Syllabus and Scheme of Examinations
Master of Science (Computer Science) – Regular w.e.f. 2016-17

Programme Specific Outcomes:

The students upon completion of **M.Sc. (Computer Science) Programme** will be able:

PSO1 To possess practical and theoretical knowledge of computer science and software development sufficient to earn a living and contribute to the economic development of the region, state and nation.

PSO2 To Understand and analyze a given real-world problem and propose feasible computing solutions.

PSO3 To Analyze customer requirements, create high level design, implement and document robust and reliable software systems

PSO4 To Use the techniques, skills and modern hardware and software tools necessary for innovative software solutions and to recognize the social, professional, cultural and ethical issues involved in the use of computer technology and give them due consideration in developing software systems.

PSO5 To be prepared for higher education in computer science and related areas, and pursue research in relevant areas of computer science.

PSO6 To Understand and respect the professional standards of ethics expected of computer scientists and software engineers and appreciate the social impact of computing.

PSO7 To recognize the importance of and possess the skills necessary for life-long learning in the area.

PSO8 To Work collaboratively as a member or leader in multidisciplinary teams and be able to select teaching/software engineer as their career after acquiring necessary eligibility requirement.

M.Sc.(Computer Science) First Year
First Semester

Paper Code	Nomenclature	University Exams	Internal Assessment	Total Marks	Credits (L:T:P)
16MCS21C1	Discrete Mathematics	80	20	100	4:0:0
16MCS21C2	Computer Fundamentals and Programming in C	80	20	100	4:0:0
16MCS21C3	Data Base Management Systems	80	20	100	4:0:0
16MCS21C4	Computer Organization and Architecture	80	20	100	4:0:0
16MCS21CL	Practical-I (Based on 16MCS21C2 & 16MCS21C3	100*	-----	100	0:0:4
					Total Credits=20

Second Semester

Paper Code	Nomenclature	University Exams	Internal Assessment	Total Marks	Credits (L:T:P)
16MCS22C1	Data Structures Using C	80	20	100	4:0:0
16MCS22C2	Object Oriented Programming Using C++	80	20	100	4:0:0
16MCS22C3	Software Engineering	80	20	100	4:0:0
16MCS22C4	Computer Networks	80	20	100	4:0:0
16MCS22CL	Practical-II (Based on 16MCS22C1 & 16MCS22C2)	100*	-----	100	0:0:4
					Total Credits=20
Foundation Elective (F)					
To be chosen from the pool of Foundation Electives provided by the university.					2 Credits
Open Elective (O)					
To be chosen from the pool of Open Electives provided by the University (excluding the Open Elective prepared by the Department of Comp Sc. & Appls.)					3 Credits

Total Credits: 25

*20 marks out of 100 will be based on the evaluation/assessment of the candidate in Test(s) and Assignment(s) during the semester, which will be forwarded by the Head of Dept./Director/Principal to the Examiner(s).

M.Sc.(Computer Science) Second Year
Third Semester

Paper Code	Nomenclature	University Exams	Internal Assessment	Total Marks	Credits (L:T:P)
17MCS23DA1/ 17MCS23DA2/ 17MCS23DA3	i) Compiler Design or ii) Computer Security or iii) Computer Graphics	80	20	100	4:0:0
17MCS23DB1/ 17MCS23DB2/ 17MCS23DB3	i)Management Information System or ii) Digital Image Processing or iii)Artificial Intelligence	80	20	100	4:0:0
17MCS23C1	Operating System and Unix	80	20	100	4:0:0
17MCS23C2	Visual Programming	80	20	100	4:0:0
17MCS23CL	Practical-III (Based on 17MCS23C1, 17MCS23C2,17MCS23DA3)	100*	-----	100	0:0:4
					Total Credits=20
Open Elective (O)					
To be Chosen from the pool of Open Electives provided by the University (excluding the open elective prepared by the Department of Comp Sc. & Appls.)					3 Credits

Total Credits : 23

Fourth Semester

Paper Code	Nomenclature	University Exams	Internal Assessment	Total Marks	Credits (L:T:P)
17MCS24C1	Java Programming	80	20	100	4:0:0
17MCS24DA1/ 17MCS24DA2/ 17MCS24DA3	i) Data Warehouse and Data Mining or ii) Analysis and Design of Algorithms or iii) Multimedia and Its Applications	80	20	100	4:0:0
17MCS24DB1/ 17MCS24DB2/ 17MCS24DB3	i) Internet and Web Designing or ii) Software Testing or iii) Advances in Database Systems	80	20	100	4:0:0
17MCS24CL	Practical-IV (Based on 17MCS24C1, 17MCS24DB1)	100*	-----	100	0:0:4
17MCS24C3	Project Report	100**	-----	100	0:4:0
					Total Credits=20

Overall Credits : 88

*20 marks out of 100 will be based on the evaluation/assessment of the candidate in Test(s) and Assignment(s) during the
semester, which will be forwarded by the Head of Dept./Director/Principal to the Examiner(s).

**20 marks out of 100 will be based on the progress of the candidate in the Project assigned during the semester, which will be forwarded by the Head of Dept./Director/Principal to the Examiner(s).

M.Sc.(Computer Science) First Year
First Semester

SUBJECT: DISCRETE MATHEMATICS
PAPER CODE: 16MCS21C1

Course Outcomes:
By the end of the course the students will be able to:

CO1 Identify and apply basic concepts of set theory, arithmetic, logic, proof techniques, binary relations, graphs and trees

CO2 Write an argument using logical notation and discriminate between valid and invalid arguments.

CO3 Demonstrate an understanding of relations and functions and be able to determine their properties and able to determine when a function is one to one, onto, many to many and so on.

CO4 Identify different types of matrices and able add, subtract, multiply matrices. Also able to calculate determinant, minors and cofactors of the matrices.

CO5 Identify different types of grammars used in automata and able to convert NFA to DFA and mealy to more machines.

Maximum marks: 100 (**External: 80**, **Internal: 20**)   **Time:** 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT I
Sets: Sets, Subsets, Equal Sets Universal Sets, Finite and Infinite Sets, Operation on Sets, Union, Intersection and Complements of Sets, Cartesian Product, Cardinality of Set, Simple Applications.
Relations and functions: Properties of Relations, Equivalence Relation, Partial Order Relation, Function: Domain and Range, Onto, Into and One to One Functions, Composite and Inverse Functions.

UNIT – II
Propositional Logic: Proposition logic, basic logic, Logical Connectives, truth tables, tautologies, contradiction, Logical implication, Logical equivalence, Normal forms, Theory of Inference and deduction.
Predicate Calculus: Predicates and quantifiers. Mathematical Induction.

UNIT – III
Matrices: Definition, Types of Matrices, Addition, Subtraction, Scalar Multiplication and Multiplication of Matrices, Adjoint and Inverse of a matrix.
Determinants: Definition, Minors, Cofactors, Properties of Determinants, Applications of determinants in finding area of triangle, Solving a system of linear equations.

UNIT – IV
Introduction to defining language, Kleene Closure, Arithmetic expressions, Chomsky Hierarchy, Regular expressions.

Conversion of regular expression to Finite Automata, NFA, DFA, Conversion of NFA to DFA, FA with output: Moore machine, Mealy machine.

Suggested Readings:
1. C.L.Liu: Elements of Discrete Mathematics, McGraw Hill.
2. Lipschutz, Seymour: Discrete Mathematics, Schaum's Series
3. Babu Ram: Discrete Mathematics, Vinayek Publishers, New Delhi.
4. Trembley, J.P & R. Manohar: Discrete Mathematical Structure with Application to Computer Science, TMH.
5. Kenneth H. Rosen: Discrete Mathematics and its applications, TMH.
6. Doerr Alan & Levasseur Kenneth: Applied Discrete Structures for Computer Science, Galgotia Pub. Pvt. Ltd.

Note: Latest and additional good books may be suggested and added from time to time.

SUBJECT: COMPUTER FUNDAMENTALS AND PROGRAMMING IN C
PAPER CODE: 16MCS21C2

Course Outcomes:
By the end of the course the students will be able to:
  CO1 Understand the Computer fundamentals.
  CO2 Use of various problem solving techniques.
  CO3 Understand the C programming fundamentals.
  CO4 Understand C by using arrays, functions, structures and union.
  CO5 Develop the Programs in C using its advance features.

Maximum marks: 100 (**External: 80**, **Internal: 20**)   **Time:** 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT-I
Computer Fundamentals: Concept of data and information; Components of Computer: Hardware Input Device, Output Device. CPU: Components of CPU; Memory and Storage Devices; Computer Software: System Software and Application Software; Functions of Operating System. Programming Languages: Machine, Assembly, High Level Language, 4GL; Language Translator; Linker, Loader; Classification of Computers: Micro, Mini, Mainframe, Super computer. Advantages of Computer, Limitations of Computer, Range of Applications of Computer, Social concerns of Computer Technology: Positive and Negative Impacts, Computer Crimes, Viruses and their remedial solutions.

UNIT-II
Problem Solving: Problem Identification, Analysis, Flowcharts, Decision Tables, Pseudo codes and algorithms, Program Coding, Program Testing and Execution.
C Programming Fundamentals: Keywords, Variables and Constants, Structure of a C program. Operators & Expressions: Arithmetic, Unary, Logical, Bit-wise, Assignment & Conditional Operators, Library Functions, Control Statements: Looping using while, do…while, for statements, Nested loops; decision making using if…else, Else If Ladder; Switch, break, Continue and Goto statements.

UNIT-III
Arrays & Functions: Declaration and Initialization; Multidimensional Arrays. String: Operations of Strings; Functions: Defining & Accessing User defined functions, Function Prototype, Passing Arguments, Passing array as argument, Recursion, Use of Library Functions; Macro vs. Functions.
Pointers: Declarations, Operations on Pointers, Passing to a function, Pointers & Arrays, Array of Pointers, Array accessing through pointers, Pointer to functions, Function returning pointers, Dynamic Memory Allocations.

