Rama University Uttar Pradesh, Kanpur
Faculty of Engineering & Technology
(Effective from the Session 2014-15)
B. Tech. Computer Science Engineering
Third Semester

BEC-308: Digital Logic Design

L	T	P	Credit-4
3	1	**0**	

Unit-I **08 Hours**

Digital system and binary numbers: Signed binary numbers, binary codes, cyclic codes, error detecting and correcting codes, hamming codes.

Floating point representation, Gate-level minimization: The map method up to five variable, don't care conditions, POS simplification, NAND and NOR implementation, Quine McClusky method (Tabular method).

Unit-II **08 Hours**

Combinational Logic: Combinational circuits, analysis procedure, design procedure, binary adder-subtractor, decimal adder, binary multiplier, magnitude comparator, decoders, encoders, multiplexers.

Unit-III **08 Hours**

Synchronous Sequential logic: Sequential circuits, storage elements: latches, flip flops, analysis of clocked sequential circuits, state reduction and assignments, design procedure.

Registers and Counters: Shift registers, ripple counter, synchronous counter, and other counters.

Unit-IV **08 Hours**

Memory and programmable logic: RAM, ROM, PLA, and PAL.

Design at the register transfer level: ASMs, design example, design with multiplexers.

Unit-V **08 Hours**

Asynchronous sequential logic: Analysis procedure, circuit with latches, design procedure, reduction of state and flow table ,race free state assignment, hazards.

Text Book:

M. Morris Mano and M.D. Ciletti, "Digital Design", 4th Edition, Pearson Education

BAS-301: MATHEMATICS-III

L T P **Credit-4**

3 1 **0**

Unit - I: Function of Complex variable **08 Hours**

Analytic function, C-R equations, Cauchy's integral theorem, Cauchy's integral formula for derivatives of analytic function, Taylor's and Laurent's series, singularities, Residue theorem, Evaluation of real integrals of the type and

Unit - II : Statistical Techniques - I **08 Hours**

Moments, Moment generating functions, Skewness, Kurtosis, Curve fitting, Method of least squares, fitting of straight lines, Polynomials, Exponential curves etc., Correlation, Linear, non -linear and multiple regression analysis, Probability theory.

Unit - III : Statistical Techniques - II **08 Hours**

Binomial, Poisson and Normal distributions, Sampling theory (small and large), Tests of significations: Chi-square test, t-test, Analysis of variance (one way) , Application to engineering, medicine, agriculture etc.

Time series and forecasting (moving and semi-averages), Statistical quality control methods, Control charts, , R, p, np, and c charts.

Unit-IV:Numerical Techniques-I **08 Hours**

Zeroes of transcendental and polynomial equation using Bisection method, Regula-falsi method and Newton-Raphson method, Rate of convergence of above methods.

Interpolation: Finite differences, difference tables, Newton's forward and backward interpolation, Lagrange's and Newton's divided difference formula for unequal intervals.

Unit-V:NumericalTechniques-II **08 Hours**

Solution of system of linear equations, Gauss- Seidal method, Crout method. Numerical differentiation, Numerical integration , Trapezoidal , Simpson's one third and three-eight rules, Solution of ordinary differential (first order, second order and simultaneous)equations by Euler's, Picard's and forth-order Runge- Kuttamehthods.

Test Books:-

1. Peter V. O' Neil, Advance Engineering Mathematics Thomson (Cengage) Learning, 2007.

2. Jain, Iyenger & Jain, Numerical Methods for Scientific Computation, New Age International, New Delhi , 2003.

3. J.N. Kapur, Mathematical Statistics, S. Chand & company Ltd., 2000.

Reference Books:-

1. R.K. Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publication House, 2002.
2. Chandrika Prasad, Advanced Mathematics for Engineers, Prasad Mudralaya,1996.
3. Kreysig, Advanced Engineering Mathematics, John Wiley & Sons, 2005.
4. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 2005.

BCS-301: DATA STRUCTURES USING - C

L T P **Credit-4**

3 1 0

Unit-1 **08 Hours**

Introduction: Basic Terminology, Elementary Data Organization, Algorithm, Efficiency of an Algorithm, Time and Space Complexity, Asymptotic notations: Big-Oh, Time-Space trade-off. Abstract Data Types (ADT)

Arrays: Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Application of arrays, Sparse Matrices and their representations.

Linked lists: Array Implementation and Dynamic Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition, Generalized Linked List.

Unit-II **08 Hours**

Stacks: Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Recursion, Tower of Hanoi Problem, Simulating Recursion, Principles of recursion, Tail recursion, Removal of recursion .

Queues, Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, Dequeue and Priority Queue.

Unit-III **08 Hours**

Trees: Basic terminology, Binary Trees, Binary Tree Representation: Array Representation and Dynamic Representation, Complete Binary Tree, Algebraic Expressions, Extended Binary Trees, Array and Linked Representation of Binary trees, Tree Traversal algorithms: In order, Preorder and Post order, Threaded Binary trees, Traversing Threaded Binary trees, Huffman algorithm.

Unit-IV **08 Hours**

Graphs: Terminology, Sequential and linked Representations of Graphs: Adjacency Matrices, Adjacency List, Adjacency Multi list, Graph Traversal : Depth First Search and Breadth First Search, Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prims and Kruskal algorithm. Transitive Closure and Shortest Path algorithm: Warshal Algorithm and Dijikstra Algorithm, Introduction to Activity Networks.

Unit-V **08 Hours**

Searching: Sequential search, Binary Search, Comparison and Analysis.

Internal Sorting: Insertion Sort, Selection, Bubble Sort, Quick Sort, Two Way Merge Sort, Heap Sort, Radix Sort, Practical consideration for Internal Sorting.

Search Trees: Binary Search Trees (BST), Insertion and Deletion in BST, Complexity of Search Algorithm, AVL trees, Introduction to m-way Search Trees, B Trees & B+ Trees

Hashing: Hash Function, Collision Resolution Strategies

Storage Management: Garbage Collection and Compaction.

Text books and References:

1. Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein "Data Structures Using C and C++", PHI

2. Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publication

3. Jean Paul Trembley and Paul G. Sorenson, "An Introduction to Data Structures with applications", McGraw Hill

4. R. Kruse etal, "Data Structures and Program Design in C", Pearson Education

5. Lipschutz, "Data Structures" Schaum's Outline Series, TMH

6. G A V Pai, "Data Structures and Algorithms", TMH

BCS-302: DISCRETE MATHEMATICAL STRUCTURES

L T P **Credit-4**

3 1 **0**

Unit-I **08 Hours**

Set Theory: Introduction, Combination of sets, Multisets, Ordered pairs. Proofs of some general identities on sets.

Relations: Definition, Operations on relations, Properties of relations, Composite Relations, Equality of relations, Recursive definition of relation, Order of relations.

Functions: Definition, Classification of functions, Operations on functions, Recursively defined functions. Growth of Functions.

Natural Numbers: Introduction, Mathematical Induction, Variants of Induction, Induction with Nonzero Base cases. Proof Methods, Proof by counter - example, Proof by contradiction.

Unit-II **08 Hours**

Algebraic Structures: Definition, Groups, Subgroups and order, Cyclic Groups, Cosets, Lagrange's theorem, Normal Subgroups, Permutation and Symmetric groups, Group Homomorphism's, Definition and elementary properties of Rings and Fields, Integers Modulo *n*.

Unit-III **08 Hours**

Partial order sets: Definition, Partial order sets, Combination of partial order sets, Hasse diagram. Lattices: Definition, Properties of lattices - Bounded, Complemented, Modular and Complete lattice.

Boolean algebra: Introduction, Axioms and Theorems of Boolean algebra, Algebraic manipulation of Boolean expressions. Simplification of Boolean Functions, Karnaugh maps, Logic gates, Digital circuits and Boolean algebra.

Unit-IV **08 Hours**

Propositional Logic: Proposition, well formed formula, Truth tables, Tautology, Satisfiability, Contradiction, Algebra of proposition, Theory of Inference.

Predicate Logic: First order predicate, well formed formula of predicate, quantifiers, Inference theory of predicate logic.

Unit-V **08 Hours**

Trees: Definition, Binary tree, Binary tree traversal, binary search tree.

Graphs: Definition and terminology, Representation of graphs, Multigraphs, Bipartite graphs, Planar Graphs, Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph coloring, Recurrence Relation & Generating function: Recursive definition of functions, Recursive algorithms,

Method of solving recurrences.

Combinatorics: Introduction, Counting Techniques, Pigeonhole Principle, Pólya's Counting Theory.

References Book:

1. Koshy, Discrete Structures, Elsevier Pub. 2008

2. Kenneth H. Rosen, Discrete Mathematics and Its Applications, 6/e, McGraw-Hill, 2006.

3. B. Kolman, R.C. Busby, and S.C. Ross, Discrete Mathematical Structures, 5/e, Prentice Hall, 2004.

4. E.R. Scheinerman, Mathematics: A Discrete Introduction, Brooks/Cole, 2000.

5. R.P. Grimaldi, Discrete and Combinatorial Mathematics, 5/e, Addison Wesley, 2004.

6. Jean Paul Trembley, RManohar, Discrete Mathematical Structures with Application to Computer Science, McGraw-Hill, Inc. New York, NY, 1975.

BCS-303: Web technology

L T P **Credit-4**

3 1 **0**

Unit I: **08Hours**

Introduction & Web Develop. Strategic: Introduction Web Technology, History of Web ,Protocols governing Web, Creating Websites for Individual & Corporate World, Cyber Laws, Web application, Writing Web Projects, Identification of Objects, Web Team, Planning & Process Development

Unit II: **08Hours**

HTML, XML & SCRIPTING LANGAUGE: List, Tables, Images, Forms, Frames, CSS, Document type Definition, XML Schemes, Object Models, Presenting XML, Processing: DOM & SAX, Introduction of Java Script, Object in Java Script, Dynamic HTML with Java Script

Unit III: **08Hours**

JAVA BEANS & WEB SERVERS: Introduction of Java Beans, Java Beans Advantage & properties, BDK, Introduction of EJB, Java Beans API, Introduction to Servlets, Life Cycle of Servlet & JSDK, Servlet API, Servlet Packages: HTTP Package, Working with HTTP Request &Response, Security Issues.

Unit IV: **08Hours**

JAVA SERVER PAGES: Introduction of JSP,JSP Processing, JSP Application Design, Tomcat Server, Implicit JSP Objects, Conditional Processing, Declaring Variable & Methods, Error Handling & Debugging, Sharing Data b\w JSP pages-sharing Session, Sharing Data b\w JSP pages-sharing Application Data.

Unit V: **08Hours**

DATABASE CONNECTIVITY: Database Programming using JDBC, Studying Javax.sql.*, Accessing a database from JSP pages, Application -specific Database Action, Developing Java Beans in a JSP page, Introduction of struts frame work.

Reference Books:

1. Patrick Naughton and Herbertz Schildt, “J ava-2 The Complete Reference” 199, TMH.
2. Shelley Powers, “Dynamic Web Publishing” 2nd Ed. Techmedia, 1998.
3. Ivor Horton, “Beginning Java-2” SPD Publication
4. Jason Hunter, “Java Servlet Programming” O’Reilly

BEC-358: Logic Design Lab

L T P **Credit-1**

0 0 2

1. Introduction to digital electronics lab- nomenclature of digital ICs, specifications, study of the data sheet, concept of $V_{cc}$and ground, verification of the truth tables of logic gates using TTL ICs.
2. Implementation of the given Boolean function using logic gates in both SOP and POS forms.
3. Verification of state tables of RS, JK, T and D flip-flops using NAND & NOR gates.
4. Implementation and verification of Decoder/De-multiplexer and Encoder using logic gates.
5. Implementation of 4x1 multiplexer using logic gates.
6. Implementation of 4-bit parallel adder using 7483 IC.
7. Design, and verify the 4-bit synchronous counter.
8. Design, and verify the 4-bit asynchronous counter.
9. Mini Project.

BCS-351: Data Structure Lab

L T P **Credit-1**

0 0 3

Write Program in C or C++ for following.

1. Array implementation of Stack, Queue, Circular Queue, List.
2. Implementation of Stack, Queue, Circular Queue, List using Dynamic memory Allocation.
3. Implementation of Tree Structures, Binary Tree, Tree Traversal, Binary Search Tree, Insertion and Deletion in BST.
4. Implementation of Searching and Sorting Algorithms.
5. Graph Implementation, BFS, DFS, Min. cost spanning tree, shortest path algorithm

BCS-353: Web Technology Lab

L	T	P	Credit-1
0	0	2	

EXPERIMENTS:

1. Create a web page with the following using HTML

   i) To embed an image map in a web page

   ii) To fix the hot spots

   iii) Show all the related information when the hot spots are clicked.

2. Create a web page with all types of Cascading style sheets.

3. Client Side Scripts for Validating Web Form Controls using DHTML

4. Write programs in Java to create applets incorporating the following features:

   - Create a color palette with matrix of buttons
   - Set background and foreground of the control text area by selecting a color from color palette.
   - In order to select Foreground or background use check box control as radio buttons
   - To set background images

5. Write programs in Java using Servlets:

   - To invoke servlets from HTML forms
   - To invoke servlets from Applets

6. Write programs in Java to create three-tier applications using JSP and Databases

   - for conducting on-line examination.
   - for displaying student mark list. Assume that student information is available in a database which has been stored in a database server.

7. Programs using XML - Schema - XSLT/XSL

8. Programs using AJAX

9. Consider a case where we have two web Services- an airline service and a travel agent and the travel agent is searching for an airline. Implement this scenario using Web Services and Data base.

BCS-352: Numerical Techniques Lab

L T P **Credit-1**

0 0 2

Write Programs in 'C' Language:

1. To deduce error envolved in polynomial equation.
2. To Find out the root of the Algebraic and Transcendental equations using
3. Bisection, Regula-falsi, Newton Raphson and Iterative Methods. Also give the
4. rate of convergence of roots in tabular form for each of these methods.
5. To implement Newton's Forward and Backward Interpolation formula.
6. To implement Gauss Forward and Backward, Bessel's, Sterling's and Evertt's
7. Interpolation formula
8. To implement Newton's Divided Difference and Langranges Interpolationformula.
9. To implement Numerical Differentiations.
   a. To implement Numerical Integration using Trapezoidal, Simpson1/3 andSimpson3/8 rule.
   b. To implement Least Square Method for curve fitting.
   c. To draw frequency chart like histogram, frequency curve and pie-chart etc.
   d. .To estimate regression equation from sampled data and evaluate values of
      i. standard deviation, t-statistics, regression coefficient, value of R^2 for atleast two
      ii. independent variables.

