PANJAB UNIVERSITY CHANDIGARH - 160014 (INDIA)
(Estd. under the Panjab University Act VII of 1947— enacted by the Govt. of India)

FACULTY OF SCIENCE

SYLLABI

FOR

MASTER OF COMPUTER APPLICATIONS (MCA) (SEMESTER SYSTEM)

EXAMINATIONS 2015- 2016

i.e.
1st Semester, November/December, 2015
2nd Semester, May/June, 2016
3rd Semester, November/December, 2015
4th Semester, May/June, 2016
5th Semester, November/December, 2015
6th Semester, May/June, 2016

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APPLICABILITY OF REGULATIONS FOR THE TIME BEING IN FORCE

Notwithstanding the integrated nature of a course spread over more than one academic year, the regulations in force at the time a student joins a course shall hold good only for the examinations held during or at the end of the academic year. Nothing in these regulations shall be deemed to debar the University from amending the regulations subsequently and the amended regulations, if any, shall apply to all the students whether old or new.

PANJAB UNIVERSITY, CHANDIGARH

**Outlines of Tests, Syllabi and Courses of Reading for Master of Computer Applications (MCA)
(Three Year Degree Programme) for Exam. 2015-2016.**

Paper Code	Paper Name	Theory & Practical Lectures	Univ. Exam. Marks	Int. Exam. Marks
FIRST YEAR				
	FIRST SEMESTER			
CS-55	Computer Fundamentals and C Programming	4+4	80	20
CS-60	Computer Organization and Assembly Language	4+0	80	20
CS-61	Data Base Management Systems	4+0	80	20
CS-62	Mathematical Structures for Computer Science (Elective I)	4+0	80	20
CS-56	Linux Operating System (Elective II)	4+4	80	20
	SECOND SEMESTER			
CS-63	Data and File Structures(Using C)	4+4	80	20
CS-64	Object Oriented Programming (Through C++ and Java)	4+4	80	20
CS-48	Data Communication and Networks	4+0	80	20
CS-40	Computer Oriented Numerical and Statistical Methods (Elective III)	4+0	80	20
CS-07	Accounting and Financial Management (Elective IV)	4+0	80	20
SECOND YEAR				
	THIRD SEMESTER			
CS-65	Software Engineering	4+0	80	20
CS-66	Operating Systems	4+0	80	20
CS-67	Analysis and Design of Algorithms	4+0	80	20
CS-68	.NET Framework and C# (Elective V)	4+4	80	20
CS-69	Relational Data Base Management Systems (Elective VI)	4+4	80	20
	FOURTH SEMESTER			
CS-70	Data Mining and Data Warehousing	4+0	80	20
CS-12	Interactive Computer Graphics	4+4	80	20
CS-37	Theory of Computations	4+0	80	20
CS-71	Artificial Intelligence (Using LISP) (Elective VII)	4+0	80	20
CS-72	Advanced Java and Network Programming (Elective VIII)	4+4	80	20
THIRD YEAR				
	FIFTH SEMSTER			
CS-17	Computer Based Optimization Techniques	4+0	80	20
CS-57	Software Project Management	4+0	80	20
CS-58	Mobile Communication and Android Application Development (Elective IX)	4+4	80	20
CS-59	Soft Computing Techniques using Neural Networks (Elective X)	4+4	80	20
CS-19	Seminar Each student will be required to give seminar on selected topics. The seminar will carry 100 marks.			
	SIXTH SEMESTER			
CS-18	**PROJECT WORK** The Project period will be of 20 to 24 weeks duration. The Project will involve development of application/system software in industries, commercial or scientific environment. It will carry 400 marks.		320	80

PRACTICAL EXAMINATIONS (EXAM 2015-2016)

The Practical examination will be conducted for each of the following:

FIRST YEAR (1st and 2nd Semesters)

		SEMESTER	Prac. Exam. Marks	Int. Ass. Marks
PR-11	Computer Fundamentals and C Language (Minor Project)	First	80	20
PR-12	Linux Operating System (Minor Project)	First	80	20
PR-03	C++ and Java Programming Language (Minor Project)	Second	80	20
PR-04	Data Structures (Minor Project)	Second	80	20

Each student is required to undergo a two months Summer Training at the end of Second Semester. The Internal Assessment Marks for each practical will be based on Minor Project.

SECOND YEAR (3rd and 4th Semesters)

		SEMESTER	Prac. Exam. Marks	Int. Ass. Marks
PR-05	RDBMS (SQL Server/Oracle/My SQL) (Minor Project)	Third	80	20
PR-06	Programming in .NET and C# (Minor Project)	Third	80	20
PR-07	Computer Graphics and Algorithms Analysis (Minor Project)	Fourth	80	20
PR-08	Advanced Java and Network Programming (Minor Project)	Fourth	80	20

Each student is required to undergo a two months Summer Training at the end of Fourth Semester. The Internal Assessment Marks for each practical will be based on Minor Project and Summer Training.

THIRD YEAR (5th Semester)

		SEMESTER	Prac. Exam. Marks	Int. Ass. Marks
PR-13	Mobile Application Development using Android (Minor project)	Fifth	80	20
PR-14	Programming using LISP and MATLAB	Fifth	80	20

The Internal Assessment Marks for each practical will be based on Minor Project.

ELECTIVES

CS-01   Mathematical Foundations of Computer Science

CS-02   Computer Programming & Problem Solving (Using C)

CS-03   Data and File Structures (Using C) - OLD

CS-04   Object Oriented Programming(Through C++ and Java) - OLD

CS-05   Computer Organization and Assembly Language - OLD

CS-06   Data Base Management System (DBMS) - OLD

CS-07   Accounting and Financial Management

CS-08   Information Systems and Enterprise Resource Planning

CS-09   Software Engineering - OLD

CS-10   Information System Design and Implementation

CS-11   Operating Systems - OLD

CS-13   Data Mining and Data Warehousing - OLD

CS-14   Analysis and Design of Algorithms - OLD

CS-15   Data Base Management System - OLD

CS-20   Emerging Database Technologies

CS-21   .NET Framework and C# - OLD

CS-22   Introduction to Distributed and Parallel Processing

CS-23   Distributed Computing, Networks and Applications

CS-24   Microprocessor & Applications

CS-25   Advanced Java and Network Programming - OLD

CS-26   Emerging Trends and Technologies

CS-27   Relational Data Base Management Systems - OLD

CS-32   Compiler Design

CS-33   Simulation & Modeling

CS-40   Computer Oriented Numerical and Statistical Methods

CS-41   Image Processing

CS-42   Object Oriented Programming Using C++

CS-43   Unix and Shell Programming

CS-44   Web Application Tools and E-Commerce

CS-45   Visual C++ Programming

CS-46   Linux Administration

CS-47   Visual Basic Programming

CS-48   Data Communications and Networks

CS-49   Fundamentals of Information Technology

CS-50   Multimedia Technologies

CS-51   Mathematical Structures for Computer Science - OLD

CS-52	Software Testing and Quality Control
CS-53	Software Testing and Quality Assurance
CS-54	Multi Agent Systems
CS-56	Linux Operating System
CS-58	Mobile Communication and Android Application Development (Elective IX)
CS-59	Soft Computing Techniques using Neural Networks (Elective X)
CS-62	Mathematical Structures for Computer Science
CS-68	.NET Framework and C#
CS-69	Relational Data Base Management Systems
CS-71	Artificial Intelligence (Using LISP)
CS-72	Advanced Java and Network Programming
CS-73*	Mathematical, Numerical and Statistical Techniques
CS-74*	Current Trends and Technologies

* New Elective according to UGC Compliance and attached as Page No. (i) – (iv)

SYLLABUS AND COURSE OF READINGS
FIRST SEMESTER

Paper Title: COMPUTER FUNDAMENTALS AND C PROGRAMMING.

Paper Code: CS-55   Max. Marks: 80   Time: 3 Hrs.

Course Duration : 60 Lectures of one hour each.

Objective:

The objective of this course is to familiarize students with concepts of fundamentals of information technology along with developing the logic for solving a given problem using the procedure oriented language for construction of code.

Note :   (i)   The Question paper will consist of four units.
(ii)   Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
(iii) The students are required to attempt one question from each unit and the compulsory question.
(iv) All questions carry equal marks.

UNIT-I

1.   Overview of Computer System:

Computer system and its characteristics, Generations of computers, Parts of computer system: CPU, Memory, Input, Output & storage, Categories of computers, Working of input & output devices: Keyboard, Mouse, Trackball, Pen, Touch screens, Scanner, Digital camera, Monitor, Printers, Plotters, Working of storage devices : Magnetic tape, Magnetic disk, CD, DVD, Flash drives, Types of Software.

2.   Information Technology and Internet Basics:

Information Technology, Its role and applications, Internet : Internet & its applications, Working of search engines, Basic network topologies, Internet Services (www, e-mail, telnet, ftp, IRC, news), Structure and types of internet connections, Addressing schemes, Disk management tools: PC tools, Norton Utilities, Virus, Worms, Threats, Virus detection, Prevention and cure utilities, Firewalls, Proxy servers.

UNIT-II

3.   Problem Solving:

Problem Identification, Analysis, Flowcharts, Decision tables, Pseudo codes and algorithms, Program coding, Program Testing and execution, Types of programming languages, Translators: Interpreters, Compilers, Assemblers and their comparison.

4.   Fundamentals of C language:

History of C Language, Structure of a C program, Variables, Constants, Keywords, Data types, Operators, Expressions and their evaluation using rules of hierarchy, Input/Output statements, Assignment statements, Control statements**:** If-else, switch, while, do-while, for, nested loops, break, continue, goto statements.

UNIT-III

5. Functions:

Declaration, Definition, Passing arguments, Call by value, Call by reference, Recursion, Use of library functions, Storage classes: Automatic, External and Static variables.

6. Arrays and Strings:

Defining and processing arrays, Passing array to a function, Using multi-dimensional arrays, Solving matrices problem using arrays, Strings: Declaration, Operations on strings.

UNIT-IV

7. Pointers, Structures and Union:
Pointer declarations, Passing pointer to function, Operations on pointers, Pointers and arrays, Array of pointers, Structures: Defining and processing, Passing structure to a function, Unions.

8. Files Handling:

File operations: Open, Close, Create, Process, Unformatted data files.

Suggested Readings:

1. Norton, Peter: Introduction to Computers, 4th Edition, TMH.
2. Indu Chhabra and Gursharan Singh: Insight into Microprocessors (Principles, Implementation and Technology), AP Publishers, New Delhi, India.
3. Basundara: Computers Today.
4. Cooper, Mullish, 1987: The Spirit of C, An Introduction to Modern Programming, Jaico Publ. House, New Delhi.
5. Kenneth, A.: C Problem Solving and Programming, Prentice Hall International.
6. Kerninghan, B.W. & Ritchie, D.M.: The C Programming Language, Prentice Hall of International.
7. Gottfried, B.: Theory and Problems of Programming in C, Schaum Series.
8. Jones, A./Kenith Harvow: C Programming with Problem Solving, Wiley India Pvt. Ltd.
9. Gookin, Dan: C Programming, Wiley India Pvt. Ltd.

Paper Title: COMPUTER ORGANIZATION AND ASSEMBLY LANGUAGE

Paper Code: CS-60   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objectives:

The objective of the course is to provide students with a solid foundation in computer design. Examine the operation of the major building blocks of a computer system. To introduce students to the design and organization of modern digital computers by showing the relationship between hardware and software and focusing on the concepts that are the basis of the current computers such as microprocessors. Includes machine language, instruction set architecture, control design, memory hierarchy, Input/output and communication. To introduce basic assembly language, describe the instruction format/set of a computer and write simple assembly language programs.

Note :   (i)   The Question paper will consist of four units.
         (ii) Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
         (iii) The students are required to attempt one question from each unit and the compulsory   question.
         (iv) All questions carry equal marks.

UNIT-I

1. **Information Representation**:

   Number Systems: Binary, Octal, Decimal, Hexadecimal numbers and their interconversions; Complement's: $(r-1)$'s and (r)'s complement; Fixed-point and Floating-point representation of numbers; Error Detection and Correction codes: Parity Check, CRC, and Hamming Code; Binary Logic: Digital logic gates, Boolean algebra, Boolean functions, Truth tables, Simplification of Boolean functions, K-maps for 2, 3 and 4 variables.

2. **Basic Building Blocks:**

   Combinational logic design: half-adder, fulladder, Encoder, Decoder, Multiplexer.
   Sequential circuits: Concept, flip-flops (D, RS, JK, T, and Master-Slave); Registers: Buffer, Shift and Controlled shift registers; Counters: Binary, Ripple, Ring Counter.

UNIT-II

3. **Register Transfer and Micro-operations:**

   Register Transfer Language, Bus and Memory Transfer, Logic and Shift micro-operations.

4. **Computer Organization:**

   Microcomputer Organization; Microprocessor Organization; Instruction codes; Instruction cycle; Instruction formats; Processing Unit Design: one, two and three-bus organization.

UNIT-III

5. Memory Organization:

Memory Hierarchy, Types of Memory: RAM and ROM Chips, Associative Memory, Cache Memory, Auxiliary Memory, Memory Address Map.

6. Input-Output Organization:

Input-output Interface, Memory-Mapped I/O, Interrupt, Interrupt Cycle, Types of Interrupt: Program interrupt, Priority Interrupts, Direct Memory Access (DMA).

UNIT-IV

Assembly Language Programming:

7. Micro Processor Architecture:

Microcomputer Architecture, Structure of 8086/8088 CPU, The Bus Interface Unit, Execution Unit (EU); Registers, Addressing modes, Instruction set for 8086/8088; Programmers model of a machine. Example of a typical 16 to 32 bit processor.

8. Introduction to Assembly Language:

Machine vs Assembly Language, Assembler : One Pass and Two Pass Assembler, Assembly Language programs for : numeric manipulations and Simple string: String Reversal, Counting Vowels, Counting Characters, operations and sorting of a list using arrays.

Suggested Readings:

1. Mano, M.M., 1986: Computer System Architecture, Prentice Hall of India.
2. Mano, M.M: Digital Logic and Computer Design, Prentice Hall of India.
3. Indu Chhabra and Gursharan Singh: Insight into Microprocessors (Principles, Implementation and Technology), AP Publishers, India.
4. Tannenbaum, A.S.: Structured Computer Organization, Prentice Hall of India.
5. Assembler Manual for the Chosen Machine.
6. B. Brey: The Intel Microprocessors, Pearson Education.
7. Hayes: Computer Architecture and Organization, McGraw-Hill International Edition.
8. Sloan, M.E.: Computer Hardware and Organization, 2nd Edition, Galgotia, Pvt. Ltd.
9. Malvino, Albert Paul: Digital Computer Electronics, 2nd Edition, Tata McGraw Hill Co.
10. Schaum Series: Introduction to Microprocessors.
11. Mathur, Aditya, P.: Introduction to Microprocessors, 2nd Edn., Tata McGraw-Hill Co.
12. Rafiquzzaman, Microprocessors & Microcomputers Based System Design, UBS.
13. Gupta, Vikas: Comdix Computer Hardware and Networking Course Kit, Wiley India Pvt. Ltd.
14. William, Jones B.: Assembly Language Programming for IBM PC Family, 3rd Edition, Wiley India Pvt. Ltd.
15. Duntmann, Jeff: Assembly Language Step by Step: Programming with DOS and Linux, 2nd Edition, Wiley India Pvt. Ltd.
16. Dandamundi, P.: Fundamentals of Computer Organization and Design, Wiley India Pvt. Ltd.

Paper Title: DATABASE MANAGEMENT SYSTEMS

Paper Code: CS-61   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objective:

 The objective of this course is to teach the students concepts related to database, database design techniques, transaction management, crash recovery, backup and security of databases.

Note :   (i)   The Question paper will consist of four units.
          (ii)   Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
          (iii) The students are required to attempt one question from each unit and the compulsory question.
          (iv)   All questions carry equal marks.

UNIT-I

1. **Basic Concepts:**

    Database, DBMS: Need, Characteristics, Database Users, 3-tier Architecture, Advantages over 2-tier, Components, Advantages, Disadvantages, Views of data-schemas and instances, Data independence, Conventional data models & systems.

2. **Data Models:**

    Data Associations, Entities, Representation of associations and relationships, Data models classification: File based System, Traditional data models - Hierarchical, Network, Relational Models. Entity-relationship model: Entities, Relationships, Representation of entities, attributes, Representation of relationship set, Generalization, Aggregation.

UNIT-II

3. **Storage and File Organization:**

    Overview of physical storage media, RAID, Storage access; File organization, Operations on Files, Serial Files, Sequential Files, Indexed-Sequential Files, Direct Files.

4. **The Relational Model:**

    Relational Database: Attributes, Domains, Tuples, Relations and their schemes, Relation representation, Keys, Relationship, Relational operations, Integrity constraints.

UNIT-III

5. **Relational Algebra and Relational Calculus:**

     Relational Algebra: Operations - Union, Intersection, Difference, Cartesian product, Projection, Selection, Division and relational algebra queries; Relational Calculus: Tuple oriented and domain oriented relational calculus and its operations.

6. Transaction and Concurrency control:

Concept of Transaction, ACID properties, Serializibility, States of transaction, Concurrency control: Locking techniques, Time stamp based protocols, Granularity of data items, Deadlock.

UNIT-IV

7. Crash Recovery and Backup:

Failure classifications, storage structure, Recovery & atomicity, Log base recovery, Recovery with concurrent transactions, Failure with loss of non-volatile storage, Database backup & recovery from catastrophic failure, Remote Backup System.

8. Security and privacy:

Database security issues, Discretionary access control based on grant & revoking privilege, Mandatory access control and role based access control for multilevel security, Encryption & public key infrastructures.

Suggested Readings:

1. Introduction to Database Sytems   :   C.J. Date
2. Database Management Systems   :   Bipin Desai
3. Database System Concepts   :   Korth
4. Principles of Database Management   :   James Martin
5. Computer Database Organization   :   James Martin
6. Fundamentals of Database Systems   :   Elmasri Navathe
7. Object-Oriented Modeling and Design :   Rumbaugh and Blaha
8. Object-Oriented Analysis and Design   :   Grady Booch

Paper Title: MATHEMATICAL STRUCTURES FOR COMPUTER SCIENCE

Paper Code: CS-62   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objective:

 To provide basic knowledge about mathematical structures required for various computer science courses.

Note :   (i)   The Question paper will consist of four units.
      (ii) Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
      (iii) The students are required to attempt one question from each unit and the compulsory question.
      (iv) All questions carry equal marks.

UNIT-I

1.   Mathematical Logic:

Introduction, Conjunction, Disjunction & negation, Propositions and truth table, Tautologies and contradictions, Equivalence of formulas, Duality law, Normal forms: Disjunctive Normal form, Conjunctive Normal form, Predicate Calculus: Predicates, the statement function, variables and quantifiers, predicate formulas, Methods of proof (Inference Theory).

2.   Functions:

Composite functions & their range, Domain, Functions for computer science like characteristic function, Hashing function, Growth of a function.

UNIT-II

3.   Ordered Sets, Lattices, Boolean Algebra :

Partially Ordered Sets, External elements of POSET, HASSE Diagrams of POSETS, Lattices, Finite Boolean Algebra, Functions on Boolean algebra, Circuit Designs.

4.   Introduction to Finite State Machine:

Introduction to Finite State Machine, Simplification of machine, Machine and regular languages.

UNIT-III

5.   Graphs:

Incidence and Degree, Handshaking Lemma, Isomorphism, Connectedness, Walk, Path and Circuits, Shortest Path Algorithm between two Vertices, Eulerian graph, Fleury's Algorithm, Directed graphs, Kuratowski's graphs, Detection of planarity.

6.   Trees:

Properties of Trees, Rooted and Binary Trees, Directed Tree, Spanning Tree, Cutest & Cut Vertices, Max-flow–Min-cut theorem.

UNIT-IV

7.   Recurrence Relations:

Recursion, Recurrence Relation, Linear homogenous recurrence relations with constant coefficients, Non-homogeneous recurrence relation, Generating Functions.

8.   Coding Theory :

Coding of binary Information & Error detection, Decoding & Error Correction.

Suggested Readings:

1.   Kolman, Busby, Ross : Discrete Mathematical Structure, PEARSON Education, 5th Edition.
2.   Schaum Series: Theory and Problems of Essential Computer Mathematics, McGraw Hill, New York, 3rd Edition.
3.   Sengadir,T. : Discrete Mathematics and Combinatorics, PEARSON Education.
4.   Kenneth, H. Rosen: Discrete Mathematics and Its Applications, Mc GRAW Hill, International Edition.
5.   Deo, N.: Graph Theory with Applications to Engineering and Computer Science, PHI.
6.   Clark, John & Hetlan: A First Look at Graph Theory, Allied Publishers Limited.

Paper Title: LINUX OPERATING SYSTEM

Paper Code: CS-56   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objective:

The objective of the course is to make students aware of the functioning of a multi-user operating system. This course will serve as a foundation for the higher level course in Linux. The students are expected to learn the commands while doing practical and emphasis should be given to those switches/options and flags, which are most frequently used in real life.

Note : (i)   The Question paper will consist of four units.
        (ii) Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
        (iii) The students are required to attempt one question from each unit and the compulsory question.
        (iv) All questions carry equal marks.

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UNIT-I

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1.   Theoretical Concepts of LINUX Operating System:

Basic Features of Operating System, File Structure, CPU Scheduling, Memory management: Swapping, Demand Paging; File system: ext2 and ext3 architecture, Blocks and Fragments, Inodes Directory Structure.

2.   Getting Started with LINUX:

User Names and Groups; Logging in; Changing your password; Format of LINUX commands.