Structures and Union: Defining and Initializing Structure, Array within Structure, Array of Structure, Nesting of Structure, Pointer to Structure, Passing structure and its pointer to Functions; Unions: Introduction to Unions and its Utilities.

Files Handing: Opening and closing file in C; Create, Read and Write data to a file; Modes of Files, Operations on file using C Library Functions; Working with Command Line Arguments. Program Debugging and types of errors.

Suggested Readings:
1. Gill Nasib Singh: Computing Fundamentals and Programming in C, Khanna Books Publishing Co., New Delhi.
2. Kenneth.A.: C problem solving and programming, Prentice Hall.
3. Gottfried, B.: Theory and problems of Programming in C, Schaum Series.
4. Gill, Nasib Singh: Handbook of Computers, Khanna Books Publishing Co., New Delhi.
5. Sanders, D.: Computers Today, Tata McGraw-Hill.
6. Rajender Singh Chhillar: Application of IT to Business, Ramesh Publishers, Jaipur.
7. Cooper, Mullish :The spirit of C, An Introduction to Modern Programming, Jaico Publ. House, New Delhi.
8. Kerninghan & Ritchie: The C Programming Language, PHI.
9. Gottfried, B.: Theory and problems of Programming in C, Schaum Series.
10. E. Balaguruswamy: Programming in C, Tata McGraw Hill.
11. H. Schildt: C-The Complete Reference, Tata McGraw Hill.
12. Y. Kanetkar: Let us C, BPB Publication

Note: Latest and additional good books may be suggested and added from time to time.

SUBJECT: DATABASE MANAGEMENT SYSTEM
PAPER CODE: 16MCS21C3

Course Outcomes:
By the end of the course the students will be able to:
  CO1 Understand the database concepts and structures.
  CO2 Understand data modeling and database development process.
  CO3 Construct and normalize conceptual data models. Implement a relational database into a database management system.
  CO4 Use database management systems (Oracle SQL Plus).
  CO5 Become proficient in using database query language (SQL)

Maximum marks: 100 (**External: 80**, **Internal: 20**)   **Time:** 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT-I

Introduction: Database System vs File Processing System, Characteristics of database approach, Views of data, DBMS architecture and Data independence, Data Abstraction, Instance and Schemas, Data models; Database Languages: DDL, DML, DCL, Database Access for applications Programs, Database Users and Administrator, Transaction Management, Database system Structure, Storage Manager, Query Processor, History of Database.

Database Design and E-R Modeling: Database Design: Conceptual, Logical and Physical Design; E-R Model: Entity types, Entity set, attribute and key, Relationships, Relation types, Roles and Structural constraints, Weak entities, Enhanced ER Model.

UNIT-II

Relational Model: Introduction to the Relational Model, Integrity Constraint over Relations, Enforcing Integrity constraints, Querying relational data, Introduction to views, Destroying/altering Tables and Views.

Relational Algebra and Calculus: Relational Algebra, Set operations, Selection and projection, renaming, Joins, Division, Examples of Algebra overviews, Relational calculus: Tuple relational Calculus, Domain relational calculus, Expressive Power of Algebra and Calculus.

UNIT-III

Schema Refinement, Functional dependencies: Schema refinement in Data base Design, Problems Caused by redundancy, Decompositions, Problem related to decomposition, Lossless join Decomposition, Dependency preserving Decomposition, Normalization : FIRST, SECOND, THIRD Normal forms, BCNF, Forth Normal Form, Fifth Normal Form .

Transaction Management: ACID Properties, Transactions and Schedules, Concurrent Execution of transaction, Serializability and recoverability.

Concurrency Control: Introduction to Lock Management, Lock Conversions, Dealing with Dead Locks, Concurrency without Locking, Recovery Techniques, Database Security.

Introduction to Oracle : Getting started, Modules of Oracle, Invoking SQLPLUS, Data types, Data Constraints, Operators, Data manipulation - Create, Modify, Insert, Delete and Update; Searching, Matching and Oracle Functions.

Introduction to PL/SQL: Advantages of PL/SQL, Generic PL/SQL Block, Execution Environment, Control Structure, Transactions, Security, database objects.

Suggested Readings:
1.Raghurama Krishnan : Data base Management Systems, Johannes Gehrke, Tata McGraw Hill.
2.Siberschatz, Korth : Data base System Concepts, McGraw Hill.
3.P. Radha Krishna : Database Management Systems, HI-TECH Publications.
4.C.J. Date : Introduction to Database Systems, Pearson Education.
5.Rob & Coronel : Data base Systems design, Implementation, and Management,Thomson.
6.Elmasri Navrate : Data base Management System, Pearson Education.
7.Mathew Leon : Data base Management System, Leon Vikas Publishers.
8.Connoley : Data base Systems, Pearson Education.

Note: Latest and additional good books may be suggested and added from time to time.

SUBJECT: COMPUTER ORGANIZATION AND ARCHITECTURE
PAPER CODE : 16MCS21C4

Course Outcomes:
By the end of the course the students will be able to:
  CO1 Design a circuit for any digital function
  CO2 Use K-map for simplification of Boolean expressions
  CO3 Identify the addressing modes of instructions and calculation of effective address
  CO4 Determine which hardware blocks and control lines are used for different instructions
  CO5 Classify the parallel processors.

Maximum marks: 100 (**External: 80**, **Internal: 20**)   **Time:** 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In additio n to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT-I

Representation of Information: Number Systems: Binary, Octal and Hexadecimal, Integer and Floating-point representation, Character codes: ASCII and EBCDIC.
Basic Building Blocks and Circuit Design: Boolean Algebra and Logic Gates: OR, AND, NOT, XOR Gates; De Morgan's theorem; Universal building blocks; Simplifying logic circuits : sum of product and product of sum form; Karnaugh Map simplification; Combinational logic blocks (Adders, Multiplexers, Encoders, Decoder), Sequential logic blocks (Latches, Flip-Flops, Registers, Counters).

UNIT-II
Register transfer and Micro-operations: Register Transfer Language; Bus and memory Transfer; Micro operations: Arithmetic, Logic & Shift Micro operations.
Basic Computer Organization and Design: Instructions Codes, Register reference, Memory Reference & Input-Output instructions, Instruction Cycle, Timing and Control, Interrupts; Design of Control unit: Hardwired control unit, Micro-programmed control unit.

UNIT-III
Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Cache Memory, Virtual Memory.
Register Organization and Parallel Processing: General Register Organization, Stack Organization, Instruction Formats, Addressing Modes; Data Transfer & Manipulation Instructions, CISC and RISC: Features and Comparison**,** Pipeline and Vector Processing: Parallel processing, Pipelining, Arithmetic Pipeline, Instruction pipeline and Arrays Processors.

UNIT-IV
Input-Output Organization: Peripheral Devices, Input-Output interface, Asynchronous Data Transfer, Modes of transfer, Priority interrupt, Direct Memory Access (DMA), input-output processors (IOP),

Serial communication. Multi-processors, characteristics of multi-processors, Interconnection structures, Inter-processor Arbitration, Inter-processor Communication and Synchronization, Cache Coherence.

Suggested Readings:

1.Mano, M.M. : Digital Logic and Computer Design, Prentice- Hall of India.
2.Gill Nasib Singh and Dixit J.B.: Digital Design and Computer Organization, University Science Press (Laxmi Publications), New Delhi.
3.Mano, M.M. : Digital Design, Prentice-Hall of India.
4.Anand Kumar : Fundamentals of Digital Circuits, PHI.
5.Tokheim : Digital Electronics, TMH.
6.S. Rangnekar; Digital Electronics, ISTE/ EXCE.L
7.C. Hamacher, Z. Vranesic and S. Zaky, "Computer Organization", McGraw-Hill.
8.W. Stallings, "Computer Organization and Architecture - Designing for Performance", Prentice Hall of India.
9.D. A. Patterson and J. L. Hennessy, "Computer Organization and Design –The Hardware/Software Interface", Morgan Kaufmann,P. Hayes, "Computer Architecture and Organization", McGraw-Hill.

Note: Latest and additional good books may be suggested and added from time to time

PRACTICAL-I
PAPER CODE: 16MCS21CL
(BASED ON 16MCS21C2 & 16MCS21C3)

Course Outcomes:

By the end of the course the students will be able to:

CO1 Knowledge of Basic fundamentals and their implementation syntax of programming.

CO2 Able to develop basic programs of in c language and Use various problem solving techniques.

CO3 Able to implement arrays in C Programming.

CO4 Programming in C by using functions, structures and union.

CO5 Able to solve various problems using C language on small scale.

SEMESTER-II

SUBJECT: DATA STRUCTURES USING C
PAPER CODE: 16MCS22C1

Course Outcomes:
By the end of the course the students will be able to:

    CO1 Knowledge of programming fundamentals including structured and efficient programming.

    CO2 Use various problem solving techniques using C.

    CO3 Knowledge of stacks, queues, recursion and linked lists and their implementation in C.

    CO4 Knowledge of trees and file structures.

    CO5 Knowledge and Development of Programs in C for searching and sorting techniques.

Maximum marks: 100 (**External: 80**, **Internal: 20**)   **Time:** 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT-I

Introduction to Algorithm Design and Data Structure: Algorithm definition, Top-down and Bottom-up approaches to Algorithm design, Algorithm for searching, sorting, merging, Analysis of Algorithm: Frequency count, Time Space tradeoff, Structured approach to programming.

UNIT-II

Arrays: Representation of single and multidimensional arrays; Address calculation using column and row major ordering. Various operation on Arrays, Vectors, Application of arrays, Sparse arrays - lower and upper triangular matrices and Tri-diagonal matrices.