Fourth Semester

Departmental Elective-I

1. BCS -041 Software Testing
2. BCS -042 Software Reliability
3. BCS -043 Software Quality Engineering
4. BCS-044 Principal of Programming Language
5. BCS-045 Management Information System

Department Elective-I

BCS-041: Software Testing

L T P **Credit-4**

3 1 **0**

Unit-I: Introduction **08 hours**

Faults, Errors, and Failures, Basics of software testing, Testing objectives, Principles of testing, Requirements, behavior and correctness, Testing and debugging, Test metrics and measurements, Verification, Validation and Testing, Types of testing, Software Quality and Reliability, Software defect tracking.

Unit-II: White Box and Black Box Testing **08 hours**

White box testing, static testing, static analysis tools, Structural testing: Unit/Code functional testing, Code coverage testing, Code complexity testing, Black Box testing, Requirements based testing, Boundary value analysis, Equivalence partitioning, state/graph based testing, Model based testing and model checking, Differences between white box and Black box testing.

Unit-III: Integration, System, and Acceptance Testing **08 hours**

Top down and Bottom up integration, Bi-directional integration, System integration, Scenario Testing, Defect Bash, Functional versus Non-functional testing, Design/Architecture verification, Deployment testing, Beta testing, Scalability testing, Reliability testing, Stress testing, Acceptance testing: Acceptance criteria, test cases selection and execution,

Unit-IV: Test Selection & Minimization for Regression Testing **08 hours**

Regression testing, Regression test process, Initial Smoke or Sanity test, Selection of regression tests, Execution Trace, Dynamic Slicing, Test Minimization, Tools for regression testing, Ad hoc Testing: Pair testing, Exploratory testing, Iterative testing, Defect seeding.

Unit-V: Test Management and Automation **08 hours**

Test Planning, Management, Execution and Reporting, Software Test Automation: Scope of automation, Design & Architecture for automation, Generic requirements for test tool framework, Test tool selection, testing in Object Oriented Systems.

Reference Books:

1. S. Desikan and G. Ramesh, "Software Testing: Principles and Practices", Pearson Education.
2. Aditya P. Mathur, "Fundamentals of Software Testing", Pearson Education.
3. Naik and Tripathy, "Software Testing and Quality Assurance", Wiley
4. K. K. Aggarwal and Yogesh Singh, "Software Engineering", New Age International Publication.

BCS-042: Software Reliability

L T P **Credit-4**

3 1 **0**

UNIT-I: Introduction **08 hours**

Defining Software Reliability, Software Reliability Attributes and Specification, Concept of Defects, Faults, Failures, Defect Rate and Reliability, Defect Prevention, Reduction, and Containment, Overview of Different Types of Software Review, Introduction to Measurement and Inspection Process, Documents and Metrics.

UNIT-II: Software Reliability Metrics **08 hours**

Collection of fault and failure data, Measurement of internal and external product attributes, Customer Problems Metric, Customer Satisfaction Metrics, In-Process Quality Metrics: Defect Arrival Pattern, Phase-Based Defect Removal Pattern, Defect Removal Effectiveness, Metrics for Software Maintenance, Software Reliability indicators, Software Reliability Metrics, Static Code Metrics, Dynamic Metrics.

UNIT-III: Software Reliability Assessment Models **08 hours**

Basics of Reliability Theory, Software Reliability Problem, Modeling Process, Software Reliability Models, Parametric Reliability Growth Models, The Rayleigh Model, Exponential Distribution and Software Reliability Growth Models, Software Quality Assessment Models: Hierarchical Model of Software Quality Assessment.

UNIT-IV: Software Reliability Allocation Models **08 hours**

Software Reliability Allocation Models, Criteria for Model Evaluation, Optimal ReliabilityAllocation, Quality Planning and Control, Quality Improvement Process, Evolution of Software Quality Assurance (SQA), Major SQA Activities, Major SQA Issues, Zero Defect Software.

UNIT-V: Software Reliability Techniques **08 hours**

Reliability Techniques: Trending Reliability Techniques, Predicting Reliability Techniques, Error Seeding, Failure Rate, Curve Fitting, Reliability Growth, Models and Tools: Study of tools like CASRE, SARA, SMERFS.

Reference Books:

1. John Musa, "Software Reliability Engineering", McGraw-Hill

2. Fenton, and P fleeger, "Software Metrics: A Rigorous and Practical Approach", International Thomson Computer Press

3. Jeff Tian, Software Quality Engineering (SQE), Wiley.

BCS-043: Software Quality Engineering

L T P **Credit-4**

3 1 **0**

UNIT-I: Introduction **08 hours**

Defining Software Quality, Software Quality Attributes and Specification, Cost of Quality, Defects, Faults, Failures, Defect Rate and Reliability, Defect Prevention, Reduction, and Containment, Overview of Different Types of Software Review, Introduction to Measurement and Inspection Process, Documents and Metrics.

UNIT-II: Software Quality Metrics **08 hours**

Product Quality Metrics: Defect Density, Customer Problems Metric, Customer SatisfactionMetrics, Function Points, In-Process Quality Metrics: Defect Arrival Pattern, Phase-Based Defect Removal Pattern, Defect Removal Effectiveness, Metrics for Software Maintenance: Backlog Management Index, Fix Response Time, Fix Quality, Software Quality Indicators.

UNIT-III: Software Quality Management and Models **08 hours**

Modeling Process, Software Reliability Models: The Rayleigh Model, Exponential Distribution and Software Reliability Growth Models, Software Reliability Allocation Models, Criteria for Model Evaluation, Software Quality Assessment Models: Hierarchical Model of Software Quality Assessment.

UNIT-IV: Software Quality Assurance **08 hours**

Quality Planning and Control, Quality Improvement Process, Evolution of Software Quality Assurance (SQA), Major SQA Activities, Major SQA Issues, Zero Defect Software, SQA Techniques, Statistical Quality Assurance, Total Quality Management, Quality Standards and Processes.

UNIT-V: Software Verification, Validation & Testing: **08 hours**

Verification and Validation, Evolutionary Nature of Verification and Validation, Impracticality of Testing all Data and Paths, Proof of Correctness, Software Testing, Functional, Structural and Error Oriented Analysis & Testing, Static and Dynamic Testing Tools, Characteristics of Modern Testing Tools.

Reference Books:

1. Jeff Tian, Software Quality Engineering (SQE), Wiley

2. Stephen H. Kan, Metrics and Models in Software Quality Engineering, Addison-Wesley

BCS-044: Principal of Programming Languages

L T P **Credit-4**

3 1 **0**

UNIT I **08 hours**

Program Design: Introduction- fundamental Design Concepts - Modules and Modularization Criteria Design notation: Procedure Template, Pseudo Code - Structured Flow Chart - Decision Tables- Designt echniques: Stepwise refinement, Levels of abstraction, Top down- Test Plans- Design Guidelines. Implementation Issues: Introduction - Structured Coding techniques: single entry and single exit constructs, Efficiency consideration, Validation of single entry and single exit, Coding Style.

UNIT II **08 hours**

Introduction: Characteristics of programming Languages, Factors influencing the evolution of programming language, Development in programming methodologies, desirable features and design issues. Programming Language processors: Structure and operations of translators, software simulated computer, syntax, semantics, structure, virtual computers, binding and binding time.

UNIT III **08 hours**

Data types: Properties of types and objects - elementary data types - structured data types. Abstraction: Abstract data types - encapsulation by subprograms - type definition – storage management.

UNIT IV **08 hours**

Sequence Control: Implicit and explicit sequence control - sequencing with arithmetic and non arithmetic expressions - sequence control between statements. Subprograms Control: Subprogram sequence control - attributes of data control - shared data in.

UNIT V **08 hours**

Object Oriented Programming: The class notion - Information hiding and data abstraction using classes, derived classes and inheritance, Polymorphism, Parameterized types. Logic Programming: Formal logical systems - PROLOG. Functional Programming: Features of functional languages - LISP - Applications of functional and logic programming languages.

BOOK

1. Richard Fairley," Software Engineering Concepts", Tata Macgraw Hill, 2006 (UNIT I)

2. Terrance W. Pratt, and Marvin V. Zelkowitz, "Programming Languages, Design and Implementation", Prentice-Hall of India, Fourth edition, 2002 (UNIT II to V)

REFERENCES

1. Ravi Sethi, "Programming Languages - Concepts and Constructs", Addison-Wesley, Second edition, 1996.

2. Allen B. Tucker, Robert Noonan, Programming Languages: Principles and Paradigms, Tata McGraw-Hill, 2006.

3. E. Horowitz, "Fundamentals of Programming Languages", Galgotia Publishers, 1984.

4. A.B. Tucker, Robert, Noonan, "Programming Languages", McGraw-Hill, 2002.

5. Robert W. Sebesta, "Concepts of Programming Languages", Addison Wesley, Sixth edition, 2003.

BCS-045: Management Information System

L T P **Credit-4**

3 1 0

UNIT I **08 hours**

INFORMATION SYSTEM AND ORGANIZATION

Matching the Information System Plan to the Organizational Strategic Plan – Identifying Key Organizational Objective and Processes and Developing an Information System Development User role in Systems Development Process - Maintainability and Recoverability in System Design.

UNIT II **08 hours**

REPRESENTATION AND ANALYSIS OF SYSTEM STRUCTURE

Models for Representing Systems: Mathematical, Graphical and Hierarchical (Organization Chart, Tree Diagram) - Information Flow - Process Flow - Methods and Heuristics - Decomposition and Aggregation - Information Architecture - Application of System Representation to Case Studies.

UNIT III **08 hours**

SYSTEMS, INFORMATION AND DECISION THEORY

Information Theory - Information Content and Redundancy - Classification and Compression Summarizing and Filtering - Inferences and Uncertainty - Identifying Information needed to Support Decision Making - Human Factors - Problem characteristics and Information System Capabilities in Decision Making.

UNIT IV **08 hours**

INFORMATION SYSTEM APPLICATION

Transaction Processing Applications - Basic Accounting Application - Applications for Budgeting and Planning - Other use of Information Technology: Automation - Word Processing - Electronic Mail Evaluation Remote Conferencing and Graphics - System and Selection - Cost Benefit Centralized versus Decentralized Allocation Mechanism.

UNIT V **08 hours**

DEVELOPMENT AND MAINTENANCE OF INFORMATION SYSTEMS

Systems analysis and design - System development life cycle - Limitation - End User Development Managing End Users - off- the shelf software packages - Outsourcing -Comparison of different methodologies.

REFERENCES BOOK

1. Laudon K.C, Laudon J.P, Brabston M.E, "Management Information Systems - Managing the digital firm", Pearon Education, 2004.

2. Turban E.F, Potter R.E, "Introduction to Information Technology"; Wiley, 2004.

3. Jeffrey A.Hoffer, Joey F.George, Joseph S. Valachich, "Modern Systems Analysis and Design", Third Edition, Prentice Hall, 2002.

BCS-401: Software Engineering

L T P **Credit-4**

3 1 **0**

Unit I **08Hours**

Overview of System Analysis & Design, Business System Concept, System Development Life Cycle, Water fall Model, Spiral Model, Feasibility Analysis, Technical Feasibility, Cost Benefit Analysis, COCOMO model.

Unit II **08Hours**

System Requirement Specification-DFD, Data Dictionary, ER diagram, Process Organization &Interactions. System Design- Problem Partitioning, Top down and Bottom Up design; Decision tree, decision table and structured English; Functional vs. Object Oriented approach.

Unit III **08Hours**

Coding & Documentation Structured Programming, OOPS Programming, Information Hiding, Reuse, System Documentation. Testing - Levels of Testing, Integration Testing, Test case Specification, Reliability Assessment. , Validation & Verification Metrics, Monitoring & Control.

Unit IV **08Hours**

Software Project Management - Project Scheduling, Staffing, Software Configuration Management.

Unit V **08Hours**

Quality Assurance, Project Monitoring. CASETOOLS: Concepts, use and application.

Reference Books:

1. R.G.Pressman-Software Engineering, TMH
2. Behforooz, Software Engineering Fundamentals, OUP
3. Ghezzi, Software Engineering, PHI
4. Pankaj Jalote-An Integrated Approach to Software Engineering, NAROSA.
5. Object Oriented & Classical Software Engineering (Fifth Edition),SCHACH,TMH

BCS-402: Computer Organization &Design

L T P **Credit-4**

3 1 0

Unit-I **08 Hours**

Introduction: Number representation; fixed and floating point number representation, IEEE standard for floating point representation. Error detection and correction codes: Hamming code. Digital computer generation, computer types and classifications, functional units and their interconnections, buses, bus architecture, types of buses and bus arbitration. Register, bus and memory transfer.

Unit-II **08 Hours**

Central Processing Unit: Addition and subtraction of signed numbers look ahead carry adders. Multiplication: Signed operand multiplication, Booths algorithm and array multiplier. Division and logic operations. Floating point arithmetic operation Processor organization, general registers organization, stack organization and addressing modes.

Unit-III **08 Hours**

Control Unit: Instruction types, formats, instruction cycles and sub cycles (fetch and execute etc) , micro-operations, execution of a complete instruction.

Hardwire and micro programmed control: microprogramming sequencing, wide branch addressing, and microinstruction with next address field, pre-fetching microinstructions, concept of horizontal and vertical microprogramming.

Unit-IV **08 Hours**

Memory: Basic concept and hierarchy, semiconductor RAM memories, 2D & 2 1/2D memory organization. ROM memories.

Cache Memories: concept and design issues 9 performance, address mapping and replacement)

Auxiliary Memories: magnetic disk, magnetic tape and optical disks Virtual memory: concept implementation.

Unit-V **08 Hours**

Input / Output: Peripheral devices, I/O interface, I/O ports, Interrupts: interrupt hardware, types of interrupts and exceptions.

Modes of Data Transfer: Programmed I/O, interrupt initiated I/O and Direct Memory Access.,I/O channels and processors.

Serial Communication: Synchronous & asynchronous communication, standard communication interfaces.

Reference Books

1. Patterson, Computer Organisation and Design, Elsevier Pub. 2009
2. William Stalling, " Computer Organization", PHI
3. Vravice, Hamacher & Zaky, "Computer Organization", TMH
4. Mano," Computer System Architecture", PHI
5. John P Hays, " Computer Organization", McGraw Hill
6. Tannenbaum," Structured Computer Organization', PHI
7. P Pal chaudhry, ' Computer Organization & Design', PHI

BCS-403: Data Base Management System

L T P **Credit-4**

3 1 0

Unit-I **08 Hours**

Introduction: An overview of database management system, database system Vs file system, Database system concept and architecture, data model schema and instances, data independence and database language and interfaces, data definitions language, DML, Overall Database Structure.

