21EC103 DIGITAL ELECTRONICS

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

SOURCE:

https://i0.wp.com/blog.oureducation.in/wp-content/uploads/2013/01/Digital-Electronics-Projects.jpg?ssl=1

COURSE DESCRIPTION AND OBJECTIVES:

Digital Electronics deals with fundamentals of number systems and Boolean expressions that are used to realize combinational and sequential circuits. Its objective is to minimize the logical expressions using Boolean postulates, To design various combinational and sequential circuits and to provide with sufficient number of applications to demonstrate the techniques and mathematics used.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes:

COs	Course Outcomes
1	Apply the knowledge of digital logic concepts to optimize digital circuits.
2	Develop Combinational digital circuits for given problem statement by applying the digital techniques.
3	Analyze sequential digital circuits for given problem statement.
4	Compare the characteristics of logic families.
5	Design a given application / problem statement using digital ICs.

SKILLS:

- ✓ *Perform conversions between numbers of different radices.*
- ✓ *Identify the different gates and their properties.*
- ✓ *Minimize Boolean expressions.*
- ✓ *Design combinational and sequential circuits for a given application.*
- ✓ *Develop VHDL Code for a given application.*

UNIT - I **L-9**

NUMBER SYSTEMS: Review of number systems - Conversions, Binary codes.

BOOLEAN ALGEBRA: Fundamental concepts of boolean algebra basic theorems and properties, Canonical and standard forms - SOP and POS forms, Logic gates, Algebraic simplification and realization with basic gates and universal gates, Karnaugh maps - 3, 4, 5 variables.

UNIT - II **L-9**

COMBINATIONAL LOGIC DESIGN Part I: Design using conventional logic gates, Half adder, Full adder, Half subtractor, Full subtractor, Ripple carry adder, Adder/subtractor, BCD adder, Code converters, Comparator, Parity generator/detector.

UNIT - III **L-9**

COMBINATIONAL LOGIC DESIGN Part II: Decoder , Encoder, Multiplexer, De-multiplexer, Design of combinational circuits using multiplexer and decoder.

COMBINATIONAL LOGIC DESIGN Part III: Programming Logic devices-PROM, PAL,PLA, Implementation of combinational logic circuits using PROM, PLA, PAL, Introduction to FPGA architecture.

UNIT - IV **L-9**

SEQUENTIAL LOGIC DESIGN: Classification of sequential circuits, Latches, Flip-Flops - SR, JK, D, T, Master slave flip flop, Triggering and excitation tables, Shift registers, Counters - Ripple counters, Mod-n counter.

FSM: State diagram, State table, Design of sequential counter, Mealy FSM, Moore FSM, Case study: Sequence Detectors.

UNIT - V **L-9**

DIGITAL LOGIC FAMILIES: Introduction to logic families, TTL logic family, Totem pole, Open collector and tri-state output operations, MOS transistor switches - NMOS, PMOS, CMOS inverter and logic gates, ECL logic families, Comparison of TTL, CMOS and ECL logic families.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS **TOTAL HOURS: 30**

Design and Implementation of

1. Basic Logic Gates.
2. Adders: Half Adder, Full Adder, Ripple Carry Adder.
3. Subtractors: Half Subtractors, Full Subtractors.
4. Encoder.
5. Decoder.
6. Multiplexer.
7. De-Multiplexer.
8. Parity Circuits.
9. Code Converters.
10. Flip Flops: SR, JK, D, T.
11. Registers.
12. Counters.
13. Sequence Detectors.

* Above said Experiments can be verified with the Hardware ICs and /or Simulated with VHDL coding.

TEXT BOOKS:

1. M. Morris Mano, “Digital Design”, 4th Edition, Prentice Hall of India Pvt. Ltd., 2008 / Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2003.
2.. ZviKohavi, Niraj K. Jha, “Switching and Finite Automata Theory”, Cambridge University Press, 2010.

REFERENCE BOOKS:

1. John F.Wakerly, “Digital Design Principles and Practices”, Third Edition, Pearson/PHI, 2015
2. John.M Yarbrough, “Digital Logic Applications and Design”, Thomson Learning, 2006.
3. Charles H.Roth. “Fundamentals of Logic Design”, 6th Edition, Thomson Learning, 2013.
4. Donald P.Leach and Albert Paul Malvino, “Digital Principles and Applications”, 6th Edition, TMH, 2006