Digital Logic

Course Code: ELX102
Year : 1
Semester : II
Credit Hour: (2TH + 1 PR)

Course Objectives:

The purpose of the course is to provide fundamental knowledge of basic principle of digital logic design and its implementation.

1. **Introduction to Digital Logic:**
   Analog and Digital signal, Analog system, Digital System, Digital Operation, Application of Digital System, Modern Digital Computer, Clock signal. **4hrs**

2. **Number System:**
   Introduction to Number Systems, Binary Number System, Decimal Number system, Octal Number System, Hexa-Decimal Number System and Conversion, Complements and Need of Complements, r's and (r-1)'s Complements, Binary Coded Decimal (BCD) and its Properties, Gray code, ASCII code, Excess-3 code, Negative and Positive Logic. **7hrs**

3. **Boolean Algebra:**
   Basic Logic Gates (NOT, AND, OR, EX-OR, EX-NOR), Universal Gates, De-Morgan's Theorem, Boolean laws and Theorems, Sum of Product (SOP), Product of Sum (POS), Boolean Simplification using Boolean Algebra, The Karnaugh Map Method, Don't Care Map Entries, Implementation using Universal gates. **9hrs**

4. **Combinational Circuits:**
   Introduction to combinational circuit, Half Adder, Full Adder, Half Subtractor, Full Subtractor, Adder-Subtractor circuit, Multiplexers/De-Multiplexers, Encoder/Decoder, Design of Encoder/Decoder, 7-segment Decoder, Design of Multiplexer/De-Multiplexer, Introduction to ROM and PLA, Design of ROM and PLA using K-map. **12hrs**

5. **Sequential Circuits:**
   Introduction to sequential circuit, Synchronous and Asynchronous sequential circuit, Edge Triggered and Level Triggered, Flip-Flop: R-S Flipflop, D-Flipflop, Clocked R-S flipflop, T-FlipFlop, J-K flipflop, Master Slave J-K Flipflop. **7hrs**

6. **Counter and Register** Introduction to counter, Concept of up and Down counting Asynchronous counter (Ripple counter), Modulo Counter, Synchronous Counter, Register and their types: SISO, SIPO, PIPO, PISO. **6hrs**

   Laboratory Work:

   - Familiarization with basic logic gates.
   - Realization of De-Morgan's Theorem and Universal gates.
   - Adder and Subtractor circuits
   - Multiplexers and De-Multiplexers
   - Encoders and Decoders
   - Seven Segment Display Decoder
   - Flip-flops (R-S Flipflop, D-Flipflop, Clocked R-S flipflop, T-FlipFlop, J-K Flipflop)
   - Asynchronous Counter, Synchronous Counter, Modulo Counter
   - Shift Register

References:

1. Donald P. Leach, Albert Paul Malvino and Goutam Saha, *Digital Principles and Applications*, 6th edition, Tata McGraw-Hill, 2006

2. William H. Gothmann, *Digital Electronics, An introduction to Theory and Practice*, 2nd edition, PHI, 2009

3. M. Mano, *Digital Logic and Computer Design*, Prentice Hall of India, 4th Edition.