16EC205 DIGITAL ELECTRONICS

Hours Per Week :

L	T	P	C
3	-	2	4

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:

Upon successful completion of this course, students should be able to:

CO1: Understand number systems and its conversion; simplify Boolean expressions by different methods and implementation using logic gates.

CO2: Apply the Boolean algebra knowledge of mathematics to analyze combinational and sequential digital electronic circuits using K-map and QM technique.

CO3: Design combinational and sequential circuits for the given specifications/constraints.

CO4: Synthesize the state diagram, state table, state equation for Finite state machine.

CO5: Compare the characteristics of logic families for implementing combinational & sequential circuits.

CO6: Demonstrate applications of digital circuits.

SKILLS:

- ✓ *Perform conversions between numbers of different radices.*
- ✓ *Identify the different gates and their properties.*
- ✓ *Minimize Boolean expression.*
- ✓ *Design combinational circuits for a given application.*
- ✓ *Develop sequential circuits for a given application.*
- ✓ *Verify the functionality of digital circuits.*
- ✓ *Design memories for a given specification.*

ACTIVITIES:

- *Choose a Gate for digital circuit.*
- *Design digital circuits using universal gates.*
- *Implement Combinational circuits like adder encoder, decoder.*
- *Design Sequential circuits like flip flops, counters.*
- *Develop 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: Minimization of switching functions - K-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 - Decoder, Encoder, Multiplexer, Demultiplexer, Parity bit generator, code converters (Designing with IC's); Basic PLDs - PAL, PLA, ROM, PROM.

UNIT - 4 **L-10**

SEQUENTIAL LOGIC DESIGN: Classification of sequential circuits, Latches, Flip-Flops - SR, JK, D, T, 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

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 and Computer Design”, 1st edition, Pearson, 2013.
2. John 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, 2010.