

1. Digital Integrated Circuit Design
Course Code: EE-808

Course Description

This course focuses on the fundamental principles to design digital integrated circuits. Students will be introduced to various characteristics and metrics of the basic building blocks in any digital circuit. Students will learn about designing both combinational as well as sequential digital circuits, using MOS devices. Timing constraints in digital circuit would be explained along with their impact on design choices. Students will also learn about circuit-level design of adders, multipliers, shifters, sequential elements and memories. The course also covers how mainstream memory technologies can be used for computation which is an exciting new computing paradigm.

Text Book:

1. Digital Integrated Circuits, 2nd Edition, Jan M. Rabaey, Anantha Chandrakasan and Borivoje Nikolic

Reference Book:

1. CMOS Digital Integrated Circuits, 4th Edition, Sung-Mo Kang, Yusuf Leblebici and Chulwoo Kim

Prerequisites

None

ASSESSMENT SYSTEM

Quizzes	10%
Assignments	10%
Mid Terms	30%
ESE	50%

Teaching Plan

Week No	Topics	Learning Outcomes
1	Introduction	Course Outline, objectives, teaching plan, assessment method, and motivation to Digital IC Design
2-6	Fundamentals of Digital ICs	<ul style="list-style-type: none">- Introduction to CMOS Manufacturing Process- Understanding of MOSFET Transistors- Discussion of Wire Models- Fundamental concepts of CMOS Inverter- Power, Energy and Delay

7-8	Combinational Circuits Design	<ul style="list-style-type: none"> - Complementary CMOS Logic Design - Pass Transistor Logic - Dynamic CMOS Design - Power & Delay in Dynamic CMOS Circuits
9	MID TERM EXAM	
10-12	Sequential Circuit Design	<ul style="list-style-type: none"> - Memory elements - Static Latches and Registers - Dynamic Latches and Registers - Pipelining - Non-Bistable Circuits - Timing in Synchronous Circuits - Setup and Hold Time Constraints - Clock Skew and Jitter - Clock Distribution Techniques
13-17	Common Digital Circuits	<ul style="list-style-type: none"> - Arithmetic Circuits - Shifters - Memories – SRAM, DRAM and Flash
18	END TERM EXAM	