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UNIT-II

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3.   Characters with special meaning; LINUX Documentation; Files and Directories :

Current Directory, Access the directory contents, absolute and relative pathnames, some LINUX directories and files, Access file contents, file permissions, changing permission modes, Standard files, Standard output, Standard input, Standard Error, Filters and Pipelines, Processes: PID,PPID, Process creation, killing a process, stopping background process; LINUX VIth Editor.

4.   Text Manipulation :

Inspecting Files; File Statistics; Searching for Patterns, Comparing Files; Operating on Files; Printing Files; Rearranging Files; Sorting Files; Splitting Files; Translating characters.

UNIT-III

5. Shell Programming:

Programming in the Borne and the C-shell: Wild cards, simple shell programs, shell variables, shell programming constructs, interactive shell scripts, Advanced features.

6. System Administration:

Definition, Booting the system, Maintaining user accounts, File system and special files, Backups and restoration, Role and functions of a system manager.

UNIT-IV

7. System Calls :

C as System Programming Language, I/O system calls – umask(); create(); open(); read(); write(); lseek(); dup(); link(); access(); chmod(); chown(); Process management system calls; fork(); getpid(); getppid(); exit(); wait(); sleep() ; Signal system calls – kill(); signal().

Suggested Readings :

1. Parker, Tim: Linux Unleashed, Latest Edition, Techmedia.
2. Tackett, J.: Special Edition using LINUX, PHI.
3. Norton, P.: Complete Guide to LINUX, Techmedia.
4. Komarinski, M.: LINUX System Administration Handbook, Prentice Hall.
5. Stones, Richard and Mathew Neil: Beginning Linux Programming, 3rd Edition, Wrox.
6. Nyus, Christopher, 2006: Linux Bible, Wiley.
7. Graham, Steven: Linux Administration, Tata McGraw.
8. Jones, Tim: GNU/Linux Application Programming, Wiley India Pvt. Ltd.

SECOND SEMESTER

Paper Title: DATA AND FILE STRUCTURES (USING C)

Paper Code: CS-63   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objectives:

The emphasis of this course is on the organization of information, the implementation of common data structures such as lists, stacks, queues, trees, and graphs.

Note : (i)   The Question paper will consist of four units.
        (ii) Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
        (iii) The students are required to attempt one question from each unit and the compulsory question.
        (iv) All questions carry equal marks.

UNIT-I

1. **Introduction to Data Structures:**

   Concepts and definition of data types, Linear and non-linear data structures.

2. **Arrays:**

   Representation of one and multidimensional arrays in memory, ADT, Operations: traversing, insertion, deletion, reversing, searching, sorting, merging two arrays; Matrix operations: addition, multiplication; Sparse matrices: ADT, representation; Applications of array: Polynomial evaluation and addition of two polynomials.

UNIT-II

3. **Linked List:**

   Introduction, sequential vs linked representation, Operations: traversal, creation, insertion, deletion, reversing; Application of linked lists: Polynomial addition; Introduction to the operations of circular linked lists and doubly linked lists; Fundamental concepts of dynamic memory allocation and garbage collection.

4. **Stacks and Queues:**

   Sequential and linked representations, ADT, Stack Operations: Traversal, pop, push; Applications of stack: polish notation, infix to postfix, evaluating postfix expression; Queues: Sequential and linked representation, Queue operations : Traversal, insertion, deletion; Dequeue, Circular queues.

UNIT-III

5. **Trees:**

   Terminology, ADT, Types: Binary tree, Complete binary tree, Threaded Binary tree, Binary search tree, B-trees; Binary tree: properties, sequential and linked representation, Traversal techniques: inorder, pre-order, postorder; BST operations: Traversal, Searching, Insertion, Deletion.

6. Sets and Graphs:

Sets: Representation, union and find algorithms; Graphs: ADT, types, sequential and linked representation; Operations: Insertion, deletion, traversal: DFS, BFS; Minimum cost spanning trees: Kruskal's and Prim's algorithm.

UNIT-IV

7. Searching and Sorting:

Definition of recursion and its applications, Towers of Hanoi; Sorting Techniques: Bubble sort, Selection sort, Merge sort, Heap sort, Quick sort; Implementation of linear and binary searchs techniques in C.

8. File Structures:

Sequential file organization, variable length records and text files; Indexing structures: B-trees, ISAM, Hashing techniques for direct files.

Suggested Readings:

1. Horwitz, E., and Sahni, S., 2003: Fundamentals of Data Structures, Computer Science Press.
2. Wirth, Niclaus, 2002: Algorithms + Data Structures = Programs, Prentice Hall International.
3. Tremblay, 2002: An introduction to Data Structures with Applications, Tata McGraw.
4. Aho, A. V., Hopcroft, and Ullman, J.E., 1982: Data Structures and Algorithms, Addison Wesley.
5. Tanenbaum, A. M. and Augenstein, M.J., 1985: Data Structures using C, Prentice Hall International.
6. Lipschutz, Seymour, 1986: Theory & Problems of Data Structures, Schaum Series.
7. Berman, A. Michael, 2002: Data Structure via C++, Oxford University Press.
8. Deshpanday: C and Data Structures, Wiley India Pvt. Ltd.
9. Boldwins, Douglas: Algorithms and Data Structures: The Science of Computing, Wiley India Pvt. Ltd.
10. Jim Keogh/Davidson: Data Structures—Principles and Fundamentals, Wiley India Pvt. Ltd.
11. Leendert: Algorithms and Data Structure in C++, Wiley India Pvt. Ltd.

Paper Title: OBJECT ORIENTED PROGRAMMING (THROUGH C++ AND JAVA)

Paper Code: CS-64   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objectives:

This course will expose you to the features in C++ and Java as well as help you design software using the object oriented paradigm of programming using C++ and Java.

Note :   (i)   The Question paper will consist of four units.
        (ii)   Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
        (iii)   The students are required to attempt one question from each unit and the compulsory   question.
        (iv)   All questions carry equal marks.

UNIT-I

1.   Introduction to Object Oriented Programming, Characteristics of OOPs, Dynamic binding, Message Passing, Tokens, Expressions, Data Types, Variables, Operators, Control Statements, Arrays, String Handling.

UNIT-II

2.   Classes, Objects, Constructors, Destructors, new and delete operators, Inheritance, Access modes, Method overloading, friend functions, Pass by value vs Pass by Reference, Operator overloading, Dynamic polymorphism: Virtual functions, pure virtual functions, abstract class; Exception Handling, File Handling, Templates.

UNIT-III

3.   Java – Introduction, JVM, Byte code, Data Types, Variables, Arrays, Operators, Control Statements, Classes, Objects, Overloading methods, Member access and inheritance, Method overriding, Using super and final, Defining a package, Understanding CLASSPATH, Importing Packages, Interface and its implementation.

UNIT-IV

4.   Multithreaded Programming : Lifecycle of thread, Creating a Thread, Implementing runnable, Extending Thread, Thread priorities, Using synchronized methods, Suspending, Resuming and Stopping Threads; Applet : Applet lifecycle, Applet class, creating applets; AWT: Using AWT Controls, Layout Managers.

Suggested Readings:

1. Balaguruswamy, E.: Object Oriented Programming with C++, TMH.
2. Lafore, Robert: OOP in Turbo C++, Galgotia.
3. Strostrup: The C++ Programming Language, Addison Wesley.
4. Parsa, N.R.: OOPS with C++ from the Foundation, Wiley India Pvt. Ltd.
5. Gaddis, Tonny: Starting out with C++, 3rd Edition, Wiley India Pvt. Ltd.
6. Gaddis, Tonny: Starting out with Object Oriented Programming in C++, 3rd Edition, Wiley India Pvt. Ltd.
7. Al Steven: Al Steven's C++ Programming, 7th Edition, Wiley India Pvt. Ltd.
8. Nicolai: Object Oriented Programming in C++, Wiley India Pvt. Ltd.
9. Schildt, Herbert: The Complete Reference Java 2, TMH.
10. Balaguruswamy, E.: Programming with Java, TMH.

Paper Title: DATA COMMUNICATION AND NETWORKS

Paper Code: CS-48   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objectives:

As part of this course, students will be introduced to computer networks and data communication paradigms, about network models and standards, network protocols and their use, wireless technologies.

Note :   (i)   The Question paper will consist of four units.
         (ii) Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
         (iii) The students are required to attempt one question from each unit and the compulsory question.
         (iv) All questions carry equal marks.

UNIT-I

1.   **Introduction:**

     Data Transmission concepts, transmission impairments, switching, modulation, multiplexing.
     Network Hardware: LAN, MAN, WAN, Wireless networks, Internet-works.
     Network Software: Layer, Protocols, interfaces and services.
     Reference Models: OSI, TCP/IP and their comparison.

2.   **Physical Layer :**

     Transmission Media :
     Magnetic, twisted pair, coaxial cable, fiber optics, wireless transmission (Radio, Microwave, Infrared, Light wave).

UNIT-II

3.   Introduction to ATM, ISDN, Cellular radio and communication satellites.

4.   **Data Link Layer :**

     Framing, Error control, Sliding window protocols (one bit, Go back n, selective repeat).
     Examples of DLL Protocols – HDLC, PPP.

     Medium Access Sub layer :
     Channel Allocation, MAC protocols – ALOHA, CSMA protocols, Collision free protocols, Limited Contention Protocols, Wireless LAN protocols, IEEE 802.3, 802.4, 802.5 standards and their comparison.
     Bridges - Transparent, source routing, remote.

UNIT-III

5. Network Layer:

Design issues, routing algorithms (shortest path, flooding, flow based, distance vector, hierarchical, broadcast, multicast, for mobile hosts). Congestion control algorithms (Leaky bucket, Token bucket, Choke Packet, Load shedding), Internetworking, IP Protocol, ARP, RARP.

6. Network Trouble Shooting:

Using Ping, Traceroute, IP config, Netstat, nsloopup etc.

UNIT-IV

7. **Transport Layer:**
Addressing, establishing and releasing connection, flow control, buffering, Internet Transport Protocol (TCP and UDP).

8. **Application Layer:**

Domain name system, E-mail, File transfer protocol, HTTP, HTTPS, World Wide Web.

Suggested Readings:

1. Tanenbaum, Andrew S., 2009: Computer Networks (4th Edition), PHI.
2. Forouzan, B. A., 2009: Data Communications and Networking, Fourth Edition, Tata McGraw Hill.
3. Douglas E. Comer, 2004: Internet Working with TCP/IP (Vol.1, 4th Edition), CPE.
4. Stallings, William 2008: Data and Computer Communications (8th Edition), PHI.
5. Nance, Bary, 1997: Introduction to Networking, PHI, 4th Edition.

Paper Title: COMPUTER ORIENTED NUMERICAL AND STATISTICAL METHODS

Paper Code: CS-40   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objectives:

The course aims at discussing various significant and fundamental concepts to inculcate in the students an adequate understanding of the application of Numerical Algorithms and Statistical Methods.

Note :   (i)   The Question paper will consist of four units.
         (ii) Examiner will set total of **nine** questions comprising **two** questions from each unit and **one** compulsory question of short answer type covering whole syllabi.
         (iii) The students are required to attempt one question from each unit and the compulsory question.
         (iv) All questions carry equal marks.
         (v)   The students can use only Non-programmable & Non-storage type calculator.

Prerequisite: Mathematical Foundation of Computer Science, Probability and Statistics.

UNIT-I

Numeric Computation:
Computer Arithmetic: Floating point numbers - Operations, Normalization and their consequences.

Iterative Methods: Zeros of a single transcendental equation and zeros of polynomial using Bisection, False position, Newton-Raphson, convergence of solution.

Simultaneous Linear Equations, Solution of simultaneous Linear equation, Gauss elimination method and pivoting, ILL - conditioned equations and refinement of solutions, Gauss Siedel iterative methods.

UNIT-II

Numerical differentiation & integration, Solutions of differential equations: Runga-Kutta methods, Predictor corrector method. Automatic error monitoring, Stability of solutions.

Interpolation and Approximation: Polynomial interpolation - Newton Lagranges, Difference tables, Approximation of function by Taylor series and Chebyshev polynomials.

UNIT-III

Statistical Computation :
Frequency Charts: Different Frequency charts.

Regression Analysis: Least square fit, Polynomial and curve fittings, Linear regression and Nonlinear regression Algorithms; Introduction to Multiple regression.

UNIT-IV

Time Series and forecasting, moving averages, smoothening of curves, Forecasting models and methods.

Tests of significance: Chi square test and F-test.

SPSS and Mat Lab: Introduction and features of SPSS and Mat Lab.

Suggested Readings:

1. Stoer, Bullrich, 1980: Computer Oriented Numerical Methods, Springer Verlag.
2. Krishnamurthy, E.V., Sen, S.K., 1984: Computer Based Numerical Algorithms, East West Press.
3. Affi, A.A., 1979: Statistical Analysis: A Computer Oriented Approach, Academic Press, Inc.
4. Scalzo, F., 1978: Elementary Computer Assisted Statistics, Van Nostrand Reinherd Co. Ltd.
5. Rajaraman, V., 1980: Computer Oriented Numerical Methods, 3rd Ed., Prentice Hall of India.
6. Salaria, R.S., 1996: Numerical Methods: A Computer Oriented Approach, BPB Publ.
7. Wolfram, Stephan: Mathematica - A System of Doing Mathematics by Computers, Addison- Wesley, Publishing Company.
8. Wolfram, Stephan. : The Mathematica Book, 4th Edition, Cambridge University Press.
9. Dominick, Salbatore: Statistics and Econometrics, Schaum's Outline Series.

Paper Title: ACCOUNTING AND FINANCIAL MANAGEMENT

Paper Code: CS-07   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objectives:

To provide an overview of theoretical and practical concepts of Accounting.

Note :   (i)   The Question paper will consist of four units.
         (ii) Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
         (iii) The students are required to attempt one question from each unit and the compulsory question.
         (iv) All questions carry equal marks.

UNIT-I

1. **Accounting:**
    Principles, concepts and conventions, double entry system of accounting, introduction of basic books of accounts of sole proprietary concern, closing of books of accounts and preparation of trial balance.

2. **Final Accounts:**

    Trading, profit and loss accounts and balance sheet of sole proprietary concern with normal closing entries, Introduction to manufacturing account, final accounts of partnership firms, limited company.

UNIT-II

3. **Financial Management:**
    Meaning and role.
4. **Ratio Analysis:**
    Meaning, advantages, limitations, types of ratios and their usefulness.
5. **Fund Flow Statement:**
    Meaning of the terms – fund flow and fund working capital cycle, preparation and interpretation of the fund flow statement.

UNIT-III

6. **Costing:**

    Nature, importance and basic principles.

7. **Marginal Costing:**

    Nature, scope and importance, Break-even analysis, its uses and limitations, construction of breakeven chart, practical applications of marginal costing.

8. **Standard Costing:**

    Nature and scope, Computational and analysis of variances with reference to material cost, labour cost and overhead cost, interpretation of the variances.

UNIT-IV

9.   Budget and Budgetary Control:

 Nature and scope, importance, method of finalization of master budget and functional budgets.

10.   Introduction to Computerized Accounting System:

Coding logic and codes required, master files, transaction files; Introduction to documents used for data collection, processing of different files and outputs obtained (The concepts may be explained using available accounting package).

Suggested Readings:

1.   Kellock, John: Elements of Accounting, Heinemann, 1978.
2.   Rockely, L.E.: Finance for the Non-Accountant, 2nd Edition, Business Books (Pub.).
3.   Levy and Sarnet: Principle of Financial Management, Prentice-Hall International.
4.   Arnolel: Financial Accounting, Prentice Hall International (Paperback Edition).
5.   Horngren and Sundem: Introduction to Financial Accounting, Prentice Hall International
6.   Murthy, U.S., 1978: Management Finance, 2nd Edition, Vakils Fefers & Simons Ltd.
7.   Van Home, James, C.: Financial Management & Policy, Prentice Inc.
8.   Pandey, I.M., 1979: Financial Management, Vikas Publications.
9.   Shah Parish P.: Financial Management, Wiley India Pvt. Ltd.

THIRD SEMESTER

Paper Title: SOFTWARE ENGINEERING

Paper Code: CS-65　　　　　　　　　Max. Marks: 80　　　　　　　　Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objectives:

The course aims to give students a theoretical foundation in Software Engineering and help them learn its principles and methods including emerging practices and support tools. It also familiarizes students with concepts of software testing and quality assurance and its various techniques.

Note :　(i)　The Question paper will consist of four units.
　　　　(ii)　Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
　　　　(iii)　The students are required to attempt one question from each unit and the compulsory question.
　　　　(iv)　All questions carry equal marks.

UNIT I

1.　Introduction:

Software Engineering goals, SDLC, Software Process Models: Waterfall, Prototyping, Spiral; S/w Inspection, Preview and Inspection Procedures, Communication skill for Software Engineer, Human factors in Software Engineering, Software requirements: Definition, Software requirements specifications (SRS), Components of SRS.

2.　Software Project Planning:

Objectives, Decomposition techniques, Problem based estimation (LOC, FP), Empirical Estimation Models, COCOMO model, Risk in estimation.

UNIT II

3.　Software Design:

Objectives, Principles, Concepts, Design Process, Design Strategies and Methods, Structured design, Object oriented design, User-interface design, Structured Analysis and Design Tools: DFD, DD & decision tables.

4.　Quality Assurance:

Overview of Software Quality, Software Quality Attributes, Factors Affecting Software Quality, Building Software Quality Assurance Plan, Components of SQAP, Quality Management Principles, Essence of International Standards: ISO 9000 Quality Standard, SEI Capability Maturity Model.

UNIT III

5. Software Testing and Techniques:

Software Testing, Objectives of Software Testing, Software Testing Process, Static and Dynamic Analysis, Black-Box Testing & its Techniques: Equivalence Class Partitioning, Boundary Value Analysis, Cause-Effect Graph, Comparison Testing, White-Box Testing & its Techniques: Basis Path Testing, Structural Testing, Logic Based Testing, Fault Based Testing.

6. Software Testing Strategies:

Characteristics, Unit Testing, Integration Testing, Regression Testing, System and Acceptance Testing, Object Oriented Testing, Alpha and Beta Testing.

UNIT IV

7. Software Maintenance:

Characteristics, Types of software maintenance, Reverse Engineering, Software maintenance process models.

8. System Configuration Management (SCM) :

Basic requirements for SCM System, SCM principles, Planning and Organizing for SCM, Benefits of SCM, Change Management, Version and Release Management.

Suggested Readings:

1. Pressman: Software Engineering, Tata McGraw Hill.
2. Sommerville, I., 1986: Software Engineering, Narosa Publ. House.
3. Mall, Rajiv, 2009: Fundamentals of Software Engineering.
4. Jalote, Pankaj, 1995: An Integrated Approach to Software Engineering, Narosa Publ.
5. Fairley, R.E., 1985: Software Engineering Concepts, McGraw Hill.
6. Lewis, T.G., 1982: Software Engineering, McGraw Hill.
7. Meyers, G., 1979: The Art of Software Testing, Wiley-Inter-Science.
8. Hibbard, P.G.: Constructing Quality Software, North Holland Publication.
9. Shere, Kenneth, 1988: Software Engineering & Management, Prentice Hall.
10. Deutsch, Willis, 1989: Software Quality Engineering: A Total Technical and Management Approach, Prentice Hall.

Paper Title: OPERATING SYSTEMS

Paper Code: CS-66   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objectives:

To understand the various concepts of Operating System like process management, synchronization, deadlocks, storage and memory management.

Note :   (i)   The Question paper will consist of four units.
         (ii) Examiner will set total of ***nine*** questions comprising ***two*** questions from each unit and ***one*** compulsory question of short answer type covering whole syllabi.
         (iii) The students are required to attempt one question from each unit and the compulsory question.
         (iv) All questions carry equal marks.

UNIT I

1. **Introduction to Operating System:**

    Introduction to operating system, its need and services; Operating system classification: Single user, Multi user, Simple batch processing, Multiprogramming, Multitasking, Parallel systems, Distributed systems, Real time systems.

2. **Process Management:**

    Process: Process state, Process control block, Threads; Process scheduling: Scheduling queues, Schedulers, Context switch; Operations on process: Process creation and termination; Inter process communication: Shared memory systems, Message passing systems; Process scheduling: CPU-I/O burst cycle, CPU scheduler, Pre-emptive and non pre-emptive scheduling; Scheduling algorithms: FCFS, SJFS, RRS, Priority scheduling, Multilevel queue scheduling, Multilevel feedback queue scheduling.

UNIT II

3. **Synchronization:**

    Critical section problem, Peterson's solution, Synchronization hardware, Semaphores: Mutual exclusion, Binary semaphores, Bounded concurrency, Producer-consumers, Reader-writers problem; Deadlocks & starvation, Problems of synchronization: Bounded buffer, Dining philosophers; Monitors.

4. **Deadlocks:**

    System model, Deadlock characterization: Necessary conditions, Resource allocation graph, Method for handling deadlock; Deadlock prevention: Mutual exclusion, Hold and wait, No preemption, Circular wait, Deadlock avoidance: Safe state, Resource allocation graph algorithm, Banker's algorithm; Deadlock detection, Recovery from deadlock.

UNIT III

5. Memory Management-I:

Static and dynamic memory allocation, Memory allocation to process: Stacks, Heap, Memory allocation model; Reuse of memory: Performing fresh allocations using a free list, memory fragmentation, Merging free areas; Contiguous memory allocation: Fragmentation, Swapping.

6. Memory Management-II:

Paging: Hardware support, Protection, shared pages, Techniques for structuring of page table, Memory mapped files, Segmentation**,** Demand paging, Page replacement Algorithms: FIFO, Optimal, LRU, Counting based page replacement; Thrashing.

UNIT IV

7. Storage Management I:

File Concept: Attributes, Operations, Types, Structure; Access methods: Sequential and direct access, Index; Directory structure: Single level, Two Level, Tree Structured, acyclic Graph directories; File System mounting, File sharing, Protection: Types of access, access Control.

