DIGITAL SYSTEM DESIGN

III Semester: ECE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AECB07	Core	3	1	-	4	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

OBJECTIVES:

The students will try to learn:

I. Simplification of the logic functions using Boolean algebraic theorems and techniques.
II. Implementation of conventional combinational and sequential circuits including conversions of flip-flops.
III. The exploration of the logic families and semiconductor memories.
IV. The realization of the micro and macro circuits using VHDL programming.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: **Outline binary addition, subtraction, 2's complement representation and operations for performing computations.**
CO 2: **Identify the importance of sum of products and product of sums, canonical forms to optimize Boolean functions using Karnaugh and tabulation method.**
CO 3: **Explain comparators, multiplexers, encoder, decoder, adders, subtractors, barrel shifter and ALU for realization of basic building blocks of conventional electronic circuits.**
CO 4: **Analyze bi-stable elements such as latches, flip-flops using excitation tables.**
CO 5: **Build the bidirectional and universal shift registers for organization of data applications.**
CO 6: **Interpret the knowledge of flip-flops in synchronous counters for clock tree based circuits.**
CO 7: **Compare the Asynchronous and synchronous counters for memory storing applications.**
CO 8: **Build the finite state machines for synchronous circuits such as pulse train generator, pseudo random binary sequence generator.**
CO 9: **Analyze the characteristics of logic family such as TTL, ECL and CMOS to enhance the design skills in digital integrated circuits.**
CO 10: **Extend the knowledge of programmable logic devices for understanding the architectural blocks of FPGA.**
CO 11: **Examine the design elements and procedure for dataflow, behavioral and structural modeling of digital circuits using VHDL programming.**
CO 12: **Evaluate synthesis and simulation of VHDL modules for implementing combinational and sequential circuits for computer aided design tools.**

MODULE-I	LOGIC SIMPLIFICATION AND COMBINATIONAL LOGICDESIGN	Classes: 09

Review of Boolean Algebra and De Morgan's Theorem, SOP & POS forms, Canonical forms, Karnaughmaps up to 6 variables, Binary codes, Code Conversion.

MODULE-II	MSI DEVICES	Classes: 09
MSI devices like Comparators, Multiplexers, Encoder, Decoder, Driver & Multiplexed Display, Half and Full Adders, Subtractors, Serial and Parallel Adders, BCD Adder, Barrel shifter and ALU		
MODULE-III	**SEQUENTIAL LOGIC DESIGN**	**Classes: 09**
Building blocks like S-R, JK and Master-Slave JK FF, Edge triggered FF, Ripple and Synchronous counters, Shift registers. Finite state machines, Design of synchronous FSM, Algorithmic State Machines charts. Designing synchronous circuits like Pulse train generator, Pseudo Random Binary Sequence generator, Clock generation		
MODULE-IV	**LOGIC FAMILIES AND SEMICONDUCTOR MEMORIES**	**Classes: 09**
TTL NAND gate, Specifications, Noise margin, Propagation delay, fan-in, fan-out, Tristate TTL, ECL, CMOS families and their interfacing, Memory elements, Concept of Programmable logic devices like FPGA. Logic implementation using Programmable Devices.		
MODULE-V	**VLSI DESIGN FLOW**	**Classes: 09**
Design entry: Schematic, FSM & HDL, different modeling styles in VHDL, Data types and objects, Dataflow, Behavioral and Structural Modeling, Synthesis and Simulation VHDL constructs and codes for combinational and sequential circuits.		

Text Books:

1. R.P. Jain, "Modern digital Electronics", Tata McGraw Hill, 4th Edition, 2009.
2. Douglas Perry, "VHDL", Tata McGraw Hill, 4th Edition, 2002.
3. W.H. Gothmann, "Digital Electronics- An introduction to theory and practice", PHI, 2nd Edition,2006.

Reference Books:

1. D.V. Hall, "Digital Circuits and Systems", Tata McGraw Hill, 1989
2. Charles Roth, "Digital System Design using VHDL", Tata McGraw Hill 2nd Edition 2012.

Web References:

1. mcsbzu.blogspot.com
2. http://books.askvenkat.com
3. http://worldclassprogramme.com
4. http://www.daenotes.com
5. http://nptel.ac.in/courses/117106086/1

E-Text Books:

1. https://books.google.co.in/books/about/Switching_Theory_and_Logic_Design
2. https://www.smartzworld.com/notes/switching-theory-and-logic-design-stld
3. https://www.researchgate.net/.../295616521_Switching_Theory_and_Logic_Design
4. https://books.askvenkat.com/switching-theory-and-logic-design-textbook-by-anand-kumar/
5. http://www.springer.com/in/book/9780387285931