DIGITAL AND PULSE CIRCUITS

IV Semester: EEE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AEC019	Foundation	4	-	-	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. Enrich the knowledge of probability on single random variables and probability distributions and apply the concept of correlation and regression to find covariance.
II. Analyze the given data for appropriate test of hypothesis and discuss the concept of sequential circuits and analyze sequential systems.
III. Interpret the concept of feedback and classify various types of feedback amplifiers and understand the principle of oscillation and design different types of oscillators.
IV. Design and analyze single stage and multi stage Amplifiers.

COURSE LEARNING OUTCOMES (CLOs):

1. Understand number systems, binary addition and subtraction, 2's complement Representation and operations with this representation and understand the different binary codes.
2. Illustrate the switching algebra theorems and apply them for reduction of Boolean function.
3. Identify the importance of SOP and POS canonical forms in the minimization or other optimization of Boolean formulas in general and digital circuits.
4. Discuss about digital logic gates and their properties, and implement logic gates using universal gates.
5. Evaluate functions using various types of minimizing algorithms like Boolean algebra.
6. Evaluate functions using various types of minimizing algorithms like Karnaugh map or tabulation method.
7. Design Gate level minimization using K-Maps and realize the Boolean function using logic gates.
8. Analyze the design procedures of Combinational logic circuits like adder, binary adder, carry look ahead adder.
9. Understand bi-stable elements like latches, flip-flop and illustrate the excitation tables of different flip flops.
10. Analyze and apply the design procedures of small sequential circuits to build the gated latches.
11. Understand the concept of Shift Registers and implement the bidirectional and universal shift registers.
12. Implement the synchronous counters using design procedure of sequential circuit and excitation tables of flip – flops.
13. Implement the Asynchronous counters using design procedure of sequential circuit and excitation tables of flip – flops.
14. Understand the design analysis of feedback amplifiers & types of feedback circuits.
15. Design various sinusoidal Oscillators like RC Phase shift, Wien bridge, Hartley and Colpitts oscillator for various frequency ranges.
16. Analyze the design of BJT as single stage and multistage amplifier circuits.
17. Implement the design analysis of coupling amplifiers and types of coupling circuits.

Unit-I	BOOLEAN ALGEBRA AND SWITCHING FUNCTIONS	Classes: 09
Introduction of binary numbers: Complements of numbers, codes, binary codes, binary code decimal code and its properties, unit distance codes, alpha numeric codes, error detecting and correcting codes; Boolean algebra: Basic theorems and properties, switching functions, canonical and standard form.		
Unit -II	**MINIMIZATION TECHNIQUES AND DESIGN OF MSI**	**Classes: 09**
Minimization with theorem: Karnaugh map method, five variable map, prime and essential implications, don't care map entries, tabular method, partially specified expressions; combination all design: Arithmetic circuits, comparator, multiplexers, code converters, hazards and hazard free relations.		
Unit -III	**SEQUENTIAL CIRCUITS DESIGN**	**Classes: 09**
Basic differences between combinational and sequential logic circuits, binary cell, fundamentals of sequential machine operation, D Flip Flop, T Flip Flop, J K Flip Flop, design procedure for conversion of Flip Flops, conversion from one type of Flip-Flop to another, timing and triggering consideration, clock skew. Counters: Design of single mode counter, ripple counter, ring counter, shift register, shift register sequences, ring counter using shift register.		
Unit -IV	**FEEDBACK AMPLIFIERS AND OSCILLATORS**	**Classes: 09**
Feedback Amplifiers: Concepts of feedback, classification of feedback amplifiers, general characteristics of negative feedback amplifiers, effect of feedback on amplifier characteristics, voltage series, voltage shunt; Current series; Current shunt feedback configurations, illustrative examples; Oscillators: Classification of oscillators, condition for oscillations, RC phase shift oscillators; Generalized analysis of LC oscillators: Hartley and Colpitts oscillators, Wien Bridge and crystal oscillators, stability of oscillators.		
Unit -V	**SINGLE STAGE AMPLIFIERS AND MULTISTAGE AMPLIFIERS**	**Classes: 09**
Single Stage Amplifiers: Classification of amplifiers, distortion in amplifiers, analysis of CE, CC and CB configurations with simplified hybrid model, analysis of CE amplifier with emitter resistance and emitter follower, Miller's theorem and its dual design of single stage RC coupled amplifier using BJT; Multistage amplifiers: Analysis of cascaded RC coupled BJT amplifiers, cascade amplifier, darlington pair, different coupling schemes used in amplifiers RC coupled amplifiers, transformer coupled amplifier, direct coupled amplifier.		

Text Books:

1. M Morris Mano, Michael D Ciletti, "Digital Design", Pearson Education / PHI, 3rd Edition, 2008.
2. Fletcher W I, "An Engineering Approach to Digital Design", Prentice Hall India Learning Private Limited, 1990.
3. Zvi Kohavi, "Switching and Finite Automata Theory", Tata McGraw-Hill, 3rd Edition, 2004.
4. John M Yarbrough, "Digital logic applications and design", Thomson publications, 1st Edition, 2006.
5. J Millman, C C Halkias, "Integrated Electronics", Tata McGraw -Hill, 2008.

Reference Books:

1. Fredriac J Hill, Gerald R Peterson, "Introduction to Switching Theory and Logic Design", 3rd Edition, 2008.
2. Thomas L Floyd, "Digital Fundamentals", Pearson Publications, 10th Edition, 2013.
3. Roth, "Fundamentals of Logic Design", Thomson Publications,7th Edition, 2004
4. Comer, "Digital Logic and State Machine Design", Oxford Publications, 3rd Edition, 2013.
5. Rashid, "Electronic Circuit Analysis", Cengage Publishers, 12th Edition, 2013.
6. Robert L Boylestad, Louis Nashelsky, "Electronic Devices and Circuits Theory", PHI, 9th Edition, 2008.