

## **SEMESTER – IV**

### **Major/DS course (Core) BCA 4011 Digital Logic**

**Credit : 5**

**Course Learning Outcomes :**At the end of this course student will:

- Understand various types of number systems and their conversions.
- Simplify the Boolean expressions and apply the Boolean theorems through logical gates
- Design and implement variety of logical devices using combinational circuits concepts.
- Demonstrate and compare the construction of programmable logic devices and different types of ROM
- Analyze sequential circuits like Registers and Counters using flip-flops

Number systems: Positional number systems; Binary, Octal , Hexadecimal and Decimal number systems; conversion of a number in one system to the other; Representation of signed numbers signed magnitude, one's complement, 2's complement representation techniques, Merits of 2's complement representation scheme; Various binary codes- BCD, excess -3, Gray code; Binary arithmetic- addition, subtraction, multiplication and division of unsigned binary numbers. [5L]

Logic gates: Basic logic operations- logical sum(or), logical product (AND), complementation (not), Anti coincidence (EX-OR)and coincidence (EX-NOR) operations: Truth tables of Basic gates; Boolean Variables and Expressions; Demorgan's theorem; Universal gates- NAND and NOR; Boolean expressions Simplification- Algebraic technique, Karnaugh map technique, 3 variable and 4 variable Karnaugh map. [15L]

Combinational Circuits: Half adder, full adder, binary magnitude comparator, adder /subtractor circuits, multiplexer and demultiplexer circuits, BCD adder/ subtractor; ALU; parity generators, code converters, priority encoders, PLAs. [30L]

Sequential circuits: flip- flops, - RS, clocked RS, D, JK, T flipflops,: Race condition, Master Slave JK: Registers- universal shift registers; Counters- Binary, decade; modulo-r divider; Practical IC's; Sequential Machine design. [30L]

Memory Circuits- Qualitative discussion of memory circuits; Classification- Read only, read write, Sequential access, random access; ROM- PROM, EPROM; Static and Dynamic RAM (qualitative) ; Basic idea on CCD memory and magnetic memory: CD-ROM: Structure and use. [10L]

Associative memory, cache memory organization, Virtual memory organization. [10L]

**Books:**

1. Digital Principles and Applications: Malvino and Leach
2. Modern Digital Electronics : R.P. Jain

3. Digital Circuits & Design – S.Salivahanan, S.Arivazhagan – Vikas Publishing House Pvt Ltd.
4. Digital logic & Computer Design- M.Mano- Prentice Hall of India.

## **Major/DS course (Core) BCA 4012**

### **Design and Analysis of Algorithms**

**Credit : 5**

**Course Learning Outcomes: On successful completion of this course, the student will be able to:**

- Given an algorithm, identify the problem it solves.
- Write algorithms choosing the best one or a combination of two or more of the algorithm design techniques: Iterative, divide-n-conquer, Dynamic Programming using appropriate data structures.
- Write proofs for correctness of algorithms.

Introduction Basic Design and Analysis techniques of Algorithms, Correctness of Algorithm. (5 L)

Algorithm Design Techniques Iterative techniques, Divide and Conquer (Karatsuba integer multiplication, Strassen's matrix multiplication, etc.), Dynamic Programming (Convex hull, DFT & FFT), Greedy Algorithms (Knapsack, Denomination of notes/coins), Scheduling. (8 L)

Sorting and Searching Techniques Elementary sorting techniques– Merge Sort, Advanced Sorting techniques - Heap Sort, Quick Sort, Sorting in Linear Time - Bucket Sort, Radix Sort and Count Sort, Searching Techniques, Medians & Order Statistics, complexity analysis. (17 L)

Lower Bounding Techniques: Decision Trees (2 L)

Balanced Trees: AVL Trees, Red-Black Trees (10 L)

Advanced Analysis Technique: Amortized analysis (5 L)

Graphs Graph Algorithms–Breadth First Search, Depth First Search and its Applications, Minimum Spanning Trees (Prim, Kruskal), Shortest Paths (Dijkstra, Bellman-Ford, Floyd-Warshall). (5 L)

String Processing: String Matching, Edit Distance, Document distance, Rabin-Karp, KMP, Boyer-Moore Techniques (5 L)

Cryptographic algorithms and Overview of complexity Classes: Basic cryptographic algorithms like DSA, RSA; P, NP, NP-Hard, NP-Complete (3 L)

**Recommended Books:**

1. T.H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein Introduction to Algorithms, PHI, 3rd Edition 2009

2. Sarabasse& A.V. Gelder Computer Algorithm – Introduction to Design and Analysis, Publisher – Pearson 3rd Edition 1999

## **Major/DS course (Core) BCA 4013**

### **Software Engineering**

**Credit : 5**

#### **Course Learning Outcomes:**

- Students will be able to decompose the given project in various phases of a lifecycle.
- Students will be able to choose appropriate process model depending on the user requirements.
- Students can apply the knowledge, techniques, and skills in the development of a software product.

