Debre Tabor University

Gafat Institute of Technology

Department of Electrical and Computer Engineering

Instructor's Name: Sileabat D. Phone No.: +251984249738

Email: sileabat@gmail.com Office Block/No.: 143/105

Course Code	ECEg4103			
Course Title	VLSI Design			
Degree Program	BSc in Electrical and Computer Engineering			
Module Title	Digital Electronics			
Pre-requisites	ECEg4132 (Computer Architecture and Organization)			
ECTS	5			
Contact Hours (per week)	Lecture	Tutorial	Laboratory	Home study
	2	1	2	5
Target Groups: 4th Year Section: Computer Eng. Semester: II Academic Year: 2024				
Assessment Methods	• Quiz (5%), Test (15%), Assignments/Project (15%), Laboratory exercise (15%)) • Final exam (50%)			
Course policies	All students are expected to abide by the code of conduct of students throughout this course. Academic dishonesty, including cheating, fabrication, and plagiarism will not be tolerated. Class activities will vary day to day, ranging from lectures to discussions. Students will be active participants in the course. Students are required to submit and present the assignments/projects provided according to the time table indicated. **100% of class attendance is mandatory!** Every student should be on time for the session. Students are not allowed to enter if they are late more than five minutes. Active participation in the lab is essential. Cell phones MUST be turned off before entering the lab.			

COURSE OBJECTIVES

- To understand MOS transistor fabrication processes.
- To understand basic circuit concepts.
- To have an exposure to the design rules to be followed for drawing the layout of circuits.
- Design of building blocks using different approaches.
- To have a knowledge of the testing processes of CMOS circuits.

CHAPTER I

Introduction: Brief Introduction to IC technology MOS, PMOS, NMOS, CMOS & BiCMOS Technologies Basic Electrical Properties of MOS and BiCMOS Circuits: IDS - VDS relationships, MOS transistor Threshold Voltage-VT, figure of merit -ω0, Transconductance-gm, gds; Pass transistor, NMOS Inverter, Various pull ups, CMOS Inverter analysis and design, Bi-CMOS Inverters.

CHAPTER II

VLSI Circuit Design Processes: VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout, Lambda(λ)-based design rules for wires, contacts and Transistors, Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits, Limitations of Scaling.

CHAPTER III

Gate level Design: Logic gates and other complex gates, Switch logic, Alternate gate circuits. Basic Circuit Concepts: Sheet Resistance Rs and its concepts to MOS, Area Capacitances calculations, Inverter Delays, Driving large Capacitive Loads, Wiring Capacitances, Fan-in and fan-out.

CHAPTER IV

Subsystem Design: Shifters, Adders, ALUs, Multipliers, Parity generators, Comparators, Counters. VLSI Design styles: Full-custom, Standard Cells, Gate-arrays, FPGAs, CPLDs and Design Approach for Full-custom and Semi-custom devices, parameters influencing low power design.

CHAPTER V

CMOS Testing: CMOS Testing, Need for Testing, Test Principles, Design Strategies for Test, Chip Level and Board Level Test Techniques.

REFERENCE BOOKS:

1. Essentials of VLSI Circuits and Systems, Kamran Eshraghian, Eshraghian Dougles, A.Pucknell, 2005, PHI.
2. Modern VLSI Design – Wayne Wolf, 3 Ed., 1997, Pearson Education.
3. CMOS VLSI Design-A Circuits and Systems Perspective, Neil H.E Weste, David Harris, Ayan Banerjee, 3rd Edn, Pearson, 2009.