8. Storage Management II:

File system structure, File system implementation, Directory implementation, Allocation methods, Free space management, Disk scheduling: FCFS, SSTF, SCAN, C-SCAN, LOOK, C-LOOK; Disk management, Swap space management, RAID.

Suggested Readings:

1. Peterson, James, L. and Silberschatz, A., 1985: Operating System Concepts, Wiley Publ. Comp.
2. Dhamdhere, D M: Operating Systems-A Concept Based Approach, Mc Graw Hill.
3. Deitel, H.M., 1984: An Introduction to Operating System, Addison-Wesley Publ. Comp.
4. Milenkovic, M., 1987: Operating System – Concepts and Design, McGraw Hill International Editions.
5. Richie: Operating System, BPB.
6. Hansen Per Brineh, 1978: Operating System Principles, Prentice Hall India.
7. Madnick and Donovan: Operating System, McGraw Hill Book Co.
8. Joshi, R.C.: Operating Systems, Wiley India Pvt. Ltd.

Paper Title: ANALYSIS AND DESIGN OF ALGORITHMS

Paper Code: CS-67   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objective:

The objective of the module is to create skills in students to design and analyze algorithms.

Note :   (i)   The Question paper will consist of four units.
(ii) Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
(iii) The students are required to attempt one question from each unit and the compulsory question.
(iv) All questions carry equal marks.

UNIT I

1. **Algorithms and Analysis:**

Introduction, Algorithms specification, Recursive algorithms, space and time complexity, Asymptotic Notation (O, _, and Θ, *o*) practical complexities, Best, average and worst case performance of algorithms, examples, Introduction to recurrence relations.

2. **Divide and Conquer:**

General method, Binary search, Merge sort, Quick sort, Selection problem, Strassen's matrix multiplication and analysis of these problems.

UNIT II

3. **Greedy Method:**

General Method, Knapsack problem, Job sequencing with deadlines, Minimum spanning Trees, Single source shortcut paths and analysis of these problems.

4. **Dynamic Programming:**

General method, Optimal binary search trees, 0/1 Knapsack, the travelling salesperson problem.

UNIT III

5. **Back Tracking:**

General method, 8 queen's problem, Graph coloring, Hamiltonian cycles, Analysis of these problems.

6. **Branch-And-Bound:**

Method, 0/1 Knapsack and Travelling Salesperson problems, Efficiency considerations.

UNIT IV

7. Lower-Bound Theory:

Introduction to Algebraic problems, Introduction to lower bounds, Comparison Trees, Techniques for Algebraic problems, Some Lower Bounds on Parallel Computation.

8. NP-hard and NP-complete problems:

Basic concepts, Statement of Cook's Theorem, Examples of NP-hard graph and NP-scheduling problems, some simplified NP-hard problems.

Suggested Readings:

1. Horowitz, Ellis and Sahni, Sartaj 2008: Fundamentals of Computer Algorithms, Galgotia Publications, 2nd Edition.
2. Aho, A.V., Hopcroft, J.E., Ullman, J.D., 2003: The Design and Analysis of Computer Algorithms, Addison-Wesley, First Edition.
3. Bentley, J.L.: Writing Efficient Programs, Prentice-Hall India, Eastern Economy Edition.
4. Goodman, S.E. & Hedetniemi, 2004: Introduction to the Design and Analysis of Algorithms, McGraw-Hill Book Comp.
5. Knuth, D. E., 1996: Fundamental of Algorithms: The Art of Computer Programming, Vol.-1, Naresh Publ. House.
6. Brassad, Gilles and Bartley, Paul 1996: Fundamentals of Algorithms, Prentice Hall of India.
7. Mark Allen Weiss: Data Structure and Algorithms Analysis in C++, Pearson Education.

Paper Title: .NET FRAMEWORK AND C#

Paper Code: CS-68   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objectives:

This course aims at making a student's capable of developing console, windows and web applications using C# on .NET platform.

Note :   (i)   The Question paper will consist of four units.
        (ii)   Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
       (iii) The students are required to attempt one question from each unit and the compulsory question.
      (iv) All questions carry equal marks.

UNIT I

1.   Introduction to .NET environment:

The .NET strategy, the origins of the .NET technology, the .NET framework, the common language runtime, framework base classes, user and programs interface, visual studio .NET, .NET languages, benefits of the .NET approach.

2.   Introduction to C#:

Introducing C#, Overview of C#, Literals, Variables, Data Types, Operators, Expressions, Branching, Looping, Methods, Arrays, Strings, Structures, Enumerations, difference between C++ and C#, difference between Java and C#.

UNIT II

3.   Object oriented aspects of C#:

Classes, Objects, Inheritance, Polymorphism, Interfaces, Operator Overloading, Delegates, Events, Errors and Exceptions.

4.   I/O and object serialization:

I/O: System, I/O, Streams, TextWriter, TextReader, BinaryWriter, BinaryReader, FileStream, File; Serialization: Binary, SOAP, XML and custom serialization.

UNIT III

5. Writing windows forms applications and deploying windows forms applications:

Writing windows forms applications: Understanding windows forms, Window form controls, Menus, MDI forms, Using inheritance in windows forms, Using common dialog controls, Deploying windows forms applications: Introduction to deployment, Click Once deployment, Creating an installation package for project.

6. Writing asp.net applications and deploying asp.net applications:

Introduction to ASP.NET, Using validation controls, Managing state in ASP.NET web applications, Deploying ASP.NET Applications with windows installer.

UNIT IV

7. Accessing data with ado .net:

ADO.NET: Architecture, Components, Database, Data Reader, Data Adapter, Dataset, Viewing data using Data Grid View Control, Creating applications.

Suggested Readings:

1. Jones, Bradley L.: Sams Teach Yourself C# in 21 Days.
2. Balagurusamy, E., 2004: Programming in C#, Tata McGraw-Hill (Unit I, II).
3. Liberty, J., 2002: Programming C#, 2nd ed., O'Reilly (Unit III, IV, V).
4. Schildt, Herbert 2004: The Complete Reference: C#, Tata McGraw-Hill.
5. Robinson, 2002: Professional C#, 2nd Ed., Wrox Press.
6. Jason Beres: Sams Teach Yourself Visual studio.net 2003 in 21 days.
7. Watsel, Nagel, Pedersen, Reid, Skinne, White: Beginning Microsoft Visual C#2008, Wrox Publications.

Paper Title : RELATIONAL DATA BASE MANAGEMENT SYSTEMS

Paper Code: CS-69   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objective:

The course aims at providing the students through insight on few DBMS principles and practices. Students will learn and implement the operations for making and using databases with help of SQL and PL/SQL.

Note :   (i)   The Question paper will consist of four units.
         (ii) Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
         (iii) The students are required to attempt one question from each unit and the compulsory question.
         (iv) All questions carry equal marks.

UNIT I

1. **Relational Design:**

   Relation scheme, Codd's Rules for RDBMS, Anomalies in a database, Functional Dependency: Dependencies and logical implications, Closure set, Testing if FD is in closure, Covers, Non redundant and minimum cover, Canonical cover, Functional dependencies and keys.

2. **Normalization:**

   Normal forms- 1NF, 2NF, 3NF, BCNF, Difference between 3NF and BCNF, Multivalued dependencies and joined dependencies, 4NF, 5NF, Difference between 4NF and 5NF**.**

UNIT II

3. **SQL :**

   Introduction to SQL, Oracle server and oracle database, Oracle products, Oracle data types, Starting SQL *Plus, Querying database tables, Conditional retrieval of rows, Working with null values, Matching a pattern from a table, Ordering the result of a query, Aggregate Functions, Grouping the result of a query, ROLLUP operation: Getting sub totals, CUBE operation : Getting cross tabs, Command summary of SQL *Plus editor, Querying multiple tables: Equi Joins, Cartesian Joins, Outer Joins, Self Joins; SET Operators: Union, Intersect, Minus; Functions: Arithmetic functions, Character functions, Date functions, Group functions.

4. **Data Manipulation and Control-I :**

   Data Definition Language (DDL), Creating Tables, Creating a Table with data from another table, Inserting Values into a Table, Updating Column(s) of a Table, Deleting Row(s) from a Table, Dropping a Column; VIEW: Manipulating the Base table, Rules of DML Statements on Join Views, Dropping a VIEW, Inline Views, Materialized Views.

UNIT III

5. Data Manipulation and Control-II :

Database security and privileges, GRANT command, REVOKE command, Application privileges management, Enhancing performance, Sequences, Maintaining database objects, COMMIT and ROLLBACK.

6. PL/SQL-I:

 Introduction to PL/SQL, The Advantages of PL/SQL, PL/SQL block structure, PL/SQL Architecture, Fundamentals of PL/SQL, PL/SQL Data types, variables and constants, scope and visibility of a variable, Assignments and expressions, Operator precedence, referencing Non-PL/SQL variables, Built-in-functions, conditional and iterative control, SQL within PL/SQL, writing PL/SQL code, composite data types.

UNIT IV

7. PL/SQL-II:

Cursor management in PL/SQL, Cursor manipulation, Implicit cursor attributes, Exception handling in PL/SQL; Predefined exceptions, User defined exceptions.

8. Advanced PL/SQL:

Subprograms in PL/SQL, advantages of subprograms, procedure, functions, actual versus formal parameters, argument modes, stored packages, advantages of packages, dropping a procedure, dropping a function, dropping a package, using stored function in SQL statements, database trigger, Types of triggers, Dropping triggers.

Suggested Readings:

1. Desai, B.C., 1993: An Introduction to Database Systems, Galgotia Publ. Private Ltd.
2. Date, C.J.: Data Base Systems, Vols. I & II, Narosa Publications.
3. Ivan Bayross : PL/SQL The Programming Language of ORACLE, (BPB Publication)
4. Mukhi, Vijay 1992: Mastering Oracle 6.0, BPB Publications.

FOURTH SEMESTER

Paper Title : DATA MINING AND DATA WAREHOUSING

Paper Code: CS-70   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objectives:

This course will introduce concepts and techniques of data mining and data warehousing, including concepts, principles, architecture, design, implementation, application of data warehousing and data mining. Some systems for data warehousing and/or data mining will also be introduced. To study the methodology of engineering legacy databases for data warehousing and data mining to derive business rules for decision support systems.

Note :   (i)   The Question paper will consist of four units.
         (ii) Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
         (iii) The students are required to attempt one question from each unit and the compulsory question.
         (iv) All questions carry equal marks.

UNIT I

1. Introduction:

Data Warehousing: Definition, usage and trends, Characteristics of a Data Warehouse, DBMS vs data warehouse

2. Developing Data Warehouse:

Building a Data warehouse, Data warehousing components, Architecture for a warehouse, Three-tier Data warehouse architecture, Steps and Crucial decisions for the design and construction of Data Warehouses, Design performance and technological considerations, Metadata.

UNIT II

3. Developing Data Mart based Data warehouse:

Types of data marts, Loading a data mart, Metadata for a data mart, Data model for a data mart, Maintenance of a data mart, Software components for a data mart, External data, Reference data, Performance issues, Security in data mart, Nature of data in data Mart: External data, Reference data.

4. OLTP and OLAP Systems:

OLTP vs OLAP, types of OLAP, Relational vs Multidimensional OLAP, Data modeling, Schemas for multidimensional view: Star schema, Snowflake schema, implementing data warehouse; Categories of OLAP tools.

UNIT III

5. Data Mining:

Introduction to data mining definition, KDD versus data mining, data mining process, Application areas for data mining, Data preprocessing: Data cleaning, Data integration and transformation, Data reduction; Tools for data mining.

6.   Data Mining Techniques:

Association rules: Introduction, Market basket analysis, Association rules mining algorithms: Apriori algorithm, Partition algorithm.

UNIT IV

7.   Classification and Prediction:

Definition, issues regarding classification and prediction, classification by decision tree induction, Bayesian Classification, Prediction: Linear and Non-Linear Regression

8.   Clustering:

Definition, Types of data in cluster analysis, Clustering paradigms, Partitioning Algorithms: K-means and K-method, CLARANS; Hierarchical methods: BIRCH, CURE.

Suggested Readings:

1.   Inmon, W. H., 2002: Building the Data Warehouse, John Wiley.
2.   Inmon, W. H., 1996: Developing the Data Warehouse, John Wiley.
3.   Mattison, 1999: Data Warehousing and Knowledge Management, Tata McGraw Hill.
4.   Inmon, W.H., 1999: Managing the Data Warehouse, C. L. Gassey, John Wiley.
5.   Jiawei Han, Micheline Kamber, 2000: Data Mining: Concepts and Techniques, Morgan Koffman Elsvier.
6.   Fayyad, Usama M., 1996: Advances in Knowledge Discovery and Data Mining, MIT Press.

Paper Title : INTERACTIVE COMPUTER GRAPHICS

Paper Code: CS-12   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objectives :

The aim is to introduce the students to key concepts of Computer Graphics like display devices, co-ordinate system, transformations, line and circle drawing, pointing, positioning, projections, etc.

Note :   (i)   The Question paper will consist of four units.
       (ii)   Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
     (iii)   The students are required to attempt one question from each unit and the compulsory question.
     (iv)   All questions carry equal marks.

UNIT I

1. **Display Devices :**

Line and point plotting systems, Raster, vector, pixel and point plotters, Continual Refresh and storage displays, Digital frame buffer, Plasma panel displays, Display processors, Character generators, Colour-display techniques: shadow mask and penetration CRT, Colour look-up tables, hard-copy colour printers.

UNIT II

2. **Display Description:**

Screen co-ordinates, user co-ordinates, use of homogeneous coordinates, Display code generation, Graphical functions, the view algorithm, Two-dimensional transformation, Line-drawing, Circle drawing algorithms.

UNIT III

3. **Interactive Graphics:**

Pointing and positioning devices (cursor, light pen, digitizing tablet, the mouse, track balls), Interactive graphical techniques, Positioning, (Elastic or Rubber Band lines, Linking, zooming, panning, clipping, windowing, scissoring), Mouse Programming.

4. **3-D Graphics:**

Wire-frame, perspective display, perspective depth, Projective transformations, Hidden line and surface elimination (Black face removal algorithm).

UNIT IV

5. Turbo-C Graphic Language:

Primitives (constants, actions, operators, variables), Plotting and geometric transformations, Display subroutines, Concept of Animation, Saving, Loading and Printing graphics images from/to disk, Animated algorithms for Sorting, Towers of Hanoi.

6. Open GL:

Primitives of the language and interface with C/C++.

7. Programming Projects:

Two Dimensional Transformations, 3-dimensional Transformations, Interactive Graphical Techniques, GUI, Turbo C (Graphics Routines) is to be used as the standard teaching tool.

Suggested Readings:

1. Giloi, W.K., 1978: Interactive Computer Graphics, Prentice-Hall.
2. Newman, W., Sproul, R.F., 1980: Principles of Interactive Computer Graphics, McGraw-Hill.
3. Rogers, D.F., 1985: Procedural Elements for Computer Graphics, McGraw-Hill.
4. Harrington, S., 1983: Computer Graphics: A Programming Approach, Tata McGraw-Hill.
5. Foley, J.D., Van Dam A., 1982: Fundamentals of Interactive Computer Graphics, Addison-Wesley.
6. Hearn, D., Baker, P.M., 1986: Computer Graphics, Prentice-Hall.
7. Tosijasu, L.K., 1983: Computer Graphics, Springer-Verlag.
8. Kelley Bootle: Mastering Turbo C. Galgotia.
9. Plastock, Roy, 1986: Theory & Problems of Computer Graphics, Schaum Series, Tata McGraw Hill.

Paper Title : THEORY OF COMPUTATIONS

Paper Code: CS-37   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objectives:

The goal of this course is to provide students with an understanding of basic concepts of Theory of Computation.

Note : (i)   The Question paper will consist of four units.
        (ii)   Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
        (iii) The students are required to attempt one question from each unit and the compulsory question.
        (iv) All questions carry equal marks.

UNIT I

1.   Recursive Languages:

Recursive definition, Alphabets, Language, Regular expression, definitions of Finite state machine, Transition graphs, Deterministic & non-deterministic finite state machines, Regular grammar, Left-linear and right linear, Thomson's construction to convert regular Expression to NDFA & subset algorithm to convert NDFA to DFA. Minimization of DFA, Finite state machine with output (Moore machine and Meally Machine), conversion of Moore machine to Meally machine & vice-versa.

UNIT II

2.   Properties of Regular Languages:

Conversion of DFA to regular expression, Pumping lemma, Properties and limitations of finite state machine, Decision properties of regular languages, ApplicationS of finite automata.

3.   Context Free Grammar:

Context free grammar, Writing context free grammar for problems, Derivation tree and ambiguity, Application of context free grammars, Chomsky and Greibach Normal form, Conversion of CFG to CNF and GNF Properties of context free grammar, CYK algorithm.

UNIT III

4.   PDA:

Push down stack machine, Design of deterministic and non-deterministic push-down stack, Parser design.

5.   Turing Machine:

Turing machine definition and design of Turing Machine, Church-Turing Thesis, Variations of Turing Machines, combining Turing machine, Universal Turing Machine, Post Machine, Chomsky Hierarchy.

UNIT IV

6. Incommutability:

Halting problem, Turing enumerability, Turing acceptability and Turing decidabilities, Unsolvable problems about Turing machines.

7. Computation Complexity:

 P, NP and NP Complete Problems.

Suggested Readings:

1. Lewis, Harry R. and Papadimitriou, Christos H.: Theory of Computation, Prentice Hall of India, 1996.
2. Hopcroft, John E. and Ullman, Jefrey D.: Introduction to Automata Theory, Languages and Computation, Addison-Wesley Publishing Company Inc.
3. Brady, J.M.: Theory of Computer Science, Wiley.
4. A.V. Aho, J.E. Hopcroft and J.D. Ullman, 'Introduction to Automata, Languages and Computations, Addison Wesley, 1980.
5. V.J. Rayward Smith, 'A First Course on Computability, Blackwell Scientific Publications, Oxford, 1986.
6. M.Davis and E.J. Weyuker 'Computability, Complexity and Languages' Academic Press, 1982.
7. D. Gries, 'Science of Programming', Springer Verlag, New York, 1981.
8. Dewire, Dawna Tranis: Client Server Computing, McGraw Hill.

Paper Title : ARTIFICIAL INTELLIGENCE (USING LISP)

Paper Code: CS-71   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objectives :

The objective of this course is to familiarize students with concepts of AI, its tools & technologies.

Note :   (i)   The Question paper will consist of four units.
         (ii) Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
         (iii) The students are required to attempt one question from each unit and the compulsory question.
         (iv) All questions carry equal marks.

Prerequisite: System Software, Operating System, Data and File Structure.

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UNIT I

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1.   Introduction to Artificial Intelligence (AI) and Problem Space:

Introduction AI technique, Turing test, History and developments in AI, applications of AI, State space representation, production systems, systematic control strategies: Breadth first search and Depth first search, problem characteristics, product system characteristics, issues in the design of search programs.

2.   Heuristic Search Technologies:

Introduction to heuristic search, Generate and test, Hill Climbing, Best First search, A*, Problem reduction, AO*, constraint satisfaction and Means-ends-analysis techniques.

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UNIT II

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3.   Knowledge representation:

Information and knowledge, Knowledge acquisition and manipulation, Issues in knowledge representation, Knowledge representation methods-Propositional logic and first order predicate logic, Resolution principle, Horn's clauses, Features of language PROLOG, Semantic networks, Partitioned semantic nets, Frames, Scripts and conceptual dependencies.

4.   Game playing:

Mini Max search procedure, reducing alternatives using Alpha-Beta pruning method examples.

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UNIT III

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5.   Expert systems:

Introduction, examples, characteristics architecture, People involved and their role in building an expert system, case studies of expert systems, MYCIN and DENDRAL; features of knowledge acquisition systems: MOLE and SALT.

6. Natural Language understanding and processing:

Introduction, Complexity of the problem, Chompsky hierarchy of grammars, Techniques for Syntactic processing, Semantic Analysis, Discourse and pragmatic processing

UNIT IV

7. Tools and Technologies for AI:

Introduction to AI language LISP: Symbolic expression, creating, appending and modifying lists, defining functions, Predicates, Conditionals, Recursion, Iteration, Printing and reading, Lambda expressions and higher order function, List storage.

Laboratory work:

1. Programming in LISP & PROLOG.
2. Hands on experience with expert system shell.

Suggested Readings:

1.   Rich Elaine and Knight Kevin Shiva Shankar B Nair: Artificial Intelligence, Third Edition, Tata-McGraw Hill.
2.   Winston, P.H. and Horn, B.K.P.: LISP, Pearson.
3. Rajasekharan, S. and Vijayalakshmi Pai, G. A.: Neural Networks, Fuzzy Logic and Genetic Algorithms, Prentice Hall of India.
4. Russel & Norvig: Artificial Intelligence, Pearson.
5. Patterson: Artificial Intelligence and Expert Systems, Pearson Education.

Paper Title : ADVANCED JAVA AND NETWORK PROGRAMMING

Paper Code: CS-72   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objectives :

To create enterprise application development skills among students using Advanced Java.

Note : (i)   The Question paper will consist of four units.
        (ii) Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
        (iii) The students are required to attempt one question from each unit and the compulsory question.
        (iv) All questions carry equal marks.

UNIT I

1. Review of Java Basic Features, Applets, AWT Controls, Event Handling, Multithreading, I/O files.

2. **Swing:** Features, components, Swing vs AWT, swing containers, controls, using Dialogs, Sliders, Progress bars, tables, Creating user interface using swing.

UNIT II

3. **Java Database Connectivity:** Connectivity model, Java.SQL package, JDBC Exception classes, Database connectivity, Data manipulation and navigation, creating database applications.