Sorting: Selection sort, Insertion sort, Bubble sort, Quick sort, Merge sort, Heap sort, Radix sort and their complexity.

Searching: Linear search, Binary search, Hashing function and Collision Handling methods.

UNIT-III

Stacks and Queues: Introduction and Primitive operations on stack; Stack application: Infix, postfix, prefix expressions; Evaluation of postfix expression; Conversion from infix to Postfix; Introduction and Primitive Operation on queues, D-queues and Priority queues, Circular queue.

Linked Lists: Introduction to Linked lists; Implementation of linked lists, operations such as traversal, Insertion, deletion, searching, Circular linked lists, Doubly Linked lists.

UNIT-IV

Trees: Introduction and Terminology; Traversal of binary trees; Recursive algorithms for tree operations such as traversal, insertion, deletion; threaded Binary trees, binary search trees; AVL trees, B tress.

Graph: Adjacency matrix, Adjacency lists, Traversal schemes: Depth first and Breadth first search,

Spanning tree: Definition, Minimal spanning tree algorithms, Shortest path algorithms (Prim's and Kruskal's)

Suggested Readings:
1. Kenneth, A. : C problem solving and programming, Prentice Hall.
2. Gill Nasib Singh: Computing Fundamentals and Programming in C, Khanna Books Publishing Co., New Delhi
3. Gottfried, B. : Theory and problems of Programming in C, Schaum Series.
4. Kerninghan & Ritchie : The Programming Language, PHI.
5. E. Horowitz and S. Sahani, "Fundamentals of Data Structures", Galgotia Booksource Pvt. Ltd.
6. R. S. Salaria, "Data Structure & Algorithms", Khanna Book Publishing Co. (P) Ltd.
7. P. S. Deshpande and O.G. Kakde, "C & Data Structure", Wiley Dreamtech..
8. Schaum's outline series, "Data Structure", TMH.

Note : Latest and additional good books may be suggested and added from time to time.

SUBJECT: OBJECT ORIENTED PROGRAMMING USING C++
PAPER CODE: 16MCS22C2

Course Outcomes:
By the end of the course the students will be able to:

CO1 Use the characteristics of an object-oriented programming language in a program.
CO2 Use the basic object-oriented design principles in computer problem solving.
CO3 Apply C++ features to program design and implementation.
CO4 Design and implementation programs of Constructor, Destructor, and Inheritance.
CO5 Design and implementation programs of Polymorphism, Exception handling, Templates and Working with files.

Maximum marks: 100 (**External: 80**, **Internal: 20**)   **Time:** 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In additio n to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT-I
Object Oriented Programming Concepts: Procedural Language and Object Oriented approach. Characteristics of OOP: Objects, classes, Encapsulation, Data Abstraction, Inheritance, Polymorphism, Dynamic Binding, Message Passing.
Structure of C++ program: Data-types, Variables, Static Variables, Operators in C++, Arrays, Strings, Structure, Functions, Recursion, Control Statements.

UNIT-II
Classes: Class, object, Memory Allocation for Objects, memory layout of objects, private, public, protected member functions, static members. Constructors: Features, types, dynamic constructor, Parameterized constructors; destructors.
Memory management: Dynamic Memory allocation: new, delete, Object Creation at Run Time; This Pointer.

UNIT-III
Inheritance: Derived Class and Base Class, Different types of Inheritance, Overriding member function, Public and Private Inheritance, Ambiguity in Multiple inheritance, Virtual Inheritance, Abstract Class.
Polymorphism: Definition, operator overloading, Overloading Unary and Binary Operators, Function overloading, Virtual function, Friend function, Static function.

UNIT-IV
Exception handling: Throwing, Catching, Re-throwing an exception, specifying exceptions; processing unexpected exceptions; Exceptions when handling exceptions, resource capture and release.

Templates: Introduction; Class templates; Function templates; Overloading of template function, namespaces. Introduction to STL: Standard Template Library: benefits of STL; containers, adapters, iterators, vector, lists.

Suggested Readings:
1. Herbert Schildts : C++ - The Complete Reference, Tata McGraw Hill Publications.
2. Balaguru Swamy : C++, Tata McGraw Hill Publications.
3. Balaguruswamy : Object Oriented Programming and C++, TMH.
4. Shah & Thakker : Programming in C++, ISTE/EXCEL.
5. Johnston : C++ Programming Today, PHI.
6. Olshevsky : Revolutionary Guide to Object Oriented Programming Using C++, SPD/WROX.
7. Object Oriented Programming and C++, Rajaram, New Age International.
8. Samanta : Object Oriented Programming with C++ & JAVA, PHI.
9. Subburaj : Object-Oriented Programming with C++, VIKAS.
10. Any other book(s) covering the constents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time.

SUBJECT: SOFTWARE ENGINEERING
PAPER CODE: 16MCS22C3

Course Outcomes:

By the end of the course the students will be able to:

CO1 Analyze and resolve software crisis issues by using systematic and scientific approaches in the development of software system.

CO2 Aiming to develop the software system with low cost, high quality and within the given time frame.

CO3 Use a variety of scripting tools and languages to automate routine tasks such as analysis, design, coding and testing tasks, security issues to the implementation of software systems.

CO4 Install, configure, troubleshoot, maintain, and upgrade software components.

CO5 Provide efficient and effective technical support to clients in a manner that promotes safe computing practices and reduces the software riska.

Maximum marks: 100 (**External: 80**, **Internal: 20**)   **Time:** 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT I

Introduction to Software Engineering: Software crisis, Software engineering Approach and Challenges, Principles of software engineering, Software development process models with comparison: Waterfall, Prototype, Time boxing and Spiral Models, RAD Model and Automation through software environments. Quality Standards like ISO 9001, SEI-CMM.

Software Project Management: Management activities, Project planning, Project scheduling, Risk management activities.

UNIT II

Software Requirements Engineering: Requirements Engineering Processes, Feasibility studies, Requirements elicitation and analysis, Requirements validation, Requirements management.

Software Requirements Analysis & Specifications: Software requirements, Structured analysis: Data Flow diagram, data dictionary. Object oriented analysis, Software Requirement Specification (SRS): Need of SRS, Characteristics of SRS, Components of SRS, Structure of SRS.

Software Metrics and Measure: Need and benefits of Software Metrics, Size Metrics: Line of code, Token metrics, Function point metrics, Control Complexity Metrics, Software Project Estimation Models- COCOMO models.

UNIT III

Software Design: Fundamentals, problem partitioning & abstraction, design methodology, Function Oriented Design, Cohesion, Coupling & their classification, User Interface Design and Detailed design.

Coding: Goals of coding phase, Programming style, Structured programming: objectives of structured programming, Principles of structured programming, advantages and disadvantages of structured programming.

Software Testing: Impracticality of Testing all Data and Paths, Levels of testing, Functional vs. Structural testing, Static and Dynamic Testing Tools, Regression testing, Mutation Testing, Stress Testing; Validation Vs. verification.

UNIT IV

Software Maintenance: Need of maintenance, Categories of maintenance, Maintainability, Maintenance tasks, Maintenance side effects

Software Re-Engineering: Source Code Translation, Program Restructuring, Data Re-Engineering, Reverse Engineering.

Configuration Management: Maintaining Product Integrity, Change Management, Version Control, Configuration accounting: Reviews, Walkthrough, Inspection, and Configuration Audits.

Suggested Reading:
1. Sommerville Ian, Software Engineering, Addison Wesley
2. Gill, Nasib Singh: Software Engineering, Khanna Book Publishing Co.(P) Ltd, N. Delhi
3. Hoffer, George, Valacich, Modern System Analysis and Design . Pearson Education
4. Pressman S. Roger, Software Engineering, Tata McGraw-Hill.
5. Jalote Pankaj, An integrated Approach to Software, Engineering, Narosa Publishing House.
6. Jorgensen P. C., "Software Testing-A Craftman's Approach", CRC Press.
7. Tom Gilb, Principles of Software Engineering Management, Addison-Wesley.

Note: Latest and additional good books may be suggested and added from time to time.

SUBJECT: COMPUTER NETWORKS
PAPER CODE-16MCS22C4

Course Outcomes:

By the end of the course the students will be able to:

CO1 Independently understand basic computer network technology.

CO2 Understand and explain Data Communications System and its components, different types of network topologies and protocols.

CO3 Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer, different types of network devices and their functions within a network .

CO4 Understand and building the skills of subnetting and routing mechanisms.

CO5 Familiarity with the basic protocols of computer networks, and how they can be used to assist in network design and implementation.

Maximum marks: 100 (**External: 80**, **Internal: 20**) **Time:** 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each unit.

UNIT-I

Introduction to Computer Network: Types of Networks, Network Topologies, OSI and TCP/IP Reference Models; Comparison of Models.

Data Communications Concepts: Digital Vs. Analog communication; Parallel and Serial Communication; Synchronous, Asynchronous and Isochronous Communication; Communication modes: simplex, half duplex, full duplex; Multiplexing; Transmission media: Wired-Twisted pair, Coaxial cable, Optical Fiber, Wireless transmission: Terrestrial, Microwave, Satellite, Infra red.

UNIT-II

Communication Switching Techniques: Circuit Switching, Message Switching, Packet Switching.

Data Link Layer Fundamentals: Framing, Basics of Error Detection, Forward Error Correction, Cyclic Redundancy Check codes for Error Detection , Flow Control.

Media Access Protocols: ALOHA, Carrier Sense Multiple Access (CSMA), CSMA with Collision Detection (CSMA/CD), Token Ring, Token Bus.

UNIT-III

High-Speed LAN: Standard Ethernet, Fast Ethernet, Gigabit Ethernet, 10G; Wireless LANs: IEEE 802.11, Bluetooth.

