RAMAKRISHNA MISSION VIDYAMANDIRA

NEP Syllabus for B.Sc. in Computer Science

Semester - IV

Course Code: 4CMSMIN1 Credit: 4

Course Type: Minor Course (MIN)

Course Outcome:

i) To differentiate between analog and digital electronic circuit components.
ii) To be able to understand the design and implementation of various digital circuit components.
iii) To understand the working of important digital circuit components like registers, clock generators and so on.
iv) To understand the concepts of hardware.

4CMSMIN1: Digital Electronics (Theory)

Credit: 3 **Marks: 50**

Introduction to Digital Electronics: Need of Digital Electronics, Comparison with Analog Electronics; Classes of Digital Circuits – Combinational and Sequential. [3L]

Number Systems and Codes: Number Systems – Decimal, Binary, Hexadecimal and Octal Number Systems, Base Conversions, Representation of Signed and Unsigned Numbers, Arithmetic Operations – Addition and Subtraction by Complement Method, Decimal number representation with Binay codes – Binary Coded Decimal (BCD) Codes, Weighted and Non-weighted, Symmetric and Non-symmetric, Unit-Distance and Reflected Codes, X3 and Gray Code, ASCII, Error Detection and Correction, Parity. [7L]

Logic Gates and Basic Operations: Logic gates – Basic and Derived, Switching Equivalent Circuits of Basic Gates, Truth Table and Symbolic Representation of OR, AND, NOT, NAND, NOR XOR, XNOR Gates, Universal Logic Gates, Logic Circuit Representation using Universal Logic Gates. [4L]

Concepts of Boolean Algebra: Basic Postulates and Fundamental Theorems of Boolean Algebra, Simplification of Boolean Expressions, Logic Circuit to Expression and Logic Expression to Circuit, Standard Representation of Logic Functions (SOP and POS), Concept of

Karnaugh Map, Karnaugh Map Minimization. [6L]

Combinational Circuits and Applications: Encoder and Decoder, Multiplexer and De-Multiplexer, Designing using basic / universal gates, Available ICs and their features, Cascading of ICs, Implementation of Logic Functions with Multiplexer, Binary Adder and Subtractor – Half and Full, Parallel Adder / Subtractor, BCD Adder, Circuit Implementation using adders – Code Converters, Comparator – 1-bit Comparator using Universal Gates, 4-bit and Higher bit Comparison using ICs, Parity Checker. [15L]

Sequential Circuits and Applications: Latches and Flip-Flops, Study of Flip-Flops – Characteristic Functions, Preset and Clear, Enable Functionality, Clocked Flip-Flops, Timing Diagram; Types – SR, JK, Master-Slave, D and T, Sequential Design Procedures – Design with State Equation, Asynchronous and Synchronous circuits, Counters – Asynchronous, Ripple Counter – UP, DOWN and UP/DOWN Counter (Upto 4-bit), Modulo Counters, Presettable Counter; Synchronous Counter – UP, DOWN and UP/DOWN Counter (Upto 4-bit), Modulo Counters, Registers – Shift (Serial, Parallel and Serial/Parallel), Types of Registers, Ring Counter and Johnson's Counter, Applications. [10L]

4CMSMIN1: Digital Electronics (Practical)

Credit:1 **Marks: 25**

a) Design basic gates using analog discrete components
b) Study of various logic gates and verification of truth tables
c) Universal gates – validation
d) Design half and full adder
e) Design half and full subtractor
f) Adder IC (7483/74283) and its applications – 4/8 bit adder, adder/subtractor, code converter using adder ICs
g) 1-bit comparator design and 4-bit comparator IC study
h) Designing Encoder, Decoder, MUX and DeMUX
i) Study of MUX and Decoder / DeMUX ICs
j) Use of seven segment display unit with driver
k) Study of various sequential circuits, Designing counter and register circuit, Study of functionalities and applications of IC 7476, IC 74194, IC 74193.

Text / Reference Books

1. Tokheim, Digital Principles, Schaum's Outline Series, Tata McGraw Hill.
2. Flyod, Digital Fundamentals, Pearson.
3. Raychaudhuri, Digital Circuits,Vol.1&2,Platinum.
4. Gothmann, Digital Electronics: An Introduction to Theory and Practice, PHI.
5. Kumar, Fundamentals of Digital Circuits, PHI.
6. Dueck, Digital Design, Cengage.
7. Comer, Digital Logic and State Machine Design, Oxford.
8. Salivahanan and Kumar, Digital Circuits and Design, Vikas.
9. Fletcher, An Engineering Approach to Digital Design, Pearson.
10. Wakerly, Digital Design: Principles and Practices, Pearson.