4. **Java RMI:** Distributed object technologies, RMI architecture, creating RMI applications.

UNIT III

5. **Java Servlets:** Servelets vs CGI, Servlet lifecycle, creating and running servlets.

6. **Networking :** Networking basics, Client/server model, Java and the Net, TCP/IP client sockets, TCP/IP server sockets, Inet Address, URL, Data grams, creating networking applications.

UNIT IV

7. **Java Beans:** Component architecture, Components, Advantages of Beans, Bean Developer kit (BDK), JAR files, introspection, developing Beans, Using Bound properties, The Java Beans API, Introduction to EJB (Enterprise Java Beans), Types of EJB, Uses of EJB.

8. **Java Server Pages:** Introduction, JSP Architecture, JSP objects, developing Web Applications.

Suggested Readings:

1. Schildt , Herbert: The Complete Reference Java 2, TMH.
2. Ivan Bayross: Web Enabled Commercial Application Development using Java 2.0, BPB.
3. Cornell , Gary and Horstmann Cay S.: Core Java, Vol. I and Vol. II, Sun Microsystems Press.
4. Keogh , James: J2EE: The Complete Reference.
5. Martin Bond, Debbie Law, Andy Longshaw, Dan Haywood, Peter Roxburgh**:** Sams: Teach Yourself J2EE in 21 days, Pearson.

FIFTH SEMESTER

Paper Title : COMPUTER BASED OPTIMIZATION TECHNIQUES

Paper Code: CS-17   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objectives:

To introduce linear programming, dynamic programming and related Optimization Theories to solve real life / simulated problems.

Note :   (i)   The Question paper will consist of four units.
         (ii) Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
         (iii) The students are required to attempt one question from each unit and the compulsory   question.
         (iv) All questions carry equal marks.
         (v)   **The student can use only Non-programmable & Non-storage type Calculator.**

UNIT I

1.   Linear Programming-Mathematical model, Assumptions of linear programming, Principles of Simplex method, Revised Simplex method, Applications, Duality, Dual simplex method, Sensitivity analyses.

UNIT II

2.   Special types of linear programming problems-Transportation and assignment problems.

3.   Integer programming: Introduction, Branch and bound techniques, Binary linear programming.

UNIT III

4.   Assignment and Travelling salesman problem.

5.   Dynamic Programming, Deterministic and probabilistic dynamic programming.

UNIT IV

6.   Queuing models: Application and characteristics of queuing models, Structure of basic queuing system.

7.   PERT and CPM: Phases of project management, PERT and CPM computations.

8.   Simulation: Definition types of simulation models, Phases of simulation, Applications of simulation, Inventory and queuing problems, Advantages and disadvantages.

Suggested Readings:

1.   Hiller, F.S. & Liberman, G.J., 1974: Introduction to Operations Research, 2nd Edn. Holden Day Inc. London.
2.   Tara, H.A., 1982: Operations Research, 3rd Edn., McMillan Publishing Company.
3.   Beightler, C.S. & Phillips, D.T., 1979: Foundations of Optimisation, 2nd. Edn. Prentice-Hall.
4.   McMillan Claude Jr.: Mathematical Programming, 2nd. Edn., Wiley Series.
5.   Srinath, L.S.: Linear Programming, East-West, New Delhi.
6.   Churchman, C.W. & Arnchoff, E.L.: Introduction to Operations Research, John Wiley and Sons.
7.   Gillett, B.G., 1976: Introduction to Operation Research - A Computer Oriented Algorithmic Approach, McGraw-Hill Book Comp.
8.   Hillier, F.S. & Liberman, G.T., 1967: Introduction to Operation Research, Holden Day Inc.
9.   Rao, S. S., 1978: Introduction to Optimization : Theory & Applications, Wiley Eastern.

Paper Title: SOFTWARE PROJECT MANAGEMENT

Paper Code: CS-57   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objectives:

To familiarize the students with Project management, Project Planning and Scheduling, Advanced DSS, ERP and Software metrics.

Note :   (i)   The Question paper will consist of four units.
         (ii) Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
         (iii) The students are required to attempt one question from each unit and the compulsory question.
         (iv) All questions carry equal marks.
         (v)   **The student can use only Non-programmable & Non-storage type Calculator.**

UNIT I

1.   Project Management:

Introduction to project and project management, problems with software projects, Project management knowledge area and framework, Stages of project: feasibility study: cost-benefit analysis, Planning, project execution, project and product life cycle; Project stakeholders: All parties of project, role of project manager; Exploration of open source software tools for project management.

2.   Checkpoints and Processes of Project:

Major milestones, Minor milestones, Periodic status assessments, Project processes: Initiating processes, Planning processes, Control processes, Executing processes, Closing processes, Process Groups, Process interactions.

UNIT II

3.   Project Planning:
Integration management: Introduction, Project plan development, Plan execution; Scope management: Introduction, methods for selecting projects, project charter, scope statement, work breakdown structure; Stepwise project planning: Overview, Main steps in project planning.

4.   Project Scheduling:
Time Management: Importance of project schedules, Schedules and activities, Sequencing and scheduling activity; Project network diagrams: Network planning models, Duration estimating and schedule development, Critical path analysis, Program evaluation and review Techniques.

UNIT III

5.   Technical Metrics for Software:

Software process and project metrics: Size-oriented metrics, Function-oriented metrics, Extended function point metrics, A Framework for technical software metrics, Metrics for requirement specification quality, Metrics for analysis, Metrics for design, Metrics for source code, Metrics for testing, Metrics for maintenance.

6. Technical Metrics for Object-Oriented Systems:

Intent of object-oriented metrics, Characteristics of object-oriented metrics, Metrics for OO design model, Class-oriented metrics, Operation-oriented metrics, Metrics for object-oriented testing, Metrics for object-oriented projects.

UNIT IV

7. Introduction to ERP:

Overview, Benefits, Technologies related to ERP, ERP packages, Business process re-engineering, Implementation life cycle of ERP, Training: Team training, End user training; Post implementation (maintenance mode), Implementation in large-scale organization, Applications of ERP in functional areas: Marketing, Personnel, Financial & Production.

8. DSS:

Decision structure, Decision support trends, DSS components, Using DSS: What-if analysis, sensitivity analysis, Goal seeking analysis, Optimization analysis, Executive information systems, Enterprise portals and decision support, knowledge management systems.

Suggested Readings:

1. James A O'Brien, George M. Maracas, Ramesh Behl: Management Information Systems, Mc Graw Hill.
2. Walker Royce: Pearson Education, 2005: Software Project Management.
3. A Guide to the Project Management Body of Knowledge (PMBOK), Project Management Institute, PA, (2004).
4. Harold Kerzner, Frank P. Saladis, Project Management Workbook and PMP/CAPM Exam Study Guide, Wiley Publishers (2006).
5. Claudia M. Baca, Patti, PMP: Project Management Professional Workbook, Sybex, Workbook (2003).
6. Joel Henry, Pearson Education: Software Project Management.
7. Pankaj Jalote, Pearson Education, 2005: Software Project Management.

Paper Title : MOBILE COMMUNICATION AND ANDROID APPLICATION DEVELOPMENT

Paper Code: CS-58   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objectives:

The course will familiarize the students with basic concepts about mobile communication, its architecture, protocols, mobile databases and operating systems. It will also enable them to develop mobile applications using Android.

Note : (i)   The Question paper will consist of four units.
  (ii)   Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
  (iii) The students are required to attempt *one* question from each unit and the compulsory   question.
  (iv) All questions carry equal marks.
  (v) **The student can use only Non-programmable & Non-storage type Calculator.**

UNIT I

1.   Mobile communication:

Definition, Guided Transmission, Unguided Transmission; Mobile computing architecture, Mobile Devices, Mobile System Networks: Cellular, WLAN, Ad hoc networks; GSM: Services and System Architecture, Radio Interfaces, Localization, Calling, Handover, Security; CDMA: Architecture, Spread Spectrum, Coding Methods; GPRS: Introduction, system Architecture; Introduction to EDGE

UNIT II

2.   Mobile database:

Database hoarding techniques, Data Caching, Client Server computing: 2tier and 3tier client server architecture; Transactional models, Query processing, Data Recovery process; Data Dissemination; Communication Asymmetry, Classification of Data delivery mechanism: Push based, pull based, Hybrid; Selective tuning and indexing technique, Mobile Application Languages, Mobile Operating system: PalmOS, Symbian, Android.

UNIT III

3.   Android Application Development:

Android Application Development: Getting started with Android, Mastering Android Development tools: Using Android Documentation, Debugging Applications with DDMS, Working with Android Emulator; Building Android Applications: Designing typical Android Application, Using the Application Context, Working with Activities, Working with intents, Dialogs, Fragments, Logging application information.

UNIT IV

4.   Android Application Development:

Managing Application Resources: Working with Simple Resource values, Drawable Resources, Layouts, Files; Configuring the Android Manifest file and basic application Settings, registering activities, Designating the launch activity, Managing Application permissions, Designing an application framework.

Suggested Readings:

1. Kamal, Raj, Mobile Computing, Oxford Higher Education.
2. Jochen Schiller, "Mobile Communications", PHI/Pearson Education, Second Edition.
3. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, "Principles of Mobile Computing", Springer, New York, 2003.
4. Reto Meier, Professional Android 2 Application Development, Wrox Publications.
5. Hazysztof Wesolowshi, "Mobile Communication Systems", John Wiley and Sons Ltd.
6. Shane Conder, Lauren Darcey: Sams Teach Yourself Android™ Application Development in 24 Hours.

Paper Title : SOFT COMPUTING TECHNIQUES USING NEURAL NETWORKS

Paper Code: CS-59   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objectives:

To get the knowledge and exposure for Advanced AI Techniques to solve the problem lying in fuzzy environment.

Note :   (i)   The Question paper will consist of four units.
         (ii)   Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
         (iii) The students are required to attempt one question from each unit and the compulsory question.
         (iv)   All questions carry equal marks.
         (v)   **The student can use only Non-programmable & Non-storage type Calculator.**

UNIT I

Fundamentals:

1. **Introduction to Soft Computing:**

   Basic soft computing techniques: Neural networks, Fuzzy logic, Genetic algorithms; Hybrid systems, Applications to soft computing.

2. **Basics of Neural Networks:**

   Characteristics of neural networks, Basic models of artificial neural network: Connections, Learning method, Activation functions; Neural network architectures; Applications of neural networks.

UNIT II

Neural Network Learning Models:

3. **Supervised Learning Networks:**

   Introduction to supervised learning, Architecture and training algorithms for perception network and back propagation networks.

4. **Unsupervised Learning Networks:**

   Introduction to unsupervised learning, Architecture and training algorithms for Kohonen self-organizing maps and adaptive resonance theory networks (ART1, ART2).

5. **Hopfield Networks:**

   Introduction, Architecture and training algorithm for discrete Hopfield nets.

UNIT III

Fuzzy Logic:

6. **Fuzzy Logic:**

   Introduction and Application to Fuzzy logic, Classical sets, Fuzzy Sets, Operations on Fuzzy Sets, Fuzzy Relations, Membership functions: Features & Methods of membership value assignment, Defuzzification methods.

7. **Fuzzy Logic Control Systems:**

Architecture and Operation of Fuzzy Logic Control (FLC) systems, FLC System Models, Applications of FLC Systems.

UNIT IV

Genetic Algorithms:

8. Introduction to genetic algorithms; Biological background, Genetic algorithms versus traditional algorithms. Basic terminologies in genetic algorithm: Genes, fitness and populations.

9. General Genetic Algorithm; Operations in genetic Algorithm: Selection, Crossover and Mutation, Applications of Genetic Algorithm.

Suggested Readings:

1. S.N. Sivanandam and S.N. Deepa: Principles of Soft Computing, Second Edition, John Wiley.
2. Karray and Silva: Soft Computing and Intelligent Systems Design, Pearson Education.
3. Gallant Stephen: Neural Network Learning and Expert System, MIT Press.
4. S. Rajasekaran and Pai: Neural Networks, Fuzzy Logic, and Genetic Algorithms, PHI.
5. Rao and Rao: C++ Neural Networks & Fuzzy Logic, BPB.
6. Rao, Vallinu B. and Rao, Hayagriva: Neural Networks and Fuzzy Logic.
7. Anderson J. A.: An Introduction to Neural Networks.
8. G. J. Kiler & B. Yuan: Fuzzy sets & Fuzzy logic.
9. Haykin S.: Neural Networks – A Comprehensive Foundations.

CS-19 Seminar   **Max. Marks: 100**

Each student will be required to give seminar on selected topic and submit the report.

SEMINARS TOPICS

1. Artificial Neural Networks.
2. Tele Immersion - The future of Internet telecommunication.
3. Biometric Identification & Authentication.
4. Network Intrusion Detection System.
5. Natural Language Processing.
6. Genetic Programming.
7. Honey pots & Honey net.
8. Ubiquitous Computing.
9. Virtual Network Computing.
10. MANET.
11. Cryptography.
12. Grid Computing.
13. Mobile Computing.
14. Cloud Computing
15. J2EE
16. Bio-informatics.
17. Digital Watermarking.
18. Software Agents (Mobile Agents, Intelligent Agents).
19. Information Security (Security, Cryptography, Digital Signatures etc.).
20. Security protocol for sensor networks.
21. Nano-technology Assembler Design and Nano-Communication.
22. Robotic Surgery.
23. Any other topic related to recent developments.

SIXTH SEMESTER

CS-18   GUIDELINES FOR SUBMISSION OF PROJECT REPORT   **Max. Marks: 320**

The report should consist of the following:

- Cover page including Project title, Name of the student, Name of the Department and Names of the Project Guides (both External and Internal).
- Acknowledgements.
- Certificate from company and department duly signed by external guide, chairman and internal guide.
- Contents with page numbers.
- Introduction (includes background and application or importance of the project).
- Objectives.
- System Analysis.

System Feasibility Study :

- Software requirement specifications.
- Design with system flowcharts and input/output design.
- Implementation and Testing
     - Hardware and software used.
     - Listing of well commented programs with result/output or detailed algorithms with input and output.

Further Scope of the Project :

- Bibliography.
- Appendices (any other information related to project).

Each student should observe the following norms while submitting the synopsis/thesis for the Project:-

(a) Use both sides of the paper instead of only single side.
(b) Use one and half interline spacing in the text (instead of double space).
(c) Stop using a blank sheet before the page, carrying figure or table.
(d) Try to insert figure/table in the text page itself (instead of using a fresh page for it, each time).

Students must consult/inform the internal guides regarding the progress of their work at least once in 20 days. It is the duty of the student to be in touch with his/her internal guide. The student must prepare 5 copies of the report including one copy for self. The remaining four are to be submitted before 31st May every year as per the following :

1. Main Library, 2. Department Library, 3. Internal Guide, 4. Company

One softcopy of the work is to be submitted to the concerned head of the dept./institution along with the report. The student must present his/her work in 15 minutes mainly focusing on his/her contribution with the help of slides followed by demonstration of the practical work done. The Project Viva will be completed before 15th June every year. Exact dates will be informed before 31st May every year.

Project Viva will be conducted by an external examiner, internal examiner and the internal guide.

OLD PAPERS (ELECTIVES)

Paper Title : MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

Paper Code: CS-01   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objectives:

To provide basic mathematical foundation required for various computer science courses.

Note :   (i)   The Question paper will consist of four units.
        (ii)   Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
        (iii) The students are required to attempt one question from each unit and the compulsory question.
        (iv) All questions carry equal marks.

UNIT-I

1.   Sets, Relations and Functions:

Definition of Sets and Subsets; Venn Diagrams, Intersection, Union and Complements; DeMorgan's Law; Set Properties, Cardinality, Relations-Equivalence relations etc., Classes of Sets; Mappings-One-one, Onto etc.

2.   Calculus: Functions; Limits and Continuity; Differentiation and Integration.

UNIT-II

3.   Solution of Differential Equations of First Order & First Degree.

4.   Logic: Logic Operators like AND, OR etc., Truth Tables; Theory of Inference and Deduction; Mathematical Induction; Predicate Calculus; Predicates and Quantifiers.

UNIT-III

5.   Linear Equations & Matrices:

Various types of matrices, Row/Column Operations, Solution of Linear Equations, Determinants, Properties of Determinants, Cramer's Rule, Gaussian Elimination; Decomposition, Inverse of a Matrix, Calculation of Inverse by Elementary Row Operations.

6.   Vector Spaces, Inner Products and Norms:

Linear Independence; Linear Dependence; Bases, Subspaces and Dimensionality.

UNIT-IV

7.   Length of an Inner Product, Angle, Direction Cosines; Orthogonalizations. Definitions and Theorems on each topic.

8.   Graph, Directed Graph, Machines:

Basic Concepts, Paths & Connectivity, Labelled Graphs, Tree Graph, Rooted Trees, Directed Graphs, Finite State Machines.

Suggested Readings:

1.   Kenneth, H. Rosen: Discrete Mathematics & Its Applications, 3rd Edition, McGraw Hill Internation Edition, 1995.
2.   Schaum Series: 2000 Solved Problems in Discrete Mathematics, McGraw Hill.
3.   Trembley, J.P. and Manohar, R.P.: Discrete Mathematical Structures with Applications to Computer Science, McGraw-Hill, 1975.
4.   Lipschutz, Seymour: Theory and Problems of Essentials Computer Mathematics, McGraw Hill, 1987.

Paper Title : COMPUTER PROGRAMMING AND PROBLEM SOLVING (USING C)

Paper Code: CS-02   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objectives:

To develop the Logic for given problem and to gain experience of procedure oriented language, its syntax and construction of code.

Note :   (i)   The Question paper will consist of four units.
         (ii) Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
         (iii) The students are required to attempt one question from each unit and the compulsory question.
         (iv) All questions carry equal marks.

UNIT-I

1. **Problem Solving:**

   Problem Identification, Analysis, Flowcharts, Decision Tables, Pseudocodes and algorithms, Program Coding, Program Testing and Execution, Types of Programming Languages.

UNIT-II

2. **Computer Programming Language (C Language):**

   Concept of variables and constants, Structure of a C program, various operators, Expressions and their evaluation using rules of hierarchy, Assignment statements.

UNIT-III

3. **Control Structures:**
   Sequencing, alternation, iteration, Arrays, Manipulating vectors and matrices, Pointers, Strings and string functions, structures.

4. User defined functions, Data management, Input/Output and files, Documentation, debugging, C preprocessors, Macros.

UNIT-IV

5. A brief introduction to C++ Object Oriented Programming techniques, Difference between C & C++.

6. Examples illustrating structured program development methodology and use of a block structured algorithmic language to solve specific problems.

Suggested Readings:

1. Cooper, Mullish, 1987: The Spirit of C, An Introduction to Modern Programming, Jaico Publ. House, New Delhi.
2. Kenneth, A.: C Problem Solving and Programming, Prentice Hall International.
3. Kerninghan, B.W. & Ritchie, D.M.: The C Programming Language, Prentice Hall of International.
4. Sanders: Computer Today, Tata McGraw.
5. Basandra: Computers Today, Galgotia.
6. Leavens, Alen : Visual C++, A Developers Guide.
7. Gottfried, B.: Theory and Problems of Programming in C, Schaum Series.
8. Jones, A. /Kenith Harvow : C Programming with Problem Solving, Wiley India Pvt. Ltd.
9. Gookin, Dan: C Programming, Wiley India Pvt. Ltd.
10. Harton, Ivor 2005: Harton's Beginning Visual C++, Wiley India Pvt. Ltd.

Paper Title : DATA AND FILE STRUCTURES (USING C) - OLD

Paper Code: CS-03   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objectives:

After completing this course, the learner will be able to use various concepts of Algorithm development, use various Data Structures, apply various Sorting and Searching Techniques, apply Data Structures and other techniques to real life problems.

Note :   (i)   The Question paper will consist of four units.
(ii)   Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
(iii)   The students are required to attempt one question from each unit and the compulsory question.
(iv)   All questions carry equal marks.

UNIT-I

1.   **Introduction to Data Structures:**

Concepts and definition of Data types, Data objects, Data structures (linear and non-linear).
Lists:
Linear lists, arrays and operations including traversing, insertion, deletion, reverting searching, Sorting and merging two arrays, Representation of one and multidimensional arrays in memory, Matrix operations, algorithms, Sparse matrices and their representation in memory, Application of array: Polynomial Evaluation and addition of two polynomial, Algorithms to implement array operations and applications.

UNIT-II

2.   **Linked list:**

Introduction, Sequential representation versus linked representation, operations using linked lists: Creation, Insertion, Deletion, Traversal, Inverse, Concatenation, Application of linked lists: Polynomial addition; algorithms to implement operations and applications, Circular linked lists, doubly linked lists and operations, dynamic memory allocation and garbage collection.

3.   **Stacks:**

Sequential and linked representations, Operations, Applications of stack: Conversion from infix to postfix form, Evaluation of postfix expression, Algorithm to implement operation and applications.

4.   **Queues:**

Sequential and linked representation operations, Circular queues.

UNIT-III

5.   **Trees:**

Introduction to terminology of trees, Binary tree, full binary tree, complete binary tree, Sequential and linked representation of binary trees in memory, conversion of tree into a binary tree, Tree traversal: inorder, pre-order and post-order, Application of binary trees: binary search trees, Algorithms to implement tree operations, creation of heap, and heap sort.

6.   **Sets and Graphs:**

Set representation, Union and find algorithms, Graphs and their representation in memory.

UNIT-IV

7.   Searching and Sorting:

Recursion and recursive algorithms, Bubble sort, Insertion sort, Selection sort, Merger sort, Linear and binary Searching techniques, Algorithms to implement the above methods and complexity of the algorithms.

