COURSE CONTENT

DIGITAL CIRCUITS								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
AECD13	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	-	-	3	40	60	100
Contact Classes: 48	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes: 48**		
Prerequisite: Electronic Devices and circuits, Digital System Design								

I. COURSE OVERVIEW:

This course intended to logic gates, various logic families. Design of digital circuits using logic gates, combinational circuits and sequential circuits. Apply op-amp characteristics to design analog to digital converters and digital to analog converters. Classification and characteristics of memories such as Read-only memory, Random access memory and programmable logic devices such as programmable logic array and programmable array logic

II. COURSES OBJECTIVES:

The students will try to learn

I. The fundamentals of number systems, Boolean algebra and representation of switching functions using Boolean expressions and their minimization techniques.
II. The combinational and sequential logic circuits to design various complex switching devices, and their realizations.
III. The programmable logic devices, Semiconductor memories and their use in realization of switching functions.
IV. The exploration of the logic families and semiconductor memories.

III. COURSE OUTCOMES:

At the end of the course students should be able to:

CO1 Understand the different forms of number representations and binary codes in digital logic circuits
CO2 Make use of Boolean postulates, theorems and k-map for obtaining minimized Boolean expressions
CO3 Construct the synchronous and asynchronous modules using flip-flops used for memory storing applications
CO4 Utilize the functionality and characteristics of flip-flops and latches for designing sequential circuits
CO5 Describe the characteristics of the logic family and PLDs to enhance the design skills in digital integrated circuits.
CO6 Extend the knowledge of memories and programmable logic devices for understanding the architectural blocks of FPGA.

IV. COURSE CONTENT:

MODULE - I: LOGICS IMPLIFICATION AND COMBINATIONAL LOGIC DESIGN(10)

Review of decimal, binary, octal and hexadecimal number system and conversions , 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, Full adder using Half adders ,Full subtractor using Half subtractors, Serial and Parallel Adders, BCD Adder, Barrelshifter and ALU.

MODULE –III: SEQUENTIAL LOGIC DESIGN (10)

Building blocks like S-R, T FF, D FF, JK and Master-Slave JK FF, Edge triggered FF, Characteristics and Excitation of SR, JK, T, D 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 (09)

Properties of random numbers, Generation of pseudo-random numbers, Techniques for generating random numbers, Tests for random numbers, Inverse-transform technique, Acceptance-rejection technique, Special properties.

MODULE-V: SEMICONDUCTOR MEMORIES AND PROGRAMMABLE LOGIC DEVICES (09)

Memory organization and operation, expanding memory size, classification and characteristics of memories, sequential memory, read only memory (ROM), read and write memory(RAM), content addressable memory (CAM), charge de coupled device memory (CCD), commonly used memory chips, ROM as a PLD, Programmable logic array, Programmable array logic, complex Programmable logic devices (CPLDS), Field Programmable Gate Array (FPGA).

V. TEXT BOOKS:

1. P Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.
2. M M Mano, "Digital logic and Computer design", Pearson Education India, 2016.

VI. REFERENCE BOOKS:

1. A Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.

VII. ELECTRONIC RESOURCES:

1. NPTEL :: NOC : Digital Electronic Circuit
   https://www.youtube.com/playlist?list=PLbRMhDVUMnge4gDT0vBWjCb3Lz0HnYKkX

VIII. MATERIALS ONLINE:

1. Course template
2. Tutorial question bank
3. Tech talk topics
4. Open end experiments
5. Definitions and terminology
6. Assignments
7. Model question paper - I
8. Model question paper - II
9. Lecture notes
10. E-learning readiness videos (ELRV)
11. Power point presentation