Software Engineering Fundamentals: Definition of software product, Software Engineering Paradigms; Software engineering, Knowledge engineering, and End user development approaches. [8%]

System Analysis: An abstraction, Partitioning and projection, Systems specification, Software Requirements Specification (SRS) standards, Formal Specification methods, Specification tools, Flow based, Data based and Object – Oriented Analysis. [15%]

System Documentation: Principles of system documentation, types of documentation and their importance [5%]

System Planning: Data and fact gathering techniques-Interviewing, communications, presentations and site visit. Feasibility study, feasibility reports, prototyping, cost-benefit analysis-tools and techniques. [8%]

Systems Design:Idealized and constrained design, Process oriented design (Game and Sarson and Yourdon notations), Data oriented design (Warnier–Orr, E-R modelling), Object oriented design (Booch approach), Cohesion and Coupling, Design matrices, Design documentation standard. [25%]

Role of CASE Tools: Relevance of CASE Tools, High-end and Low-end CASE Tools.[7%]  
Coding and Programming : Choice of programming languages, Mixed language programming and cell semantics ,Re-engineering legacy systems, Coding standard. [5%]

Software Quality and testing: Software quality assurance .Types of Software Testing (White Box and Black Box Testing, Unit Testing, Integration Testing, Verification and Validation of Software) , Debugging and Software Reliability analysis , Software quality and matrices, Software maturity model and extensions. [10%]

Software Cost and Time estimation: Functions points , Issues in software cost estimation : Introduction to the Rayleigh curve, Algorithmic cost models (COCOMO, Putnam- Slim, Watson, and Felix), Other approaches to software cost and Size estimation (software complexity, Delphi , costing by analogy). [10%]

Software Project Management : Planning software , projects, Work breakdown structures, Integrating software design and project planning ,Software project teams, Projecting monitoring and control. [7%]

Books :

1. Software Engineering, A practioner's Approach- R. S. Pressman ( Mc-Graw Hill Inc)
2. An Integrated Approach to Software Engineering-P.Jalote (Narosa Publication House)

## **Minor Course BCA 4021**

### **Discrete Structure**

**Credit : 4**

**Course Learning Outcomes: students learn:**

- To develop understanding of Logic Sets and Functions.
- To use mathematical reasoning techniques including induction and recursion
- To understand and apply counting techniques to the representation and characterization of relational concepts.
- To develop an understanding of how graph and tree concepts are used to solve problems arising in the computer science.

Introduction: Sets - finite and Infinite sets, uncountably Infinite Sets; functions, relations, Properties of Binary Relations, Closure, Partial Ordering Relations; counting - Pigeonhole Principle, Permutation and Combination; Mathematical Induction, Principle of Inclusion and Exclusion. (15 L)

Growth of Functions: Asymptotic Notations, Summation formulas and properties, Bounding Summations, approximation by Integrals. (8 L)

Recurrences: Recurrence Relations, Generating functions, Linear Recurrence Relations with constant coefficients and their solution, Substitution Method, Recurrence Trees, Master Theorem. (10 L)

Graph Theory: Basic Terminology, Models and Types, multi-graphs and weighted graphs, Graph Representation, Graph Isomorphism, Connectivity, Euler and Hamiltonian Paths and Circuits, Planar Graphs, Graph Coloring, Trees, Basic Terminology and properties of Trees, Introduction to Spanning Trees. (15 L)

Propositional Logic: Logical Connectives, Well-formed Formulas, Tautologies, Equivalences, Inference Theory. (12 L)

Recommended Books:

1. C.L. Liu , D.P. Mahopatra, Elements of Discrete mathematics, 2nd Edition , Tata McGraw Hill, 1985,
2. Kenneth Rosen, Discrete Mathematics and Its Applications, Sixth Edition ,McGraw Hill 2006
3. T.H. Cormen, C.E. Leiserson, R. L. Rivest, Introduction to algorithms, 3rd edition Prentice Hall on India, 2009
4. M. O. Albertson and J. P. Hutchinson, Discrete Mathematics with Algorithms , John wiley Publication, 1988

5. J. L. Hein, Discrete Structures, Logic, and Computability, 3rd Edition, Jones and Bartlett Publishers, 2009
6. D.J. Hunter, Essentials of Discrete Mathematics

## **Minor Course BCA 4022**

### **Principles of Management**

**Credit : 4**

#### **Course Learning Outcomes: Students learn:**

- Fundamental knowledge and exposure to Theories and Concept in the Field of Management.
- To develop the knowledge of business and management principles.
- Decision thinking and problem skills.
- To teach a sense of responsibility and a capacity for business management.
- To Explain the financial concepts used in making business decision.

Meaning and Role of Management Information System- Introduction, Definition, System? Approach. Development of Organizational Theory, Management & Organizational Behaviour, Management, Information & System Approach. [25L]

Data Processing- Operation of Manual Information System, Components of Computer System, Conversion of Manual to Computer Based Systems, Data Bank Concept, Types of Computer Based Applications. Information System for Decision Making- Evolution of Information System, Decision Making & Management Information System. [25L]

Strategic & Project Planning for Management Information System- Business Planning, Management Information System Responses, Management Information System Planning- General & Details. Conceptual System Design- Define Problem, Set System Objective, Establish System Constraints, Determine Information Needs & Sources, Develop Alternative Conceptual Design & Documentation, Prepare the Design Report. [25L]

Detailed System Design- Aim, Project Management, Define Subsystem, Input, Output & Process Design, System Testing, Software & Hardware selection, Documentation of Detailed Design. Pitfalls in Management Information Systems. [25L]

Text & Reference Books:

1. Robert G. Murdick, Joel E. Ross, James R. Claggett, Information System for Modern Management.
2. Surendra Basandra, Computers Today