Data modeling using the Entity Relationship Model:

ER model concepts, notation for ER diagram, mapping constraints, keys, Concepts of Super Key, candidate key, primary key, Generalization, aggregation, reduction of an ER diagrams to tables extended ER model, relationship of higher degree.

Unit-II **08 Hours**

Relational data Model and Language: Relational data model concepts, integrity constraints, entity integrity, referential integrity, Keys constraints, Domain constraints, relational algebra, relational calculus, tuple and domain calculus.

Introduction on SQL: Characteristics of SQL, advantage of SQL. SQL data type and literals. Types of SQL commands.SQL operators and their procedure. Tables, views and indexes. Queries and sub queries. Aggregate functions. Insert, update and delete operations, Joins, Unions, Intersection, Minus, Cursors, Triggers, Procedures in SQL/PLSQL

Unit-III **08 Hours**

Data Base Design & Normalization: Functional dependencies, normal forms, first, second, third normal forms, BCNF, inclusion dependence, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design.

Unit-IV **08 Hours**

Transaction Processing Concept: Transaction system, Testing of serializability, serializability of schedules, conflict & view serializable schedule, recoverability, Recovery from transaction failures, log based recovery, checkpoints, deadlock handling.

Distributed Database: distributed data storage, concurrency control, directory system.

Unit-V **8 Hours**

Concurrency Control Techniques: Concurrency control, Locking Techniques for concurrency control, Time stamping protocols for concurrency control, validation based protocol, multiple Granularity, Multi version schemes, Recovery with concurrent transaction, case study of Oracle.

Reference Books

1. Date C J, " An Introduction to Database Systems", Addision Wesley
2. Korth, Silbertz, Sudarshan," Database Concepts", McGraw Hill
3. Elmasri, Navathe, "Fudamentals of Database Systems", Addision Wesley O'Neil, Databases, Elsevier Pub.
4. Leon & Leon, "Database Management Systems", Vikas Publishing House
5. Bipin C. Desai, " An Introduction to Database Systems", Gagotia Publication

BCS-404: Theory of Automata and Formal Languages

L T P **Credit-4**

3 1 **0**

Unit–I **8 Hours**

Introduction:

Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition table, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transition, Language of NFA, Equivalence of NFA and DFA, Minimization of Finite Automata, Distinguishing one string from other, My hill-Nerode Theorem .

Unit-II **8 Hours**

Regular expression (RE), Definition, Operators of regular expression and The precedence, Algebraic laws for Regular expressions, Kleen's Theorem, Regular expression to FA, DFA to Regular expression, Arden Theorem, Non Regular Languages, Pumping Lemma for regular Languages. Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine, Applications and Limitation of FA.

Unit-III **8 Hours**

Context free grammar (CFG) and Context Free Languages (CFL): Definition, Examples, Derivation , Derivation trees, Ambiguity in Grammar, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless symbols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Closure properties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Membership, Pumping lemma for CFLs.

Unit-IV **8 Hours**

Push Down Automata (PDA): Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG, Two stack PDA.

Unit–V **8 Hours**

Turing machines (TM): Basic model, definition and representation, Instantaneous Description, Language acceptance by TM, Variants of Turing Machine, TM as Computer of Integer functions, Universal TM, Church's Thesis, Recursive and recursively enumerable languages, Halting problem,

Introduction to Undesirability, Undecidable problems about TMs. Post correspondence problem (PCP), Modified PCP, Introduction to recursive function theory.

Text Books and References:

1. Hopcroft, Ullman, "Introduction to Automata Theory, Languages and Computation", Pearson Education

2. K.L.P. Mishra and N.Chandrasekaran, "Theory of Computer Science: Automata, Languages and Computation", PHI

3. Martin J. C., "Introduction to Languages and Theory of Computations", TMH

4. Papadimitrou, C. and Lewis, C.L., "Elements of the Theory of Computation", PHI

BCS-451: Software Engineering Lab

L	T	P	Credit-1
0	0	2	

1. Program for configuration Management.

2. Perform SA/SD for the following software.

- Hotel Automation System
- Book Shop Automation Software
- Word processing Software
- Software Component Cataloguing Software.

3. Design and development of test cases for testing.

4. Writing program in Java for Computing Cyclomatic Complexity.

5. Development of Software t ool for Halstead Analysis.

6. Perform Cost/Benefit analysis.

7. Illustration of various activities of Software development using MS Project 2000.

8. Lab exercise involving development of various practical applications using software Like VJ++VB, SYBASE, JDK.

[Students are to be given a major assignment t to be completed using one or more of these tools, Student's exposure to any CASE tool is desirable]

9. Case Studies: Payroll System, Banking System, Purchase Order System, Library Management System, Railway Reservation System, Bill Tracking System, College Admission System, State management System.

BCS-452: Computer Organization LAB

L	T	P	Credit-1
0	0	2	

1. Bread Board Implementation of Flip-Flops.
2. Experiments with clocked Flip-Flop. Design of Counters.
3. Bread Board implementation of counters & shift registers.
4. Implementation of Arithmetic algorithms.
5. Bread Board implementation of Adder/Subtractor (Half, Full)
6. Bread Board implementation of Binary Adder.
7. Bread Board implementation of Seven Segment Display.
8. Institute may also develop the experiment based on the infrastructure available with them.

BCS-453: DBMS LAB

L T P **Credit-1**

0 0 3

1. Write the queries for Data Definition and Data Manipulation Language.
2. Write SQL queries using logical operations (=,<,>,etc)
3. Write SQL queries using SQL operators
4. Write SQL query using character, number, date and group functions
5. Write SQL queries for relational algebra
6. Write SQL queries for extracting data from more than one table
7. Write SQL queries for sub queries, nested queries
8. Write a programme by the use of PL/SQL
9. Concepts for ROLL BACK, COMMIT & CHECK POINTS
10. Create VIEWS, CURSORS and TRGGERS & write ASSERTIONS.
11. Create FORMS and REPORTS

Note:

1. The queries to be implemented on DBMS using SQL
2. Students are advised to use Developer 2000/Oracle9i or other latest version for above experiments.. However student may use Power Builder/SQL SERVER .Mini Projects may also be planned & carried out throughout the semester to understand important concepts of database.

BCS-454: Principal of Programming Language LAB

L T P **Credit-1**

0 0 2

1. Introducing Turbo C++ Compiler and its environment / Linux Environment
2. A Sample C program. Some problems related formatted strings.
3. Write a program to convert centigrade to Fahrenheit. [F = 9/5 * C + 32]
4. Write a program that calculates the area of a circle and circumference.
5. Write a program that calculates the area of a triangle.
6. Write a program that reads the marks in each subject and calculates the percentage.
7. Write a program that reads a number and identifies whether the given number is even or odd.
8. Write a program to find the largest number among two numbers
9. Write a program to read the mark of a subject and prints the equivalent grade.
10. Write a program to read a sentence and counts the total number of character (excluding space) using while loop.
11. Write a program to generate Fibonacci number using do while loop.
12. Write a program to read number and identifies whether the given number is a prime number ornot.
13. Write a program to identify whether the given number is a perfect number or not. 28 is a perfect number.
14. Write a program to calculate the factorial of a given number.
15. Write a program to identify whether the given number is a perfect number or not using a function. 28 is a perfect number.
16. Write a program to evaluate GCD of two given integers. Use function that returns GCD.
17. Write a recursive program to find the factorial of a given number.
18. Write a recursive program to find a GCD of two numbers.
19. Write a recursive program to find the sum of n natural numbers.
20. Write a C program to store N numbers in a one dimensional array and calculate its average with the help of the function.
21. Write a C program to convert a binary number to decimal with the help of the function.

    [*Inttodecimal (char bits[20], int length)]* here *bits* is the character array to represent bits of binary numbers and *length* is the number of bits in the binary number.
22. Write a program to evaluate transpose of n by n matrix with the help of function.

    [*int [][20] transpose(int matrix[][20],n*] here *matrix is* the matrix is the to be transformed and *n* is the dimension of *matrix*. The function should return transpose of the matrix.

23. Write a C program for matrix addition with the help of function

[*int [][20] add(int a[][20], int b[][20], int n, int m)*] Here *a* and *b* are matrix to be added and *n* and *m* are dimension of *a* and *b*. the function should return *m* by *n* matrix containing the addition data.

Fifth Semester

Departmental Elective-II

1. BCS -051 Graph Theory & Combinatorics
2. BCS -052 Mobile Computing
3. BCS -053 Software Project Management
4. BCS-054 E-Commerce Technology
5. BCS-055 Microprocessor

Department Elective-II

BCS-051: Graph Theory and Combinatory

L T P **Credit-4**

3 1 0

Unit –I **08 hours**

Introduction to graphs - definitions - sub graphs - paths and cycles - matrix representation of graphs Euler tours - Chinese postman problem planar graphs Euler's formula platonic bodies applications of Kuratowski's theorem - Hamiltonian graphs - graph coloring and chromatic polynomials – map coloring.

Unit –II **08 hours**

Trees - definitions and properties - rooted trees - trees and sorting - weighted trees and prefix code biconnected components and articulation points - the max-flow min-cut theorem - maximum bipartite matching - Matching's' and augmenting paths -the personal assignment problem – Networks flows and cuts - ford and Fulkerson algorithm - separating sets.

Unit- III **08 hours**

Planer graphs, combinatorial and geometric dual: Kuratowski graphs, detection of planarity, geometric dual, Discussion on criterion of planarity, thickness and crossings.

Unit- IV **08 hours**

Fundamental principles of counting permutations and combinations binomial theorem combinations with repetition combinatorial numbers principle of inclusion and exclusion derangements arrangements with forbidden positions.

Unit –V **08 hours**

Generating functions partitions of integers the exponential generating function the summation operator - recurrence relations first order and second order non-homogeneous recurrence relations method of generating functions.

Reference Books:

1. Corman T.H., Leiserson C.E. & Rivest R.L., Introduction to Algorithms, Prentice Hall India.

2. Mott J.L., Kandel A. & Baker T.P, Discrete Mathematics for Computer Scientists and arithmeticians, Prentice Hall of India.

3. Liu C.L., Elements of Discrete Mathematics, McGraw Hill.

4. Rosen K.H., Discrete Mathematics and Its Applications, McGraw Hill.

BCS-052: Mobile Computing

L T P **Credit-4**

3 1 0

Unit–I **08 hours**

Introduction, issues in mobile computing, overview of wireless telephony: cellular concept, GSM: air-interface, channel structure, location management: HLR-VLR, hierarchical, handoffs, channel allocation in cellular systems, CDMA, GPRS.

Unit - II **08 hours**

Wireless Networking, Wireless LAN Overview: MAC issues, IEEE 802.11, Blue Tooth, Wireless multiple access protocols, TCP over wireless, Wireless applications, data broadcasting, Mobile IP, WAP: Architecture, protocol stack, application environment, applications.

Unit - III **08 hours**

Data management issues, data replication for mobile computers, adaptive clustering for mobile wireless networks, File system, Disconnected operations.

Unit - IV **08 hours**

Mobile Agents computing, security and fault tolerance, transaction processing in mobile computing environment.

Unit - V **08 hours**

Adhoc networks, localization, MAC issues, Routing protocols, global state routing (GSR), Destination sequenced distance vector routing (DSDV), Dynamic source routing (DSR), Ad Hoc on demand distance vector routing (AODV), Temporary ordered routing algorithm (TORA), QoS in Ad Hoc Networks, applications.

Reference Books:

1. J. Schiller, Mobile Communications, Addison Wesley.
2. Charles Perkins, Mobile IP, Addison Wesley.
3. Charles Perkins, Ad hoc Networks, Addison Wesley.
4. . Upadhyaya, "Mobile Computing", Springer

BCS-053: Software Project Management

L T P **Credit-4**

3 1 0

UNIT-I: Introduction and Software Project Planning **08 hours**

Fundamentals of Software Project Management (SPM), Need Identification, Vision and Scope document, Project Management Cycle, SPM Objectives, Management Spectrum, SPM Framework, Software Project Planning, Planning Objectives, Project Plan, Types of project plan, Structure of a Software Project Management Plan, Software project estimation, Estimation methods, Estimation models, Decision process.

UNIT-II: Project Organization and Scheduling **08 hours**

Project Elements, Work Breakdown Structure (WBS), Types of WBS, Functions, Activities and Tasks, Project Life Cycle and Product Life Cycle, Ways to Organize Personnel, Project schedule, Scheduling Objectives, Building the project schedule, Scheduling terminology and techniques, Network Diagrams: PERT, CPM, Bar Charts: Milestone Charts, Gantt Charts.

UNIT-III: Project Monitoring and Control **08 hours**

Dimensions of Project Monitoring & Control, Earned Value Analysis, Earned Value Indicators: Budgeted Cost for Work Scheduled (BCWS), Cost Variance (CV), Schedule Variance (SV), Cost Performance Index (CPI), Schedule Performance Index (SPI), Interpretation of Earned Value Indicators, Error Tracking, Software Reviews, Types of Review: Inspections, Desk checks, Walkthroughs, Code Reviews, Pair Programming.

UNIT-IV: Software Quality Assurance and Testing **08 hours**

Testing Objectives, Testing Principles, Test Plans, Test Cases, Types of Testing, Levels of Testing, Test Strategies, Program Correctness, Program Verification & validation, Testing Automation & Testing Tools, Concept of Software Quality, Software Quality Attributes, Software Quality Metrics and Indicators, The SEI Capability Maturity Model CMM), SQA Activities, Formal SQA Approaches: Proof of correctness, Statistical quality assurance, Clean room process.

UNIT-V: Project Management and Project Management Tools **08 hours**

Software Configuration Management: Software Configuration Items and tasks, Baselines, Plan for Change, Change Control, Change Requests Management, Version Control, Risk Management: Risks and risk types, Risk Breakdown Structure (RBS), Risk Management Process: Risk identification, Risk analysis, Risk planning, Risk monitoring, Cost Benefit Analysis, Software Project Management Tools: CASE Tools, Planning and Scheduling Tools, MS-Project.

Reference Books:

1. M. Cotterell, Software Project Management, Tata McGraw-Hill Publication.
2. Royce, Software Project Management, Pearson Education
3. Kieron Conway, Software Project Management, Dreamtech Press
4. S. A. Kelkar, Software Project Management, PHI Publication.

