INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal - 500 043, Hyderabad, Telangana

COURSE CONTENT

DIGITAL ELECTRONICS								
VII Semester: ECE								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
AECD52	**Elective**	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. Analog to Digital and Digital to Analog converters applicable in the field of microprocessors, microcontrollers and VLSI

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: Choose an appropriate A/D and D/A converters for signal processing applications.
CO6: Extend the knowledge of memories and programmable logic devices for understanding the architectural blocks of FPGA.

IV. COURSE CONTENT:

MODULE-I: FUNDAMENTALS OF DIGITAL SYSTEMS AND LOGIC FAMILIES (09)

Digital signals, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-OR operations, Boolean algebra, examples of IC gates, number systems-binary, signed binary, octal hexadecimal number, binary arithmetic, one's and two's complements arithmetic, codes, error detecting and correcting codes, characteristics of digital lCs.

Logic Families: Introduction to digital logic family such as RTL, DTL, TTL, ECL, CMOS etc., their comparative study, Basic circuit, performance

MODULE-II: COMBINATIONAL DIGITAL CIRCUITS (09)

Standard representation for logic functions, K-map representation, and simplification of logic functions using Kmap, minimization of logical functions. Don't care conditions.

Multiplexer, De-Multiplexer, Decoders, Adders, Subtractors, BCD arithmetic, Parallel prefix adder, ALU, elementary ALU design, popular MSI chips, digital comparator, parity checker/generator

MODULE-III: SEQUENTIAL CIRCUITS AND SYSTEMS (10)

1-bit memory, the circuit properties of Bi-stable latch, the clocked SR flip flop, J- K-T and D types flip flops, applications of flip flops, Register, Shift register, Universal shift register, Linear feedback shift registers, applications of shift registers.

Serial to parallel converter, Parallel to serial converter, ring counter, sequence generator, ripple (Asynchronous) counters, synchronous counters, counters design using flip flops, special counter IC's, asynchronous sequential counters, applications of counters.

MODULE-IV: A/D AND D/A CONVERTERS (10)

Digital to analog converters: weighted resistor, converter, R-2R Ladder D/A converter, specifications for D/A converters, examples of D/A converter lCs, sample and hold circuit, analog to digital converters: quantization and encoding, parallel comparator A/D converter, successive approximation A/D converter, counting A/D converter, dualslope A/D converter, A/D converter using voltage to frequency and voltage to time conversion, specifications of A/Dconverters, example of A/D converter ICs.

MODULE-V: SEMICONDUCTOR MEMORIES AND PROGRAMMABLE LOGIC DEVICES (10)

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. ELECTRONICS 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. Definition and terminology
4. Tech-talk topics
5. Assignments
6. Model question paper - I
7. Model question paper - II
8. Lecture notes
9. Early learning readiness videos (ELRV)
10. Power point presentations