Network Layer: IP Addressing and Routing, Network Layer Protocols: IPv4 (Header Format and Services), ARP, ICMP (Error Reporting and Query message); IPv6 (Header Format and Addressing).

UNIT-IV

Transport Layer: Process-to-Process Delivery: UDP, TCP; Connection Management by TCP; Routing and Congestion Control.

Application Layer: Domain Name System (DNS); SMTP; HTTP; WWW.
Network Security: Security Requirements and attacks; Cryptography: Symmetric Key (DES, AES), Public Key Cryptography (RSA); Firewall.

Suggested Readings:
1. Behrouz A. Forouzan, "Data Communications and Networking", McGraw Hill.
2. William Stallings, "High-Speed Networks and Internets, Performance and Quality of Service", Pearson Education.
3. Douglas E. Comer, "Internetworking with TCP/IP Volume – I, Principles, Protocols, and Architectures", Pearson Education.
4. George Coulouris, Jean Dollimore, Tim Kindberg, "Distributed Systems-Concepts and Design", Pearson Education.
5. B. Muthukumaran, "Introduction to High Performance Networks", Vijay Nicole Imprints.
6. Wayne Tomasi, "Introduction to Data Communications and Networking", Pearson Education.
7. James F. Kurose, Keith W. Ross, "Computer Networking, A Top-Down Approach Featuring the Internet", Pearson Education.
8. Andrew S. Tanenbaum, "Computer Networks", Pearson Education.
9. Mahbub Hassan, Raj Jain, "High Performance TCP/IP Networking, Concepts, Issues, and Solutions", Pearson Education.
10. Andrew S. Tanenbaum, Marten Van Steen, "Distributed Systems-Principles & Paradigms", Pearson Education.

Note: Latest and additional good books may be suggested and added from time to time.

PRACTICAL-II
PAPER CODE: 16MCS22CL
(BASED ON 16MCS22C1 & 16MCS22C2)

Course Outcomes:

By the end of the course the students will be able to:

CO1 Demonstrate use of copy constructor and class member functions with suitable example.

CO2 Elaborate on inheritance and virtual functions with suitable example.

CO3 Learn how to use basic principles of Exception Handling with Multiple Catch in programs.

CO4 Elaborate on Virtual Base Class in application with suitable example.

CO5 Demonstrate on Function Overloading with suitable example.

M.Sc.(Computer Science) Second Year
SEMESTER-III

SUBJECT: COMPILER DESIGN
PAPER CODE: 17MCS23DA1

Course Outcomes:
By the end of the course the students will be able to:
- CO1 To deal with different translators
- CO2 To use the knowledge of patterns, tokens & regular expressions for solving a problem.
- CO3 Representation of expressions in the form of symbol table, parse tree, three address code, quadruple, triples etc.
- CO4 To learn the new code optimization techniques to improve the performance of a program in terms of speed & space.
- CO5 To acquire the knowledge of modern compiler & its features.

Maximum marks: 100 (**External: 80**, **Internal: 20**)   **Time:** 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each unit.

UNIT – I
Overview of language processing: Preprocessors, compiler, assembler, interpreters, linkers & loaders , structure of a compiler, phases of a compiler.
Lexical Analysis: Role of Lexical Analysis, Lexical Analysis Vs. Parsing, Token, patterns and Lexemes, Lexical Errors, Regular Expression, Definitions for the language constructs, Strings, Sequences, Comments, Transition diagram for recognition of tokens, Reserved words and identifiers, Examples.

UNIT – II
Syntax Analysis: Role of a parser, classification of parsing techniques, Top down parsing, First and Follow, LL(1) Grammars, Non-Recursive predictive parsing, Error recovery in predictive parsing.
Introduction to simple LR: Why LR Parsers, Model of an LR Parsers, Operator Precedence- Shift Reduce Parsing, Difference between LR and LL Parsers, Construction of SLR Tables.

UNIT – III
Powerful LR Parsers: Construction of CLR (1), LALR Parsing tables, Dangling ELSE Ambiguity, Error recovery in LR Parsing.
Semantic analysis: SDT, evaluation of semantic rules, symbol tables, use of symbol tables. Runtime Environment: storage organization, stack allocation, access to non-local data, heap management, parameter passing mechanisms.

<div align="center">**UNIT – IV**</div>

Intermediate code: Three address code, quadraples, triples, abstract syntax trees, basic blocks, CFG. Machine independent code optimization; Common sub expression elimination, constant folding, copy propagation, dead code elimination, strength reduction, loop optimization, procedure inlining.

Machine dependent code optimization: Peephole optimization, register allocation, instruction scheduling, inter procedural optimization, garbage collection via reference counting.

Suggested Readings:

1. Compilers, Principles Techniques and Tools- Alfred V Aho, Monical S Lam, Ravi Sethi, Jeffrey D. Ullman.
2. Principles of Compiler design, V. Raghavan, TMH.
3. Principles of Compiler design, Nandini Prasad, Elsevier
4. Compiler construction, Principles and Practice, Kenneth C Louden, CENGAGE
5. Implementations of Compiler, A new approach to Compilers including the algebraic methods, Yunlinsu, SPRINGER.

Note : Latest and additional good books may be suggested and added from time to time.

SUBJECT: COMPUTER SECURITY
PAPER CODE: 17MCS23DA2

Course Outcomes:
By the end of the course the students will be able to:
  CO1 Apply security measures to commonly used computer resources
  CO2 Identify the possible threats and apply protection mechanisms
  CO3 Classify sensitive data and its relevance
  CO4 Identify malicious and non-malicious codes
  CO5 Determine ethical and legal issues of computer security

Maximum marks: 100 (**External: 80**, **Internal: 20**)   **Time:** 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT-I
The Security Problem in Computing: The meaning of Computer Security, Computer Criminals, Methods of Defense, Elementary Cryptography: Substitution Ciphers, Transpositions, Making "Good" Encryption Algorithms, The Data Encryption Standard, The AES Encryption Algorithm, Public Key Encryptions, Uses of Encryption.

UNIT-II
Program Security: Secure Programs, Non-malicious Program Errors, viruses and other malicious code, Targeted Malicious code, controls Against Program Threats, Protection in General-Purposeoperating system protected objects and methods of protection, File protection Mechanisms, User Authentication Designing Trusted O.S : Security polices, models of security, trusted O.S. design, Assurance in trusted OS.

UNIT-III
Database Security: Security requirements, Reliability and integrity, Sensitive data, Inference, multilevel database, proposals for multilevel security.
Security in Network: Threats in Network, Network Security Controls, Firewalls, Intrusion Detection Systems, Secure E-mail.

UNIT-IV
Administering Security: Security Planning, Risk Analysis, Organizational Security policies, Physical Security. Legal Privacy and Ethical Issues in Computer Security:
Protecting Programs and data, Information and the law, Rights of Employees and Employers, Software failures, Computer Crime, Praia, Ethical issues in Computer Security, Case studies of Ethics.

Suggested Readings:

1.P. Pfleeger, Shari Lawrence Pfleeger Charles: Security in Computing, PHI.
2.William Stallings: Cryptography & Network Security, Pearson Education.
3.Charlie Kaufman, Radia Perlman, Mike Speciner: Network Security, Private communication in a public world, PHI.
4.Douglas R.Stinson: Cryptography – Theory and Practice, CRC Press.
5.Bruce Schneier , Niels Ferguson: Practical Cryptography, Wiley Dreamtech India Pvt Ltd.
6.Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time

<div align="center">

SUBJECT: COMPUTER GRAPHICS
PAPER CODE: 17MCS23DA3

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Course Outcomes
By the end of the course the students will be able to:

CO1 Explain the concepts used in various computer graphic devices.
CO2 Draw different primitive drawing objects and apply transformations.
CO3 Apply clipping on points, lines and closed objects with respect to given rectangular window.
CO4 Explain the concepts of interactive computer graphics.
CO5 Implement the algorithms learnt in some programming language.

Maximum marks: 100 (**External: 80**, **Internal: 20**)   **Time:** 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

<div align="center">

UNIT-I
</div>

Overview of Computer Graphics: Computer Graphics and Its Types, Applications of Computer Graphics; Graphics Display Devices: CRT (Random-Scan and Raster Scan Monitor), Color CRT Monitors, Refresh CRT and Interlacing; DVST, Emissive and Non- Emissive Display devices; Hard copy devices; Graphics Software Standards.

<div align="center">

UNIT-II
</div>

Scan Conversion: Scan Converting a Point, Line: Slope Method, DDA and Bresenham's Algorithm, Circle: Mid Point and Bresenham's Algorithm, Anti- aliasing.
2-D Graphics Transformations: Rotations, Scaling, Translation, Reflection, Shearing; Homogeneous coordinates: Need, Transformations in Homogeneous Coordinates. Composite Transformation.

<div align="center">

UNIT-III
</div>

Polygon Filling: Scan-Line Polygon Fill Algorithm, Inside-Outside tests, Boundary-Fill Algorithm, Flood Fill Algorithm, Cell Array, Character Generation.
Two-Dimensional Viewing: The Viewing Pipeline, Window to View port coordinate transformation, Clipping Operations, Point Clipping, Line Clipping, Polygon Clipping for convex and concave polygons, Text Clipping, Exterior Clipping.

<div align="center">

UNIT-IV
</div>

Interactive Picture-Construction Techniques: Basic Positioning Method, Constraints, Grids, Gravity field, Rubber Band Methods, Dragging, Painting and Drawing.
Three–Dimensional Concepts: Three Dimensional Display Methods: Parallel Projection and Perspective Projection; 3D Transformations: Translation, Rotation & Scaling. Applications of 3D graphics.

