Digital Electronics

Subject Code : 18CS3SP03   **Total Contact Hours: 45**
Credits   : 03   **L-T-P:3-0-0**

Prerequisite: Knowledge on basics of Electrical&Electronics is strongly recommended.

Course Objectives:

- Students understand the concepts and terminology of digital electronics.
- The course will introduce the student with fundamental concept of digital techniques
- To acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits.
- To prepare students to perform the analysis and design of various digital circuits
- To develop skill to build, and troubleshoot digital circuits.

Unit I :
        (9 Hours)
Binary Codes and Boolean algebra

Signals: Analog and Digital, Binary Number System. Addition, Subtraction, Multiplication, Division of binary numbers, Subtraction using 2's complement method. Binary codes: weighted and non-weighted codes, self-complementary

Codes, BCD, Excesses-3, Gray codes, Alphanumeric codes, ASCII Codes.
Boolean algebra: Boolean Laws and Expression using Logic Gates, Realization of different gates using Universal gates,De- Morgan's Theorem, Duality Theorems.

Unit II:
        (9 Hours)
Boolean Function minimization Techniques
Standard forms: SOP, POS, Simplification of Switching function & representation (Maxterm&Minterm), Boolean expression & representation using logic gates, Propagation delay in logic gate. Karnaugh map: K-map, mapping and minimization of SOP and POS expression, Don't care condition, conversion from SOP to POS and POS to SOP form using K-map, Minimization of multiple output circuits,

Unit III:
        (9 Hours)

Combinational Circuits Design
Adder & Subtractor(Half and Full), Parallel Binary adder, BCD Adder, Binary multipliers, Code Converters, parity bit generator, Comparators, Decoder, BCD to 7-segment Decoder, Encoders, Priority Encoders, Multiplexers, De- Multiplexers.

Unit IV:
          (9 Hours)
Sequential Circuits Elements
Introductionto Sequential Circuit, Flip-flop and Latch: SR latch, JK flip-flop, Master Slave JK Flip-flop, T flip-flop, D flip-flop and latch, Master-slave RS flip-flop, Master-slave JK flip-flop, asynchronous inputs.

Unit V:
          (9 Hours)
Shift Registers and Counters
Shift registers: buffer register, controlled buffer register. Data transmission in shift resistor SISO, SIPO, PISO, PIPO, Bidirectional shift register, universal shift registers. Counter: Classification, Ripple or asynchronous counter, Effect of propagation delay in ripple counters, up-down counter, Design of Mod-n counter, synchronous counter, Ring counter, Johnson counter.

Course Outcomes:

At the end of the course, students will be able:

- Understand number systems and its arithmetic operations and Illustrate Use of Boolean algebra.
- Formulate and apply Karnaugh Map to reduce Boolean expressions and logic circuits to their simplest forms.
- To understand the working of combinational and sequential circuits with characteristic equation and truth table.
- Design of combinational and sequential circuits to interface logic families and remembering concept of memory technology.

Text Books:

1. "R.P. Jain, "Modern digital Electronics", Tata McGraw Hill, 4th edition, 2009.
2. Douglas Perry, "VHDL", Tata McGraw Hill, 4th edition, 2002.
3. W.H. Gothmann, "Digital Electronics- An introduction to theory and practice", PHI, 2nd edition, 2006. 2012.

References Books:

1. D.V. Hall, "Digital Circuits and Systems", Tata McGraw Hill, 1989
2. Charles Roth, "Digital System Design using VHDL", Tata McGraw Hill 2nd edition