Course Type	Course Code	Name of Course	L	T	P	Credit
DE	ECD405	Digital System Design using HDL	3	0	0	9

Course Objective

This course is to teach students the way digital circuits are designed in practice today. The emphasis is on modern design methodology using Computer Aided Design (CAD) to meet desired specifications. This course is an extension to digital logic design. This course introduces the role of Hardware Description Languages (HDL) like Very High Speed Integrated Circuit Hardware Description Language (VHDL) and Verilog in conceptual structures, descriptions and processing in Digital System design.

Learning Outcomes

Upon successful completion of this course, students will:

- understand syntax of various commands available with HDL and fundamental concepts associated with design of digital systems,

- be able to explain modeling of digital systems using HDL methodology,

- be able to design and simulate combinatorial and sequential digital sub-systems in HDL,

- be able to design complex and large digital systems to solve real world problems

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Introduction to Digital System Design - Programmable Logic Device (PLD), Field Programmable Gate Array (FPGA), Application Specific Integrated Circuit (ASIC)	08	This unit will introduce the students to different methodologies of digital system design and their pros and cons.
2	Introduction to HDL – Evolution of HDL, Characteristics and role of HDL, HDL based digital design flow, Types of HDLs, their merits and demerits	06	This unit will introduce the students to HDL and its utility in designing digital systems.
3	Basics of HDL – Basic Structure, Syntax, Datatypes, HDL construct, hierarchical modeling, different types of modeling styles in HDL (Behavioral, Data flow, Structural and mixed style of modeling), Hardware modeling examples	08	This unit will discuss various features of HDL through various modeling examples.
4	Implementation of Logic Design (both combinatorial and sequential) using HDL, Combinational Logic Statements, Sequential Logic Statements, Concurrent Statements	08	This unit will help students in designing combinatorial and sequential sub-systems in HDL.
5	Design of Finite State Machines (FSM), Some applications (sequence generator, traffic light controller, Processor design)	06	This unit will help students to design real life FSM based systems using HDL.
6	Introduction to HDL simulation and synthesis – Overview of HDL simulator, introduction to testbenches, overview of design synthesis	06	This unit introduces the students to HDL simulation and synthesis for Digital systems.

Text Books:

1. Charles Roth, Lizy K. John, Kil Lee Byeong, "Digital Systems Design Using Verilog", 1st Edition, CL Engineering.
2. Z. Navabi, "VHDL - analysis and modeling of digital systems", 2nd edition, McGraw-Hill Professional

Reference Books:

3. Z.Navabi, "Digital Design and Implementation with Field Programmable Devices", 1st Edition, Kluwer Academic Publishers, 2005.
4. Samir Palnitkar, "Verilog HDL: A Guide to Digital Design and Synthesis", 2nd Edition, Pearson Publishers.
5. Kenneth Short, "VHDL for Engineers", 1st Edition, Pearson Publishers.