8.   File structures:

Concepts of fields, records and files, Sequential file organisation, variable length records and text files, Indexing structures like B-trees, ISAM, Hashing techniques for direct files, Inverted lists.
Multilists.

Suggested Readings:

1.   Wirth, Niclaus, 2002: Algorithms + Data Structures = Programs, Prentice Hall International.
2.   Horwitz, E., and Sahni, S., 2003: Fundamentals of Data Structures, Computer Science Press.
3.   Tremblay, 2002: An Introduction to Data Structures with Applications, Tata McGraw.
4.   Aho, A. V., Hopcroft, and Ullman, J.E., 1982: Data Structures and Algorithms, Addison Wesley.
5.   Tanenbaum, A. M. and Augenstein, M.J., 1985: Data Structures using C, Prentice Hall International.
6.   Lipschutz, Seymour, 1986: Theory & Problems of Data Structures, Schaum Series.
7.   Berman, A. Michael, 2002: Data Structure Via C++, Oxford University Press.
8.   Deshpanday: C and Data Structures, Wiley India Pvt. Ltd.
9.   Boldwins, Douglas: Algorithms and Data Structures: The Science of Computing, Wiley India Pvt. Ltd.
10. Jim Keogh/Davidson: Data Structures—Principles and Fundamentals, Wiley India Pvt. Ltd.
11. Leendert: Algorithms and Data Structure in C++, Wiley India Pvt. Ltd.

Paper Title : OBJECT ORIENTED PROGRAMMING (THROUGH C++ AND JAVA) - OLD

Paper Code: CS-04   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objectives:

This course will expose you to the features in C++ and Java as well as help you design software using the object oriented paradigm of programming using C++ and Java.

Note : (i)   The Question paper will consist of four units.
     (ii) Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
     (iii) The students are required to attempt one question from each unit and the compulsory question.
     (iv) All questions carry equal marks.

UNIT-I

1. Introduction to Object Oriented Programming – Objects, Classes, Data abstraction, Data Encapsulation, Inheritance (Single, Multiple, Hierarchical, Multilevel, Hybrid) Polymorphism, Dynamic binding, Message Passing, Tokens, Expressions, Data Types, Variables, Operators, Control Statements, Arrays, Constructors & Destructors, new and delete operators, string handling.

UNIT-II

2. Classes, Objects, Functions & Methods, Virtual functions, Friend functions, pass by value vs Pass by Reference, Operator overloading, File Handling, Exception Handling, Class and Functions, Templates.

UNIT-III

3. Java – Introduction, JVM, byte-code, Data Types, Variables and Arrays, Operators, Control Statements, Classes, Overloading Methods, Member Access and Inheritance, Method Overriding, Using super and final, Defining a Package, Understanding CLASSPATH, Importing Packages, Defining an Interface, Implementing Interfaces, Applying Interfaces, Variables in Interfaces.

UNIT-IV

4. Multithreaded Programming: The Java Thread Model, Thread Priorities, Creating a Thread, Implementing Runnable, Extending Thread, Choosing an Approach, Creating Multiple Threads, Thread Priorities; Using Synchronized Methods, Suspending, Resuming and Stopping Threads Applet Fundamentals, The Applet Class, Using AWT Controls, Layout Managers.

Suggested Readings:

1. Strostrup : The C++ Programming Language, Addison Wesley.
2. Lafore, Robert: OOP in Turbo C++, Galgotia.
3. Balaguruswamy, E.: Object Oriented Programming with C++, TMH.
4. Parsa, N.R.: OOPS with C++ from the Foundation, Wiley India Pvt. Ltd.
5. Gaddis, Tonny: Starting out with C++, 3rd Edition, Wiley India Pvt. Ltd.
6. Gaddis, Tonny: Starting out with Object Oriented Programming in C++, 3rd Edition,Wiley India Pvt. Ltd.
7. Al Steven: Al Steven's C++ Programming, 7th Edition, Wiley India Pvt. Ltd.
8. Nicolai: Object Oriented Programming in C++, Wiley India Pvt. Ltd.
9. Schildt, Herbert: The Complete Reference Java 2, TMH.
10. Balaguruswamy, E.: Programming with Java, TMH.

Paper Title : COMPUTER ORGANIZATION AND ASSEMBLY LANGUAGE - OLD

Paper Code: CS-05   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objectives:

The objective of the course is to provide students with a solid foundation in computer design. Examine the operation of the major building blocks of a computer system. To introduce students to the design and organization of modern digital computers by showing the relationship between hardware and software and focusing on the concepts that are the basis of the current computers such as microprocessors. Includes machine language, instruction set architecture, and control design, memory hierarchy, and input/output and communication. To introduce basic assembly language. Describe the instruction format/set of a computer. Write simple assembly program.

Note :   (i)   The Question paper will consist of four units.
         (ii) Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
         (iii) The students are required to attempt one question from each unit and the compulsory question.
         (iv) All questions carry equal marks.

UNIT-I

1.   **Representation of Information:**

     Number Systems, Integer and floating point representation, Character codes, (ASCII, EBCDIC), Error detection and correction codes, Boolean Algebra.

UNIT-II

2.   **Basic Building Blocks:**

     K-maps for 2, 3 & 4 variables, Flip-flops: RS Latches, D, JK and Master-slave, Registers, Buffer, Shift and Controlled shift registers, Counters: Ripple, Synchronous and Ring Counters, Half Adders and Full Adders.

UNIT-III

3.   **Organization of Control Unit, Memory:**

     Types and Organization, Peripheral Devices: I/O devices (Video Terminals and Printers) and Controllers, Storage Devices (Tape and disks)

UNIT-IV

4.   **Assembly Language Programming :**

     Programmers model of a machine, Example of a typical 16 to 32 bit processor (8088 microprocessor) — Registers, Addressing modes, Instruction set, Use of an Assembly Language for specific programmes for typical problems: Simple string and numeric manipulations, searching and sorting of a list and use of I/O instructions.

Suggested Readings :

1. Tannenbaum, A.S.: Structured Computer Organization, Prentice Hall of India.
2. Mano, M.M., 1986: Computer System Architecture, Prentice Hall of India.
3. Assembler Manual for the Chosen Machine.
4. Hayes: Computer Architecture and Organization, McGraw-Hill International Edition.
5. Sloan, M.E.: Computer Hardware and Organization, 2nd Edn., Galgotia, Pvt. Ltd.
6. Malvino, Albert Paul: Digital Computer Electronics, 2nd Edn., Tata McGraw Hill Co.
7. Schaum Series: Introduction to Microprocessors .
8. Mathur, Aditya, P.: Introduction to Microprocessors, 2nd Edn., Tata McGraw-Hill Co.
9. Rafiquzzaman, Microprocessors & Microcomputers Based System Design, UBS.
10. Gupta, Vikas: Comdix Computer Hardware and Networking Course Kit, Wiley India Pvt. Ltd.
11. William, Jones B.: Assembly Language Programming for IBM PC Family, 3rd Edition, Wiley India Pvt. Ltd.
12. Duntmann, Jeff: Assembly Language Step by Step: Programming with DOS and Linux, 2nd Edition, Wiley India Pvt. Ltd.
13. Dandamundi, P.: Fundamentals of Computer Organization and Design, Wiley India Pvt. Ltd.

Paper Title : DATABASE MANAGEMENT SYSTEMS (DBMS) - OLD

Paper Code: CS-06   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objectives :

The concepts related to database, database design techniques, transaction management, SQL, PL/SQL and database operations are introduced in this subject. This creates strong foundation for data base creation.

Note : (i)   The Question paper will consist of four units.
       (ii) Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
       (iii) The students are required to attempt one question from each unit and the compulsory question.
       (iv) All questions carry equal marks.

UNIT-I

1. **Data Base Concepts:**

   Data base vs file oriented approach, Data Independence, Data Base Models, General Architecture of a Data Base Management Software, Components of a DBMS, Advantages and Disadvantages of DBMS.

UNIT-II

2. **Data Base Design:**

   Entities, Attributes, E-R Diagrams, EE-R Diagrams, Functional dependencies, Normalization, Multivalued dependencies, Decomposition, Relational algebra and calculus, The relational calculus query processor and optimizer, Storage organization for relations.

UNIT-III

3. **Data Base Protection:**

   Concurrency, recovery, Integrity, Protection, essentials of security, Authorization, types of database security.

UNIT-IV

4. **System Development using RDBMS:**

   Brief introduction to RDBMS, Oracle data types, Querying database tables, conditional retrieval of rows, working with Null values, matching a pattern from the table, querying multiple tables: equi joins, Cartesian joins, Outer joins, Self join, Set operator: Union, Intersect, Minus, Nested queries, views. Introduction to PL/SQL, the PL/SQL block structure, PL/SQL data types, variables and constants, assignment and expressions, Writing PL/SQL code, cursor management in PL/SQL, Concept of stored packages, Database triggers, types of triggers, Dropping triggers, storage of triggers. Program Design & Development for Inventory, Personnel and Financial Management using Oracle.

Suggested Readings:

1. Desai, B.C., 2008: An Introduction to Database Systems, Galgotia Publ. Private Ltd.
2. Date, C.J., 2008: Data Base Systems, Vols. I & II, Narosa Publication.
3. Watson John, 2008: OCA Oracle Database 11G: SQL Fundamentals First Edition.

Paper Title : INFORMATION SYSTEMS AND ENTERPRISE RESOURCE PLANNING

Paper Code: CS-08   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objectives :

The key objective of an ERP system is to integrate information and processes from all functional divisions of an organization. The course provides students a fundamental understanding of Management Information System Concepts and their role in contemporary business. At the end of this course, students should be able to participate in information systems development as an informed person.

Note :   (i)   The Question paper will consist of four units.
(ii)   Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
(iii) The students are required to attempt one question from each unit and the compulsory question.
(iv) All questions carry equal marks.

UNIT-I

1.   Information systems, The sub-systems of Information systems, EDP & MIS, management levels, EDP/MIS/DSS/ESS MIS: Overview, Definition and characteristics, components, Framework, Anthony's Hierarchy of Management Activity, Information requirements and levels of management, Simon's model of decision making, structured Vs unstructured decisions, Formal Vs Informal systems.

UNIT-II

2.   Meaning, Nature, Role of MIS for decision making, software Development Process: SDLC, Requirements Analysis, Analysis and Design Tools i.e. DFD, DD, Decision tables and decision trees, I/O design.

UNIT-III

3.   System Testing: Testing and debugging definition, testing objectives and principles, System Maintenance: Significance, types, side effects, Reverse Engineering, Re-engineering, Functional MIS: A study of Marketing, Personnel, Financial & Production MIS.

UNIT-IV

4.   Introduction to ERP: Overview, Benefits, Technologies related to ERP, Implementation Life Cycle of ERP, Role of SDLC, Critical success & failure factors, ERP Modules: Finance, Human Resource, Sales and Distribution.

Suggested Readings:

1.   Awad, E. : Systems Analysis and Design.
2.   Rajaraman, V.: Analysis and Design of Information Systems, PHI.
3.   Senn, James A.: Analysis and Design of Information Systems, McGraw Hills, International Edition.
4.   Goyal, D.P.: Management Information Systems, McMillan Publications.
5.   Garg, V.K. and Krishnan, N.K.V.: Enterprise Resource Planning Concepts & Practice, PHI.
6.   Leons, Alexis: Enterprise Resource Planning, Tata McGraw Hill Publications

Paper Title : SOFTWARE ENGINEERING - OLD

Paper Code: CS-09   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objectives :

The course aims to give students a theoretical foundation in Software Engineering and help them learn its principles and methods including emerging practices and support tools.

Note :   (i)   The Question paper will consist of four units.
         (ii) Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
         (iii) The students are required to attempt one question from each unit and the compulsory question.
         (iv) All questions carry equal marks.

         Prerequisite: Computer Organization & Assembly Language Programming, Problem Solving and C Programming.

UNIT-I

1. **Introduction:**

Software Engineering goals, Characteristics of well-engineered software, Software Process Models: Waterfall, Prototyping, Spiral, Fourth Generation Techniques, Role of Matrices and Measurements, S/w Inspection, Communication skills for Software Engineer, Preview and Inspection Procedures, Composition of inspection team, Checklist, Human factors in Software Engineering.

2. **Software Specifications:**

Software requirements, Definition, Software requirements specifications (SRS), Components of SRS.

UNIT-II

3. **Software Project Planning & Scheduling:**

Objectives, Decomposition techniques, Problem based estimation, Cost estimation models, COCOMO model, Risk in estimation.

4. **System Analysis:**

Principles of Structured Analysis, DFD, E-R-diagram, Data Dictionary.

UNIT-III

5. **Software Metrics:**

Objectives, introduction, estimation technique Decomposition Tech Model: Problem Based Estimation (LOC, FP), Process Based Estimation: Efforts (LOC, FP), Empirical Estimation Model, COCOMO model.

6. **Software Design:**

Objectives, Principles, Concepts, Design Process, Design Methodologies, Structured design, Modular design, Object oriented design, User-interface design, Features of a Modern GUI, Windows, icons, error messages etc.

UNIT-IV

7. System Administration and Training:

User manual, Implementation Documentation, Operation plan and Maintenance.

8.   Hardware and Software Selection:

Hardware acquisition, Benchmarking, Vendor selection, Software selection, Performance and acceptance criteria, Site preparation.

Suggested Readings :

1. Fairley, R.E., 1985: Software Engineering Concepts, McGraw Hill.
2. Lewis, T.G., 1982: Software Engineering, McGraw Hill.
3. Meyers, G., 1979: The Art of Software Testing, Wiley-Inter-Science.
4. Hibbard, P.G.: Constructing Quality Software, North Holland Publication.
5. Shere, Kenneth, 1988: Software Engineering & Management, Prentice Hall.
6. Deutsch, Willis, 1989: Software Quality Engineering : A Total Technical and Management
    Approach, Prentice Hall.
7. Sommerville, I., 1986: Software Engineering, Narosa Publ. House.
8. Doug Bell, Ian Murrey and John Pugh, 1992: Software Engineering: A Programming Approach, Prentice
    Hall.
9. Pressman: Software Engineering, Tata McGraw Hill.
10. Ghazzi, Carlo, 1995: Fundamentals of Software Engineering, PHI.
11. Jalote, Pankaj, 1995: An Integrated Approach to Software Engineering, Narosa Publ.

Paper Title : INFORMATION SYSTEM DESIGN AND IMPLEMENTATION

Paper Code: CS-10   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objectives :

Coursework is designed with the objective of teaching Methodologies of designing Information System and also their implementation.

Note : (i) The Question paper will consist of four units.
   (ii) Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
   (iii) The students are required to attempt one question from each unit and the compulsory question.
   (iv) All questions carry equal marks.

UNIT-I

1. Meaning, Nature, Need, Role, Importance, Evolution of Management through Information System, Relatedness of MIS with Management activities, Management functions and decision making.
2. Concepts of balanced MIS Effectiveness and Efficiency criteria.

UNIT-II

3. Development of MIS-Methodology and Tools/Techniques for systematic identification, Evaluation, modification of MIS.

UNIT-III

4. Advanced MIS-Concept, need and problems in achieving advanced MIS, Decision Support System.
5. Rationale of Computer Application.

UNIT-IV

6. A study of major financial, production, Manpower and marketing MIS.

Suggested Readings :

1. Murdick, R.G., Ross, J.E. & Claggtt, J.R.: Information Systems for Modern Management, 3rd Edition, Prentice Hall of India, 1987.
2. Thoms, R. & Prince: Information Systems for Management Planning & Control, Irwin Pub.
3. Wigarders, K., Svenssan, A., Sehong, L., Rydin, A.S. Dahlgren, G.: Structured Analysis and Design of Information System, McGrawHill Book Company, 1986.
4. Aktas: Structured Analysis and Design of Information System, Prentice Hall International (Paper Back Edition).
5. Spargue and Watson: Decision Support System, 2nd Edition, Prentice Hall International, 1989.
6. David: Applied Decision Support, Prentice Hall International, 1988.
7. Kanter, J.: Management Information System, 3rd Edition, Prentice Hall India,1984.
8. Bennett, J.L.: Building Decision Support System, Addison Wesley Publ. Comp.,1983.
9. Lucas: Analysis, Design and Implementation of Information System, 3rd Edition, McGraw Hill Book Comp.
10. Newman: Designing Integrated Systems for the Office Environment, McGraw Hill Book Comp.
11. Senn: Analysis and Design of Information System, McGraw Hill Book Comp.

Paper Title : OPERATING SYSTEMS - OLD

Paper Code: CS-11   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objectives:

To understand the concepts and components of system programming and to learn the fundamentals of Operating System including dealing with deadlocks and file management.

Prerequisite: Computer Organization & Assembly Language Programming, Problem Solving and C Programming.

Note :   (i) The Question paper will consist of four units.
         (ii) Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
         (iii) The students are required to attempt one question from each unit and the compulsory question.
         (iv) All questions carry equal marks.

UNIT-I

1. **Introduction to Operating System:**

    OS, Types of OS, functions/operations of OS, History of OS, User services/jobs.

2. **Memory Management-I:**

    Address Protection, Segmentation, Virtual memory, paging, page replacement algorithms.

UNIT-II

3. **Memory Management-II:**

    Cache memory, hierarchy of memory types, Associative memory.

4. **Support for Concurrent Process:**

    Mutual exclusion, shared data, critical sections, Busy form of waiting, Lock and unlock primitives, synchronization.

UNIT-III

5. **Scheduling:**

    Process states, Virtual processors, Interrupt mechanism, Scheduling algorithms, Preemptive Scheduling & Non-Preemptive scheduling.

UNIT-IV

6. **System Deadlock:**

    Prevention, detection and avoidance.

7. **Multiprogramming System:**

    Queue management, File and directory systems, Disk scheduling: FCFS, SSTF, SCAN, C-SCAN, LOOK, C-LOOK.

Suggested Readings:

1. Peterson, James, L. and Silberschatz, A., 1985: Operating System Concepts, Wiley Publ. Comp.
2. Deitel, H.M., 1984: An Introduction to Operating System, Addison-Wesley Publ. Comp.
3. Milenkovic, M., 1987: Operating System – Concepts and Design, McGraw Hill International Editions.
4. Richie: Operating System, BPB.
5. Hansen Per Brineh, 1978: Operating System Principles, Prentice Hall India.
6. Madnick and Donovan: Operating System, McGraw Hill Book Co.
7. Joshi, R.C.: Operating Systems, Wiley India Pvt. Ltd.

Paper Title : DATA MINING AND DATA WAREHOUSING - OLD

Paper Code: CS-13   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objectives:

This course will introduce concepts and techniques of data mining and data warehousing, including concept, principle, architecture, design, implementation, application of data warehousing and data mining. Some systems for data warehousing and/or data mining will also be introduced. To study the methodology of engineering legacy databases for data warehousing and data mining to derive business rules for decision support systems.

Note :   (i)   The Question paper will consist of four units.
          (ii) Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
          (iii) The students are required to attempt one question from each unit and the compulsory   question.
          (iv) All questions carry equal marks.

UNIT-I

1.   Introduction:

Data Warehousing, Characteristics of a Data Warehouse, Data marts and Data mining.

2.   Developing Data Warehouse:

Building a Data Warehouse, Data Warehouse architectural strategies, Design considerations, Data content, metadata, distribution of data, Tools for Data Warehousing, performance considerations, Crucial decisions in Designing a Data Warehouse, various technological considerations.

UNIT-II

3.   Developing Data Mart based Data Warehouse:

Types of Data Marts, Loading a Data Mart, Metadata for a data Mart, Data Model for a Data Mart, Maintenance of a Data Mart, Nature of Data in Data Mart, Software components for a Data Mart, Tables in Data Mart, External Data, Reference Data, Performance issues, Monitoring requirements for a Data Mart, Security in Data Mart.

UNIT-III

4.   OLTP and OLAP Systems:

Data Modeling, Star Schema for multidimensional view, Multi fact star schema, categories of OLAP tools, Managed Query Environment.

UNIT-IV

5.   Data Mining:

Introduction, From Data Warehouse to Data Mining, Steps of Data Mining Process, Types of Data Mining Tasks, Data Mining Algorithms Viz. Classification, Association Rules and Clustering, Database Segmentation, Predictive Modeling, Link Analysis, Tools for Data Mining.

Suggested Readings :

1.   Inmon, W. H., 2002: Building the Data Warehouse, John Wiley.
2.   Inmon, W. H., 1996: Developing the Data Warehouse, John Wiley.
3.   Mattison, 1999: Data Warehousing and Knowledge Management, Tata McGraw Hill.
4.   Inmon, W.H., 1999: Managing the Data Warehouse, C. L. Gassey, John Wiley.
5.   Fayyad, Usama M.,1996: Advances in Knowledge Discovery and Data Mining, MIT Press.
6.   Jiawei Han, Micheline Kamber, 2000: Data Mining: Concepts and Techniques, Morgan Koffman Elsvier.

Paper Title : ANALYSIS AND DESIGN OF ALGORITHMS - OLD

Paper Code: CS-14   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objective :

The objective of the module is to create skills in students to design and analyses the algorithms.

Note :   (i)   The Question paper will consist of four units.

   (ii)   Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.

   (iii) The students are required to attempt one question from each unit and the compulsory question.

   (iv) All questions carry equal marks.

   Prerequisite : Computer Programming and Problem Solving, Data and File Structure.

UNIT-I

1.   Algorithms and Analysis:

Introduction, Algorithms specification, Recursive algorithms, space and time complexity, Asymptotic Notation (O, _, and Θ, *o*) practical complexities, Best, average and worst case performance of algorithms, examples, Introduction to recurrence relations.

2.   Divide and Conquer:

General method, Binary Search, Merge sort, Quick sort, Selection sort, Strassen's matrix multiplication and analysis of these problems.

UNIT-II

3.   Greedy Method:

General Method, Knapsack problem, Job sequencing with deadlines, Minimum spanning Trees, Single Source Shortcut paths and analysis of these problems.