Suggested Readings:

1. Hearn, D.,Baker, : Computer Graphics, Prentice Hall.
2. Plastock : Theory & Problem of Computer Graphics, Schaum Series.
3. Foley & Van Dam: Fundamentals of Interactive Computer Graphics, Addison-Wesley.
4. Newman : Principles of Interactive Computer Graphics, McGraw Hill.
5. Bufford: Multimedia Systems, Addison Wesley.
6. Jeffcoate : Multimedia in Practice, Prentice-Hall.

Note : Latest and additional good books may be suggested and added from time to time.

SUBJECT: MANAGEMENT INFORMATION SYSTEM
PAPER CODE-17MCS23DB1

Course Outcomes:
By the end of the course the students will be able to:

CO1 Identify with the usage of Information Systems in management.

CO2 To be aware of the activities that are undertaken in acquiring an Information System in an organization.

CO3 Aware of various Information System solutions like ERP, CRM, SCM and the issues in successful implementation of these technology solutions in any organization.

CO4 Learn about the importance of managing organizational change associated with information systems implementation.

CO5 Understand the process of developing and implementing information systems.

Maximum marks: 100 (**External: 80**, **Internal: 20**)   **Time:** 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT-I

Evolution of MIS: Concepts, framework for understanding and designing MIS in an Organization.

Organization and Information Systems: The Organization: Structure, Managers and activities, Data, information and its attributes , The level of people and their information needs , Types of Decisions and information, Information System, categorization of information on the basis of nature and characteristics.

UNIT-II

Kinds Of Information Systems: Transaction Processing System (TPS), Office Automation System (OAS), Management Information System (MIS), Decision Support System (DSS) and Group Decision Support System (GDSS), Expert System (ES), Executive Support System (EIS or ESS).

UNIT-III

Manufacturing and Service Systems: Information systems for Accounting, Finance, Production and Manufacturing, Marketing and HRM functions - IS in hospital, hotel, bank.

Enterprise System: Enterprise Resources Planning (ERP): Features, selection criteria, merits, issues and challenges in Implementation - Supply Chain Management (SCM): Features, Modules in SCM - Customer Relationship Management (CRM): Phases.

UNIT-IV

Choice of IT: Nature of IT decision; Strategic decision; Configuration design and evaluation Information technology implementation plan.

Security and Ethical Challenges: Ethical responsibilities of Business Professionals – Business, technology. Computer crime – Hacking, cyber theft, unauthorized use at work. Piracy – software and

intellectual property. Privacy – Issues and the Internet Privacy. Challenges – working condition, individuals. Health and Social Issues, Ergonomics and cyber terrorism.

Suggested Books :
1.Management Information Systems, Kenneth J Laudon, Jane P. Laudon, Pearson/PHI.
2.Management Information Systems, W. S. Jawadekar, Tata McGraw Hill.
3.Introduction to Information System, James A. O' Brien, Tata McGraw Hill.
4.Management Information Systems, S.Sadagopan, PHI.
5.Management Information Systems, Effy Oz, Thomson Course Technology.
6.Corporate Information Strategy and Management", Lynda M AppleGate, Robert D Austin et al, Tata McGraw Hill.

Note : Latest and additional good books may be suggested and added from time to time.

SUBJECT: DIGITAL IMAGE PROCESSING
PAPER CODE: 17MCS23DB2

Course Outcomes:
By the end of the course the students will be able to:

- CO1 Quantize and to perform sampling on given images.
- CO2 Transform and filter the digital image for improving the image quality.
- CO3 Generate Color images by applying different image characteristics.
- CO4 Compress the digital images by applying different lossless and lossy compression techniques.
- CO5 Identify different representations of digital images.

Maximum marks: 100 (**External: 80**, **Internal: 20**)   **Time:** 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 (short parts -answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT – I
Introduction to Digital Image Processing: Applications of digital image processing, Steps in digital image processing, Components of an Image Processing system, Image sampling and Quantization, Relationships between pixels.

Image Enhancement: Intensity transformations and spatial filtering, Point and Mask based techniques, Histogram processing, Fundamentals of spatial filtering, Smoothing and sharpening spatial filters.

UNIT – II
Filtering in frequency domain: Fourier Series and Transform, Discrete Fourier Transform, Frequency Domain Filtering Fundamentals, Homomorphic Filtering.

Color Image Processing: Color Fundamentals, Color characteristics, Color models, RGB, CYK, CMYK, HIS, YIQ models, Pseudo color image processing, full color image processing, color transformations, Smoothening and sharpening of images.

UNIT – III
Image Restoration: Model of Image Degradation/Restoration process, Noise models, Linear, Inverse filtering, Mean Square Error Restoration, Least Square Restoration.

Image Compression Fundamentals: Lossless and Lossy Compression, Basic Compression Methods: Huffman Coding, Run-Length Coding, LZW Coding, Arithmetic Coding, Bit-Plane Coding, Predictive Coding, Transform Coding, Wavelet Coding, Compression standards.

UNIT – IV
Image Segmentation: Fundamentals, Point, Line and Edge Detection, Thresholding, Region-Based Segmentation.

Image Representation: Boundary Representation, Chain Codes, Polygonal Approximations, Signatures, Boundary Descriptors, Simple Descriptors, Shape Numbers, Regional Descriptors, Topological Descriptors, Texture.

Suggested Reading:

1. Gonzalez R.C., Woods R.E., "Digital Image Processing", Pearson Education.
2. Vipula Singh, "Digital Image Processing with MATLAB and LABVIEW", Elsevier India.
3. Ganzalez R.C., "Digital Image Processing with MATLAB", Tata McGraw Hill.
4. Sonka Milan, "Image Processing Analysis and Machine vision", Cengage Learning.
5. William K. Pratt, "Digital Image Processing", Wiley India Pvt. Ltd.
6. Chanda B., Majumder D. Dutta, "Digital Image Processing and Analysis", PHI Learning.
7. Jain A.K., "Fundamental of Digital Image Processing", PHI Learning.
8. Jayaraman S., Esakkirajan S., Veerakumar T., "Digital Image Processing", Tata McGraw Hill.
9. Annadurai, "Digital Image Processing", Pearson Education

Note : Latest and additional good books may be suggested and added from time to time.

SUBJECT: ARTIFICIAL INTELLIGENCE
PAPER CODE: 17MCS23DB3

Course Outcomes:

By the end of the course the students will be able to:

CO1   Learn the concept of Artificial intelligence, problem solving with example and searching process.

CO2   2. Understand basic concepts of Expert system with its architecture and development life cycle.

CO3   Understand the concepts of knowledge, acquisition of knowledge and various levels and schemes with the help of which knowledge can be represented.

CO4   Learn the concepts of perception, basic concepts of Neural network, learning in neural network with its applications.

CO5   Handle the uncertainty in knowledge using fuzzy logic and understand various concepts of fuzzy logic.

Maximum marks: 100 (**External: 80**, **Internal: 20**)   **Time:** 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT-I

Introduction: Definition and applications of Artificial Intelligence, Problem solving: Defining problem as State space search, Production systems, Problem characteristics, Search techniques: Brute force and Heuristic search and their different searching techniques.

Knowledge representation: Types of knowledge, Inference rule, Knowledge Representation: Logic based Knowledge representation, Rule based knowledge representation;

UNIT-II

Knowledge representation: Non-Monotonic reasoning, Knowledge representation based on probability and uncertainty; Knowledge representation schemes: Formal logic, Inference Engine, Semantic net, Frame, Scripts.

Expert System: Definition, Role of Knowledge in expert system, Architecture of Expert system.

UNIT-III

Expert system development life cycle: Problem selection, Prototype construction, Formalization, Implementation, Evaluation, Knowledge acquisition: Knowledge engineer, Cognitive behavior, Acquisition techniques.

Perception: Sensing, Speech recognition, Vision, Action.

Learning, Planning and Understanding: Learning and its different types, Planning, understanding.

UNIT-IV

Neural Networks: Introduction, Comparison of artificial neural networks with biological neural

networks, Learning in neural networks, Perceptions, Back propagation networks, application of neural networks.

Fuzzy logic: Definition, Difference between Boolean and Fuzzy logic, fuzzy subset, fuzzy membership function, fuzzy expert system, Inference process for fuzzy expert system, fuzzy controller

Suggested Readings :
1. Rich Elaine and Knight Kevin : Artificial Intelligence, Tata McGraw Hill .
2. Ela Kumar: Introduction to Artificial Intelligence.
3. David W. Rolston: Principles of Art ificial Intelligence and Expert System Development, McGraw Hill Book Company.
4. Tani Moto : Introduction to AI using LISP.
5. Patterson : Artificial Intelligence and Expert Systems.
6. Balagurusamy : Artificial Intelligence & Technology.
7. Mishkoff, Henry C: Understanding Artificial Intelligence, BPB Publ.
8. Bharti & Chaitenya: Natural Language Processing, PHI

Note : Latest and additional good books may be suggested and added from time to time.

SUBJECT: OPERATING SYSTEM AND UNIX
PAPER CODE: 17MCS23C1

Course Outcomes:
By the end of the course the students will be able to:
  CO1 Design the structure of an Operating system as per requirements.
  CO2   Perform CPU scheduling to achieve maximum throughput from the system.
  CO3 Manage the memory space more effectively and efficiently by implementing paging, segmentation.
  CO4 Compare the performance of any system in terms of different performance evaluators.
  CO5 Design the Shell scripts in UNIX environment.

Maximum marks: 100 (**External: 80**, **Internal: 20**)   **Time:** 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT-I
Operating systems overview: Operating systems as an extended machine & resource manager, Operating systems classification; Operating systems and system calls; Operating systems architecture.
Process Management functions: Process model, hierarchies, and implementation; process states and transitions; multi-programming, multi-tasking, multi-threading; level of schedulers and scheduling algorithms.

