# PROGRAMME OF STUDY OF M.SC. I.T. PART I
# (SEMESTER I & II)
# 2021-22, 2022-23 SESSIONS

## Semester-I

| Paper Code | Name of Subject | Contact hours per week | | | | Examination scheme marks | | | | Credit |
|---|---|---|---|---|---|---|---|---|---|---|
| | | L | T | P | Total | Internal | External | Practical | Total | |
| MS-111 | Computer Fundamentals | 4 | 1 | | 5 | 30 | 70 | | 100 | 5 |
| MS-112 | Computer Programming using C | 5 | | | 5 | 30 | 70 | | 100 | 5 |
| MS-113 | Computer Organization and Architecture | 4 | 1 | | 5 | 30 | 70 | | 100 | 5 |
| MS-114 | Mathematical Foundation of Computer Science | 4 | 1 | | 5 | 30 | 70 | | 100 | 5 |
| MS-115 | Operating Systems | 4 | 1 | | 5 | 30 | 70 | | 100 | 5 |
| MS-116 | Programming Lab – I (Based on MS-112 ) | | | 4 | 4 | 30 | | 70 | 100 | 2 |
| MS-117 | CBC-I* | 2 | | | 2 | 50 | | | 50 | 2 |
| | **Total** | **23** | **4** | **4** | **31** | **230** | **350** | **70** | **650** | **29** |

## Semester-II

| Paper Code | Name of Subject | Contact hours per week | | | | Examination scheme marks | | | | Credit |
|---|---|---|---|---|---|---|---|---|---|---|
| | | L | T | P | Total | Internal | External | Practical | Total | |
| MS-121 | Object Oriented Programming Using C++ | 5 | | | 5 | 30 | 70 | | 100 | 5 |
| MS-122 | Data and File Structures | 5 | | | 5 | 30 | 70 | | 100 | 5 |
| MS-123 | Software Engineering | 4 | 1 | | 5 | 30 | 70 | | 100 | 5 |
| MS-124 | RDBMS and Oracle | 5 | | | 5 | 30 | 70 | | 100 | 5 |
| MS-125 | Programming Lab – II (Based on MS-121 & MS-122) | | | 4 | 4 | 30 | | 70 | 100 | 2 |
| MS-126 | Programming Lab – III (Based on MS-124) | | | 4 | 4 | 30 | | 70 | 100 | 2 |
| MS-127 | CBC-II** | | | 4 | 4 | 50 | | | 50 | 2 |
| | **Total** | **19** | **1** | **12** | **32** | **230** | **280** | **140** | **650** | **26** |

**APPROVED**
Board of Studies Meeting held on 23rd June 2021

***CBC-I: Students can opt any of the following papers:**

| | |
|---|---|
| MS-117 E1 | Computer Oriented Statistical Methods |
| MS-117 E2 | Quantitative Aptitude & Reasoning |

****CBC-II: Students can opt any of the following papers:**

| | |
|---|---|
| MS-127 E1 | Workshop on Corel Draw |
| MS-127 E2 | Workshop on Adobe Photoshop |

**NOTE:**

The Break-up of Marks for Practical exams (External) will be as under:

1. Viva Voce (External examination) 20 Marks
2. Program Development and Execution 20 Marks
3. File Record 30 Marks

The breakup of marks for Workshop Examination will be as under

1. Practical file Evolution 15 Marks
2. Viva Voce 15 Marks
3. Program Development and Execution 20 Marks

Internal Assessment of **30%** will be based on Continuous Comprehensive Assessment (CCA) pattern and the breakup of **30%** will be as under:

| | |
|---|---|
| Mid Semester Tests-I | 25% |
| Mid Semester Tests-II | 25% |
| Attendance | 15% |
| Seminars / Projects | 35% |

**Complete M.Sc. (IT) Course carries 100 credits and each core paper carries 5 Credits and Workshop and Practical carries 2 Credits.**

**Total Credits= 29+26+21+24=100 Credits**

**PAPER: MS-111**
**Computer Fundamentals**
**5 CREDITS: 4H(L) + 1H(T)**

Teaching Hours per week: 5
Time Allowed: 3 Hrs.
Pass Marks: 35%

Internal Assessment: 30 Marks
External Marks: 70 Marks

**Instructions for Paper Setter/Examiners**

The Question paper will consist of three sections-A, B & C. Section A and B will have four questions each from the respective unit of the syllabus and will carry 10 marks each. Candidates are required to attempt two questions each from section A and B. Section C will consist of 10 short answer type questions covering entire syllabus and will carry 3 marks each. Section C is Compulsory.