4.   Dynamic Programming:

General method, Optimal Binary Search Trees, 0/1 Knapsack, the travelling salesperson problem.

UNIT-III

5.   Back Tracking:

General method, 8 queen's problem, Graph colouring, Hamiltonian cycles, Analysis of these problems.

6.   Branch-And-Bound:

Method, 0/1 Knapsack and Travelling Salesperson problem, Efficiency considerations.

UNIT-IV

7.   Lower-Bound Theory:

Techniques for Algebraic problems, Some Lower Bounds on Parallel Computation.

8.   NP-hard and NP-complete problems:

Basic concepts, Statement of Cook's Theorem, Examples of NP-hard graph and NP-scheduling problems, some simplified NP-hard problems.

Suggested Readings:

1.   Horowitz, Ellis and Sahni, Sartaj 2008: Fundamentals of Computer Algorithms, Galgotia Publications, 2nd Edition.

2.   Aho, A.V., Hopcroft, J.E., Ullman, J.D., 2003: The Design and Analysis of Computer Algorithms, Addison-Wesley, First Edition.

3.   Bentley, J.L.: Writing Efficient Programs, Prentice-Hall India, Eastern Economy Edition.

4.   Goodman, S.E. & Hedetniemi, 2004: Introduction to the Design and Analysis of Algorithms, McGraw-Hill Book Comp.

5.   Knuth, D. E., 1996: Fundamental of Algorithms: The Art of Computer Programming, Vol.-1, Naresh Publ. House.

6.   Brassad, Gilles and Bartley, Paul 1996: Fundamentals of Algorithms, Prentice Hall of India.

7.   Mark Allen Weiss: Data Structure and Algorithms Analysis in C++, Pearson Education.

Paper Title : DATA BASE MANAGEMENT SYSTEM - OLD

Paper Code: CS-15   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objective :

The course aims at providing the students through insight on DBMS principle and practices. Starting from the rudimentary concepts, students will move on to the complex topics related to DBMS. After completion of the course, students will be able to design, implement and use database system. At the end of the course, the students will be able to create small client server application, write SQL Queries, Draw ER Diagram and design databases, and describe and use the features of Recovery, Concurrency and Security in DBMS.

Note: (i)   The Question paper will consist of four units.
         (ii) Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
         (iii) The students are required to attempt one question from each unit and the compulsory question.
         (iv) All questions carry equal marks.

UNIT-I

1.   Data independence, data models, Network model, DBTG proposal; Data definition and manipulation languages; Hierarchical and relational models.

UNIT-II

2.   Storage organization for relations, Relational algebra and calculus; Query language, SQL: Introduction, basic structure, data types, select command and option, union, insert, delete, update, aggregate function, grouping result, views, null, nested queries. The relational calculus query processor and optimizer.

UNIT-III

3.   Functional dependencies: Normal forms, multivalued dependencies: decomposition, Integrity; Protection.

UNIT-IV

4.   Security, essential of security, Authorization, types of database security, Concurrency, Recovery, Distributed databases.

Suggested Readings :

1.   Date, C.J.: An Introduction to Database Systems, Volumes I & II, Addison-Wesley,1981, 1983.
2.   Ullman, Jeffrey D.: Principles of Database Systems, 2nd Edition, Galgotia Publ. Pvt. Ltd., 1982.
3.   Simpson, A.: Understanding dBASE-IV, BPB Publications, Delhi.
4.   Whittington, R.P.: Database System Engineering, Clavendon Press.
5.   Pratt, P.: Data Base Systems Management and Design, Boyd and Fraser Publ.Comp., 1987.
6.   Kroenke, D.M.: Database Processing : Fundamentals, Design, Implementation, 2nd Edition, Galgotia Publ., Pvt. Ltd.
7.   Wiederhold: Database Design, McGraw Hill Book Comp.
8.   Martin, James: Principles of Data Base Management, PHI.
9.   Desai, Bipin, C.: Introduction to Database Systems, Galgotia Publ.

Paper Title : EMERGING DATABASE TECHNOLOGIES

Paper Code: CS-20   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objectives:

The Objective of this course is to introduce the students with the Emerging database technologies and their applications.

Note :   (i)   The Question paper will consist of four units.
         (ii) Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
         (iii) The students are required to attempt one question from each unit and the compulsory question.
         (iv) All questions carry equal marks.

UNIT-I

1.   Object Oriented Databases:

Concepts of Object oriented databases, Object Identity, structure and type constructors, encapsulation, Hierarchies and Inheritance, Object Definition Language, Object Query Language, ODBMS conceptual design, Object relationship features of Oracle/SQL server, overview of SQL3, Database design and tuning in relational model.

UNIT-II

2.   Enhanced Data Models, Distributed Database and Client Server Architecture:

Active Database concepts, Temporal database concepts, Spatial and multimedia databases, Distributed database concepts, Data Fragmentation, Replication and Allocation techniques, Query processing recovery and concurrency control in distributed databases. Types of Distributed databases, Client server and Distributed database relationship.

UNIT-III

3.   Deductive Databases :

Prolog/Datalog Notation, Rules, Inference Mechanism, Datalog programs and evaluation, Deductive database systems, Deductive object oriented databases, Applications of Deductive databases.

UNIT-IV

4.   Data Warehousing & Data Mining:

Data Warehousing concepts and techniques, Concepts of data mining and techniques, database on World Wide Web, Mobile databases, Geographic Information Systems, Genome Data Management, Digital Libraries, XML databases, XML design for Data, XML schemas, XML query language, Relationship between RDMBS and XML databases.

Books Recommended:

1.   Elmasri, Ramez, Shamkant and Navathe, B. 2001: Fundamentals of Database Systems, 3rd Edition, Pearson Education Asia.
2.   Silberschatz, Abraham, Korth, Henry F and Sudarshan, S.: Database System Concepts, McGraw Hill.
3.   Williams, Kevin: XML Database, Wrox Publications.
4.   Berson, Alex, Smith, Stephen J. 1997: Data Archousing Data Mining and OLA, McGraw

Paper Title : .NET FRAMEWORK AND C# -OLD

Paper Code: CS-21   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objectives:

At the completion of this course, the student will be able to:
- Create and populate Windows Forms and use user controls, menus in a Windows Forms application
- Add code to form and control event procedures in a Windows Forms application
- Create Multiple Document Interface (MDI) applications and Validate user input.

Note :   (i)   The Question paper will consist of four units.
         (ii)   Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
         (iii) The students are required to attempt one question from each unit and the compulsory question.
         (iv) All questions carry equal marks.

UNIT-I

1.   INTRODUCTION TO .NET ENVIRONMENT :

The .NET strategy, the origins of the .NET technology, the .NET framework, the common language runtime, framework base classes, user and programs interface, Visual Studio .NET, .NET languages, benefits of the .NET approach.

2.   INTRODUCTION TO C#:

Introducing C#, Overview of C#, Literals, Variables, Data Types, Operators, Expressions, Branching, Looping, Methods, Arrays, Strings, Structures, Enumerations, difference between C++ and C#, difference between Java and C#.

UNIT-II

3.   OBJECT ORIENTED ASPECTS OF C#:

Classes, Objects, Inheritance, Polymorphism, Interfaces, Operator Overloading, Delegates, Events, Errors and Exceptions.

4.   I/O, OBJECT SERIALIZATION AND REMOTING:

System. I/O, Streams, TextWriter, TextReader, BinaryWriter, BinaryReader, Serialized Object Persistence and formatters, Remoting.

UNIT-III

5.   WRITING WINDOWS FORMS APPLICATIONS AND DEPLOYING WINDOWS FORMS APPLICATIONS:

Writing Windows Forms Applications : Understanding Windows Forms, Working with Controls Dynamically in Code, Using Menus and MDI Forms, Using Inheritance in Windows Forms, Using Common Dialog Controls Deploying Windows Forms Applications: Deployment, Introduction, Understanding, Creating, Adding.

6.   WRITING ASP .NET APPLICATIONS AND DEPLOYING ASP.NET APPLICATIONS:

Introduction to ASP.NET, Using Validation Controls, Managing State in ASP.NET Web Applications, Deploying ASP.NET Applications : Introduction, Creating, Project Deploying, Deploying ASP.NET Applications with Windows Installer.

UNIT-IV

7.   ACCESSING DATA WITH ADO .NET:

Looking Inside ADO.NET, Database, Using Objects, Using Data Adapters and Datasets, Using Binding to a Data Grid Control, Creating Applications.

Suggested Readings:

1.   Jones, Bradley L.: Sams Teach Yourself C# in 21 Days.
2.   Balagurusamy, E., 2004: Programming in C#, Tata McGraw-Hill (Unit I, II).
3.   Liberty, J., 2002: Programming C#, 2nd ed., O'Reilly (Unit III, IV, V).
4.   Schildt, Herbert 2004: The Complete Reference: C#, Tata McGraw-Hill.
5.   Robinson, 2002: Professional C#, 2nd Ed., Wrox Press.
6.   Troelsen, Andrew, 2003: C# and the, NET Platform, A. Press.
7.   Thamarai, S. Selvi, R.Murugesan, 2003: A Textbook on C#, Pearson Education.
8.   Lam, Hoang Thuan L. Thai: .NET Framework Essentials, 2nd Edition, O'Reilly Media

Paper Title: INTRODUCTION TO DISTRIBUTED AND PARALLEL PROCESSING

Paper Code: CS-22   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objectives:

- To develop proficiency in parallel methodologies
- To study and understand the technologies enabling parallel computing
- To study different parallel programming models

Note :   (i)   The Question paper will consist of four units.
       (ii)   Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
      (iii) The students are required to attempt one question from each unit and the compulsory question.
      (iv) All questions carry equal marks.

UNIT-I

1. **Introduction:** Need for Computational speed; Applications of parallel computers in various fields including Mathematics, Physics, Chemistry and Computer Science, Configuration of some existing Mainframe and Super Computers for parallel processing; issues in parallel processing.

2. **Parallel Processing Architectures:** Parallelism in Sequential Machines, Abstract model of parallel computer, multiprocessor architecture, programmability issues.

UNIT-II

3. **Data Dependency Analysis:** Introduction, Types of Dependencies, Loop and Array Dependence, Loop Dependence Analysis, Solving Diophantine Equations.

4. **Shared Memory Programming:** General Model, Process Model under UNIX.

UNIT-III

5. **Thread Based Implementation:** Thread Management, Thread Implementation.

6. **Distributed Computing:** Message passing model, Parallel Virtual Machine (PVM), Remote procedure call.

7. **Algorithms for Parallel Machines:** Speedup, Complexity and Cost, Parallel Reduction.

UNIT-IV

8. Quadrature Problem, Matrix Multiplication, Parallel Sorting Algorithms and Solving Linear System.

9. **Parallel Programming Languages:** Fortran 90, nCUBE C, Occam, C-Linda.

    Laboratory Exercise:
    Using FORTRAN—90 or 'C' Write Parallel programs for sorting, matrix multiplication, merging operations, Graph algorithms, solving linear systems.
    Minor Project Work:
    Design and simulate parallel environment using MPI and PVM.

Suggested Readings:

1. Sasikumar, M., Shikhara, Dinesh and Ravi Prakash, P.: Introduction to Parallel Processing, PHI.
2. Wilkinson, Barry: Parallel Programming Techniques & Applications & Michael Allen Using Networked Workstations and Parallel Computers, Pearson Education.
3. Crichlow, Joel M.: An Introduction to Distributed and Parallel Computing, PHI.
4. Rajaraman, V.: Elements of Parallel Computing, PHI.
5. Ragsdale, Susann: Parallel Programming, Intel McGraw Hill.

Paper Title : DISTRIBUTED COMPUTING, NETWORKS AND APPLICATIONS

Paper Code: CS-23   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objectives :

The objective of this course is to introduce students to the fundamentals and techniques of distributed computing and provide them with the basic skills of how to write distributed programs. Topics to be covered include: distributed computing, distributed programming, distributed systems, concurrency, distributed computing paradigms, inter-process communications, group communications, operating system support, distributed objects, application programming interfaces (RMI, RPC), client server model, the socket API, security issues and Internet applications. Students are expected to develop distributed applications using latest technologies.

Note :   (i)   The Question paper will consist of four units.
        (ii) Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
       (iii) The students are required to attempt one question from each unit and the compulsory   question.
      (iv) All questions carry equal marks.

        Prerequisite : Data and File Structures, Operating System.

UNIT-I

1.   **Distributed Processing Potential:**

    Forms of Distributed Processing Strategies, Hexagon diagrams.

UNIT-II

2.   **Communications:**

    Concepts of data transmission, Signal encoding, Modulation methods, Synchronization, Multiplexing and concentration, Coding method, Cryptography.

UNIT-III

3.   **Networks:**

    Communication system architecture OSI reference model, Topology types, Selections, Design, Local Area Networks (LAN), Switching techniques,

UNIT-IV

4.   CSMA/CD, Token bus, Token ring techniques. Link Level Control (LLC) protocols, Medium Access Control (MCA) protocols, Wide Area Networks (WAN), Physical layer description (X.21), Data link layer protocols, HDLC, Analysis of protocols and performance, Concepts in network layer, Routing methods.

Suggested Readings:

1.   Tannanbaum, A.S., 1985: Computer Networks, Prentice-Hall.
2.   Martin, J., 1983: Design and Strategy for Distributed Data Processing, Prentice-Hall.
3.   Martin, J., 1985: Computer Networks and Distributed Processing, Prentice-Hall.
4.   Stallings, William: Local Networks: An Introduction, Macmillan Publishing Co.
5.   Black: Computer Networks: Protocols, Standards and Interfaces, Prentice-Hall International (Paper Back Edition).
6.   Black, 1988: Data Networks: Concepts, Theory and Practices, Prentice-Hall International.

Paper Title : MICROPROCESSOR AND APPLICATIONS

Paper Code: CS-24   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objectives:

The purpose of this course is to teach students the fundamentals of microprocessor and to introduce students to features and technology of microprocessor systems. The students studying the subject are supposed to learn the architecture of a typical microprocessor and also get general information about microprocessor based control systems.

Note :   (i)   The Question paper will consist of four units.
          (ii)   Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
          (iii) The students are required to attempt one question from each unit and the compulsory question.
          (iv)   All questions carry equal marks.

          Prerequisite : Computer Organization and Assembly Language Programming.

UNIT-I

1. Microcomputer structure (Processor, Memory and I/O); Bit slices and 8/16/32- bit microprocessors, Micro processor architecture (registers, index and stack pointers, addressing modes); I/O interface adapters (parallel and serial) interface devices, system clock, clock phase and bit rates.

UNIT-II

2. Memory read-write and read only, memory mapping of I/O; Interrupts, types, handling of interrupts, polling and vectored interrupts.

UNIT-III

3. Direct memory access methodologies.
4. Software development and debugging aids.

UNIT-IV

5. Microprocessor based real-time control and instrumentation systems.

Suggested Readings :

1. Khambata, J., 1985: Microprocessor and Microcomputer, John Wiley and Sons.
2. Liu, Y., Gibson, G.A., 1986: Microcomputer Systems: The 8086/8088 Family, Prentice Hall, 2nd Edition.
3. Alexandridis Nikitas A., 1984: Microprocessor System Design Concepts, Galgotia Publications.
4. Parsons, A.J.: Microprocessors : Essentials, Components and Systems, Galgotia Publ. Pvt. Ltd.
5. Aspinall: Microprocessors and its Applications, Galgotia Publ. Pvt. Ltd.
6. Mathur, Aditya P., 1984: Introduction to Microprocessors, Tata McGraw Hill.
7. Korneev, V., Kiselev, A.: Modern Microprocessors, III Edition, Wiley India Pvt. Ltd

Paper Title: ADVANCED JAVA AND NETWORK PROGRAMMING - OLD

Paper Code: CS-25   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objectives:

To create Enterprise application development skills among students using Advanced Java.

Note :   (i)   The Question paper will consist of four units.
         (ii) Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
         (iii) The students are required to attempt one question from each unit and the compulsory question.
         (iv) All questions carry equal marks.

UNIT-I

1. Review of Java Basic Features, Applets, AWT Controls, Event Handling, Multithreading, I/O files.
2. Swing : Features, components, swing vs AWT, swing containers, controls, using Dialogs, sliders, progress bars, tables, creating user interface using swing.

UNIT-II

3. Java Database Connectivity : Connectivity model, Java. SQL package, JDBC Exception classes, Database connectivity, Data manipulation and navigation, creating database applications.
4. Java RMI : Distributed object technologies, RMI architecture, creating RMI applications.

UNIT-III

5. Java Servlets : Servlets vs CGI, Serve let lifecycle, creating and running serve lets.
6. Networking : Networking basics, Client/Server model, Java and the Net, TCP/IP client sockets, TCP/IP server sockets, Inet Address, URL, Datagrams, creating networking applications.

UNIT-IV

7. Java Beans : Component architecture, Components, Advantages of Beans, Bean Developer kit (BDK), JAR files, introspection, developing Beans, Using Bound properties, The Java Beans API.

8. Java Server Pages : Introduction, JSP Architecture, JSP objects, developing Web Applications.

Suggested Readings :

1. Cornell, Gary and Horstmann Cay S.: Core Java, Vol I and Vol II, Sun Microsystems Press.
2. Ivan Bayross: Web Enabled Commercial Application Development using Java 2.0, BPB.
3. Schildt , Herbert: The Complete Reference Java 2, TMH.
4. Keogh , James: J2EE: The Complete Reference.

Paper Title : RELATIONAL DATA BASE MANAGEMENT SYSTEMS - OLD

Paper Code: CS-27   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objectives :

The course aims at providing the students through insight on DBMS principles and practices. Knowledge of DBMS, both in terms of use and implementation, design and to make students familiar with concept of ER and EER Diagram Experience with SQL and PL/SQL and Increased proficiency with the FoxPro

Note : (i)   The Question paper will consist of four units.
        (ii)   Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
        (iii) The students are required to attempt one question from each unit and the compulsory question.
        (iv)   All questions carry equal marks.

UNIT-I

1. **Database Concepts:**

   Database vs file oriented approach, Database Models, General Architecture of a Data Base Management Software, Components of a DBMS, Advantages and Disadvantages of DBMS.

2. **Database Design:**

   Entities, Attributes, E-R Diagrams, EE-R Diagrams, Conceptual Design of a Relational database model. Designing databases for commercial applications like inventory control, financial management, personnel management etc.

UNIT-II

3   **Software Development using FOXPRO:**

   Introduction to FOXPRO, basic data types, expressions, constructs, commands used in files : SET TALK ON/OFF, RETURN, SKIP, COUNT etc. Basic screen manipulation commands, commands used for data entry and editing. Program Design and development for Library and Hospital Management System using FOXPRO.

UNIT-III

4. **Software Development using ORACLE:**

   Brief introduction to Oracle, Oracle data types, Quering database tables, Conditional retrieval of rows, working with Null values, matching a pattern from the table, quering multiple tables: Equi joins, Cartesian joins, Outer joins, Self join, Set operator : Union, Intersect, Minus, Nested queries.

UNIT-IV

5. Introduction to PL/SQL, the PL/SQL block structure, PL/SQL data types, Variables and constants, assignment and expressions. Writing PL/SQL code, cursor management in PL/SQL, Concept of stored packages, Database triggers, types of triggers, Dropping triggers, storage of triggers. Program Design & Development for Inventory, Personnel and Financial Management using Oracle.

Suggested Readings:

1. Desai, B.C., 1993: An Introduction to Database Systems, Galgotia Publ. Private Ltd.
2. Date, C.J.: Data Base Systems, Vols. I & II, Narosa Publ.
3. Mukhi, Vijay 1992: Mastering Oracle 6.0, BPB Publications.
4. Seigel, Charles 1992: Mastering FoxPro, 2nd Ed., BPB Publ.
5. Taxali, R.K.: FoxPro 2.5 Made Simple, BPB Publication

Paper Title: COMPILER DESIGN

Paper Code: CS-32   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objectives:

To Introduce the major concept areas of language translation and compiler design.

Note :   (i)   The Question paper will consist of four units.
        (ii)   Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
        (iii) The students are required to attempt one question from each unit and the compulsory question.
        (iv) All questions carry equal marks.

UNIT-I

1. Regular Expressions and Finite Automata:

The structure of a compiler, Phases of a Compiler, Compiler construction tools, Finite automata, Regular expressions, Conversion from regular expression to finite automata.

UNIT-II

2. Parsing and Syntax Analysis:

Syntax Analysis, Context Free Grammars, Top-down and Bottom-up Parsing techniques, Parsing Table Construction, LR, SLR & LALR Parsers.

UNIT-III

3. Syntax Directed Translation:

Syntax-directed translation & implementation, Intermediate Code, Postfix translation, Phase Trees, Syntax Trees.

UNIT-IV

4. Storage Management and Code Optimization:

Runtime environment, Storage organization, Storage allocation strategies, Parameter passing, Symbol tables, Code generation, Problems in code generation, A simple code generation and code optimization, Principal sources of optimization, loop optimization, DAG representation.

Suggested Readings:

1. Aho, Alfred V. and Jeffery D. Ullman: Principles of Compiler Design, Addison-Wesley.
2. Barrett: Compiler Construction, Prentice Hall.
3. Trembley, Jean-Paul & Paul G. Sorenson: The Theory and Practice of Compiler Writing, Tata McGraw Hill.
4. Dhamdhere, D.M.: Compiler Construction—Principles and Practice.
5. Grune, Dick: Modern Compiler Design, Wiley.
6. Gaddis, David: Starting out with Modern Compiler Design, Wiley India Pvt. Ltd.

Paper Title : SIMULATION AND MODELLING

Paper Code: CS-33   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objectives:

The Objective of this course is to teach students methods of Modeling the systems using discrete event simulation.

