Course Title	**VLSI System**
Course Code	**EE5332**
No. of Credit Hrs (Lecture + Tutorial/Lab)	**3 (2+0+1)**
No. of Contact Hrs (Lecture + Tutorial/Lab)	**4 (2+0+2)**
Level-Year	**9/10-5**
Prerequisite (if any)	**EE3404**

1) Course Objectives:

At the end of this course the student should be able to:

1. Understand the concepts history of LSI integration
2. Understand the fabrications steps of IC
3. Understand the concepts of design rules
4. Layout and verify the different passive element and CMOS and BJTs.
5. Design a digital integrated circuit and characterize using simulators.
6. Implement a simple digital system on FPGA.

2) Expected Learning Outcomes:

1. **Describe and explain** mathematical methods and circuit analysis models in CMOS digital electronics, including logic components and interconnects. **PLO1 [1]**
2. **Define and compare** the characteristics of CMOS circuit construction and different state-of-the-art technologies and processes. **PLO1 [1]**
3. **Apply** CMOS technology-specific layout rules in transistor placement, routing, and verification of functionality, timing, power, and parasitic effects. **PLO4**
4. **Design and model** moderately sized CMOS circuits that realize specified digital functions. **PLO2 [2]**
5. **Complete and manage** a significant VLSI design project under defined objectives and constraints. **PLO7 [5]**
6. **Communicate** technical results and practical outcomes effectively through structured reports. **PLO8 [3]**

3) Course Contents:

1. Introduction to VLSI Systems
2. CMOS logic, fabrication and layout
3. MOS Transistor theory
4. Layout Design Rules
5. Circuit characterization and performance estimation
6. Circuit Simulation
7. Combinational and sequential circuit design
8. Memory system design
9. Introduction about digital system implementation on FPGA

4) Lab experiments:

1. An Introduction to the software (for example cadence): Schematic, simulation and layout
2. Combinational CMOS Logic: Design, simulation, and layout
3. Sequential CMOS Logic: Design, simulation, and layout
4. FPGA and VLSI Design: VHDL code, synthesis, design, and verification for Combinational Logic circuit
5. FPGA and VLSI Design: VHDL code, synthesis, design, and verification for Sequential Logic circuit

6. Digital IC Design Flow: Synthesis, Verification and Layout.
7. FPGA implementation: Implement a simple digital system on FPGA

5) Teaching Methods:

- Lectures and Discussion
- Videos
- Self-learning
- Laboratory demonstrations

6) Mode of Evaluation: Course Assessment Methods

- Quizzes , Assignment, Homeworks, Reports, Presentations etc.
- Lab Work
- Mid Exam
- Final Exam

Evaluation

No	Assessment Activities *	Percentage
1.	Assignments/Quizzes/HomeWorks/Mini-Projects/Presentations/Reports+Quizzes	15%
2.	Mid Exam	25%
3.	Lab/Tutorial (Lab Exam)	10%
4.	Lab/Tutorial (Lab Reports)	10%
5.	Final Exam	40%

7) Textbook(s):

1. Weste & Harris, CMOS VLSI Design: A Circuits and Systems Perspective, 4th edition, Addison Wesley, 2011.

8) References:

1. Digital Design, 3rd edition by M. Morris Mano.
2. Principles of CMOS VLSI design by N H E Weste & K Eshraghian
3. Modern VLSI Design: System on Silicon by Wayne Wolf