DIGITAL ELECTRONICS

III Semester: EEE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AECB03	Core	3	0	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

OBJECTIVES:

The course should enable the students to:

I. Familiarize the basic concept of number systems, Boolean algebra principles and minimization techniques for Boolean algebra
II. Analyze Combination logic circuit and sequential logic circuits such as multiplexers, adders, decoders flip flops and latches.
III. Understand about synchronous and asynchronous sequential logic circuits.
IV. Analyze and design analog to digital and digital to analog Converters.
V. Impart the basic understanding of memory organization, ROM, RAM, CPLD, FPGA, and CCD.

COURSE OUTCOMES:

CO 1: Understand the basic concept of number systems and integrated circuits.
CO 2: Analyze Combination logic circuit such as multiplexers, adders, decoders.
CO 3: Understand about synchronous and asynchronous sequential logic circuits.
CO 4: Analyze analog to digital and digital to analog Converters.
CO 5: Understanding of memory organization, ROM, RAM, CPLD, FPGA, and CCD

COURSE LEARNING OUTCOMES(CLOs):

1. Understand the basic concept of number systems, Binary addition and subtraction for digital systems.
2. Explain 2's complement representation and implement binary subtraction using 1's and 2'complements.
3. Discuss about digital logic gates, error detecting and Correcting codes for digital systems.
4. Design TTL/CMOS integrated circuits and study the TTL and CMOS logic families.
5. Evaluate functions using various types of minimizing algorithms like Karnaugh map or tabulation method.
6. Design Gate level minimization using KMaps and realize the Boolean function using logic gates.
7. Analyze the design procedures of Combinational logic circuits like adder, binary adder, carry look ahead adder.
8. Analyze the design of decoder, demultiplexer, and comparator using combinational logic circuit.
9. Discuss about MSI chip, ALU design.
10. Understand bi-stable elements like latches flip-flop and Illustrate the excitation tables of different flip flops
11. Analyze and apply the design procedures of small sequential circuits to build the gated latches.
12. Understand the concept of Shift Registers and implement the bidirectional and universal shift registers.
13. Implement the synchronous counters using design procedure of sequential circuit and excitation tables of flip–flops.
14. Implement the Asynchronous counters using design procedure of sequential circuit and excitation tables of flip – flops.
15. Understand the classifications, characteristics and need of data converters such as ADC and DAC.
16. Analyze the digital to analog converter technique such as weighted resistor DAC, R-2R ladder DAC, inverted R-2R ladder DAC and IC 1408 DAC.
17. Analyze the analog to digital converter technique such as integrating, successive approximation and flash converters, Dual slope converter.
18. Implement the A/D converter using voltage to frequency and voltage to time conversion, specifications of A/D converters
19. Understand the concept of memory organization, Read only memory and random access memory.
20. Discuss and implement combinational and sequential logic circuits using PLA and PLDs.
21. Analyze the concepts of CAM, FPGA

MODULE-I	FUNDAMENTALS OF DIGITAL SYSTEMS AND LOGIC FAMILIES	Classes: 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, digital logic families, TTL, Schottky TTL and CMOS logic, interfacing CMOS and TTL, Tri-state logic.		
MODULE-II	**COMBINATIONAL DIGITAL CIRCUITS**	**Classes: 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, DeMultiplexer, Decoders, Adders, Sub tractors, BCD arithmetic, carry look ahead adder, serial ladder, ALU, elementary ALU design, popular MSI chips, digital comparator, parity checker/generator, code converters, priority encoders, decoders, drivers for display devices, Q-M method of function realization.		
MODULE-III	**SEQUENTIAL CIRCUITS AND SYSTEMS**	**Classes: 09**
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, 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**	**Classes: 09**
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, dual slope A/D converter, A/D converter using voltage to frequency and voltage to time conversion, specifications of A/D converters, example of A/D converter ICs		
MODULE-V	**SEMICONDUCTOR MEMORIES AND PROGRAMMABLE LOGIC DEVICES**	**Classes: 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).		

Text Books:

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

Reference Books:

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

Web References:

1. https://www.calvin.edu/~pribeiro/courses/engr315/EMFT_Book.pdf
2. https://www.web.mit.edu/viz/EM/visualizations/coursenotes/modules/guide02.pdf
3. https://www.nptel.ac.in/courses/108106073/
4. https://www.iare.ac.in

E-Text Books:

1. https://www.bookboon.com/en/electromagnetism-for-electronic-engineers
2. https://www.books.google.co.in/books/.../Fundamentals of Electromagnetic Fields
3. https://www.aliexpress.com/item/EBOOK...Electromagnetic-Fields-2