Note :   (i)   The Question paper will consist of four units.
          (ii)   Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
          (iii) The students are required to attempt one question from each unit and the compulsory question.
          (iv)   All questions carry equal marks.

          Prerequisite : Probability and Statistics

UNIT-I

1.   Introduction:

Definitions and scope of Modelling and Simulation; Variables, Problem formulation and constraints; Different steps in simulation; Other approaches – physical modelling and model laws, Electrical analogy methods; Utility of other approaches; Verification and Validation procedures.

2.   Analog Simulation:

Analog, Digital and Hybrid computers - a comparison; Basic principles – summer, divider, integrator, subtractor and multiplier; Time scaling; Circuit diagrams for typical examples.

UNIT-II

3.   System Modelling:

Types of systems – Continuous and discrete types; Static and dynamic systems; Principles of mathematical modelling of physical processes. Market management model; Distributed lag and cobweb models; Autopilot; Exponential models and logistic curves; Simple system dynamics diagrams. Host–parasite system.

4.   Probability Concepts:

Stochastic and random variables, Probability distributions – Rectangular, Poisson, exponential, Erlang, hyper-exponential and normal distributions with examples; Generation of uniformly distributed random numbers and related chi–square and poker tests.

UNIT-III

5.   Probabilistic Modelling:

Generation of non-uniformly distributed random numbers - inverse transformation and rejection methods; Generation of normal variates; Congestion in systems– Poisson arrivals and service times.

6.   Queuing Systems:

Queuing disciplines and measures; Computer solution of queuing problems; Utilization factor and grade of service.

UNIT-IV

7.   Simulation Examples:

Discrete events, representation of time; Simulation of time sharing in a computer system; Simulation of a telephone system.

8.   Simulation Languages:

Comparison with HLL; Study and use of GPSS, basic symbols and language; Examples of simulation of single–server and two-server queuing systems; Use of data structures and A.I. techniques in modelling and simulation.

Suggested Readings :

1.   Gorden, G., 1995: System Simulation, 2nd Edition, Prentice Hall of India.
2.   Deo, Narsingh, 1986: System Simulation with Digital Computer, Prentice Hall of India.
3.   Rajaraman, V., 1995: Analog Computation and Simulation, PHI.
4.   Ingels, Don M., 1985: Computer Modelling and Simulation, Marcel Dekker Inc., NewYork.
5.   Law, A.M. and Kelton, W.D., 1991: Simulation Modelling and Analysis, McGraw-Hill International.
6.   Spriet, W.A., 1982: Computer Aided Modelling and Simulation, Academic Press.
7.   Barnes, B., 1982: Modelling and Performance Measurement of Computer System.
8.   Payen, J.A., 1982: Introduction to Simulation, McGraw-Hill.
9.   Reitman, J., 1971: Computer Simulation Application, Wiley.
10. Karian, Z.A. and Dudewicz, E.J., 1991: Modern Statistical Systems, and GPSS Simulation, 1st Course, Computer Science Press, W.H. Freeman and Co., New York.
11. Naylor, T.H. 1968: Computer Simulation Techniques, John Wiley, New York

Paper Title: IMAGE PROCESSING

Paper Code: CS-41   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objectives:

Image processing is an advanced course offered as elective to students interested in learning the theory, techniques and applications of the subject. It also aims to stimulate interest in current research areas in image processing and in developing tools for use in research as well as in multimedia applications.

Note :   (i)   The Question paper will consist of four units.
         (ii) Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
         (iii) The students are required to attempt one question from each unit and the compulsory   question.
         (iv) All questions carry equal marks.

UNIT-I

1.   Introduction to Image Processing:

Digital Image Processing, Elements of Image Processing Systems—Image Acquisition, Processing, Communication, Display.

2.   Digital Image Fundamentals:

Uniform and Non-uniform Sampling and Quantization, Basic Relationships between pixels—Neighbours of a pixel, Connectivity, Distance Measures, Imaging Geometry—Perspective transformations, Camera Model, Stereo Imaging.

UNIT-II

3.   Image Transforms:

Introduction to Fourier Transform, Discrete Fourier Transform, Properties of the Two – Dimensional Fourier Transform, The Fast Fourier Transform (FFT), Inverse FFT, Walsh, Hadamard and Discrete Cosine Transforms.

4.   Image Enhancement:

Histogram Processing, Image Averaging, Smoothing Filters, Sharpening Filters, Low Pass and High Pass Filtering, Generation of Spatial Masks from Frequency Domain Specifications, Colour Image Processing—Colours Fundamentals, Colour Models, Pseudo-Colour image processing.

UNIT-III

5. Image Restoration:

Degradation Model, Circulant and Non-circulant Matrices, Algebraic Approach to Restoration, Inverse Filtering, Wiener Filter, Constrained Least Square Restoration, Geometric Transformations.

6.   Image Compression:

Fundamentals, Image Compression models, Low Compression, Image Compressions standards.

UNIT-IV

7. Image Segmentation:

Detection of Discontinuities, Edge Linking and Boundary Detection, Hough Transform, Thresholding , Region Oriented Segmentation.

8.   Representation, Description, recognition and Interpretation Fundamentals.

Suggested Readings:

1.   Gonzalez & Woods: Digital Image Processing, Pearson Publishing Company Ltd.
2.   Jain , Anil K.: Fundamentals of Digital Image Processing, Pearson.
3.   Jensen, John R.: Introductory Digital Image Processing, Prentice Hall.
4.   Dougherty, Edward R.: Image Processing Digital Techniques.

Paper Title: OBJECT ORIENTED PROGRAMMING USING C++

Paper Code: CS-42   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objectives :

This course will expose you to the advanced features in C++ as well as help you design software using the object oriented paradigm of programming.

Note :   (i)   The Question paper will consist of four units.
         (ii) Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
         (iii) The students are required to attempt one question from each unit and the compulsory question.
         (iv) All questions carry equal marks.

UNIT-I

1. Introduction to Object Oriented Programming – Objects, Classes, Data Abstraction, Data Encapsulation, Inheritance (Single, Multiple, Hierarchical, Multilevel, Hybrid) Polymorphism, Dynamic binding, Message Passing.

UNIT-II

2. Tokens, Expressions, Data Types, Variables, Operators, Control Statements, Arrays, Constructors & Destructors, new and delete operators, String handling.

UNIT-III

3. Classes, Objects, Functions & Methods. Virtual functions, Friend functions, pass by value vs. Pass by Reference, Operator overloading.

UNIT-IV

4. File Handling, Exception Handling, Class and Functions Templates.

Suggested Readings :

1. Strostrup: The C++ Programming Language, Addison Wesley.
2. Lafore, Robert: OOP in Turbo C++, Galgotia.
3. Balagurusamy, E. Object Oriented Programming with C++, TMH.
4. Schildt, Herbert : Schildt's Advanced Win 95 Prog. in C & C++, MH.
5. Parsa, N.R.: OOPS with C++ from the Foundation, Wiley India Pvt. Ltd.
6. Gaddis, Tonny: Starting out with C++, 3rd Edition, Wiley India Pvt. Ltd.
7. Gaddis, Tonny: Starting out with Object Oriented Programming in C++, 3rd Edition, Wiley India Pvt. Ltd.
8. Steven , Al: Al Steven's C++ Programming, 7th Edition, Wiley India Pvt. Ltd.
9. Nicolai: Object Oriented Programming in C++, Wiley India Pvt. Ltd.

Paper Title: UNIX AND SHELL PROGRAMMING

Paper Code: CS-43   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objectives :

The objective of the course is to make students aware of the functioning of a multi-user operating system. This course will serve as a foundation course for the higher level course in Unix. The students are expected to learn the commands while doing practical and emphasis should be given to those switches/options and flags, which are most frequently used in real life.

Note :   (i)   The Question paper will consist of four units.
          (ii)   Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
          (iii) The students are required to attempt one question from each unit and the compulsory question.
          (iv)   All questions carry equal marks.

UNIT-I

1. **Theoretical Concepts of UNIX Operating System:**

    Basic Features of Operating System; File Structure; CPU Scheduling; Memory Management : Swapping, Demand Paging; File System : Blocks and Fragments, Inodes Directory Structure; User to User Communication.

2. **Getting Started with UNIX:**

    User Names and Groups; Logging in; Format of UNIX commands; Changing your Password.

UNIT-II

3. Characters with special meaning, UNIX Documentation, Files and Directories : Current Directory, looking at the Directory contents, Absolute and Relative Pathnames, Some UNIX Directories and Files: Looking at File contents, File Permissions, Basic operation on Files, Changing Permission Modes, Standard files, Standard output, Standard input, Standard Error, Filters and Pipelines; Processes, Finding out about Processes, Stopping Background Process, UNIX Editor : vi.

UNIT-III

4. **Text Manipulation:**

    Inspecting Files, File Statistics, Searching for Patterns Comparing Files, Operating on Files, Printing Files, Rearranging Files, Sorting Files, Splitting Files, Translating characters, AWK utility.

5. **Shell Programming:**

    Programming in the Borne and the C-shell, Wild cards.

UNIT-IV

6. Simple Shell Programs, Shell Variables, Shell Programming Constructs, Interactive Shell Scripts, Advanced Features.

7. **System Administration:**

    Definition of System Administration: Booting the System, Maintaining user Accounts, File Systems and Special Files, Backups and Restoration, Role and functions of a system manager.

Suggested Readings:

1. Kernighan, Brian & Pike, Rob 1987 : The UNIX Programming Environment, Prentice Hall.
2. Bach, Maurice 2007: The Design of the UNIX Operating System, Prentice Hall.
3. Prato, Stephen 1986: Advanced UNIX–Programmer's Guide, BPB Publications.
4. Love: Beginning Unix.
5. Eric Faster–Johnson: Beginning Shell Scripting (Covers Linux, Unix Windows & Mac), Wiley India Pvt. Ltd.
6. Gopalan, N.P.: A Beginners Guide to Unix.
7. Mukhi, Vijay: Working with Unix BPB Publications.
8. Dass, Sumitabha: Your Unix the Ultimate Guide

Paper Title : WEB APPLICATION TOOLS AND E-COMMERCE

Paper Code: CS-44   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objectives:

To create familiarity with various Web Technologies which can be used at Client side / Sever side and encourage web applications development using them.

Note :   (i)   The Question paper will consist of four units.
         (ii) Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
         (iii) The students are required to attempt one question from each unit and the compulsory   question.
         (iv) All questions carry equal marks.

UNIT-I

1. DHTML:

Fundamentals, Cascading style sheets, Document Object Model, Using layers, Using scripts, Dynamically changing content, Dynamic position.

2. ASP:

Introduction, Basics of VB scripts (Data types, Variables, Operators, Control structures, built-in-functions etc.).

UNIT-II

3. JAVA:

The Genesis of Java: Why Java is important to the Internet, An Overview, Object-Oriented Programming, Data Types, Variables and Arrays, Operators, Control Statements.

Introducing Classes: Class Fundamentals, Declaring Objects, Assigning Object Reference Variables, Introducing Methods, Constructors, The this Keyword, Garbage Collection, Overloading Methods, Using Objects as Parameters, Argument Passing, Returning Objects, Recursion, Introducing Access Control, Understanding Static, Nested and Inner Classes, Exploring the String Class, Using Command-Line Arguments; *Inheritance:* Inheritance Basics, Member Access and Inheritance, Using super to call Super-class Constructors, Creating a Multilevel Hierarchy, Method Overriding; Dynamic Method Dispatch, Using Abstract Classes, Using final with Inheritance, Using final to prevent Overriding, Using final to prevent Inheritance.

UNIT-III

4. *Packages and Interface:* Packages, Defining a Package, Understanding CLASSPATH, Access Protection: Importing Packages, Interfaces, Defining an Interface, Implementing Interfaces, Applying Interfaces, Variables in Interfaces. *Exception Handling :* Exception-Handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and catch, Multiple Catch Clauses, Nested try Statements, Built-in Exceptions, Creating your own Exception Subclasses, Using Exceptions. *Multithreaded Programming :* The Java Thread Model, Thread Priorities, Synchronization, Messaging, The Thread class and the Runnable Interface; The Main Thread : Creating a Thread, Implementing Runnable, Extending Thread, Choosing an Approach, Creating Multiple Threads, Using is alive ( ) and join ( ), Thread Priorities; Synchronization: Using Synchronized Methods, The Synchronized Statement, Inter-thread Communication, Deadlock, Suspending, Resuming and Stopping Threads, Using Multithreading.

UNIT-IV

5. *I/O, Applets* : I/O Basics: Streams, Byte Streams and Character Streams, The Predefined Streams; Reading Console Input : Reading Characters, Reading Strings, Writing Console Output, The Print-Writer Class, Reading and Writing Files, Applet Fundamentals, The Transient and Volatile Modifiers,Using instance of, Native Methods, Problems with Native Methods.

String Handling, Exploring java.lang, java.util, Exploring java.io, The Applet Class, Event Handling,Introducing the AWT, Working with Windows, Graphics and Text, Using AWT Controls, Layout Managers.

6. **Introduction to E-commerce:**

Basics, Payment system, security and legal issues.

Suggested Readings:

1. Naughton, Patrick and Schildt,Herbert: JAVA TM 2 : The Complete Reference, Third Edition, Tata McGraw.
2. Lemay, L.: Teach yourself Java 2 in 21 days, Tech.
3. Griffiths, Steven W.: 1001 Java Programmers Tips, Jamsa Press.
4. Suleiman Lalni: Java Programmers Library, Jamsa Press.
5. DHTML unleashed Techmedia.
6. Teach yourself DHTML in a week, Techmedia.
7. Teach yourself ASP in 21 days, Techmedia.
8. Kalakota : Frontiers of Electronic Commerce, Pearson.
9. Horton, Ivor.: Beginning Java 2 JDK, 5th Edition, Wiley
10. Holznir , Steven: Java 2 JDK, 5th Edition, Black Book, Dreamtech.
11. Keogh, Jim: Java Programming Fundamentals.
12. Gaddis, Tonny: Starting out with Java, Addison-Wesley.

Paper Title: VISUAL C++ PROGRAMMING

Paper Code: CS-45   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objectives:

An Advanced course focusing on ANSI C++; the Standard Template Library and Graphical Programming using the Microsoft Foundation Classes.

Note :   (i)   The Question paper will consist of four units.
        (ii)   Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
      (iii) The students are required to attempt one question from each unit and the compulsory question.
      (iv) All questions carry equal marks.

UNIT-I

1.   Introduction to Developer Studio, its working and debugging support:

Installing and Exploring Developer Studio, Developer Studio wizards, Using App Wizard, Creating a basic application, Resource editors, The Gallery and the Info Viewer, The debugging environment, Using Developer Studio debugger, Adding debugger support.

2.   Visual C++ Programming:

Visual C++'s Program Structure, Variables, data-types, basic I/O, selection statements, Repetition statements, arrays, pointers, Dynamic memory allocation, functions, recursion, Visual C++ library of functions, inheritance, Polymorphism, Virtual functions, Storing data in disk files, using disk files.

3.   Win 32 Architecture and the Windows GUI:

The Win 32 API, Architecture of a Win 32 program, Elements of Windows GUI.

UNIT-II

4.   Windows Programming with MFC:

MFC fundamentals : The structure and usage of the MFC, The application framework, MFC support for multithreading, MFC class categories, The document/view architecture, Handling window messages, Managing handlers with Class Wizard, Errors and error handling, MFC diagnostic functions and macros, Exceptions and exception handling.

UNIT-III

MFC and user interface programming : MFC classes and user interface elements. Commands and menus, Toolbars, Dialog bars and status bars, Creating dialog boxes, Standard windows controls and MFC classes, Dialog Data Exchange (DDX) and Dialog Data Validation (DDV), Using list boxes, Building an ActiveX control framework, MFC support for Context-sensitive help. *Viewing and Storing Data :* Form views, Control views, Splitter windows, Handling multiple views.

UNIT-IV

5.   Database Creation Programming in Windows:

Data access with MFC : Introduction to data access, MFC database classes, Record sets and transactions.
Developing Database Applications : Creating an ODBC application, Structure of a database application, Connecting the recordset to controls, Creating a joined recordset.
Querying the Database : Customizing a query, Querydefs and parameterized, queries, Seek and Find functions.

6.   Application Deployment:

The Registry and application setup, Linking, MFC and DLLs.

Suggested Readings:

1.   Horton, Ivor, 1998: Beginning Visual C++ 6, Wrox Press Ltd.
2.   Kanetkar, Yashwant,1998: Visual C++ Programming, BPB.
3.   Kanetkar, Yashwant,1999: Visual C++ Projects, BPB.
4.   Holzner, Steven, 1997: Visual C++ 5, BPB.
5.   Young, Michael, 1998: Mastering Visual C++, BPB.

Paper Title: VISUAL BASIC PROGRAMMING

Paper Code: CS-47   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objectives:

This course is an introduction to computer programming using Microsoft Visual Basic. Topic include designing a Visual Basic user interface, creating a windows application, variables and arithmetic operations, applications using decision structures, loop structures, string manipulation, arrays, function procedures and exception handling, incorporating databases with ADO.NET, creating classes and introduction to object programming.

Note :   (i)   The Question paper will consist of four units.
         (ii) Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
         (iii) The students are required to attempt one question from each unit and the compulsory question.
         (iv) All questions carry equal marks.

UNIT-I

1. *Visual Basic IDE:* An Overview, The New Project Dialog, IDE Elements and Features, Starting a New Project or Opening an Existing One, Saving your Projects, Setting Environment, Editor, and General Options, Adding Different Modules to a Project, The Edit Menu; The Toolbox: Adding Control to Forms, Adding Components to the Toolbox, The Properties Window, The Project Explorer, The Form Layout, The Format Menu, Making Effective use the Code Window; The Object Browser, The Menu Editor, Debugging Tools, Compiling Executables.

2. *Event-Driven Programming:* Working with Visual Basic Source Files, Using the MSG-Box Function when an Event is Fired, Adding Code to a Form Click Event, Properties and Methods in Visual Basic: Properties, Methods, Event Firing Order: Form Startup Events, Form User Response Events, Form Shutdown Events; The MSG-Box Function and Query Unload, Adding Code to Form and control events, Basic concepts to Object-Oriented Programming, Encapsulating VB Dialog; Understanding Class Modules: Properties, Methods, Using Class Properties and Methods; Creating, Firing and Handling Custom Events.

UNIT-II

3. *Visual Basic Language Overview:* VB code lines and comments, Identifiers, Constants and Variables, Using Option Explicit, Numbers, Operators, Control loops and conditional statements, Modules, Subroutines and Functions, Passing Arguments, Programmer--Defined Structures, Arrays, Speaking the Language of Objects : Using Active X controls, Using ActiveX components, Quickly Finding Information in the Documentation, Calling External Procedures, Calling the Windows API.

4. *Visual Basic Windows User Interface Control:* Creating a Property Sheet, Using the Tab Strip control; Creating a Wizard.

5. *Secrets of Good Practice using Visual Basic:* Good Programming Practice, Architectural Design of Applications, Naming clarity and conventions, Custom from Properties and Methods: Adding acustom method, Adding a custom property, Firing custom events, Implementing a Stack as an Array, Interrupting a Do Loop, Managing List Boxes, Tracking multiple list boxes, Avoiding list box deletion errors, Copying selected list box items to the Clipboard, String Manipulation : Capitalizing words in a string, Parsing Visual Basic code and Checking line lengths, Rounding Numbers, Enumerating Fonts.

UNIT-III

6. *Visual Basic and OOP:* An Overview, Encapsulation, Inheritance, Polymorphism, Messaging Systems, Forms as classes, Referencing Objects, Classes and Class Modules : Class module events, Class module properties, Class modules and user-defined types, Collection objects.

7. *Handling Errors:* Kinds of Errors, Syntax and compile time errors, Some guidelines for testing programs, On error, Resume and Resume next, The Err Object : The Raise Method, Common trappable errors, The Last DLL Error property, Raising an Error : Raising a user-defined Error; Debugging Tools, Using Assertions.

UNIT-IV

8. *Secrets of Good Interface Design:* Interface design and the back seat, Controlling the user's Actions in an Event-Driven Environment, Dealing with Error Conditions.

9. Application development using VB with MS-ACCESS.

Suggested Readings :

1. Harold Davis: Visual Basic Secrets, IDG Books Publication.
2. Greg Perry: Visual Basic 6 in 21 days, TMH.
3. Brierley, E.: Visual Basic 6 How To/Techmedia.
4. Cornell, G.: Visual Basic 6 from the Groundup/TMH.
5. Evangelos, Petroutsor: Mastering VB 6.0, BPB.
6. Jerke, N.: The Complete Reference VB 6.0, TMH.
7. Cornel, Gary: Visual Basic from the Ground up, TMH.
8. Holzner, Steven: Visual Basic 6 Programming : Black Book, Dreamtech.

Paper Title: FUNDAMENTALS OF INFORMATION TECHNOLOGY

Paper Code: CS-49   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objectives:

The objective of this course is to familiarize students with concepts of Fundamentals of IT and its applications.

Note :   (i)   The Question paper will consist of four units.
   (ii) Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
   (iii) The students are required to attempt one question from each unit and the compulsory question.
   (iv) All questions carry equal marks.

UNIT-I

Overview of Computer System:

Evolution of Computer Systems, Generations of Computers, Parts of Computer System, Categories of Computers, Computer System Characteristics, Hardware – CPU, Memory, Input, Output & Storage devices, Organization of Secondary storage media. Working of input & output devices: keyboard, mouse, trackball, pen, touch screens, scanner, digital camera, monitor, printer. Working of storage devices: magnetic tape, magnetic disk, CD, DVD. Software-System & Application.

UNIT-II

Operating System:

Role of an OS, Types of OS, Features of OS & functions of OS. Booting procedure.