**Course Objective:** This course is meant to prepare students for work in industry in the information processing fields as well as prepare students for business and computer-related courses. On completion of this course, the students will be able to:

1. Have basic knowledge of computer hardware and software and e-technology;
2. Understand business areas to which computers may be applied;
3. Provide an introduction to business organization and information systems;
4. Develop the skills in communication, verbal and written, which play an important part in business computing and information processing;

**UNIT-I**

**Introduction:** Historical Evolution of Computer, Block Diagram of computer, characterization of computers, types of computers, the computer generations.

**Basic Anatomy of Computers:** memory unit, input-output unit, arithmetic logic unit, control unit, central processing unit, RAM, ROM, PROM, EPROM.

**Input-Output Devices**: Keyboard, Mouse, Joy tick, Track Ball, Touch Screen, Light Pen, Digitizer, Scanners, Voice Recognition Devices, Optical Recognition devices, Web Cameras, electronic white board, Dot matrix, Character and Line printer, Desk Jet printer, Laser printer, and plotters, projectors, Headphone.

**Number System:** Non-positional and positional number systems, Base conversion, binary, decimal, hexadecimal, and octal systems, conversion from one system to the other.

**Binary Arithmetic:** Addition, subtraction and multiplication. Computer Codes: weighted and non-weighted code, BCD, EBCDIC, ASCII, Unicode, XS-3, Grey Codes.

**UNIT-II**

**Computer Software:** Introduction, types of software, systems software, GUI, operating system, high level languages, assemblers, compilers and interpreters, system utilities, application packages.

**Basic concepts of algorithm and Flow Charts:** Flow charts, algorithm and decision tables,

stages in the development of computer program, testing and debugging, program documentation.

**Internet Related Concepts:** Internet, Uses of Internet, Basic services of Internet, Email, FTP, TELNET, and WWW. Familiarities with terms: HTTP, HTTPS, URL, Web Browsers, IP Address, Domain Name, ISP, Web Portal, Search Engines, Blog, Surfing, Wiki, 5G networks

**Applications of Information Technology and Trends:** IT in Business and Industry, IT in Education & training, IT in Science and Technology, IT and Entertainment, Current Trends in IT Application - AI, Virtual Reality, Voice Recognition, Robots, Multimedia Technology.

**E-Commerce:** Meaning, its advantages & limitations, Infrastructure for E-commerce, Types of E-Commerce Applications.

**Text Books:**

1. P.K. Sinha and P. Sinha, Foundations of Computing, First Edition, BPB. Reference Books

**Reference Books:**

1. Chetan Srivastva, Fundamentals of Information Technology, Kalyani Publishers.
2. Satish Jain, Information Technology, BPB.
3. Sukhmeen Kaur, Vikram Gupta, S.S. Bhatia and Navneet Kaur, "Fundamentals of Information Technology", Kalyani Publishers.

**PAPER: MS-112**
**Computer Programming using 'C'**
**5 CREDITS: 5H (L)**

Teaching Hours per week: 5 | Internal Assessment: 30 Marks
Time Allowed: 3 Hrs. | External Marks: 70 Marks
Pass Marks: 35%

**Instructions for Paper Setter/Examiners**

The Question paper will consist of three sections-A, B & C. Section A and B will have four questions each from the respective unit of the syllabus and will carry 10 marks each. Candidates are required to attempt two questions each from section A and B. Section C will consist of 10 short answer type questions covering entire syllabus and will carry 3 marks each. Section C is Compulsory.

**Course Objectives:** This course is designed to explore computing and to show students the art of computer programming. Students will be able to learn Understand programming using C concepts for writing good programs. On completion of this course, the students will be able to:

1. Write, compile and debug programs in C language.
2. Use different data types, operators and console I/O function in a computer program.
3. Design programs involving decision control statements, loop control statements and case control structures.
4. Understand the implementation of arrays, pointers and functions and apply the dynamics of memory by the use of pointers.
5. Comprehend the concepts of structures and union.
6. Use the basic file operations.

