16EC205 DIGITAL ELECTRONICS

Hours Per Week :

L	T	P	C
2	-	2	3

Total Hours :

L	T	P
30	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
2	40	2	8	2	2

Course Description and Objectives:

Digital Electronics deals with fundamentals of number systems, 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:

Students will be able to:

- determine the philosophy of number systems and codes.
- simplify the logic expressions using Boolean laws and postulates and design them by using logic gates.
- minimize the logic expressions using map method and tabular method.
- design combinational logic circuits using conventional gates.
- design sequential logic circuits.
- design the FSM for completely specified and incompletely specified sequential machines.
- gain knowledge of the nomenclature and technology in the area of memory devices: ROM, RAM, PROM, PLD, FPGAs etc.

SKILLS:

- ü *Making conversions between numbers of different radices.*
- ü *Identifing the different gates and their properties.*
- ü *Minimize Boolean expression.*
- ü *Constructing different combinational circuits.*
- ü *Constructing different sequential circuits.*
- ü *Verify the functionality of digital circuits.*
- ü *Designing memories.*

ACTIVITIES:

- *Choose a Gate for digital circuit.*
- *Design digital circuits using universal gates.*
- *Design Combinational circuits like adder encoder, decoder.*
- *Design Sequential circuits like flip flops, counters.*
- *Design Finite state machines like Mealy and Moore machines.*

UNIT - 1 **L-9**

NUMBER SYSTEMS AND BOOLEAN ALGEBRA: Review of number systems - Conversions, Arithmetic operations, Binary codes, Parity code, Hamming code; Fundamental concepts of Boolean algebra- Basic theorems and properties, Canonical and standard forms, Logic gates, Algebraic simplification and realization with basic gates and universal gates.

UNIT - 2 **L-9**

MINIMIZATION OF SWITCHING FUNCTIONS: Map method, Prime implicants, Don't care combinations, Minimal SOP and POS forms, Tabular method, Prime implicant chart.

UNIT - 3 **L-9**

COMBINATIONAL LOGIC DESIGN: Design using conventional logic gates - Encoder, Decoder, Multiplexer, Demultiplexer, Parity bit generator, Code converters, (Designing with gates along with mention of IC numbers); Basic PLDs - PAL, PLA, ROM and PROM.

UNIT - 4 **L-10**

SEQUENTIAL LOGIC DESIGN: Classification of sequential circuits - Latches, Flip-Flops, SR, JK, T, D, triggering and Excitation tables, Design of sequential circuits; Shift registers, Counters, FSM, Sequence detectors.

UNIT - 5 **L-8**

LOGIC FAMILIES: Introduction to logic families - CMOS logic, Bipolar logic, Transistor logic, TTL families; CMOS/TTL Interfacing.

LABORATORY EXPERIMENTS

Course Outcomes:

The student will be able to :

- understand different digital circuits.
- design combinational circuits.
- design sequential circuits.
- analyze FSM for completely specified and incompletely specified sequential machines.
- analyze different types of memories.

LIST OF EXPERIMENTS Total hours:30

Design and Implementation of

1. Basic Logic Gates.
2. Adders.
3. Subtractor.
4. Decoder.
5. Encoder.
6. Multiplexer.

7. De-Multiplexer.
8. Parity Circuits.
9. Comparator.
10. Flip Flops.
11. Registers.
12. Shift Registers.
13. Counters.
14. Finite State Machines (FSM).

TEXT BOOKS :

1. Morris Mano, “Digital Logic & Computer Design”, 1st edition, Pearson, 2013.
2. J.F. Walkerly, “Digital Design Principles and Practices”, 3rd edition, PHI/Pearson Education, 2015.

REFERENCE BOOKS :

1. John M. Yarbrough, “Digital Logic Applications and Design”, 1st edition,Thomson Publications, 2010.
2. Fletcher, “An Engineering Approach To Digital Design”, 1st edition, Prentice Hall of India. 2009.
3. R.P.Jain, “Modern Digital Electronics”, 3rd edition, Tata McGraw–Hill publishing company limited, New Delhi, 2010.
4. D. Roy Chowdhury, “Linear Integrated Circuits”, 2nd edition, New Age International(p)Ltd, 2012.