Course title	**Digital Systems & Lab - A slot**									Course No	**EE2001**			
Department	Electrical Engineering	New Credits	L	T	E	P	O	C	TH	Old Credits	L	T	P	
			3	1		6	6	16	16		3	1	3	
Offered for	B.Tech 2nd year									Status	Modified			
Faculty	**Ananth Krishnan, T G Venkatesh, Vinita Vasudevan**									Type	Lab			
Pre-requisite										To take effect from	16-10-2018			
Submission date	Date of approval by DCC	Date of approval by BAC								Date of approval by Senate				
08-10-2018														

Objectives:
At the end of this course, the student should be able to:1. understand number systems2. implement and analyse digit systems based on combinational and sequential logic3. understand and design state machines4. design systems usin RTL

Course Contents:

1. Introduction to Digital Systems and Boolean AlgebraBinary, octal and hexadecimal numbe systems; Truth table; Basic logic operation and logic gates. Basic postulates and fundamental theorems of Boolean algebra; Canonical (SOP and POS) forms2. Logic Minimization and ImplementationMinterm and Maxterm expansions; - Karnaugh-maps, essential prime implicants, incompletely specified functions, NAND a NOR implementation, Quine-McCluskey method; Switch level representation and realization using transistors Logic families – TTL, CMOS3. Combinational Logic Multi level gate circuits, Decoders, encoders, multiplexers demultiplexers and their applications; Parity circuits and comparators; Representation of signed numbers; Adders, Ripple carry. Introduction to HDL (VHDL /Verilog), HDL description of combinational circuits.4. Sequential LogicLatches and flip-flops: SR-latch, D-latch, D flip-flop, JK flip-flop, T flip-flop; Setup and Hold parameters, timing analysis; Registers and counters; Shift register; Ripple counter, Synchronous counter desi using D, T, and JK flip flops. HDL description of sequential circuits.5. State Machine Design State machine as sequential controller; Moore and Mealy state machines; Derivation of state graph and tables; Sequence detec state table reduction using Implication table; state assignment, logic realization; equivalent state machines, Designing state machine using ASM charts. state machine modeling based on HDL.6. Memory and Programmable Logic DevicesROM and RAM; Sequential PLDs and their applications; State- machine design with sequential PLDs; FPGAs7. Register transfer language: Notation, HDL features for RTL, Digital design a the RTL level, Simple design of a microcontroller using RTL.8. Advanced TopicsAsynchronous Sequential Machines, Static and Dynamic hazards; race free design; testing digital circuits.

   Syllabus: Laboratory Experiments on design of combinational circuits including adders and magnitude comparators; realization using multiplexers and other approaches; identification of critical path Design of sequential circuits including flip-flops, counters and registers Digital to analog converter design and study of characteristics Experiments on motor control using flip-flops and gates Introduction to hardware description languages and simulation of simple circuits

Text Books:
1. Morris. M. Mano, Michael D. Ciletti, Digital Design, Fourth Edition, Prentice-Hall India. 2008.2. Charles. H. Roth, J Fundamentals of Logic Design, Fifth Edition, Thomson Brooks /Cole, 2005. 3. S. Palnitkar, Verilog HDL: A Guide to Digital Design and Synthesis, Second Edition, Pearson Education, 2004.

Reference Books:
1. S. Brown and Z. Vranesic, Fundamentals of digital logic with Verilog design, ThirdEdition, McGraw-Hill, 2013 2. Charles. H. Roth, Jr., Digital System Design using VHDL, Indian Edition, Thomson Brooks /Cole, 2006. 3. Mohammad A.Karim, Xinghao Chen, Digital Design, CRC press 2008.4. J.F. Wakerly, Digital Design: Principles and Practices, Fourth Edition, Prentice Hall, 2005