Digital Logic

Course Title: Digital Logic
Course No: CSC111
Nature of the Course: Theory + Lab
Semester: I

Full Marks: 60 + 20 + 20
Pass Marks: 24 + 8 + 8
Credit Hrs: 3

Course Description: This course covers the concepts of digital logic and switching networks. The course includes the fundamental concepts of boolean algebra and its application for circuit analysis, multilevel gates networks, flip-lops, counters logic devices and synchronous and asynchronous sequential logic and digital integrated circuits.

Course Objectives: The main objective of this course is to introduce the basic tools for the design of digital circuits and introducing methods and procedures suitable for a variety of digital design applications.

Course Contents:

Unit 1: Binary Systems (6 Hrs.)
Digital Systems, Binary numbers, Number base conversion, Octal and hexadecimal numbers, compliments, Signed Binary numbers, Decimal codes (BCD, 2 4 2 1,8 4 -2 -1,Excess 3, Gray Code), Binary Storage and Registers, Binary logic

Unit 2: Boolean algebra and Logic Gates (5 Hrs.)
Basic and Axiomatic definitions of Boolean algebra, Basic Theorems and properties of Boolean Algebra, Boolean Functions, Logic Operations, Logic Gates, Integrated Circuits

Unit 3: Simplification of Boolean Functions (5 Hrs.)
K-map, Two and Three variable maps, Four variable maps, product of sum simplification, NAND and NOR implementation, Don't Care conditions, Determinant and selection of Prime Implicants

Unit 4: Combinational Logic (5 Hrs.)
Design Procedure, Adders, Subtractors, Code Conversions, Analysis Procedure, Multilevel NAND and NOR Circuits, Exclusive-OR Circuits

Unit 5: Combinational Logic with MSI and LSI (8 Hrs.)
Binary Parallel Adder and Subtractor, Decimal Adder, Magnitude Comparator, Decoders and Encoders, Multiplexers, Read-only-Memory (ROM), Programmable Logic Array (PLA), Programmable Array Logic (PAL)

Unit 6: Synchronous and Asynchronous Sequential Logic (10 Hrs.)
Flip-Flops, Triggering of flip-flops, Analysis of clocked sequential circuits, Design with state equations and state reduction table, Introduction to Asynchronous circuits, Circuits with latches.

Unit 7: Registers and Counters (6 Hrs.)
Registers, Shift registers, Ripple Counters, Synchronous Counters, Timing Sequences, The memory

Laboratory Works:
Students should be able to realize following digital logic circuits as a part of laboratory work.

- Familiarizations with logic gates
- Combinatorial Circuits
- Code Converters
- Design with Multiplexers
- Adders and Subtractors
- Flip-Flops
- Sequential Circuits
- Counters
- Clock Pulse Generator

Text Books:
1. M. Morris Mano, "Digital Logic & Computer Design"

Reference Books:

1. Brain Holdsworth, "Digital Logic Design", Elsevier Science.
2. John Patrick Hayes, "Introduction to Digital Logic Design", Addison-Wesley.
3. M. Morris Mano and Charles Kime, "Logic and Computer Design Fundamentals", Pearson New International.