UNIT-II
Memory Management and Virtual Memory : Logical versus Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation, Segmentation with Paging, Demand Paging, Performance of Demanding Paging, Page Replacement, Page Replacement Algorithm, Allocation of Frames, Thrashing.

UNIT-III
Device Management functions: I/O devices and controllers, interrupt handlers, Types of I/O Software: Device independent I/O software, User-space I/O software, Terminal I/O software. Disk scheduling.
File management functions: file naming, structure, types, access mechanisms, attributes and operations; directory structures and directory operations; file space allocations; file sharing, file locking; symbolic links; file protection and security: distributed file systems.

UNIT-IV
Concurrent programming: sequential and concurrent process; precedence graph, Bernsterins condition; time dependency and critical code section, mutual exclusion problem; classical process co-ordination problems; deadlock handling, inter-process communication.
Unix Operating System: Overview of UNIX OS in general and implementation of all above functions in Unix Operating System.

Suggested Books :

1.Tenenbaum : Modern Operating Systems, Prentice-Hall.
2.Godbole : Operating System, Tata McGraw-Hill.
3.Peterson, James L: Operating System Concepts, Addison Wesley Publ. & Silberschatz Comp.
4.Deitel, H.M. : An Introduction to Operating System, Addison Wesley Publ. Comp.
5.Brain Kernighen & Rob Pike: The UNIX Programming Environment, Prentice Hall.
6.Maurice Bach :Design of the UNIX Operating System, Prentice Hall.
7.Stephen Prato :Advanced UNIX-Programmer's guide, BPB.
8.Sumitabha Das : UNIX Concepts and Applications – Featuring SCO UNIX and LINUX, TMH

Note : Latest and additional good books may be suggested and added from time to time.

SUBJECT: VISUAL PROGRAMMING
PAPER CODE: 17MCS23C2

Course Outcomes:
By the end of the course the students will be able to:

CO1 Design, create, build, and debug Visual Basic applications and explore Visual Basic's Integrated Development Environment (IDE).

CO2 Implement syntax rules in Visual Basic programs. And explain variables and data types used in program development and apply arithmetic operations for displaying numeric output.

CO3 Write and apply decision structures for determining different operations, lop structures to perform repetitive tasks, procedures, sub-procedures, and functions to create manageable code.

CO4 Create one and two-dimensional arrays for sorting, calculating, and displaying of data and to write Visual Basic programs using object-oriented programming techniques including classes, objects, methods, instance variables, composition, and inheritance, and polymorphism.

CO5 Design Windows applications using forms, controls, and events.

Maximum marks: 100 (**External: 80**, **Internal: 20**)   **Time:** 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT-I
Introduction to Visual Basic: VB IDE, An overview of VB project types, VB as event-driven & object-based language, Default Controls in Tool Box: Label Box, Text Box, Command Button, List Box, Combo Box, Picture & Image Box, Shape box, Timer, Option button, Check Box & Frames.

Programming with VB: Variables, Constants, Data types, Variable Scope, Arithmetic operations, String Operations, Built-in functions, I/O in VB, Branching & Looping statements, Procedures, Arrays, Collection.

UNIT-II
Working with Forms: Working with multiple forms; Loading, Showing and Hiding forms; Creating Forms at Run Time. Introduction to MDI forms. Dialog Boxes: Types of Dialog boxes, Working with Common Dialog Box.

Menu Manipulation: Introduction to Menu Editor, Adding Menus and its manipulation: Modifying and Deleting Menu Items, Creating Submenus.

UNIT-III
Advanced Controls in VB: Introduction: Scroll Bar, Slider Control, Tree View, List View, Rich Text Box Control, Toolbar, Status Bar, Progress Bar, Cool bar, Image List, Tab Strip.

Working with Graphics: Using Paint, Line, Circle, RGB and other related method, manipulating graphics.

UNIT-IV

File Handling in VB: Creating a File, Saving and Opening files in Rich text box and Picture box, Handling file operations.

VB & Databases: The Data Controls and Data-Bound Controls; Using DAO, RDO, ADO.

ActiveX controls: Creating & Using ActiveX Controls, Creating & Using ActiveX Documents, ActiveX EXE vs. ActiveX DLL.

Suggested Readings:
1. Visual Basic 6 Programming: Black Book By Steven Holzner, dreamtech PRESS
2. Mastering Visual Baisc 6 By Evangelos Petroutsos BPB
3. Programming in Visual Basic 6.0 By Julia Case Bradley & Anita C. Millspaugh Tata McGraw-Hill Edition.
4. Step by Step Microsoft Visual Basic 6.0 Professional By Michael Halvorson PHI
5. Visual basic 6 Complete BPB
6. Teach Yourself Visual basic 6 By Scott Warner Tata McGraw-Hill Edition
7. Using Visual Basic 6 Special Edition By Brian Siler and Jeff Spotts PHI
8. Internet & World Wide Web How to Program, Pearson education, by: H.M. Deitel, P.J. Deitel, A.B. Goldberg.

Note : Latest and additional good books may be suggested and added from time to time.

PRACTICAL-III
PAPER CODE: 17MCS23CL
(BASED ON 17MCS23C1, 17MCS23C2, 17MCS23DA3)

Course Outcomes

By the end of the course the students will be able to:

CO1 Explain the concepts used in various computer graphic devices.

CO2 Draw different primitive drawing objects and apply transformations.

CO3 Apply clipping on points, lines and closed objects with respect to given rectangular window.

CO4 Explain the concepts of interactive computer graphics.

CO5 Implement the algorithms learnt in some programming language.

SEMESTER-IV

SUBJECT: JAVA PROGRAMMING
PAPER CODE: 17MCS24C1

Course Outcomes:
By the end of the course the students will be able to:

CO1 Use the characteristics of Java language in a program, variables and data types in program development.

CO2 Identify and implement arrays, String and Selection Statements.

CO3 Write Java programs using object-oriented programming techniques including classes, objects, methods, instance variables, and interface. Apply Java features to design and implementation of Packages

CO4 Design and implementation programs of Exception handling, Packages.

CO5 Design and implementation programs of Multithreading Programming, Window based programs.

Maximum marks: 100 (**External: 80**, **Internal: 20**)   **Time:** 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT-I
Introduction: Java History, Java features Java and Internet, Java and World Wide Web, Java Program Structure, Java Tokens, Java Virtual Machine, Data Types, Operators and Expressions, Decision Making and Branching, looping Classes and Methods**.** Inheritance: Using Existing Classes, Class Inheritance, Choosing Base Class, Access Attributes, types of Inheritance, Abstract Classes, Using Final Modifier.

UNIT-II
Polymorphism: Types of polymorphism. Packages & Interfaces: Understanding Packages, Defining a Package, Packaging up Your Classes, Adding Classes from a Package to Your Program, Understanding CLASSPATH, Access Protection in Packages, Concept of Interface.
Exception Handling: Types of Exceptions, Dealing with Exceptions, Exception Objects.

UNIT-III
Multithreading Programming: Creating Multiple Threads, communication
Input/Output in Java: I/O Basic, Byte and Character Structures, I/O Classes, Reading Console. Creating Applets in Java: Applet Basics, Applet Architecture, Applet Life Cycle, Simple Applet Display Methods, Requesting Repainting, Using The Status Window, The HTML APPLET Tag Passing Parameters to Applets.

UNIT-IV

AWT: Working with AWT Controls, AWT Classes, Window Fundamentals, Working with Frame, Creating a Frame Window in an Applet, Displaying Information Within a Window.

Working with Graph: Working with Graphics, Working with Color, Setting the Paint Mode, Working with Fonts, Exploring Text and Graphics, Layout Managers and Menus.

Suggested Readings:
1. Patrick Naughton & Herbert Schildt.: Java 2.0 : The Complete Reference, TMH.
2. Holzner Steven : Java 2, Swing, Servlets, JDBC & Java Beans Programming (Black Book), IDG Books India (P) Ltd.
3. Hatman & Eden : ASP with VBScript, SQL and HTML Programming Reference, IDG Books India(P), Ltd.
4. Jackson, J. : Java by Example, Sunsoft Press.
5. Wiber, J. : Using Java 2 Platform, PHI.
6. Harold, E. : Java Secrets, Comdex.
7. Zolli, A. : Mastering Java, BPB.
8. TiHel, E. :Discover Java, Comdex.

Note : Latest and additional good books may be suggested and added from time to time.

SUBJECT: DATA WAREHOUSE AND MINING
PAPER CODE: 17MCS24DA1

Course Outcomes:
By the end of the course the students will be able to:
  CO1 Compare different types of data and to propose different techniques based on it.
  CO2 Perform the pre-requisite phases: Extract, Transform and Load on the given dataset.
  CO3 Prepare the given dataset by applying different pre- processing techniques.
  CO4 Implement different data mining techniques on the pre- processed data set for extracting hidden patterns from data.
  CO5 Evaluate different techniques and prediction models by using different performance evaluators.

Maximum marks: 100 (**External: 80**, **Internal: 20**)   **Time:** 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In additio n to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT-I
Data Warehouse: Need for data warehouse, Definition, Goals of data Warehouse, Challenges faced during Warehouse Construction, Advantages, Types of Warehouse: Data Mart, Virtual Warehouse and Enterprise Warehouse.
Components of Warehouse: Fact data, Dimension data, Fact table and Dimension table, Designing fact tables. Pre-requisite Phases: Extract, Transform and load process. Warehouse Schema for multidimensional data: star, snowflake and galaxy schemas

UNIT-II
Data warehouse and OLAP technology: Difference between OLTP and OLAP, Strengths of OLAP, Applications of OLAP. Multidimensional data models: Data Cubes & Data Cuboids, Lattice.
OLAP operations: Advantages, Types: Roll up, Drill down, Pivot, Slice & Dice operations, Applications. OLAP Server: Need, Types: ROLAP, MOLAP and HOLAP, Features. Data warehouse Implementation, Introduction to Efficient computation of data cubes.