BCS-054: E-Commerce Technology

L T P **Credit-4**

3 1 **0**

UNIT I **08 hours**

Internet Concepts: WWW, Internet and E-Commerce, Linking to the Internet, Internet Address, Internet Tools- Information Retrieval tools (ftp, Gopher),Communication Tools(Email, FTP, Telnet, Usenet), Multimedia Information Tools(Home page), Information Search Tools(Archie, Veronica, WAIS). Domain Name System.

Intranet and Extranet: Intranet, Intranet vs. Groupware, Intranet Hardware, Intranet Software, Intranet Services (Web (HTTP) Publishing, HTML, Hypertext), Communication Systems (Email, Fax), Software used in Electronic mail, Electronic Meeting Systems (Audio conferencing, Video Conferencing, Groupware), Extranet.

UNIT II **08 hours**

Working of the internet with TCP/IP: Origin of TCP/IP.,TCP/IP communication architecture, Internet Architecture, Working of TCP/IP,TCP/IP Applications-FTP, Telnet, Trivial File Transfer Protocol, Simple Mail Transfer Protocol, Network File System. TCP/IP implementations

Internet Security: Security on the internet, Network and Website Security Risks, Site Hacking, Security Incidents on the internet, security and email, network and website security, Firewall (Concept, Components and Constituents, Benefits, Enterprise wide security Framework, secure physical infrastructure).

UNIT III **08 hours**

Overview of E-Commerce Technologies: Encryption overview, Elements of an encryption system, Secret key encryption, Public-key encryption, Digital signatures, Digital Certificates, Cryptography export restrictions, Secure Sockets Layer(SSL), Secure Electronic Transactions (SET),Smart Cards and its applications.

UNIT IV **08 hours**

Electronic Data Interchange- Evolution, uses, Benefits, Working of EDI, EDI Standards (includes variable length EDI standards), Cost Benefit Analysis of EDI, Electronic Trading Networks, EDI Components, File Types, EDI Services, EDI Software, Business Approach of EDI, EDIFACT (Overview, Structure, EDIFACT Software), Business Future of EDI,EDI Administration. EDI Security, Security Mechanisms, Technological aspects (Smart Cards, Worm Disks, Biometrics), Security Mechanism.

Security Issues in E-Commerce Technologies- Introduction to Security, Passwords, Viruses, Firewalls,

Encryption (PGP, SHTTP, SSL).

UNIT V **08 hours**

Enterprise Resource Planning-Evolution of ERP, Characteristics, Features, Components, Need, ERP Vendors, Business Process Reengineering, Advantages of ERP Packages, Implementation of ERP Packages, Future of ERP Systems, Integrated SAP Model, Integrated Data-Master Data, Transactional data, Integrated Processes, Pros and cons of integration, SAPArchitecture and Integration.

Books:

1. Doing Business on the Internet E-COMMERCE (Electronic Commerce for Business) S. Jaiswal, Galgotia Publications.

2. E-Commerce An Indian Perspective, P.T.Joseph, S.J., PHI.

3. Electronic Commerce: Greenstein, Merylin, Tata Mc.Graw Hill

BCS-055: Microprocessor

L T P **Credit-4**

3 1 0

UNIT I **08 hours**

Architecture of 8085 microprocessor, registers, flags, ALU-Address bus and data bus De-multiplexing address / data bus-control and status signals-Control bus-Programmer's model of 8085-Pin-out signal function diagram-Functions of different pins.

UNIT II **08 hours**

Instruction set of 8085-data transfer, arithmetic, logic, branching and machine control group of instructions-Addressing modes-register, register indirect, direct, and immediate and implied addressing modes. Assembly language and machine language - Programming exercises addition, Subtraction, multiplication and division (all 8-bit) of binary and BCD numbers. [6]

UNIT III **08 hours**

Stack and stack related operations-Subroutines-Advanced programming techniques: Code conversions Binary to BCD, BCD to Binary, Binary to ASCII, ASCII to Binary, BCD to ASCII and ASCII to BCD, Block transfer, ascending order and descending order - Time delays using single register and register pair-Delay calculations-Debugging a program.

UNIT IV **08 hours**

RAM, ROM, EPROM, EEPROM functional explanation-Memory interface, interfacing ROM, 2K X 8 and 4K X 8-Interfacing RAM, 2K X 8 and 4K X 8-Timing diagrams for memory read and memory write cycles-Instruction cycle, machine cycle and T-state.

UNIT V **08 hours**

Explanation of timing diagram for 8085 instructions, MOV R_d, R_s, MVIR, data 8, STA address 16 Introduction of Wait states-Halt state-Dynamic RAM-Cache memory-Direct Memory Access (DMA), explanation with block diagram.

Books and Reference:

1. Ramesh S. Gaonkar: Microprocessor Architecture, Programming and Application with the 8085-Penram International Publishing, Mumbai

2. B. Ram: Fundamentals of microprocessors and microcomputers-Dhanpat Rai Publications, New Delhi

3. V. Vijayendran: Fundamentals of microprocessor-8085- S. Viswanathan publishers, Chennai

BCS-501: Operating System

L T P **Credit-4**

3 1 **0**

Unit – I **8 Hours**

Introduction : Operating system and functions, Classification of Operating systems- Batch, Interactive, Time sharing, Real Time System, Multiprocessor Systems, Multiuser Systems, Multiprocess Systems, Multithreaded Systems, Operating System Structure- Layered structure, System Components, Operating System services, Reentrant Kernels, Monolithic and Microkernel Systems.

Unit – II **8 Hours**

Concurrent Processes: Process Concept, Principle of Concurrency, Producer Consumer Problem, Mutual Exclusion, Critical Section Problem, Dekker's solution, Peterson's solution, Semaphores, Test and Set operation; Classical Problem in Concurrency- Dining Philosopher Problem, Sleeping Barber Problem; Inter Process Communication models and Schemes, Process generation.

Unit – III **8 Hours**

CPU Scheduling: Scheduling Concepts, Performance Criteria, Process States, Process Transition Diagram, Schedulers, Process Control Block (PCB), Process address space, Process identification information, Threads and their management, Scheduling Algorithms, Multiprocessor Scheduling. Deadlock: System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from deadlock.

Unit – IV **8 Hours**

Memory Management: Basic bare machine, Resident monitor, Multiprogramming with fixed partitions, Multiprogramming with variable partitions, Protection schemes, Paging, Segmentation, Paged segmentation, Virtual memory concepts, Demand paging, Performance of demand paging, Page replacement algorithms, Thrashing, Cache memory organization, Locality of reference.

Unit - V **8 Hours**

I/O Management and Disk Scheduling: I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling, RAID. File System: File concept, File organization and access mechanism, File directories, and File sharing, File system implementation issues, File system protection and security.

Reference Books:

1. Silberschatz, Galvin and Gagne, "Operating Systems Concepts", Wiley

2. Sibsankar Halder and Alex A Aravind, "Operating Systems", Pearson Education

3. Harvey M Dietel, " An Introduction to Operating System", Pearson Education

4. D M Dhamdhere, "Operating Systems : A Concept based Approach", 2nd Edition, TMH

BCS-502: Design and Analysis of Algorithms

L T P **Credit-4**

3 1 **0**

Unit-I **8 Hours**

Introduction: Algorithms, Analyzing algorithms, Complexity of algorithms, Growth of functions, Performance measurements, sorting and order Statistics - Shell sort, Quick sort, Merge sort, Heap sort, Comparison of sorting algorithms, Sorting in linear time.

Unit –II **8 Hours**

Advanced Data Structures: Red-Black trees, B - trees, Binomial Heaps, Fibonacci Heaps.

Unit – III **8 Hours**

Divide and Conquer with examples such as Sorting, Matrix Multiplication, Convex hull and Searching. Greedy methods with examples such as Optimal Reliability Allocation, Knapsack, Minimum Spanning trees - Prim's and Kruskal's algorithms, Single source shortest paths - Dijkstra's and Bellman Ford algorithms.

Unit – IV **8 Hours**

Dynamic programming with examples such as Kanpsack, All pair shortest paths - Warshal's and Floyd's algorithms, Resource allocation problem. Backtracking, Branch and Bound with examples such as Travelling Salesman Problem, Graph Coloring, n-Queen Problem, Hamiltonian Cycles and Sum of subsets.

Unit –V **8 Hours**

Selected Topics: Algebraic Computation, Fast Fourier Transform, String Matching, Theory of NP-completeness, Approximation algorithms and Randomized algorithms.

Reference Books:

1. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, "Introduction to Algorithms", Printice Hall of India.
2. RCT Lee, SS Tseng, RC Chang and YT Tsai, "Introduction to the Design and Analysis of Algorithms", McGraw Hill, 2005.
3. E. Horowitz & S Sahni, "Fundamentals of Computer Algorithms",Berman, Paul," Algorithms", Cengage Learning.

BCS-503: Object Oriented Techniques

L T P **Credit-4**

3 1 **0**

Unit I **8 Hours**

Introduction: The meaning of Object Orientation, object identity, Encapsulation, information hiding, polymorphism, generosity, importance of modeling, principles of modeling, object oriented modeling, Introduction to UML, conceptual model of the UML, Architecture.

Unit II **8 Hours**

Basic Structural Modeling: Classes, Relationships, common Mechanisms, and diagrams. Class & Object Diagrams: Terms, concepts, modeling techniques for Class & Object Diagrams. Collaboration Diagrams: Terms, Concepts, depicting a message, polymorphism in collaboration Diagrams, iterated messages, use of self in messages. Sequence Diagrams: Terms, concepts, depicting asynchronous messages with/without priority, callback mechanism, broadcast messages.

Basic Behavioral Modeling: Use cases, Use case Diagrams, Activity Diagrams, State Machine, Process and thread, Event and signals, Time diagram, interaction diagram, Package diagram.

Architectural Modeling: Component, Deployment, Component diagrams and Deployment diagrams.

Unit III **8 Hours**

Object Oriented Analysis, Object oriented design, Object design, Combining three models, Designing algorithms, design optimization, Implementation of control, Adjustment of inheritance, Object representation, Physical packaging, Documenting design considerations. Structured analysis and structured design (SA/SD), Jackson Structured Development (JSD). Mapping object oriented concepts using non-object oriented language, Translating classes into data structures, Passing arguments to methods, Implementing inheritance, associations encapsulation.

Object Oriented Programming Style: reusability, extensibility, robustness, programming in the large. Procedural v/s OOP, Object oriented language features. Abstraction and Encapsulation.

Unit IV **8 Hours**

Introduction to Java, History, Features, Object Oriented concept of Java, Classes and Objects, Inheritance, Packages, Interface , abstract method and classes, Polymorphism, Inner classes, String Handling, I/O , Networking, Event Handling. Multi threading, Collection, Java APIs,

Java Beans: Application Builder tools, The bean developer kit(BDK), JAR files, Introspection, Developing a simple bean, using Bound properties, The Java Beans API, Session Beans, Entity Beans,Introduction to Enterprise Java beans (EJB).

Unit V **8 Hours**

Java Swing: Introduction to AWT, AWT v/s Swing, Creating a Swing Applet and Application. Utility of Java as internet programming language, JDBC, The connectivity model, JDBC/ODBC Bridge, Introduction to servlets.

Reference Books:

1. James Rumbaughet. al, "Object Oriented Modeling and Design", PHI
2. Grady Booch, James Rumbaugh, Ivar Jacobson, "The Unified Modeling Language User Guide", Pearson Education
3. Naughton, Schildt, "The Complete Reference JAVA2", TMH
4. Mark Priestley "Practical Object-Oriented Design with UML", TMH
5. Booch, Maksimchuk, Engle, Young, Conallen and Houstan, "Object Oriented Analysis and Design with Applications", Pearson Education
6. Pandey, Tiwari, " Object Oriented Programming with JAVA" , Acme Learning

BCS504: Computer Graphics& Multimedia

L T P **Credit-4**

3 1 **0**

Unit – I **8 Hours**

Introduction to computer graphics & graphic systems:

Overview of computer graphics, representing pictures, preparing, presenting & interacting with pictures or presentations; Visualization & image processing; RGB color model, direct coding, lookup table; storage tube graphics display, Raster scan display, 3D viewing devices, Plotters, printers, digitizers, Light pens etc.; Active & Passive graphics devices; Computer graphics software.

Scan conversion:

Points & lines, Line drawing algorithms; DDA algorithm, Bresenham's line algorithm, Circle generation algorithm; Ellipse generating algorithm; scan line polygon, fill algorithm, boundary fill algorithm, flood fill algorithm.

Unit – II **8 Hours**

2D-transformation & viewing

Basic transformations: translation, rotation, scaling; Matrix representations & homogeneous coordinates, Transformations between coordinate systems; reflection shear; Transformation of points, lines, parallel lines, intersecting lines. Viewing pipe line, Window to view port coordinate transformation, clipping operations, point clipping, line clipping, clipping circles, polygons &ellipse.

3D transformation & viewing

3D transformations: translation, rotation, scaling & other transformations. Rotational about an arbitrary axis in space, reflection through an arbitrary plane; general parallel projection transformation; clipping, viewport clipping, 3D viewing.

Unit –III **8 Hours**

Curves

Curve representation, surfaces, designs, Bezier curves, B-spline curves, end conditions for periodic B-spline curves, rational B-spline curves.

Hidden surfaces

Depth comparison, Z-buffer algorithm, Back face detection, BSP tree method, the Printer's algorithm, scan line algorithm; Hidden line elimination, wire frame methods, fractal geometry. Color & shading models Light &color model; interpolative shading model; Texture;

Unit – IV **8 Hours**

Multimedia

Introduction to Multimedia: Concepts, uses of multimedia, hypertext and hypermedia. Image, video and audio standards.

Audio: digital audio, MIDI, processing sound, sampling, compression.

Unit- V **8 Hours**

Video: MPEG compression standards, compression through spatial and temporal redundancy, inter frame and intra frame compression.

Animation: types, techniques, key frame animation, utility, morphing. Virtual Reality concepts.

Reference Books:

1. Foley, Vandam, Feiner, Hughes-"Computer Graphics principles (2ndEd.)-Pearson Education.

2. W.M. Newman, R.F.Sprou-"Principles of Interactive computer Graphics"-TMH.

3. Elsom Cook-"Principles of Interactive Multimedia"-McGrawHi

BCS-551: Operating system lab

L T P **Credit-1**

0 0 2

1. Shell programming: creating a script, making a script executable, shell syntax (variables, conditions, control structures, functions, commands).

