be given to students with the exception of weeks that include an exam or quiz. Homeworks should be solved individually and submitted in class on their due dates.

Reports: Each student will be given a research topic related to the class subjects to study and research. The student is required to write a paper based on his research and present it to the class during the final two weeks of the semester. The final paper is due at the end of the last lecture for the semester.

Projects: One design project will be given to students after the first midterm. Students are required to work in small groups and use simulation CAD tools to model MOS transistors, such as SPICE, to be used in their design project.

Final Exam: The final exam is comprehensive and will cover all the class material.

Grading policy:

First Exam	20%
Second Exam	20%
Homework and Quizzes	10%
Reports	10%
Projects	10%
Final Exam	30%
Total:	100%

Attendance policy:

Absence from classes and/or tutorials shall not exceed 15%. Students who exceed the 15% limit without a medical or emergency excuse, acceptable to and approved by the Dean of the relevant college/faculty, shall not be allowed to take the final examination and shall receive a mark of zero for the course. If the excuse is approved by the Dean, the student shall be considered to have withdrawn from the course.

February, 2017