UNIT-III
Data preprocessing: Need, Integral steps of preprocessing: Data integration, Data transformation, Data reduction, Discretization and Concept Hierarchy Generation. Data mining primitives, Types of Data Mining Systems, Data generalization & Summarization based characterization, Analytical characterization.
Mining Association Rules in large databases: Association rule mining, Single dimensional Boolean association rules from Transactional Database Systems, Multi level association rules and Multidimensional association rules from relational DBS and DWS.

UNIT-IV
Classification and Prediction: Basic Classification & Prediction Model, Difference between Classification & Prediction. Classification Algorithms: Decision tree induction & Back propagation.
Prediction Algorithms: Regression approach: Linear & Non Linear regression. Cluster analysis:

Purpose, Types: Partitioning and Hierarchical methods, Density based methods, Applications of Data Mining: Web mining, Temporal and Spatial data mining.

Suggested Readings:

1. W.H.Inmon: Building Data Ware House, John Wiley & Sons.
2. S . Anahory and D.Murray: Data warehousing, Pearson Education, ASIA.
3. Jiawei Han & Micheline Kamber: Data Mining - Concepts & Techniques, Harcourt India PVT Ltd. (Morgan Kaufmann Publishers).
4. Michall Corey, M.Abbey, I Azramson & Ben Taub: Oracle 8i Building Data Ware Housing, TMH.
5. I.H. Whiffen: Data Mining, Practical Machine Cearing tools & techniques with Java (Morgan Kanffmen)
6. Sima Yazdanri & Shirky S. Wong: Data Ware Housing with oracle.
7. A.K. Pujari: Data Mining Techniques, University Press.
8. IBM An Introduction to Building the Data Warehouse, PHI Publication.
9. Pieter Adriaans Dolf Zantinge: Data Mining, Addition Wesley.
10. David Hand, Heikki Mannila, and Padhraic Smyth: Principles of Data Mining, PHI Publication.
11. Anahory S., Murray D. :Data Warehousing in the Real World, Addison Wesley.

Note : Latest and additional good books may be suggested and added from time to time.

SUBJECT: ANALYSIS AND DESIGN OF ALGORITHMS
Paper Code: 17MCS24DA2

Course Outcomes

By the end of the course the students will be able to:

CO1   Prove the correctness and analyze the running time of the basic algorithms for those classic problems in various domains;

CO2   Analyze worst-case running times of algorithms using asymptotic analysis.

CO3   Explain the major graph algorithms and their analyses. Employ graphs to model engineering problems, when appropriate.

CO4   Compare between different data structures. Pick an appropriate data structure for a design situation.

CO5   Apply the algorithms and design techniques to solve problems.

Maximum marks: 100 (**External: 80**, **Internal: 20**)   **Time:** 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In additio n to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT-I

Sets and disjoint: sets, union, sorting and searching algorithms and their analysis in terms of space and time complexity.

Divide and Conquer: General method, binary search, merge sort, quick sort, selection sort, Strassen's matrix multiplication algorithms and analysis of algorithms for these problems.

UNIT-II

Greedy Method: General method, Knapsack problem, Job sequencing with deadlines, Minimum spanning trees- Prim's and Kruskal's algorithms, Single source paths- Dijkastra algorithms and analysis of these problems.

Dynamic Programming: General method, Optimal binary search trees, 0/1 Knapsack, Traveling Salesperson Problem.

UNIT-III

Back Tracking: General method, 8 Queen's Problem, Graph coloring, Hamiltonian cycles and analysis of these problems.

Branch and Bound: Method, 0/1 Knapsack and Traveling Salesperson Problem, efficiency considerations.

UNIT-IV

NP Hard and NP Complete Problems: Basic concepts, Cook's theorem, NP hard graph and NP scheduling problems some simplified NP hard problems.

Advanced data structures: Red-Black trees, B-trees, Fibonacci Heaps.

Suggested Readings:

1. Fundamental of Computer algorithms, Ellis Horowitz and Sartaj Sahni, Galgotia Publ.
2. Introduction to Algorithms, Thomas H Cormen, Charles E Leiserson And Ronald L Rivest: TMH.
3. The Design and Analysis of Computer Algorithm, Aho A.V. Hopcroft J.E., Addison Wesley.
4. Algorithms-The Construction, Proof and Analysis of Programs, Berlion, P.Bizard, P., Johan Wiley & Sons.
5. Writing Efficient Programs, Bentley, J.L., PHI.
6. Introduction to Design and Analysis of Algorithm, Goodman, S.E. & Hedetnieni, MGH.
7. Introduction to Computers Science- An algorithms approach , Jean Paul Trembley, Richard B.Bunt, TMH.
8. Fundamentals of Algorithms: The Art of Computer Programming Voll, Knuth, D.E., Naresh Publ.

Note : Latest and additional good books may be suggested and added from time to time.

SUBJECT: MULTIMEDIA AND ITS APPLICATIONS
PAPER CODE: 17MCS24DA3

Course Outcomes:
By the end of the course the students will be able to:
   CO1 Design Multimedia by incorporating different components of multimedia effectively.
   CO2   Identify different 3D technologies including HDTV, UDTV and Hyper speech.
   CO3 Perform dithering on 24 bit color and 8 bit color and 8 bit grey images.
   CO4 Compress the photographs and videos by applying lossy as well as loss less techniques.
   CO5 Make an animated multimedia by incorporating different enhanced features.

Maximum marks: 100 (**External: 80**, **Internal: 20**)   **Time:** 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In additio n to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each unit.

UNIT-I
Introduction : Definition of multimedia, Multimedia Basics, Where to use Multimedia, Multimedia Elements, Multimedia Application, Virtual Reality, Delivering Multimedia, Multimedia Workstation Architecture, High resolution Graphic displays; Network architecture for Multimedia systems.
Evolving Technologies For Multimedia Systems: Hypermedia Documents; Hypertext - Hyper Speech - HDTV and UDTV, 3D Technology.
Multimedia Software: Overview of Multimedia Software Tools - Open Source Replacements - Multimedia Authoring - Some Useful Editing and Authoring Tools - VRML.

UNIT II
Text, Image and Sound Fundamentals: About Fonts and Face, Hypermedia and Hypertext. Images: Making Still Images, Bitmaps - 1 bit images - 8-bit gray level images - 8-bit color images- Dithering- 24 bit color images - Vector Drawing - Vector-Drawn Objects vs. Bitmaps. Sound: MIDI Audio - MIDI vs. Digital Audi; Multimedia System Sounds; Adding Sound to Your Multimedia Project, Audio Recording.

Animation: The Power of Motion- Principles of Animation - Animation by Computer - Animation Techniques, Types of Animation.

UNIT III
Data Compression: Need for Data compression - General Data compression Scheme - Compressio n standards - Non-lossy compression for images - Lossy compression for Photographs and video, Hardware Vs Software Compression, **:** Basics of Binary image compression **Data and File Format Standards:** Popular File Formats - RTF, RIFF, GIF, PNG, TIFF, MIDI, JPEG, JFIF, AVI,WAV, BMP,WMF, MIX, MPEG standards - TWAIN.

UNIT IV
Multimedia input/output Technologies: Limitations of Traditional input devices - Multimedia input output devices - PEN input - Working of Electronic Pen - Video and image display systems – Video display technology standards; CRT - display terminology, Flat panel display system.

Making Multimedia: The Stages of a Multimedia Project, Creativity, Organization, Communication - Hardware - Software - Text Editing and Word Processing Tools - OCR Software - Painting and Drawing Tools, 3-D Modeling and Animation, Authoring Systems - Making Instant Multimedia - Types of Authoring Tools.

Suggested Readings:

1. Bufford: Multimedia Systems, Addison Wesley.
2. Vaughan, Tay, 1993, Multimedia: Making It Work, Osborne/McGraw-Hill, Berkeley.
3. Jeffcoate : Multimedia in Practice, Prentice-Hall
4. Fundamental of Multimedia - Ze-Nian Li & M. S. Drew
5. Multimedia Systems Design - Prabhat k.Andleigh, Kiran Thakra.
6. Computer Graphics Multimedia and Animation - Malay K. Pakhira PHI , New Delhi.
7. Principles of Multimedia - Ranjan Parekh - TMGH, New Delhi - Twelfth Reprint,
8. Computer Graphics and Multimedia - Anirban Mukhapathyay, Aruop Chattopadhyay - Vikas Publishing Ltd - Second Edition
9. Multimedia Technology & Applications- David Hillman Galgotia Publications Pvt Ltd.- Second Edition

Note : Latest and additional good books may be suggested and added from time to time.

SUBJECT: INTERNET AND WEB DESIGNING
PAPER CODE-17MCS24DB1

Course Outcomes:
By the end of the course the students will be able to:

CO1 Review the current topics in Web & Internet technologies and describe the basic concepts for website and internet implementation.

CO2 Learn the basic working scheme of the Internet and World Wide Web and understand fundamental tools and technologies for web design.

CO3 Comprehend the technologies for Hypertext Mark-up Language (HTML), XML and specify design rules in constructing web pages and sites. Effectively deal with programming issues relating to VB Script, JavaScript, Java, ASP, Front Page and Flash. Create and Design websites.

CO4 Figure out the various security hazards on the Internet and need of security measures.

CO5 Create and use Cascading Style Sheet (CSS) and Information architecture document for a web site and construct a web site that conforms to the web standards of today and includes e-commerce and web marketing.