2. Process: starting new process, replacing a process image, duplicating a process image, waiting for a Process, zombie process.

3. Signal: signal handling, sending signals, signal interface, signal sets.

4. Semaphore: programming with semaphores (use functions semctl, semget, semop, set_semvalue, del_semvalue, semaphore_p, semaphore_v).

5. POSIX Threads: programming with pthread functions (viz. pthread_create, pthread_join, pthread_exit,pthread_attr_init, pthread_cancel)

6. Inter-process communication: pipes (use functions pipe, popen, pclose), named pipes (FIFOs, accessing FIFO)

BCS-552: Algorithm lab

L T P **Credit-1**

0 0 3

Programming assignments on each algorithmic strategy:

1. Divide and conquer method (quick sort, merge sort, Strassen's matrix multiplication),

2. Greedy method (knapsack problem, job sequencing, optimal merge patterns, minimal spanning trees).

3. Dynamic programming (multistage graphs, OBST, 0/1 knapsack, traveling sales person Programming assignments on each algorithmic strategy:

4. Back tracking (n-queens problem, graph coloring problem, Hamiltonian cycles).

5. Sorting: Insertion sort, Heap sort, Bubble sort

6. Searching: Sequential and Binary Search

7. Selection: Minimum/ Maximum, Kth smallest element

BCS-553: Object Oriented Techniques Lab

L T P **Credit-1**

0 0 2

1. To become familiar with classes that represent entities that can interact with the user.
2. To successfully write simple programs that involve if statements.
3. To gain practice in the use of Boolean operators like && and ||.
4. To construct a class that represents a simple ATM (automatic teller machine).
5. Write a new program called Options.java that will request that the user enter an integer and then will display the message .positive,. .negative,.or zero. if the value that was entered was greater than zero, less than zero, or equal to zero, respectively.
6. Write a simple program called RandomGeneration.java that will request N, the number of values desired, and then generate a list of N random double values. Usea View Frame for input and output.
7. Write program for Java Applets.
8. Use Java Servlets for proxy server.

BCS-554: Computer Graphics & Multimedia

L	T	P	Credit-1
0	**0**	2	

1. Point plotting, line & regular figure algorithms
2. Raster scans line & circle drawing algorithms
3. Clipping &Windowing algorithms for points, lines & polygons
4. 2D/3Dtransformations
5. Simple fractals representation
6. Filling algorithms
7. Web document creation using Dreamweaver.
8. Creating Animation using Flash.

Sixth Semester

BHU-601: Engineering Economics &Industrial Management

L T P **Credit-4**

3 1 **0**

Unit-I **8 Hours**

Introduction: Meaning, Nature and Scope of Economics, Meaning of Science, Engineering and Technology Managerial Economics and its scope in engineering perspective.

Basic Concepts Demand Analysis, Law of Demand, Determinates of Demand, Elasticity of Demand- Price, and Income and cross Elasticity .Uses of concept of elasticity of demand in managerial decision.

Unit-II **8 Hours**

Demand forecasting**:** Meaning, significance and methods of demand forecasting, production function, Laws of returns to scale & Law of Diminishing returns scale. An overview of Short and Long run cost curves - fixed cost, variable cost, average cost, marginal cost, Opportunity cost.

Unit-III **8 Hours**

Market Structure: Perfect Competition, Imperfect competition, features of price determination and various market conditions. National Income, Inflation and Business Cycles Concept of N.I. and Measurement. Meaning of Inflation, Type causes & prevention methods, Phases of business cycle.

Unit-IV **8 Hours**

Introduction: Concept, Development, application and scope of Industrial Management. Management Function: Principles Production requirements.

Productivity: Definition, measurement, productivity index, types of production system, Industrial of Management- Management Tools - time and motion study, work simplification- process charts and flow diagrams, Production Planning, Specification of Ownership.

Unit-V **8 Hours**

Inventory control: Inventory, cost, Deterministic models, Introduction to supply chain Management.

Quality control: Meaning, process control, SQC control charts, single, double and Sequential sampling, Introduction to TQM.

Environmental Issues: Environmental Pollution - various management techniques to

Control Environmental pollution - Various control acts for Air, Water, Solid waste and Noise pollution.

Reference Books

1. Koutsoyiannis A: Modern Microeconomics, ELBS.

2. Managerial Economics for Engineering: Prof. D.N. Kakkar

3. Managerial Economics: D.N. Dwivedi

4. Managerial Economics: Maheshwari.

5. Khanna O.P.: Industrial Engineering

6. T.R. Banga: Industrial Engineering and Management

Departmental Elective-III

1. BCS-061 Real Time System
2. BCS-062 Advance Computer Architecture
3. BCS-063 Cryptography & Network Security
4. BCS -064 Distributed Database
5. BCS -065 Data Compression

Department Elective-III

BCS-061: Real Time System

L T P **Credit-4**

3 1 0

UNIT-I **08 hours**

Introduction

Definition, Typical Real Time Applications: Digital Control, High Level Controls, Signal Processing etc., Release Times, Deadlines, and Timing Constraints, Hard Real Time Systems and Soft Real Time Systems, Reference Models for Real Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload, Periodic Task Model, Precedence Constraints and Data Dependency.

UNIT-II **08 hours**

Real Time Scheduling

Common Approaches to Real Time Scheduling: Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach, Dynamic Versus Static Systems, Optimality of Effective Deadline-First (EDF) and Least-Slack-Time-First (LST) Algorithms, Rate Monotonic Algorithm, Offline Versus Online Scheduling, Scheduling Aperiodic and Sporadic jobs in Priority Driven and Clock Driven Systems.

UNIT-III **08 hours**

Resources Sharing

Effect of Resource Contention and Resource Access Control (RAC), Non-preemptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling Protocols, Stack Based Priority Ceiling Protocol, Use of Priority-Ceiling Protocol in Dynamic Priority Systems, Preemption Ceiling Protocol, Access Control in Multiple-Unit Resources, Controlling Concurrent Accesses to Data Objects.

UNIT-IV **08 hours**

Real Time Communication

Basic Concepts in Real time Communication, Soft and Hard RT Communication systems, Model of Real Time Communication, Priority-Based Service and Weighted Round-Robin Service Disciplines for Switched Networks, Medium Access Control Protocols for Broadcast Networks, Internet and Resource Reservation Protocols.

UNIT-V **08 hours**

Real Time Operating Systems and Databases

Features of RTOS, Time Services, UNIX as RTOS, POSIX Issues, Characteristic of Temporal data, Temporal Consistency, Concurrency Control, Overview of Commercial Real Time databases.

Reference Books:

1. Real Time Systems by Jane W. S. Liu, Pearson Education Publication.
2. Mall Rajib, "Real Time Systems", Pearson Education

BCS-062: Advance Computer Architecture

L T P **Credit-4**

3 1 0

UNIT-I **08 hours**

Parallel Computer Models

The state of Computing, Multiprocessors and Multicomputer, Multivector and SIMD Computers, PRAM And VLSI Models

Program and Network Properties

Conditions of Parallelism, Program Partitioning and Scheduling, Program Flow Mechanism, System Interconnect Architecture

UNIT-II **08 hours**

Processors and Memory Hierarchy

Advanced Processor Technology, Superscalar and vector Processors, Memory Hierarchy Technology, Virtual Memory Technology.

UNIT-III **08 hours**

Bus, Cache, and Shared Memory

Backplane Bus Systems, Cache Memory Organizations, Shared-Memory Organizations, Sequential and Weak Consistency Models

Pipelining and Superscalar Techniques

Linear Pipeline Processors, Nonlinear Pipeline Processors, Instruction Pipeline Design, Arithmetic Pipeline Design, Superscalar and Super pipeline Design.

UNIT-IV **08 hours**

Multiprocessors and Multicomputer

Multiprocessor System Interconnects, Cache Coherence and Synchronization Mechanisms, Message-Passing Mechanisms.

UNIT-V **08 hours**

Multivector, Scalable, Multithreaded, Data Flow Architecture

Vector Processing principles, Multivector Multiprocessors, Compound Vector Processing, Principles of Multithreading, Dataflow and Hybrid Architectures.

References:

1. Advanced Computer Architecture by Kai Hwang, McGraw Hill {Single author edition}

2. Computer Architecture by Micheal J. Flynn, Narosa.

BCS-063: Cryptography & Network Security

L T P **Credit-4**

3 1 0

UNIT-I **08 hours**

Introduction to security attacks, services and mechanism, Classical encryption techniques substitution ciphers and transposition ciphers, cryptanalysis, steganography, Stream and block ciphers. Modern Block Ciphers: Block ciphers principles, Shannon's theory of confusion and diffusion, fiestal structure, Data encryption standard (DES), Strength of DES, Idea of differential cryptanalysis, block cipher modes of operations, Triple DES.

UNIT-II **08 hours**

Introduction to group, field, finite field of the form GF(p), modular arithmetic, prime and relative prime numbers, Extended Euclidean Algorithm, Advanced Encryption Standard (AES) encryption and decryption Fermat's and Euler's theorem, Primality testing, Chinese Remainder theorem, Discrete Logarithmic Problem, Principals of public key crypto systems, RSA algorithm, security of RSA

UNIT-III **08 hours**

Message Authentication Codes: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions, secure hash algorithm (SHA).

Digital Signatures: Digital Signatures, Elgamal Digital Signature Techniques, Digital signature standards (DSS), proof of digital signature algorithm,

UNIT-IV **08 hours**

Key Management and distribution: Symmetric key distribution, Diffie-Hellman Key Exchange, Public key distribution, X.509 Certificates, Public key Infrastructure. Authentication Applications: Kerberos.

Electronic mail security: pretty good privacy (PGP), S/MIME.

UNIT-V **08 hours**

IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management. Introduction to Secure Socket Layer, Secure electronic, and transaction (SET).

System Security: Introductory idea of Intrusion, Intrusion detection, Viruses and related threats, Firewalls.

Reference Books:

1. William Stallings, "Cryptography and Network Security: Principals and Practice", Pearson Education.

2. Behrouz A. Frouzan: Cryptography and Network Security, Tata McGraw Hill

3. Bruce Schiener, "Applied Cryptography". John Wiley & Sons

4. Bernard Menezes," Network Security and Cryptography", Cengage Learning.

BCS-064: Distributed Database

L T P **Credit-4**

3 1 0

UNIT-I **08 hours**

Transaction and schedules, Concurrent Execution of transaction, Conflict and View Serializability, Testing for Serializability, Concepts in Recoverable and Cascade less schedules.

UNIT-II **08 hours**

Lock based protocols, time stamp based protocols, Multiple Granularity and Multiversion Techniques, Enforcing serializablity by Locks, Locking system with multiple lock modes, architecture for Locking scheduler.

UNIT-III **08 hours**

Distributed Transactions Management, Data Distribution, Fragmentation and Replication Techniques, Distributed Commit, Distributed Locking schemes, Long duration transactions, Moss Concurrency protocol.

UNIT-IV **08 hours**

Issues of Recovery and atomicity in Distributed Databases, Traditional recovery techniques, Log based recovery, Recovery with Concurrent Transactions, Recovery in Message passing systems, Checkpoints, Algorithms for recovery line, Concepts in Orphan and Inconsistent Messages.

UNIT-V **08 hours**

Distributed Query Processing, Multiway Joins, Semi joins, Cost based query optimization for distributed database, Updating replicated data, protocols for Distributed Deadlock Detection, Eager and Lazy Replication Techniques.

Reference Books:

1. Silberschatz, orth and Sudershan, Database System Concept', McGraw Hill
2. Ramakrishna and Gehrke,' Database Management System, McGraw Hill
3. Garcia-Molina, Ullman,Widom,' Database System Implementation' Pearson Education
4. Ceei and Pelagatti,'Distributed Database', TMH
5. Singhal and Shivratri, 'Advance Concepts in Operating Systems' MC Graw Hill

BCS-065: Data Compression

L T P **Credit-4**

3 1 **0**

UNIT-I **08 hours**

Compression Techniques: Loss less compression, Lossy Compression, Measures of performance Modeling and coding, Mathematical Preliminaries for Lossless compression: A brief introduction to information theory.

Models: Physical models, Probability models, Markov models, composite source model, Coding: uniquely decodable codes, Prefix codes.

UNIT-II **08 hours**

The Huffman coding algorithm: Minimum variance Huffman codes, Adaptive Huffman coding: Update procedure, Encoding procedure, Decoding procedure. Golomb codes, Rice codes, Tunstall Codes, Applications of Hoffman coding: Loss less image compression, Text compression, Audio Compression.

UNIT-III **08 hours**

Coding a sequence, Generating a binary code, Comparison of Binary and Huffman coding, Applications: Bi-level image compression-The JBIG standard, JBIG2, Image compression. Dictionary Techniques: Introduction, Static Dictionary: Diagram Coding, Adaptive Dictionary. The LZ77 Approach, The LZ78 Approach, Applications: File Compression-UNIX compress, Image Compression: The Graphics Interchange Format (GIF), Compression over Modems: V.42 bits, Predictive Coding: Prediction with Partial match (ppm): The basic algorithm, The ESCAPE SYMBOL, length of context, The Exclusion Principle, The Burrows-Wheeler Transform: Move to-front coding, CALIC, JPEG-LS, Multi-resolution Approaches, Facsimile Encoding, Dynamic Markoy Compression.

UNIT-IV **08 hours**

Distortion criteria, Models, Scalar Quantization: The Quantization problem, Uniform Quantizer, Adaptive Quantization, Non uniform Quantization.

UNIT-V **08 hours**

Advantages of Vector Quantization over Scalar Quantization, the Linde-Buzo-Gray Algorithm, Treestructured Vector Quantizers. Structured Vector Quantizers.

Reference Books:

1. Khalid Sayood, Introduction to Data Compression, Morgan Kaufmann Publishers

BCS-601 Data mining and Data warehousing

L T P **Credit-4**

3 1 0

Unit I **8 Hours**

Data Preprocessing, Language, Architectures, Concept Description: Preprocessing, Cleaning, Integration, Transformation, Reduction, Discretization, Concept Hierarchy Generation, Data Mining Primitives, Query Language, Graphical User Interfaces, Architectures, Concept Description, Data Generalization, Characterizations, Class Comparisons, Descriptive Statistical Measures.

Unit II **8 Hours**

Association Rule: Association Rule Mining, Single-Dimensional Boolean Association Rules from Transactional Databases, Multi-Level Association Rules from Transaction Databases-mining multidimensional Association rules -association mining to correlation analysis-constraint based association mining.

