COURSE CODE	COURSE NAME	L-T-P-C	YEAR OF INTRODUCTION
EC207	LOGIC CIRCUIT DESIGN	3-0-0-3	2016

Prerequisite:Nil

Course objectives:

- To work with a positional number systems and numeric representations
- To introduce basic postulates of Boolean algebra and show the correlation between Boolean expression
- To outline the formal procedures for the analysis and design of combinational circuits and sequential circuits
- To study the fundamentals of HDL
- To design and implement combinational circuits using basic programmable blocks
- To design and implement synchronous sequential circuits

Syllabus:

Positional Number Systems, Boolean algebra, Combinational Logic, HDL concepts ,Digital ICs, Programmable Logic Devices, Sequential Logic, Sequential Circuits

Expected outcome:

The student should able to:

1. Compare various positional number systems and binary codes
2. Apply Boolean algebra in logic circuit design
3. Design combinational and sequential circuits
4. Design and implement digital systems using basic programmable blocks
5. Formulate various digital systems using HDL

Text Books:

1. Donald D Givone, Digital Principles and Design, Tata McGraw Hill, 2003
2. John F Wakerly, Digital Design Principles and Practices, Pearson Prentice Hall, 2007

References:

1.Ronald J Tocci, Digital Systems, Pearson Education, 11th edition,2010
2.Thomas L Floyd, Digital Fundamentals, Pearson Education, 8th edition 2009
3.Moris Mano, Digital Design, Prentice Hall of India, 3rd edition, 2002
4.John M Yarbrough, Digital Logic Applications and Design, Cenage learning, 2009
5.David Money Harris, Sarah L Harris, Digital Design and Computer Architecture, Morgan Kaufmann – Elsevier, 2009

Course Plan

Module	Course content (42 hrs)	Hours	Sem. Exam Marks
I	Number systems- decimal, binary, octal, hexa decimal, base conversion	2	15
	1's and 2's complement, signed number representation Binary arithmetic, binary subtraction using 2's complement	2	
	Binary codes (grey, BCD and Excess-3), Error detection and correcting codes : Parity(odd, even), Hamming code (7,4), Alphanumeric codes : ASCII	2	
II	Logic expressions, Boolean laws, Duality, De Morgan's law, Logic functions and gates	2	15
	Canonical forms: SOP, POS, Realisation of logic expressions using K-	2	

	map (2,3,4 variables)		
	Design of combinational circuits – adder, subtractor, 4 bit adder/subtractor, BCD adder, MUX, DEMUX, Decoder,BCD to 7 segment decoder, Encoder, Priority encoder, Comparator (2/3 bits)	4	
FIRST INTERNAL EXAM			
III	Introduction to HDL : Logic descriptions using HDL, basics of modeling (only for assignments)	**2**	**0**
	Logic families and its characteristics: Logic levels, propagation delay, fan in, fan out, noise immunity , power dissipation, TTL subfamilies	1	**15**
	NAND in TTL (totem pole, open collector and tri-state), CMOS:NAND, NOR, and NOT in CMOS, Comparison of logic families (TTL,ECL,CMOS) in terms of fan-in, fan-out, supply voltage, propagation delay, logic voltage and current levels, power dissipation and noise margin	2	
	Programmable Logic devices - ROM, PLA, PAL, implementation of simple circuits using PLA	2	
IV	Sequential circuits - latch, flip flop (SR, JK, T, D), master slave JK FF, conversion of FFs, excitation table and characteristic equations	3	**15**
	Asynchronous and synchronous counter design, mod N counters, random sequence generator	5	
SECOND INTERNAL EXAM			
V	Shift Registers - SIPO, SISO, PISO, PIPO, Shift registers with parallel LOAD/SHIFT Shift register counter - Ring Counter and Johnson Counter	3	**20**
	Mealy and Moore models, state machine ,notations, state diagram, state table, transition table, excitation table, state equations	3	
VI	Construction of state diagram – up down counter, sequence detector	3	**20**
	Synchronous sequential circuit design - State equivalence	2	
	State reduction – equivalence classes, implication chart	2	
END SEMESTER EXAM			

Assignments:

1. Simple combinational circuit design using MUX,DEMUX, PLA & PAL
2. HDL simulation of circuits like simple ALU, up-down counter, linear feedback shift register, sequence generator

Question Paper Pattern

The question paper consists of three parts. Part A covers modules I and II, Part B covers modules III and IV and Part C covers modules V and VI. Each part has three questions. Each question have a maximum of four subparts. Among the three questions one will be a compulsory question covering both the modules and the remaining two questions will be as one question from each module, of which one is to be answered. Mark pattern is according to the syllabus with maximum 50 % for theory, derivation, proof and 50% for logical/numerical problems.