Command-Line OS:

Fundamentals of DOS, Disk organization, Internal commands, External commands, Batch files, using screen editor, spooling, communicating with other devices, parallel Vs serial communication.

Graphical OS:

Fundamentals of windows, types of windows, Anatomy of Windows, Windows explorer, customizing windows, control panel, taskbar setting, Network Neighborhoods.

UNIT-III

Personal Productivity Software:

   Word processing:

Editing features, formatting features, saving, printing, table handling, page settings, spell-checking, macros, mail-merge, equation editors.

   Spreadsheet:

Workbook, worksheets, data types, operators, cell formats, freeze panes, editing features, formatting features, creating formulas, using formulas, cell references, replication, sorting, filtering, functions, Charts & Graphs, PivotTable and PivotChart, Macros, What-If Analysis.

   Presentation Graphics Software:

Templates, views, formatting slide, slides with graphs, animation, using special features, presenting slide shows.

   Web-designing:

 Uses, interface, adding text, images, creating links, tables, forms, publishing.

UNIT-IV

Information Technology Basics:

Information, Technology, Information Technology, Role, Information technology and Internet, Applications.

Disk management tools:

PC tools, Norton Utilities, Virus, worms, threats, virus detection, prevention and cure utilities, Firewalls, Proxy servers.

Internet:

Internet & its applications, working of search engines, use of e-mail, types, Topologies, major features of internet (www, e-mail, telnet, ftp, IRC, news), structure and types of internet connections, Addressing schemes.

Suggested Readings:

1. Nortron, Peter: Introduction to Computers, 4th Edition, TMH.
2. Basundara: Computers Today.
3. Habraken, Joe: Office 2000, PHI.
4. Stultz: Learn MS-Office 2000 BPB.
5. Joshi, R.C.: Operating Systems, Wiley India Pvt. Ltd.
6. Willet, Edward/Crowder,David: Microsoft Office 2000 Bible, Wiley India Pvt. Ltd.
7. Finkelstein: How to Do Every Thing with Microsoft Office PowerPoint 2003,WileyIndia Pvt. Ltd.
8. Walkenbach: Microsoft Excel 2003 Programming with VBA Bible, WileyIndia Pvt. Ltd.

Paper Title: MULTIMEDIA TECHNOLOGIES

Paper Code: CS-50   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objectives:

The Objective of this course is to introduce the students with the various technologies related to multimedia.

Note : (i)   The Question paper will consist of four units.
   (ii) Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
   (iii) The students are required to attempt one question from each unit and the compulsory question.
   (iv) All questions carry equal marks.

UNIT-I

1. **Introduction to Multimedia Systems:**

   Architecture and Subsystems of Multimedia Computer Systems, multimedia applications, multimedia building blocks (text, hypertext, image, audio, video, animation, multimedia networks).

2. **Multimedia Hardware:**

   Input devices–Keyboard, mouse, touch screen, graphic tablets, scanner, microphone, digital camera. Output devices–Monitor, projector, sound system, video system. Memory & Storage Devices–RAM, magnetic media, CD, DVD.

UNIT-II

3. **Multimedia Files:**

   Image and sound file formats, compression standards and compression techniques.

4. **Photoshop:**

   Photoshop workspace, Image editing tools, Specifying and adjusting colours, using gradient tools, selection and move tools, Transforming, Path drawing and editing tools, using channels, layers, filters and actions.

UNIT-III

5. **Flash:**

   Exploring interface, using selection and pen tools, working with drawing and painting tools, applying color, viewing and manipulating timeline, timeline/stage relationship, animating (frame-by-frame, tweening), guiding layers, masking, importing and editing sound & video clips in flash, working with 3D graphics, using Action Script.

UNIT-IV

6. **Director:**

   Exploring interface: Score editor, Cast editor, Toolbars, Library, Palette, Inspector, menu bar; cast Libraries, painting techniques, importing images, working with stage, sprites and score, using text, using sound, using digital video, creating behaviour, using behaviours inspector, Basics of Lingo.

7. **Virtual Reality:** Basics, Hardware and Software requirements, applications.

Suggested Readings:

1. Vaughan , Tay: Multimedia Making It Work, 3rd Edition, TMH.
2. Jeffcoate , Judith: Multimedia in Practice, Technology & Practice, PHI.
3. Straznitskas: Mastering Photoshop 5.5, BPB Publications.
4. Reinhardt & Lentz: Flash 5 Bible, Wiley India Pvt. Ltd.
5. Nyquist & Martin: Director-5 and Lingo Bible, Wiley India Pvt. Ltd.
6. Mcclelland, Deke: Photoshop (Version -9), C 52, Bible, Wiley India Pvt. Ltd.

Paper Title: MATHEMATICAL STRUCTURES FOR COMPUTER SCIENCE - OLD

Paper Code: CS-51   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objectives:

To provide basic mathematical structures required for various computer science courses.

Note :   (i)   The Question paper will consist of four units.
         (ii) Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
         (iii) The students are required to attempt one question from each unit and the compulsory question.
         (iv) All questions carry equal marks.

UNIT-I

1.   Mathematical Logic:

Introduction, Conjunction, Disjunction & Negation, Propositions and Truth Table, Tautologies and Contradictions, Equivalence of formulas, Duality Law. Normal forms : Disjunctive Normal form,Conjunctive Normal form. Predicate Calculus : Predicates, the statement function, variables and quantifiers, predicate formulas. Introduction to finite state machine.

2.   Relation and Functions:

Binary relations, Composition of relations, Equivalence relations, function : Injection, Surjection & Bijection, Function Composition & Inverse function.

UNIT-II

3.   Set Theory:

Introduction, Sets & Elements, Subsets, Venn Diagrams, Operation on Sets. Union, Intersection & Complements, De Morgan's Law, Finite sets, Power sets, Product sets.

4.   Linear Equation:

Linear Equation in one, two and n-unknowns, Solution of a Triangular System, Gaussian Elimination, Determinants and System of Linear Equation.

UNIT-III

5.   Graphs:

Incidence and Degree, Handshaking Lemma, Isomorphism, Connectedness, Walk, Path and Circuits. Shortest Path Algorithm between two Vertices, Eulerian graph, Fleury's Algorithm. Directed graphs.

6.   Trees:

Properties of Trees, Rooted and Binary Trees; Directed Tree, Spanning Tree, Cutest & Cut Vertices, Max-flow–Min-cut theorem.

UNIT-IV

7.   Planner Graphs:

Combinatorial and geometric duals; Kuratowski's graphs; Detection of planarity.

8.   Matrix Representations of Graphs:

Incidence; Adjacency matrices and their properties.

Suggested Readings:

1.   Schaum Series: Theory and Problems of Essential Computer Mathematics, McGraw Hill, New York, 3rd Edition.
2.   Grimaldi Ralph P., 2003: Discrete and Combinatorial Mathematics, Pearson Education.
3.   Trembley, J.P. and Manohar, R.P.: Discrete Mathematical Structures with Applications to Computer Science, McGraw Hill.
4.   Deo, N.: Graph Theory with Applications to Engineering and Computer Science,PHI.
5.   Clark, John & Hetlan: A First Look at Graph Theory, Allied Publishers Limited.

Paper Title: SOFTWARE TESTING AND QUALITY CONTROL

Paper Code: CS-52   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objectives:

The objective of this course is to familiarize students with concepts of Software testing and quality control and its various techniques.

Note :   (i)   The Question paper will consist of four units.
         (ii)   Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
         (iii) The students are required to attempt one question from each unit and the compulsory question.
         (iv) All questions carry equal marks.

UNIT-I

1. **An Overview of Testing Process:**
    Software Testing, Objectives of Software Testing, Software Testing Process, Static and Dynamic Analysis, STEP Methodology, Elements of STEP and STEP Architecture.

2. **Software Testing Techniques:**

    BBT & its Technique, Boundary Value Analysis, Cause-Effect Graph, White-Box Testing and its Techniques: Domain and Boundary Testing, Logic Based Testing, Data Flow Testing.

UNIT-II

3. **White-Box Testing and its Techniques:**

    Domain and Boundary Testing, Logic Based Testing, Data Flow Testing.

4. **Software Testing Strategies:**

    Characteristics, Integration Testing, Functional Testing, Object Oriented Testing, Alpha and Beta Testing, Overview of Testing Tools.

UNIT-III

5. **Metrics for Software:**

    Importance of Metrics to Software Project, Software Quality Metrics, Software Metrics : Product Metrics : Software Size Metrics, Control Complexity Metrics, Object-Oriented Metrics, Software Quality Metrics.

6. **Quality Assurance:**

    Overview of Software Quality, Software Quality Attributes, Factors Affecting Software Quality, Building Software Quality Assurance Plan, Components of SQAP.

UNIT-IV

7. **Quality Management & Quality Models:**

    Software Quality System, Quality Management Principles, Essence of International Standards, ISO 9000 Quality Standard, SEI Capability, Maturity Model.

8. **Software Reliability:**

    Factors Affecting Software Reliability, Software Reliability VS Hardware Reliability, Software Reliability Metrics.

Suggested Readings:

1.   Deutsch, Wills, 2001 : Software Quality Engineering: A Total Technique and Management Approach, Prentice Hall, New Delhi.
2.   Gill, Nasib Singh : Software Engineering: Software Reliability, Testing and Quality Assurance, Khanna Book Publishing.
3.   Rick D. Craig and Stefan P. Jaskiel, 2002: Systematic Software Testing, Artech House Publishers, New York.
4.   Robert T. Futrell, Donald F. Snafer, Linda I. Shafter: Quality Software Project Management, Pearson.
5.   William E. Perry, 2000: Effective Methods for Software Testing, Wiley, London.

Paper Title: SOFTWARE TESTING AND QUALITY ASSURANCE

Paper Code: CS-53   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objective:

The objective of this course is to familiarize students with concepts of Software testing and quality assurance and its various techniques.

Note :   (i)   The Question paper will consist of four units.
          (ii)   Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
          (iii) The students are required to attempt one question from each unit and the compulsory   question.
          (iv)   All questions carry equal marks.

UNIT-I

1. **An Overview of Testing Process:**
   Software Testing, Objectives of Software Testing, Software Testing Process, Static and Dynamic Analysis, STEP Methodology, Elements of STEP and STEP Architecture.

2. **Software Testing Techniques:**
   BBT & its Technique, Boundary Value Analysis, Cause-Effect Graph, White-Box Testing and its Techniques, Domain and Boundary Testing, Logic Based Testing, Data Flow Testing.

UNIT-II

3. **Software Testing Strategies:**
   Characteristics, Integration Testing, Functional Testing, Object Oriented Testing, Alpha and Beta Testing, Overview of Testing Tools.

4. **Metrics for Software:**
   Importance of Metrics to Software Project, Software Quality Metrics, Software Metrics : Product Metrics : Software Size Metrics, Control Complexity Metrics, Object-Oriented Metrics, Software Quality Metrics.

UNIT-III

5. **Quality Assurance:**

   Overview of Software Quality, Software Quality Attributes, Factors Affecting Software Quality, Building Software Quality Assurance Plan, Components of SQAP.

6. **Quality Management & Quality Models:**

   Software Quality System, Quality Management Principles, Essence of International Standards, ISO 9000 Quality Standard, SEI Capability Maturity Model.

UNIT-IV

7. **Software Reliability:**
   Factors Affecting Software Reliability, Software Reliability Vs Hardware Reliability, Software Reliability Metrics.

8. **System Configuration Management (SCM):**
   Basic requirements for SCM System, SCM principles, Planning and Organising for SCM, Benefits of SCM, Change Management, Version and Release Management.

Suggested Readings:

1. Deutsch, Wills, Hall: Software Quality Engineering : A Total Technique and Management Approach.
2. Gill, Nasib Singh: Software Engineering : Software Reliability, Testing and Quality Assurance, Khanna Book Publishing.
3. Rick, D. Craig and Stefan P. Jaskiel: Systematic Software Testing, Artech House Publishers.
4. Robert T. Futrell, Donald F. Snafer, Linda I. Shafter: Quality Software Project Management, Pearson.
5. Perry, William E.: Effective Methods for Software Testing, Wiley.
6. Hutcheson: Software Testing Fundamentals, Wiley India Pvt. Ltd.
7. Boris Beizer: Software Testing Techniques, 2nd Edition, Wiley India Pvt. Ltd.
8. Prasad, K.V.K.K.: Software Testing Tools Covering Win Runner, Silk Test, Load Runner, J. Meter and Test Director and QTP with Case Studies, Wiley India Pvt. Ltd.

Paper Title : **MULTI AGENT SYSTEMS**

Paper Code: CS-54   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objectives:

Identify and discuss the characteristics of agent-based systems; and Program actual agents in one multiagent environment. To have a rich understanding of multiagent systems and their limitations, skills to design automation solutions using multiagent system techniques

Note :   (i)   The Question paper will consist of four units.
         (ii) Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
         (iii) The students are required to attempt one question from each unit and the compulsory question.
         (iv) All questions carry equal marks.

UNIT-I

1. **Introduction:**

   Limitation of Artificial Intelligence (AI), Introduction and Advantages of Distributed AI, Agents, Multiagent systems (MAS), applications.

2. **Intelligent Agents:**

   Examples, architecture for Intelligent agents : abstract, logic based, reactive, belief – desire intention architecture and layered architecture, agent oriented programming.

UNIT-II

3. **Agent Communication:**

   Communication levels, Message types, KQML (Knowledge Query and Manipulation Language), KIF (Knowledge Interchange Format), Ontologies, agent interaction protocol, Co-ordination & co-operation protocols, Contract nets, and black board systems.

UNIT-III

4. **Distributed Model for Decision Support:**

   Introduction, Agent architecture for distributed decision support system, Case Studies – Environmental Energy Management and Road Traffic Management Systems.

UNIT-IV

5. **Tools and Techniques for Agent Development:**

   Java Agent Development Environment (JADE), Java agents, Java agent framework. Introduction to Neural Networks, Fuzzy Logic and Genetic algorithms and agent development using these techniques.

Suggested Readings:

1. Weiss, Gerhard: Multiagent Systems : A Modern Approach to Distributed Artificial Intelligence, the MIT Press.
2. Rajasekaran, S. and Vijayalakshmi Pai G.A., 2004: Neural Network, Fuzzy Logic and Genetic Algorithms – Synthesis and Applications, Prentice Hall of India Private Limited, New Delhi.

Paper Title: MATHEMATICAL, NUMERICAL AND STATISTICAL TECHNIQUES

Paper Code: CS-73   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objectives:

To provide basic knowledge about mathematical structures required for various computer science courses and various significant and fundamental concepts to inculcate in the students an adequate understanding of the application of Numerical Algorithms and Statistical Methods.

Note :   (i)   The Question paper will consist of four units.
         (ii)   Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
         (iii) The students are required to attempt one question from each unit and the compulsory question.
         (iv)   All questions carry equal marks.

         Prerequisite : Mathematical Foundation of Computer Science, Probability and Statistics.

<h3 style="text-align:center">UNIT I</h3>

1.   Mathematical Logic:

Counting Principles, Pigeonhole Principle, Inclusion-Exclusion Principle, Ordered sets, Hasse diagrams of Partially ordered sets.

2.   Graphs and Trees:

Graph: Definition of a graph, Isomorphism, walks, paths, circuits;Types of graphs: Connected, Regular, Bipartite, Hamiltonian, Eulerian and Kuratowski's graphs; **Tree:** Definition of a Tree, Properties of Trees; Cut-set & Cut vertices: Introduction to cut-sets, properties of a cut-set, Max-flow-Min-cut theorem.

<h3 style="text-align:center">UNIT II</h3>

3.   Error and Solution of Non-Linear Equations:

Error: Types of Error, Error Propagation, Zeros of a single transcendental equation and a polynomial using Bisection, False-Position; Newton-Raphson methods – Algorithms, Examples and Convergence.

4.   Solution of System of Linear Equations:

Solution of Simultaneous Linear Equations: Gauss Elimination Method and Pivoting, ILL-Conditioned Equations and Refinement of solution; Gauss Siedel iterative method - Algorithms and Examples.

<h3 style="text-align:center">UNIT III</h3>

5.   Numerical Differentiation and Integration:

Numerical Differentiation: Differentiating a function tabulated at equal intervals and unequal intervals, Higher order derivatives.
Numerical Integration: Newton-Cotes Integration Formulae: Trapezoidal Rule, Simpson's 1/3rd and 3/8th rule - Algorithms and Examples.
Solution of Differential Equations: Euler's Method, Runga-Kutta Second order and Fourth order methods; Predictor corrector methods: Modified Euler's Method.

6.   Interpolation and Approximation:

Polynomial Interpolation – Newton Lagranges, Difference Tables, Newton's Methods of Interpolation: Newton's Forward Difference, Backward Difference and Divided Difference interpolation formulae - Algorithms and Examples.
Approximation of a function by Taylor Series and Chebyshev Polynomials.

UNIT IV

7.   Regression Analysis:

Method of Least Squares, Linear and Non-Linear Regression: Straight Line, Polynomial and Curve fittings – Algorithms and Examples; Introduction to Multiple Regression.

8.   Time Series:

Components of Time Series, Measurement of Trend: Method of Moving Averages.

9.   SPSS and Mat Lab:

Introduction and Features of SPSS and MatLab.

Suggested Readings:

1.   Schaum's Series: Discrete Mathematics, Tata McGraw Hill Education Private Limited, 3rd Edition.
2.   Deo, Narsingh : Graph Theory with Applications to Engineering and Computer Science, PHI.
3.   Salaria, R.S.: Computer Oriented Numerical Methods, Khanna Book Publishing Co.(P) Ltd.
4.   Rajaraman, V.: Computer Oriented Numerical Methods, 3rd Edition, Prentice Hall of India.
5.   Gupta, S.P.: Statistical Methods, Sultan Chand and Sons.
6.   Kolman, Busby, Ross : Discrete Mathematical Structure, Pearson Education, 5th Edition.
7.   Clark, John & Hetlan: A First Look at Graph Theory, Allied Publishers Limited.
8.   Krishnamurthy, E.V., Sen, S.K.: Computer Based Numerical Algorithms, East West Press.
9.   Affi, A.A.: Statistical Analysis: A Computer Oriented Approach, Academic Press, Inc.

PAPER TITLE: CURRENT TRENDS AND TECHNOLOGIES

Paper Code: CS-74   Max. Marks: 80   Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objectives:

To familiarize students with emerging technologies such as Multimedia, Parallel and distributed computing, E-technologies., ethics in computing.

Note :   (i)   The Question paper will consist of four units.
   (ii)   Examiner will set total of *nine* questions comprising *two* questions from each unit and *one* compulsory question of short answer type covering whole syllabi.
   (iii)   The students are required to attempt one question from each unit and the compulsory question.
   (iv)   All questions carry equal marks.

Unit I

Introduction to Multimedia Systems:

Introduction, Use of multimedia system, Hardware and software requirements for multimedia computer systems, multimedia applications.

Multimedia building blocks:

Text: fonts and faces, using text in multimedia, designing with text, choosing text fonts, hypertext, hypermedia; **Image:** bitmaps, vector drawing, 3-D drawing and rendering, color palettes, image file formats; **Audio:** digital audio, making MIDI audio, audio file formats, MIDI vs digital audio; **Video:** working of video, digital video standards and formats, storyboarding; **Animation:** Animation techniques and formats**.**

Multimedia authoring: Introduction, stages of authoring, methodologies: Frame Based, Time based, Icon Based.

Unit II

Semantic Web Technologies

Semantic Web technologies and their applications, Semantic representation and Reasoning of data using ontologies, Study of Ontology Languages: RDF,RDFS, OWL; Current Applications of the Semantic Web.

E-Content Development

Integrating Multimedia in Education & Educational software applications, Instructional Design System & Communication Modes in Education: Formulation of Instructional Strategies, Task Analysis, Designing of Instructional strategies using curriculum specific Educational software.

E-Technologies

Electronic Commerce: Framework, Media Convergence, Anatomy of Applications, Consumer and Organization Applications; Electronic Payment System: Types of Electronic Payment Systems, Digital Token based, Smart Cards & Credit Cards.

Unit III

Multiagent Technology:

Introduction to distributed artificial intelligence, Types of agents, applications of multiagent system, issues in multiagent system development, agent communication protocols : KQML and FIPA; Tools for multiagent system development: Downloading and exploring features of Java agent development environment (JADE) and understanding multiagent programs using JADE.

Parallel and distributed computing:

Fundamentals and Need for parallel and distributed computing, Parallel processing architectures, examples and requirements of complex or high end applications, issues in parallel and distributed computing: shared memory vs distributed memory programming**.**

Unit IV

Ethics in Computing:

Introduction, Need of ethics, issues related to computer ethics, ethical standards, Netiquette; Plagiarism: Introduction, types of plagiarism, risks involved in plagiarism, avoiding plagiarism, plagiarism detection software: their features and use.

Introduction to the following:

Cloud Computing, Grid Computing, Green Computing, Pervasive computing, Bio-informatics, Bio-metrics, Nanotechnology, Image Processing, Pattern recognition, Wireless Ad Hoc and Sensor networks.

References:

1. Vaughan, Tay: Multimedia Making It Work, 3rd Edition, TMH.
2. Kalakota, Ravi and Whinston, Andrew B.: Frontiers of Electronic Commerce, Pearson Education Inc.
3. Sasikumar M., Shikhara Dinesh, Prakash P. Ravi, 2004 : Introduction to Parallel Processing, PHI.
4. Multiagent Systems: A Modern Approach to Distributed Artificial Intelligence, Edited by Gerhard Weiss, The MIT Press, LONDON.
5. Semantic Web Technologies: Trends and Research in Ontology-based Systems edited by John Davies, Rudi Studer, Paul Warren
6. George W. Reynolds: Ethics in Information technology.