Unit III **8 Hours**

Classification and Prediction: Classification and Prediction, Issues, Decision Tree Induction, Bayesian Classification, Association Rule Based, Other Classification Methods, Prediction, Classifier Accuracy.

Unit IV **8 Hours**

Cluster Analysis: Cluster Analysis, Types of data, Categorization of methods, Partitioning methods, hierarchical methods, density based methods, grid based methods - Outlier Analysis. Recent trends - Multidimensional Analysis and Descriptive Mining of Complex Data Objects, Spatial Databases, Multimedia Databases, Time Series and Sequence Data, Text Databases, World Wide Web, Applications and Trends in Data Mining.

Unit V **8 Hours**

Data Warehousing: Introduction, Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Implementation - Data Warehousing to Data Mining -Data warehousing components-building a data warehouse - mapping the data warehouse to an architecture – data extraction - cleanup-transformation tools- metadata - OLAP - Patterns and models - Data visualization principles.

TEXT BOOKS

1. J. Han and M. Kamber, "Data Mining: Concepts and Techniques", Harcourt India /Morgan Kauffman, 2001. (UNITs 1 to IV)

2. Alex Berson and Stephen J. Smith, "Data Warehousing, Data mining and OLAP", TataMcGraw-Hill, 2004. (UNIT V)

REFERENCES

1. Margaret H. Dunham, "Data Mining: Introductory and Advanced Topics", PearsonEducation, 2004.

2. Sam Anahory and Dennis Murry, "Data Warehousing in the Real World", Pearson Education, 2003.

BCS-602: Computer Network

L T P **Credit-4**

3 1 **0**

Unit –I **8 Hours**

Introduction Concepts: Goals and Applications of Networks, Network structure and architecture, The OSI reference model, services, Network Topology Design - Delay Analysis, Back Bone Design, Local Access Network Design, Physical Layer Transmission Media, Switching methods, ISDN, Terminal Handling.

Unit-II **8 Hours**

Medium Access sub layer: Medium Access sub layer - Channel Allocations, LAN protocols - ALOHA protocols - Overview of IEEE standards - FDDI. Data Link Layer - Elementary Data Link Protocols, Sliding Window protocols, Error Handling.

Unit – III **8 Hours**

Network Layer: Network Layer - Point - to Pont Networks, routing, Congestion control Internetworking -TCP / IP, IP packet, IP address, IPv6.

Unit – IV **8 Hours**

Transport Layer: Transport Layer - Design issues, connection management, session Layer Design issues, remote procedure call. Presentation Layer-Design issues, Data compression techniques, cryptography - TCP - Window Management.

Unit-V **8 Hours**

Application Layer: Application Layer: File Transfer, Access and Management, Electronic mail, Virtual Terminals, Other application. Example Networks - Internet and Public Networks.

Reference Books :

1. Forouzen, "Data Communication and Networking", TMH A.S. Tanenbaum, Computer Networks, Pearson Education
2. W. Stallings, Data and Computer Communication, Macmillan Press Anuranjan Misra, "Computer Networks", Acme Learning
3. G. Shanmugarathinam, "Essential of TCP/ IP", Firewall Media

BCS-603: Compiler Design

L T P **Credit-4**

3 1 **0**

Unit – I **8 Hours**

Introduction to Compiler: Phases and passes, Bootstrapping, Finite state machines and regular expressions and their applications to lexical analysis, Optimization of DFA-Based Pattern Matchers implementation of lexical analyzers, lexical-analyzer generator, LEX-compiler, Formal grammars and their application to syntax analysis, BNF notation, ambiguity, YACC. The syntactic specification of programming languages: Context free grammars, derivation and parse trees, capabilities of CFG.

Unit – II **8 Hours**

Basic Parsing Techniques: Parsers, Shift reduce parsing, operator precedence parsing, top down parsing, predictive parsers Automatic Construction of efficient Parsers: LR parsers, the canonical Collection of LR(0) items, constructing SLR parsing tables, constructing Canonical LR parsing tables, Constructing LALR parsing tables, using ambiguous grammars, an automatic parser generator, implementation of LR parsing tables.

Unit – III **8 Hours**

Syntax-directed Translation: Syntax-directed Translation schemes, Implementation of Syntax-directed Translators, Intermediate code, postfix notation, Parse trees & syntax trees, three address code, quadruple & triples, translation of assignment statements, Boolean expressions, statements that alter the flow of control, postfix translation, translation with a top down parser. More about translation: Array references in arithmetic expressions, procedures call, declarations and case statements.

Unit – IV **8 Hours**

Symbol Tables: Data structure for symbols tables, representing scope information. Run-Time Administration: Implementation of simple stack allocation scheme, storage allocation in block structured language. Error Detection & Recovery: Lexical Phase errors, syntactic phase errors semantic errors.

Unit – V **8 Hours**

Code Generation: Design Issues, the Target Language. Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, Code Generator.

Code optimization: Machine-Independent Optimizations, Loop optimization, DAG representation of basic blocks, value numbers and algebraic laws, Global Data-Flow analysis.

Reference Books:

1. Aho, Sethi& Ullman, "Compilers: Principles, Techniques and Tools", Pearson Education

2. V Raghvan, “Principles of Compiler Design", TMH

3. Kenneth Louden," Compiler Construction", Cengage Learning.

4. Charles Fischer and Ricard LeBlanc," Crafting a Compiler with C", Pearson Education

BCS-652: Computer Network Lab

L T P **Credit-1**

0 0 2

1. IPC (Message queue)
2. NIC Installation & Configuration (Windows/Linux)
3. Familiarization with

a. Networking cables (CAT5, UTP)

b. Connectors (RJ45, T-connector)

c. Hubs, Switches

4. TCP/UDP Socket Programming
5. Multicast Broadcast Sockets
6. Implementation of a Prototype Multithreaded Server
7. Implementation of

a. Data Link Layer Flow Control Mechanism (Stop & Wait, Sliding Window)

b. Data Link Layer Error Detection Mechanism (Cyclic Redundancy Check)

c. Data Link Layer Error Control Mechanism (Selective Repeat, Go Back N)

BCS-653: Compiler Lab

L T P **Credit-1**

0 0 3

1. Design predictive parser for the given language.

2. Design a LALR bottom up parser for the given language.

3. Convert the BNF rules into YACC form and write code to generate abstract syntax tree. A program to generate machine code.

4. Design a lexical analyzer for given language and the lexical analyzer should ignore redundant

5. spaces, tabs and new lines.

6. Implement the lexical analyzer using JLex, flex or other lexical analyzer generating tools.

7. Write a YACC program to check the validity of an arithmetic expression.

BCS-651: Data Mining and Data warehousing Lab

L	T	P	Credit-1
0	0	2	

1. Evolution of data management technologies, introduction to data warehousing concepts.
2. Develop an application to implement defining subject area, design of fact dimension table, data mart.
3. Develop an application to implement OLAP, roll up, drill down, slice and dice operation
4. Develop an application to construct a multidimensional data.
5. Develop an application to implement data generalization and summarization technique.
6. Develop an application to extract association rule of data mining.
7. Develop an application for classification of data.
8. Develop an application for one clustering technique
9. Develop an application for Naïve Bayes classifier.
10. Develop an application for decision tree.

BCS-655: .Net Lab

L T P **Credit-1**

0 0 2

1. Write a Program in C# to check whether a number is Palindrome or not.
2. Write a Program in C# to demonstrate Command line arguments processing.
3. Write a Program in C# to find the roots of Quadratic Equation.
4. Write a Program in C# to demonstrate Boxing and un Boxing.
5. Write a Program in C# to implement Stack operations.
6. Write a Program to demonstrate Operator overloading.
7. Write a Program in C# to find the second largest element in a single dimensional array.
8. Write a Program in C# to multiply to matrices using Rectangular arrays.
9. Find the sum of all the elements present in a jagged array of 3 inner arrays.
10. Write a Program to reverse a given string using C#.
11. Using Try, Catch and Finally blocks write a program in C# to demonstrate error handling.
12. Design a simple calculator using Switch Statement in C#.
13. Demonstrate Use Of Virtual and override keyword in C# with a simple Program.
14. Implement Linked Lists in C# using the existing collections name space.
15. Write a Program to demonstrate abstract class and abstract methods in C#.
16. Write a Program in C# to build a class which implements an interface which already exists.
17. Write a Program to illustrate the use of different properties in C#.
18. Demonstrate arrays of interface types with a C# program.

Seventh Semester

BCS-701: Distributed Systems

L T P **Credit-4**

3 1 0

Unit–I **8 Hours**

Characterization of Distributed Systems: Introduction, Examples of distributed Systems, Resource sharing and the Web Challenges. Architectural models, Fundamental Models.

Theoretical Foundation for Distributed System: Limitation of Distributed system, absence of global lock, shared memory, Logical clocks, Lamppost's& vectors logical clocks.

Concepts in Message Passing Systems: causal order, total order, total causal order, Techniques for Message Ordering, Causal ordering of messages, global state, and termination detection.

Unit-II **8 Hours**

Distributed Mutual Exclusion: Classification of distributed mutual exclusion, requirement of mutual exclusion theorem, Token based and non token based algorithms, performance metric for distributed mutual exclusion algorithms.

Distributed Deadlock Detection: system model, resource Vs communication deadlocks, deadlock prevention, avoidance, detection & resolution, centralized dead lock detection, distributed dead lock detection, path pushing algorithms, edge chasing algorithms.

Unit-III **8 Hours**

Agreement Protocols: Introduction, System models, classification of Agreement Problem, Byzantine agreement problem, Consensus problem, Interactive consistency Problem, Solution to Byzantine Agreement problem, Application of Agreement problem, Atomic Commit in Distributed Database system.

Distributed Resource Management: Issues in distributed File Systems, Mechanism for building distributed file systems, Design issues in Distributed Shared Memory, Algorithm for Implementation of Distributed Shared Memory.

Unit-IV **8 Hours**

Failure Recovery in Distributed Systems: Concepts in Backward and Forward recovery, Recovery in Concurrent systems, obtaining consistent Checkpoints, Recovery in Distributed Database Systems.

Fault Tolerance: Issues in Fault Tolerance, Commit Protocols, Voting protocols, Dynamic voting protocols.

Unit-V

Transactions and Concurrency Control: Transactions, Nested transactions, Locks, Optimistic Concurrency control, Timestamp ordering, Comparison of methods for concurrency control.

Distributed Transactions: Flat and nested distributed transactions, Atomic Commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery. Replication: System model and group communication, Fault - tolerant services, highly available services, Transactions with replicated data.

Reference Books:

1. Singhal & Shivaratri, "Advanced Concept in Operating Systems", McGraw Hill
2. Ramakrishna,Gehrke," Database Management Systems", McGrawhill
3. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson Education
4. Tenanuanbaum, Steen," Distributed Systems", PHI
5. Gerald Tel, "Distributed Algorithms", Cambridge University Press

BCS-702: Digital Image Processing

L T P **Credit-4**

3 1 0

UNIT-I **8 Hours**

Introduction and Fundamentals

Motivation and Perspective, Applications, Components of Image Processing System, Element of Visual Perception, A Simple Image Model, Sampling and Quantization.

Image Enhancement in Frequency Domain

Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain, Filters -Low-pass, High-pass; Correspondence Between Filtering in Spatial and Frequency Domain; Smoothing Frequency Domain Filters - Gaussian Low pass Filters; Sharpening Frequency Domain Filters - Gaussian High pass Filters; Homomorphic Filtering.

UNIT-II **8 Hours**

Image Enhancement in Spatial Domain

Introduction; Basic Gray Level Functions - Piecewise-Linear Transformation Functions: Contrast Stretching; Histogram Specification; Histogram Equalization; Local Enhancement; Enhancement using Arithmetic/Logic Operations - Image Subtraction, Image Averaging; Basics of Spatial Filtering; Smoothing - Mean filter, Ordered Statistic Filter; Sharpening - The Laplacian.

UNIT-III **8 Hours**

Image Restoration

A Model of Restoration Process, Noise Models, Restoration in the presence of Noise only-Spatial Filtering - Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters - Median Filter, Max and Min filters; Periodic Noise Reduction by Frequency Domain Filtering -Band pass Filters; Minimum Mean-square Error Restoration.

UNIT-IV **8 Hours**

Morphological Image Processing

Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing, Morphological Algorithms- Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening.

UNIT-V **8 Hours**

Registration

Introduction, Geometric Transformation - Plane to Plane transformation, Mapping, Stereo Imaging - Algorithms to Establish Correspondence, Algorithms to Recover Depth.

Segmentation

Introduction, Region Extraction, Pixel-Based Approach, Multi-level Thresholding, Local Thresholding, Region-based Approach, Edge and Line Detection: Edge Detection, Edge Operators, Pattern Fitting Approach, Edge Linking and Edge Following, Edge Elements Extraction by Thresholding, Edge Detector Performance, Line Detection, Corner Detection.

Reference Books:

1. Digital Image Processing 2nd Edition, Rafael C. Gonzalvez and Richard E. Woods. Published by: Pearson Education.

2. Digital Image Processing and Computer Vision, R.J. Schalkoff. Published by: John Wiley and Sons, NY.

3. Fundamentals of Digital Image Processing, A.K. Jain. Published by Prentice Hall, Upper Saddle River, NJ.

BCS-703: Artificial Intelligence

L T P **Credit-4**

3 1 **0**

Unit-I **8 Hours**

Introduction Artificial Intelligence, Foundations and History of Artificial Intelligence, Applications of Artificial Intelligence, Intelligent Agents, Structure of Intelligent Agents. Computer vision, Natural Language Possessing.

Unit-II **8 Hours**

Introduction to Search : Searching for solutions, Uniformed search strategies, Informed search strategies, Local search algorithms and optimistic problems, Adversarial Search, Search for games, Alpha - Beta pruning.

Unit-III **8 Hours**

Knowledge Representation & Reasoning: Propositional logic, Theory of first order logic, Inference in First order logic, Forward & Backward chaining, Resolution, Probabilistic reasoning, Utility theory, Hidden Markov Models (HMM), Bayesian Networks.

Unit-IV **8 Hours**

Machine Learning : Supervised and unsupervised learning, Decision trees, Statistical learning models, Learning with complete data - Naive Bayes models, Learning with hidden data – EM algorithm, Reinforcement learning.