Maximum marks: 100 (**External: 80**, **Internal: 20**)   **Time:** 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT I
Introduction: Internet, Evolution of Internet, Types of Computer Network: LAN, WAN, MAN Internet Protocol, Internet Services, WWW, Working of Internet, Introduction to Intranet, DNS working, Configuring Internet Connection, Internet Connection Concepts, Connecting LAN to Internet; Client-**Server environment:** Single User, Multi User, Server, Workstation, Computer Network; Network Topologies; Network Protocols, E-Mail Concepts – Configuring E-Mail Program, Sending and Receiving Files through E-Mail, Fighting Spam, Sorting Mail, E-Mail mailing lists and avoiding E-Mail viruses.

UNIT-II
Searching and Web Casting Technique: Popular web servers, Web Browsers; basic features of browsers: bookmarks, cookies, progress indicators, customization of browsers, browsing tricks, next generation web browsing, search engines; Hypertext Transfer Protocol (HTTP), URL.
Internet Tools: Online Chatting, Messaging, and Conferencing Concepts, Usenet newsgroup concepts: Reading usenet newsgroups, Instant messaging, Web-Based chat rooms and discussion boards, Voice and Video conferencing. Streamlining Browsing, Keeping track of Favorite Web Sites, Web Security, Privacy, and Site-Blocking.

UNIT-III
Web Designing using HTML: Understanding HTML, XHTML Syntax and Semantics, HTML Elements: Paragraph, Lists, Tables, Images, Frames, Forms, Linking to other Web Pages: External and

Internal linking, E-mail Links; Working with Background colors and Images; Marquee; Text Alignment and Text Formatting, Advanced Layout with Tables; Publishing HTML Pages.

UNIT-IV

Cascading Style Sheets: Introduction, Inline, Internal, External CSS, Linking CSS to Web Page.

Client–Side Programming: Introduction to JavaScript, Basic Syntax, Variables and Data types, Statements, Operators, Literals, Functions, Objects, Arrays.

XML: Relation between XML and HTML, Goals of XML, Structure and Syntax of XML, Well Formed XML, DTD and its Structure, tree structures in data organization, Searching with XPath.

Suggested Readings:
1. Fundamentals of the Internet and the World Wide Web, Raymond Greenlaw and Ellen Hepp.TMH.
2. Internet & World Wide Programming, Deitel, Deitel & Nieto. Pearson Education.
3. Complete reference guide to java script, Aron Weiss, QUIE.
4. Dick Oliver: Tech Yourself HTML 4 in 24 Hours, Techmedia.
5. Satish Jain: "O" – Level Information Technology,
6. Craig Zacker: 10 minutes Guide to HTML Style Sheets, PHI.
7. V.K. Jain: "O" – Level Information Technology, BPB Publications

Note : Latest and additional good books may be suggested and added from time to time.

SUBJECT: SOFTWARE TESTING
PAPER CODE: 17MCS24DB2

Course Outcomes:
By the end of the course the students will be able to:
- CO1 Provide examples for the objectives of testing in different phases of the software life cycle
- CO2 Explain and compare the terms error, defect, fault, failure and the corresponding terms mistake and bug, using examples
- CO3 Describe why testing is part of quality assurance and explain how testing contributes to higher quality.
- CO4 Classify different types of test tools according to their
- CO5 Define different test cases, considering prioritization, and technical and logical dependencies

Maximum marks: 100 (**External: 80**, **Internal: 20**)   **Time:** 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In additio n to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT-I
Introduction: Faults, Errors, and Failures, Basics of software testing, Testing objectives, Principles of testing, Requirements, behaviour and correctness, Testing and debugging, Test metrics and measurements, STLC, Verification, Validation,
Types of testing: Functional and non – functional Testing; system testing, recovery testing, security testing, stress testing, performance testing, usability testing; Software Quality and Reliability, Software defect tracking.

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

UNIT-III
Integration, System, and Acceptance Testing: Top down and Bottom up integration, Bi-directional integration, System integration, Scenario Testing, Defect Bash, Design/Architecture verification, Deployment testing, Scalability testing, Reliability testing, Alpha, Beta and Acceptance Testing: Acceptance criteria; test cases selection and execution.
Testing Object Oriented Software: Unit Testing in OO Context, Integration Testing in OO Context, OO testing methods, Class level testing, Interclass test case design, testing for real time system.

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

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

Suggested Readings:
1. Jorgensen P. C., "Software Testing-A Craftman's Approach", CRC Press.
2. Software Testing techniques - Baris Beizer, Dreamtech.
3. Software Testing Tools – Dr.K.V.K.K.Prasad, Dreamtech.
4. Jeff Tian, Software Quality Engineering (SQE), Wiley
5. Stephen H. Kan, Metrics and Models in Software Quality Engineering, Addison-Wesley
6. John W. Horch, Practical Guide to Software Quality Management, Artech house publisher.
7. Robert Dunn, Software Quality Concepts and Plans, Prentice-Hall.
8. Alan Gillies, Software Quality, Theory and Management, Chapman and Hall.
9. Tom Gilb, Principles of Software Engineering Management, Addison-Wesley.
10. Michael Dyer, The Cleanroom approach to Quality Software Engineering, Wiley & Sons.

Note : Latest and additional good books may be suggested and added from time to time.

SUBJECT: ADVANCES IN DATABASE SYSTEMS
PAPER CODE: 17MCS24DB3

Course Outcomes:-

By the end of the course the students will be able to:

CO1 Understand the fundamentals of DBMS and conceptual design using EER model with prerequisite .

CO2 Understand differences between OODBMS and ORDBMS with their various features.

CO3 Learn the concepts of Client-Server technology, Parallel and distributed Database with their architectures and concepts.

CO4 Learn how to retrieve information and analysis of data using mining approach.

CO5 To understand the concepts of advance databases and emerging technologies such as cloud computing and big data with their various framework..

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Maximum marks: 100 (**External: 80**, **Internal: 20**)   **Time:** 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT-I
The Extended Entity Relationship Model: The ER model revisited, EER model.

Object-Oriented Databases: Overview of Object-Oriented concepts, Encapsulation of operations, Methods and Persistence, Type hierarchies and Inheritance, Type extents and queries, Complex objects; Database schema design for OODBMS; OQL, Persistent programming languages; OODBMS architecture and storage issues; Transactions and Concurrency control.

UNIT-II
Object Relational Database: Database design for an ORDBMS – Nested relations and collections; Storage and access methods, Query processing and Optimization, Comparison of OODBMS and ORDBMS.

Decision Support Systems: Information Retrieval Systems, Decision Support system, Data Analysis and OLAP, Data Mining.

UNIT-III
Parallel Database: Architectures for parallel databases, Parallel query evaluation; Parallelizing individual operations, Sorting, Joins;

Distributed database: Distributed database concepts, Data fragmentation, Replication, and allocation techniques for distributed database design; Query processing in distributed databases; Concurrency control and Recovery in distributed databases

UNIT-IV

Client-Server Architecture: Client   Server   Architectures: Two-tier and Three-tier Client   Server Architecture, Server Architectures.

Enhanced Data models: Active database, Temporal database, Spatial databases: Concepts and architecture, Deductive databases and Query processing; Mobile databases, Geographic information systems, Multimedia databases.

Suggested Readings:
1. Elmasri and Navathe, Fundamentals of Database Systems, Pearson Education.
2. Korth, Silberchatz, Sudarshan, Database System Concepts, McGraw-Hill.
3. Raghu Ramakrishnan, Johannes Gehrke, Database Management Systems, McGraw-Hill
4. Peter Rob and Coronel, Database Systems, Design, Implementation and Management, Thomson Learning.
5. C.J.Date, Longman, Introduction to Database Systems, Pearson Education
6. Thomas Connolly,Carolyn Begg, Database Systems, Pearson Education.

Note : Latest and additional good books may be suggested and added from time to time.

PRACTICAL-IV
PAPER CODE: 17MCS24CL
(BASED ON 17MCS24C1, 17MCS24DB1)

Course Outcomes:

By the end of the course the students will be able to:

CO1 Clarify the overloading concept with suitable example.

CO2 Demonstrate in detailed on multilevel inheritance with suitable example.

CO3 Demonstrate on multiple Thread class and use setPriority method with suitable example.

CO4 Elaborate on runtime polymorphism with suitable example.

CO5 Demonstrate on applet with differentiate between main () method using suitable example.

CO6 Learn the basic working scheme of the Internet and World Wide Web and understand fundamental tools and technologies for web design.

CO7 Comprehend the technologies for Hypertext Mark-up Language (HTML), XML and specify design rules in constructing web pages and sites. Effectively deal with programming issues relating to VB Script, JavaScript, Java, ASP, Front Page and Flash.

CO8 Create and Design websites.

CO9 Figure out the various security hazards on the Internet and need of security measures.

CO10 Create and use Cascading Style Sheet (CSS) and Information Architecture document for a web site and construct a web site that conforms to the web standards of today and includes e-commerce and web marketing.

PROJECT REPORT
PAPER CODE: 17MCS24C3

Course Outcomes

At the end of the course / on completion of the course, the students will be able to:

CO1 Use of various software engineering principles used in developing programming solutions to a system.

CO2 Identify the programming technologies: languages and database etc to be used for developing a software solution.

CO3 Understand and analyze the work schedule and its phases to develop a Project.

CO4 Implement the software design in the chosen programming languages/database etc.

CO5 Test the code for validation and verification of user requirements of the software. Work in a team for software development.

PAPER CODE: 17MCS24C3

Max Marks: 100

Project Guidelines

1. Each student should carry out Project using the software development tools /languages/ technologies that they have learnt and/or have studied during the concerned semester or any other development tools in view of the ongoing Software Industry trends.

2. It should be done by the student in an organization/college under the supervision of the staff(s) assigned by Head of the Department/Director/Principal.

3. The Project has to be assigned to the students in the beginning of the 4th Semester.