DIGITAL SYSTEM DESIGN

III Semester: ECE

Course Code	Category	Hours / Week				Maximum Marks		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
AECC03	**Core**	3	0	0	3	30	70	100
Contact Classes: 45	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes: 45**		

Prerequisites: There are no prerequisites to take this course.

I.   COURSE OVERVIEW:

The course will make them learn the basic theory of switching circuits and their applications in detail. Starting from a problem statement they will learn to design circuits of logic gates that have a specified relationship between signals at the input and output terminals. They will be able to design combinational and sequential circuits. They will learn to design counters, adders, sequence detectors. This course provides a platform for advanced courses like Computer architecture, Microprocessors & Microcontrollers and VLSI design. Greater Emphasis is placed on the use of programmable logic devices and State machines.

II.   COURSE 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.

III. COURSE OUTCOMES:

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

CO 1	**Outline** binary arithmetic operations and optimize boolean functions using karnaugh and tabulation method.	Understand
CO 2	**Apply** combinational circuits for realization of basic building blocks of conventional electronic circuits.	Apply
CO 3	**Interpret** the knowledge of flip-flops and latches in synchronous and asynchronous modules for memory storing applications.	Understand
CO 4	**Extend** the logic design techniques for ECL, TTL and CMOS methodologies for designing the fundamental gate level modelling.	Understand
CO 5	**Extend** the characteristics of logic families and PLDs to enhance the design skills in digital integrated circuits.	Apply
CO 6	**Evaluate** synthesis and simulation of VHDL modules for implementing combinational and sequential circuits.	Analyze

IV. SYLLABUS:

MODULE – I: LOGIC SIMPLIFICATION AND COMBINATIONAL LOGIC DESIGN (08)
Review of Boolean Algebra and De Morgan's Theorem, SOP & POS forms, Canonical forms, Karnaugh maps up to 6 variables, Binary codes, Code Conversion

MODULE – II: MSI DEVICES (10)
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 (10)
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 (08)

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 (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.

V. 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.

VI. 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.
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VII. 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