Unit-V **8 Hours**

Pattern Recognition : Introduction, Design principles of pattern recognition system, Statistical Pattern recognition, Parameter estimation methods - Principle Component Analysis (PCA) and Linear Discriminant Analysis (LDA), Classification Techniques - Nearest Neighbor (NN) Rule, Bayes Classifier, Support Vector Machine (SVM), K - means clustering.

Reference Books:

1. Stuart Russell, Peter Norvig, "Artificial Intelligence - A Modern Approach", Pearson Education
2. Elaine Rich and Kevin Knight, "Artificial Intelligence", McGraw-Hill
3. E Charniak and D McDermott, "Introduction to Artificial Intelligence", Pearson Education
4. Dan W. Patterson, "Artificial Intelligence and Expert Systems", Prentice Hall of India,

Departmental Elective-IV

1. BCS-071 Neural Networks
2. BCS-072 Embedded Systems
3. BCS-073 Cloud Computing
4. BCS-074 Soft Computing

Department Elective-IV

BCS-071: Neural Networks

L T P **Credit-4**

3 1 0

UNIT-I **08 hours**

Neurocomputing and Neuroscience

Historical notes, human Brain, neuron Mode l, Knowledge representation, Al and NN. Learning process: Supervised and unsupervised learning, Error correction learning, competitive learning, adaptation, statistical nature of the learning process.

UNIT-II **08 hours**

Data Processing : Scaling, normalization, Transformation (FT/FFT), principal component analysis, regression, co- Variance matrix, Eigen values & Eigen vectors. Basic Models of Artificial neurons, activation Functions, aggregation function, single neuron computation, multilayer perception, least mean square algorithm, gradient descent rule, nonlinearly separable problems and bench mark Problems in NN.

UNIT-III **08 hours**

Multilayered network architecture, back propagation algorithm, heuristics for making BP-algorithm performs better. Accelerated learning BP (like recursive least square, quick prop, RPROP algorithm), approximation properties of RBF networks and comparison with multilayer perceptran.

UNIT-IV **08 hours**

Recurrent network and temporal feed-forward network, implementation with BP, self-organizing map and SOM algorithm, properties of feature map and computer simulation. Principal component and Independent component analysis, application to image and signal processing.

UNIT-V **08 hours**

Complex valued NN and complex valued BP, analyticity of activation function, application in 2D information processing. Complexity analysis of network models. Soft computing. Euro-Fuzzy-genetic algorithm Integration.

Reference Books:

1. J.A. Anderson, An Introduction to Neural Networks, MIT
2. Hagen Demuth Beale, Neural Network Design, Cengage Learning
3. R.L. Harvey, Neural Network Principles, PHI

BCS-072: Embedded Systems

L T P **Credit-4**

3 1 0

UNIT-I **08 hours**

Introduction to embedded systems: Classification, Characteristics and requirements, Applications.

UNIT-II **08 hours**

Timing and clocks in embedded systems, Task Modeling and management, Real time operating system issues.

UNIT-III **08 hours**

Signals, frequency spectrum and sampling, digitization (ADC, DAC), Signal Conditioning and Processing. Modeling and Characterization of Embedded Computation System.

UNIT-IV **08 hours**

Embedded Control and Control Hierarchy, Communication strategies for embedded systems: Encoding and Flow control.

UNIT-V **08 hours**

Fault-Tolerance, Formal Verification. Trends in Embedded Processor, OS, Development Language

Reference Books:

1. H.Kopetz, "Real-Time Systems", Kluwer

2. R.Gupta, "Co-synthesis of Hardware and Software for Embedded Systems",Kluwer

3. Shibu K.V., "Introduction to Embedded Systems", TMH

4. Marwedel, "Embedded System Design", Springer

BCS-073: Cloud computing

L T P **Credit-4**

3 1 **0**

UNIT-I **08 hours**

Cloud Computing Fundamental: Cloud computing definition, private, public and hybrid cloud. Cloud types; IaaS, PaaS, SaaS. Benefits and challenges of cloud computing, public vs private clouds, role of virtualization in enabling the cloud; Business Agility: Benefits and challenges to Cloud architecture. Application availability, performance, security and disaster recovery; next generation Cloud Applications.

UNIT-II **08 hours**

Cloud Applications: Technologies and the processes required when deploying web services; Deploying A web service from inside and outside a cloud architecture, advantages and disadvantages.

UNIT-III **08 hours**

Cloud Services Management: Reliability, availability and security of services deployed from the cloud. Performance and scalability of services, tools and technologies used to manage cloud services deployment; Cloud Economics: Cloud Computing infrastructures available for implementing cloud based services. Economics of choosing a Cloud platform for an organization, based on application requirements, economic Constraints and business needs (e.g Amazon, Microsoft and Google, Salesforce.com, Ubuntu and Redhat

UNIT-IV **08 hours**

Application Development: Service creation environments to develop cloud based applications. Development environments for service development; Amazon, Azure, Google App.

UNIT-V **08 hours**

Best Practice Cloud IT Model: Analysis of Case Studies when deciding to adopt cloud computing architecture. How to decide if the cloud is right for your requirements. Cloud based service, applications and development platform deployment so as to improve the total cost of ownership (TCO).

References

1. Gautam Shroff, *Enterprise Cloud Computing Technology Architecture Applications* [ISBN: 978-0521137355]

2. Toby Velte, Anthony Velte, Robert Elsenpeter, *Cloud Computing, A Practical Approach* [ISBN: 0071626948]

3. Dimitris N. Chorafas, *Cloud Computing Strategies* [ISBN: 1439834539]

B C S-074: Soft Computing

L	T	P	Credit-4
3	1	0	

UNIT-I **08 hours**

Artificial Neural Networks: Basic concepts - Single layer perception - Multilayer Perception - Supervised and Unsupervised learning - Back propagation networks - Kohnen's self-organizing networks - Hopfield network.

UNIT-II **08 hours**

Fuzzy Systems: Fuzzy sets, Fuzzy Relations and Fuzzy reasoning, Fuzzy functions Decomposition Fuzzy automata and languages - Fuzzy control methods - Fuzzy decision making.

UNIT-III **08 hours**

Neuro- Fuzzy Modeling: Adaptive networks based Fuzzy interface systems - Classification and Regression Trees Data clustering algorithms - Rule based structure identification - Neuro-Fuzzy controls – Simulated annealing - Evolutionary computation.

UNIT-IV **08 hours**

Genetic Algorithms: Survival of the Fittest - Fitness Computations - Cross over - Mutation - Reproduction - Rank method Rank space method.

UNIT-V **08 hours**

Application of Soft Computing: Optimization of traveling salesman problem using Genetic Algorithm, Genetic algorithm based Internet Search Techniques, Soft computing based hybrid fuzzy controller, Introduction to MATLAB Environment for Soft computing Techniques.

Reference Books:

1. Sivanandam, Deepa, “Principles of Soft Computing", Wiley
2. Jang J.S.R, Sun C.T. and Mizutani E, "Neuro-Fuzzy and soft computing", Prentice Hall
3. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", McGraw Hill
4. Laurene Fausett, "Fundamentals of Neural Networks", Prentice Hall
5. D.E. Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley

Open Elective

1. BOE-071 Non-Conventional Energy Resources
2. BOE-072 Disaster Management
3. BOE-073 Engineering System Modeling and Simulation
4. BOE-074 Bioinformatics
5. BOE-075 Software Testing
6. BOE 076 Java SE 7
7. BOE 077 Network Management
8. BOE 078 Machine Learning

Open Elective

BOE-071 Non-Conventional Energy Recourse

L T P **Credit-4**

3 1 0

UNIT-I **08 hours**

Introduction: Various non-conventional energy resources- Introduction, availability, Classification, relative merits and demerits.

UNIT-II **08 hours**

Solar Cells: Theory of solar cells. Solar cell materials, solar cell power plant, limitations.

Solar Thermal Energy: Solar radiation flat plate collectors and their materials, applications and performance, focusing of collectors and their materials, applications and performance; solar thermal power plants, thermal energy storage for solar heating and cooling, limitations.

UNIT-III **08 hours**

Geothermal Energy: Resources of geothermal energy, thermodynamics of geo-thermal energy conversion-electrical conversion, non-electrical conversion, environmental considerations.

Magneto-hydrodynamics (MHD): Principle of working of MHD Power plant, performance and limitations.

UNIT-IV **08 hours**

Fuel Cells: Principle of working of various types of fuel cells and their working, performance and limitations.

Thermo-electrical and thermionic Conversions: Principle of working, performance and limitations.

Wind Energy: Wind power and its sources, site selection, criterion, momentum theory, classification of rotors, concentrations and augments, wind characteristics. performance and limitations of energy conversion systems.

UNIT-V **08 hours**

Bio-mass: Availability of bio-mass and its conversion theory.

Ocean Thermal Energy Conversion (OTEC): Availability, theory and working principle, performance and limitations.

Wave and Tidal Wave: Principle of working, performance and limitations. Waste Recycling Plants

References:

1. AndraGabdel, "A Handbook for Engineers and Economists".

2. A. Mani, "Handbook of Solar radiation Data for India".

3. Peter Auer, "Advances in Energy System and Technology". Vol. 1 & II Edited by Academic Press.

4. F.R. the MITTRE, "Wind Machines" by Energy Resources and Environmental Series. 5. Frank Kreith, "Solar Energy Hand Book".

6. N. Chermisinogg and Thomes, C. Regin, "Principles and Application of Solar Energy".

7. N.G. Calvert, " Wind Power Principles".

8. W. Palz., P. Chartier and D.O. Hall," Energy from Biomass".

BOE-072 Disaster Management

L T P **Credit-4**

3 1 0

UNIT-I **08 hours**

Understanding disaster- Concept of disaster**,** Different approaches**, Concept** of Risk**,** Levels of disasters**,** Disaster phenomena and events *(Global, national and regional).*

UNIT-II **08 hours**

Hazards and Vulnerability-Natural and man-made hazards; response time, frequency and forewarning levels of different hazards**,** Characteristics and damage potential of natural hazards; hazard assessment Dimensions of vulnerability factors; vulnerability assessment**,** Vulnerability and disaster risk**,** Vulnerabilities to flood and earthquake hazards.

UNIT-III **08 hours**

Disaster management mechanism-Concepts of risk management and crisis management**,** Disaster management cycle**, Response** and Recovery**, Development**, Prevention, Mitigation and Preparedness**,** Planning for relief.

UNIT-IV **08 hours**

Capacity building -Capacity building: Concept **,**Structural and nonstructural measures**,** Capacity assessment; strengthening capacity for reducing risk **,**Counter-disaster resources and their utility in disaster management**,** Legislative support at the state and national levels

Coping with disaster- Coping strategies; alternative adjustment processes**,** Changing concepts of disaster management**,** Industrial safety plan; safety norms and survival kits, Mass media and disaster management.

UNIT-V **08 hours**

Planning for disaster management- Strategies for disaster management planning**,** Steps for formulating a disaster risk reduction plan**,** Disaster management Act and Policy in India**,** Organizational Structure for disaster management in India**,** Preparation of state and district disaster management plans.

Text books

1. Alexander, D. *Natural Disasters,* ULC press Ltd, London, 1993.

2. Carter, W. N. *Disaster Management: A Disaster Management Handbook,* Asian Development Bank, Bangkok, 1991.

3. Chakraborty, U. K. *Industrial Disaster Management and Emergency Response*, Asian Books Pvt. Ltd., New Delhi 2007.

References

1. Abarquez I. &Murshed Z. *Community Based Disaster Risk Management: Field Practitioner's Handbook*, ADPC, Bangkok, 2004.

2. Goudie, A. *Geomorphological Techniques,* Unwin Hyman, London 1990.

3. Goswami, S. C. *Remote Sensing Application in North East India,*PurbanchalPrakesh, Guwahati, 1997.

4. *Manual on Natural Disaster Management in India,* NCDM, New Delhi, 2001.

5. *Disaster Management in India,* Ministry of Home Affairs, Government of India, New Delhi, 2011.

6. *National Policy on Disaster Management,* NDMA, New Delhi, 2009.

7. *Disaster Management Act. (2005),* Ministry of Home Affairs, Government of India, New Delhi, 2005.

8. *District Disaster Management Plan-Model Template,* NIDM, New Delhi, 2005.

BOE-073 Engineering System Modeling and Simulation

L T P **Credit-4**

3 1 0

UNIT-I **08 hours**

Introduction-Systems, System types, System Modeling, Types of system modeling, Classification and comparison of simulation models, attributes of modeling, Comparison of physical and computer experiments, Application areas and Examples.

UNIT-II **08 hours**

Mathematical and Statistical Models- Probability concepts, Queuing Models, Methods for generating random variables and Validation of random numbers.

UNIT-III **08 hours**

Language-System modeling, programming languages, comparison of languages, Identifying and selection of programming language, feasibility study of programming language for the given application.

UNIT-IV **08 hours**

Experiments-Simulation of different systems, Analysis, validation and verification of input and output simulated data, study of alternate techniques.

UNIT-V **08 hours**

Case study-Developing simulation model for information centers, inventory systems and analysis of maintenance systems.

Text Books:

1. Geoffrey Gordon, "System Simulation", Second edition, Prentice Hall, India, 2002.

2. Jerry Banks and John S.Carson, Barry L.Nelson, David M.Nicol, "Discrete Event System Simulation", Third edition, Prentice Hall, India, 2002.

Reference Books:

1. Robert E. Shannon, "System Simulation The art and science", , Prentice Hall, New Jersey, 1995.

2. D.S. Hira, "System Simulation", S.Chand and company Ltd, New Delhi, 2001.

BOE-074 Bioinformatics

L T P **Credit-4**

3 1 0

UNIT-I **08 hours**

Introductory Concepts: The Central Dogma - The Killer Application - Parallel Universes - Watson's Definition-Top Down Versus Bottom up-Information Flow-Convergence-Databases–Data Management-Data Life Cycle - Database Technology - Interfaces - Implementation - Networks-Geographical Scope - Communication Models - Transmissions Technology - Protocols - Bandwidth - Topology - Hardware - Contents - Security - Ownership - Implementation - Management.

UNIT-II **08 hours**

Search Engines and Data Visualization: The search process - Search Engine Technology – Searching and Information Theory - Computational methods - Search Engines and Knowledge Management –Data Visualization - sequence visualization - structure visualization - user Interface – Animation Versus simulation - General Purpose Technologies.

UNIT-III **08 hours**

Statistics and Data Mining: Statistical concepts -Microarrays - Imperfect Data -Randomness Variability - Approximation - Interface Noise -Assumptions -Sampling and Distributions Hypothesis Testing - Quantifying Randomness - Data Analysis - Tool selection statistics of Alignment Clustering and Classification - Data Mining - Methods - Selection and Sampling - Preprocessing and Cleaning Transformation and Reduction - Data Mining Methods - Evaluation - Visualization -Designing new queries - Pattern Recognition and Discovery - Machine Learning - Text Mining Tools.

UNIT-IV **08 hours**

Pattern Matching: Pairwise sequence alignment - Local versus global alignment - Multiple sequence alignment - Computational methods - Dot Matrix analysis - Substitution matrices – Dynamic Programming - Word methods - Bayesian methods - Multiple sequence alignment – Dynamic Programming - Progressive strategies - Iterative strategies - Tools - Nucleotide Pattern Matching - Polypeptide pattern matching - Utilities - Sequence Databases.

UNIT-V **08 hours**

Modeling and Simulation: Drug Discovery - Components - Process - Perspectives – Numeric considerations - Algorithms - Hardware - Issues - Protein structure - AbInitio Methods – Heuristic methods - Systems Biology - Tools - Collaboration and Communications - Standards - Issues - Security - Intellectual property.

TEXT BOOK

Bryan Bergeron, "Bio Informatics Computing", Pearson Education, Second edition, 2003.

REFERENCE

T.K. Attwood and D.J. Perry Smith, "Introduction to Bio Informatics", Longman Essen, 1999.

BCS-751: Distributed System Lab

L	T	P	Credit-1
0	0	2	

List of Program

1. Simulate the functioning of Lamport's Logical Clock in C.
2. Simulate the functioning of Vector Clock in C.
3. Implement a Distributed Chat Server using TCP Sockets.
4. Implement Remote Procedure Call (RPC) mechanism for a file transfer across a network in C.
5. Implement Java Remote Method Invocation (RMI) mechanism for accessing methods of remote systems.
6. Simulate Balanced Sliding Window Protocol in C.
7. Implement Common Object Request Broker Architecture (CORBA) mechanism by using Java program.

BCS-752 Mini Project

L T P **Credit 1**
0 0 2

A group of students have to make a latest technology based project in their respective stream. It may be hardware or software based.

BCS-753 Seminar

L T P **Credit 1**
0 0 3

Students have to give multiple presentations on research & recent technologies with respect to his/her course.

BCS-754 Industrial Training & Viva-voce

L T P **Credit 1**
0 0 2

Students have to undergo six to eight week industrial training at end of sixth semester.

Eight Semesters

Departmental Elective-V

1. BCS-081 VLSI Design
2. BCS-082 Web service and service Oriented Architecture
3. BCS-083 Multimedia Computing
4. BCS-084 Information Security

Department Elective-V

BCS-081 VLSI Design

L T P **Credit-4**

3 1 **0**

UNIT-II **08 hours**

Introduction: Basic principle of MOS transistor, Introduction to large signal MOS models (long channel) for digital design. MOS Circuit Layout & Simulation: MOS SPICE model, device characterization, Circuit characterization, interconnects simulation. MOS device layout: Transistor Layout, Inverter layout, CMOS digital circuit layout & simulation.

UNIT-II **08 hours**

The MOS Inverter: Inverter principle, Depletion and enhancement load inverters, the basic CMOS inverter, transfer characteristics, logic threshold, Noise margins, and Dynamic behavior, Propagation Delay, Power Consumption.

UNIT-III **08 hours**

Combinational MOS Logic Design

Static MOS design: Complementary MOS, Rationed logic, Pass Transistor logic, complex logic circuits.

Sequential MOS Logic Design

Static latches, Flip flops & Registers, Dynamic Latches & Registers, CMOS Schmitt trigger, Mon stable sequential Circuits, A stable Circuit. Memory Design: ROM & RAM cells design.

UNIT-IV **08 hours**

Dynamic MOS design: Dynamic logic families and performances. Interconnect & Clock Distribution Interconnect delays, Cross Talks, Clock Distribution. Introduction to low power design, Input and Output Interface circuits. BiCMOS Logic Circuits Introduction, BJT Structure & operation, Basic BiCMOS Circuit behavior, Switching Delay in BiCMOS Logic circuits, BiCMOS Application.

UNIT-V **08 hours**

VLSI System Testing & Verification: Introduction, A walk through the Test Process, Reliability, Logic Verification Principles, Silicon Debug Principles, Manufacturing Test Principles, Design for Testability, Boundary Scan. VLSI Applications like RISC microcontroller, ATM Switch.

Text Books

1. Kang &Leblebigi "CMOS Digital IC Circuit Analysis & Design"- McGraw Hill, 2003.

2. Rabey, "Digital Integrated Circuits Design", Pearson Education, Second Edition, 2003.

Reference Books

1. Weste and Eshraghian, "Principles of CMOS VLSI design" Addison-Wesley, 2002.

BCS-082: Web Service and service Oriented Architecture

L T P **Credit-4**

3 1 0

UNIT-I **08 hours**

Introduction - Service Oriented Enterprise - Service Oriented Architecture (SOA) - SOA and Web Services - Multi-Channel Access - Business Process management - Extended Web Services Specifications - Overview of SOA - Concepts - Key Service Characteristics - Technical Benefits Business Benefits.

UNIT-II **08 hours**

SOA and Web Services - Web Services Platform - Service Contracts - Service-Level Data Model Service Discovery - Service-Level Security - Service-Level Interaction patterns - Atomic Services and Composite Services - Proxies and Skeletons - Communication - Integration Overview XML and Web Services - .NET and J2EE Interoperability - Service-Enabling Legacy Systems - Enterprise Service Bus Pattern.

UNIT-III **08 hours**

Multi-Channel Access - Business Benefits - SOA for Multi-Channel Access -Tiers - Business Process Management - Concepts - BPM, SOA and Web Services - WSBPEL - Web Services Composition.

UNIT-IV **08 hours**

Java Web Services - JAX APIs - JAXP - JAX-RPC - JAXM - JAXR – JAXB.

UNIT-V **08 hours**

Metadata Management - Web Services Security - Advanced Messaging - Transaction Management

Text Books:

1. Eric Newcomer, Greg Lomow, "Understanding SOA with Web Services", Pearson Education, 2005.

2. James McGovern, Sameer Tyagi, Michael E Stevens, Sunil Mathew, "Java Web Services Architecture", Elsevier, 2003.

Reference Books:

1. Thomas Erl, "Service Oriented Architecture", Pearson Education, 2005.

2. Frank Cohen, "Fast SOA", Elsevier, 2007.

BCS-083: Multimedia Computing

L T P **Credit-4**

3 1 0

UNIT-I **08 hours**

Introduction to Multimedia, Multimedia Information, Multimedia Objects, Multimedia in business and work. Convergence of Computer, Communication and Entertainment products and Stages of Multimedia Projects, Multimedia hardware, Memory & storage devices, Communication devices, Multimedia software's, presentation tools, tools for object generations, video, sound, image capturing, authoring tools, card and page based authoring tools.

UNIT-II **08 hours**

Multimedia Building Blocks Text, Sound MIDI, Digital Audio, audio file formats, MIDI under windows environment Audio & Video Capture.

UNIT-III **08 hours**

Data Compression Huffman Coding, Shannon Fano Algorithm, Huffman Algorithms, Adaptive Coding, Arithmetic Coding Higher Order Modeling. Finite Context Modeling, Dictionary based Compression, Sliding Window Compression, LZ77, LZW compression, Compression, Compression ratio loss less & lossy compression.

UNIT-IV **08 hours**

Speech Compression & Synthesis Digital Audio concepts, Sampling Variables, Loss less compression of sound, loss compression & silence compression.

UNIT-V **08 hours**

Images: Multiple monitors, bitmaps, Vector drawing, lossy graphic compression, image file formatted Animations Images standards, JPEG Compression, ZigZag Coding, Multimedia Database. Content based retrieval for text and images. Video: Video representation, Colors, Video Compression, MPEG standards, MHEG Standard Video Streaming on net, Video Conferencing, Multimedia Broadcast Services, Indexing and retrieval of Video Database, recent development in Multimedia

Text Books:

1. "Multimedia Computing Communications & Applications" by Ralf Steinmetz, Klara Nahrstedt, Pearson Education (2004)

2. Principles of Multimedia by Parekh Ranjan,Tata McGraw-Hill(2007)

Reference Books:

1. Multimedia Systems, By John E Koegal, Buford, IIBK. (1994)

2. Virtual Reality Systems, John Vince, ACM Press (1995)

3. Computer Networks, A S Tanenbaum, Fourth Edition.(2004)

Departmental Elective-VI

1. BCS-085 Computational Geometry
2. BCS-086 Computational Complexity
3. BCS-087 Parallel Algorithms
4. BCS-088 Pattern Recognition

Department Elective-VI

BCS-085: Computational Geometry

L T P **Credit-4**

3 1 0

UNIT-I **08 hours**

Convex hulls: construction in 2d and 3d, lower bounds; Triangulations: polygon triangulations, representations, point-set triangulations, planar graphs.

UNIT-II **08 hours**

Voronoi diagrams: construction and applicant ions, variants; Delaney triangulations: divide-and-conquer, flip and incremental algorithms, duality of Voronoi diagrams, min-max angle properties.

UNIT-III **08 hours**

Geometric searching: point-location, fractional cascading, linear programming with prune and search, finger trees, concatenable queues, segment trees, interval trees; Visibility: algorithms for weak and strong visibility, visibility with reflections, art-gallery problems.

UNIT-IV **08 hours**

Arrangements of lines: arrangements of hyper planes, zone theorems, many-faces complexity and algorithms; Combinatorial geometry: Ham-sandwich cuts.

UNIT-V **08 hours**

Sweep techniques: plane sweep for segment intersections, Fortune's sweep for Voronoi diagrams, topological sweep for line arrangements; Randomization in computational geometry: algorithms, techniques for counting; Robust geometric computing, Applications of computational geometry.

Reference Books:

1. Computational Geometry: An Introduction by Franco P. Preparata and Michael Ian Shamos; SpringerVerlag

2. Mark de Berg , Marc van Kreveld , Mark Overmars , and Otfried Schwarzkopf, Computational Geometry, Algorithms and Applications , Springer-Verlag,

3. KetanMulmuley, Computational Geometry: An Introduction Through Randomized Algorithms, Prentice-Hall

4. Joseph O'Rourke, Computational Geometry in C, Cambridge University Press

BCS-086: Computational Complexity

L T P **Credit-4**

3 1 0

UNIT-I **08 hours**

Models of Computation, resources (time and space), algorithms, computability, complexity.

UNIT-II **08 hours**

Complexity classes, P/NP/PSPACE, reduction s, hardness, completeness, hierarchy, relationships between complexity classes.

UNIT-III **08 hours**

Randomized computation and complexity; Logical characterizations, incompleteness; Approximability.

UNIT-IV **08 hours**

Circuit complexity, lower bounds; Parallel computation and complexity; counting problems Interactive proofs.

UNIT-V **08 hours**

Probabilistically checkable proofs; Communication complexity; Quantum computation.

Reference Books:

1.Christos H. Papadimitriou., Combinatorial Optimization: Algorithms and Complexity, Prentice-Hall

2. SanjeevArora and Boaz Barak , Complexity Theory: A Modern Approach, Cambridge University Press

3. Steven Homer , Alan L. Selman , Computability and Complexity Theory , Springer

BCS-087: Parallel Algorithms

L T P **Credit-4**

3 1 **0**

UNIT-I **08 hours**

Sequential model, need of alternative model, parallel computational models such as PRAM, LMCC, Hypercube, Cube Connected Cycle, Butterfly, Perfect Shuffle Computers, Tree model, Pyramid model, fully Connected model, PRAM-CREW, EREW models, simulation of one model from another one.

UNIT-II **08 hours**

Performance Measures of Parallel Algorithms, speed-up and efficiency of PA, Cost- optimality, an example of illustrate Cost- optimal algorithms- such as summation, Min/Max on various models.

UNIT-III **08 hours**

Parallel Sorting Networks, Parallel Merging Algorithms on CREW/EREW/MCC, Parallel Sorting Networks on CREW/EREW/MCC/, linear array.

UNIT-IV **08 hours**

Parallel Searching Algorithm, Kth element, Kth element in X+Y on PRAM, Parallel Matrix Transportation and Multiplication Algorithm on PRAM, MCC, Vector-Matrix Multiplication, Solution of Linear Equation, Root finding.

UNIT-V **08 hours**

Graph Algorithms - Connected Graphs, search and traversal, Combinatorial Algorithms Permutation, Combinations, Derangements.

Reference Books:

1. M.J. Quinn, "Designing Efficient Algorithms for Parallel Computer", McGrawHill.

2. S.G. Akl, "Design and Analysis of Parallel Algorithms"

3. S.G. Akl, "Parallel Sorting Algorithm" by Academic Press

BCS-088: Pattern Recognition

L T P **Credit-4**

3 1 0

UNIT-I **08 hours**

Introduction: Basics of pattern recognition, Design principles of pattern recognition system, Learning and adaptation, Pattern recognition approaches, Mathematical foundations - Linear algebra, Probability Theory, Expectation, mean and covariance, Normal distribution, multivariate normal densities, Chi squared test.

UNIT-II **08 hours**

Statistical Patten Recognition: Bayesian Decision Theory, Classifiers, Normal density and discriminant functions,

UNIT-III **08 hours**

Parameter estimation methods: Maximum-Likelihood estimation, Bayesian Parameter estimation, Dimension reduction methods - Principal Component Analysis (PCA), Fisher Linear discriminant analysis, Expectation-maximization (EM), Hidden Markov Models (HMM), Gaussian mixture models.

UNIT-IV **08 hours**

Nonparametric Techniques: Density Estimation, Parzen Windows, K-Nearest Neighbor Estimation, Nearest Neighbor Rule, Fuzzy classification.

UNIT-V **08 hours**

Unsupervised Learning & Clustering: Criterion functions for clustering, Clustering Techniques: Iterative square - error partitioned clustering - K means, agglomerative hierarchical clustering, Cluster validation.

Reference Books:

1. Richard O. Duda, Peter E. Hart and David G. Stork, "Pattern Classification", 2nd Edition, John Wiley, 2006.

2. C. M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2009.

3. S. Theodoridis and K. Koutroumbas, "Pattern Recognition", 4th Edition, Academic Press, 2009.

BCS-851 Major Project

L T P **Credit 16**
0 0 21

A group of students have to make a latest technology based project in their respective stream. It may be hardware or software based.