**UNIT-I**

**Programming Process:** Problem definition, Program design, Coding, Compilation and Debugging, Program Development.

**Basic Constructs:** Identifiers, Keywords, Tokens, Constants, Data Types, Input and Output in C, Type Conversions, Operators and Expressions, Hierarchy of Operators, Precedence & Associativity, Control Statements: Branching, Looping and Jumping.

Functions: Definition, Prototype, Different types of functions based on arguments and return type, Parameter passing mechanisms, concept of recursive function.

**Storage Classes:** Different Storage Classes (static, auto, extern, register), Global and Local variables.

**UNIT-II**

**Arrays:** Definition, accessing elements, initialization, Passing Arrays to functions, Multi-

dimensional arrays, String handling.

**Applications of linear arrays:** Linear and Binary Search, Bubble Sort and Selection Sort.

**Pointers:** Address and Dereferencing Operators, Declaration, Assignment, Passing addresses to functions, Using Pointer Arrays to sort n strings.

**Structures and Unions:** Variables, Accessing members, Nested Structures, Pointer to Structures, Concept of self-referential structures, Difference between a Union and Structure.

**File Handling in C:** Processing a text file through C program.

**Text Books:**

1. Byron Gottfried , Jitendra Chhabra, "Programming with C, 3rd Edition, Schaum' s Outline Series, Tata McGraw Hill.
2. Shubhnandan S. Jamwal, Programming in C, Pearson Publications, 2017.

**Reference Books:**

3. E. Balagurusamy, "Programming in C", Tata McGraw Hill.
4. Ram Kumar and Rakesh Aggarwal: Programming in ANSI C, TMH.
5. Brian W. Kernighan / Dennis Ritchie, The C Programming Language", 2nd edition, PHI.

**PAPER: MS-113**
**Computer Organization and Architecture**
**5 CREDITS: 4H (L) +1(T)**

Teaching Hours per week: 5
Time Allowed: 3 Hrs.
Pass Marks: 35%

Internal Assessment: 30 Marks
External Marks: 70 Marks

**Instructions for Paper Setter/Examiners**

The Question paper will consist of three sections-A, B & C. Section A and B will have four questions each from the respective unit of the syllabus and will carry 10 marks each. Candidates are required to attempt two questions each from section A and B. Section C will consist of 10 short answer type questions covering entire syllabus and will carry 3 marks each. Section C is Compulsory.

**Course Objective:** This course will introduce students to the fundamental concepts underlying modern computer organization and architecture. On completion of this course, the students will be able to:

1. Understand the basics of computer hardware and how software interacts with computer hardware.
2. Analyze and evaluate computer performance.
3. Understand how computers represent and manipulate data.
4. Understand computer arithmetic and convert between different number systems.
5. Assemble a simple computer with hardware design including data format, instruction format, instruction set, addressing modes, bus structure, input/output, memory, Arithmetic/Logic unit, control unit, and data, instruction and address flow.
6. Use Boolean algebra as related to designing computer logic, through simple combinational and sequential logic circuits.

**UNIT - I**

**Digital Logic Circuits:** Logic Gates, Boolean expression - Minimization of Boolean expressions - Minterm - Maxterm - Sum of Products (SOP) - Product of Sums (POS) - Karnaugh map minimization- Don't care conditions.

**Combinational and Sequential circuits:** half-adder, full adder, Flip-Flops: SR, D-Flip Flop, JK Flip Flop, race- around condition, Master Slave J-K Flip Flop, D-Flip-Flop, and Excitation Tables of Flip Flops. Edge- Triggered Flip Flops.

**Digital Components:** Multiplexer, Demultiplexer, decoder, encoder, Registers, Asynchronous/ Ripple counter, Synchronous Decade counter (using JK flip flop).

**Basic Computer Organization and Design:** Instruction Codes, Stored program organization, Computer registers, Common bus system, Computer instructions, Timing and

Control, Instruction cycle, Memory reference instructions.

## UNIT - II

**Register Transfer and Micro-operations:** Register transfer language, Register transfer micro operations, Arithmetic, Logic and Shift micro operations, Arithmetic Logic Shift unit.

**Central Processing Unit:** General register organization, Instruction formats – three address, two address, one address, zero address instructions, Addressing modes, Types of Interrupts, RISC and CISC features.

**Memory Organization:** Memory hierarchy, Associative memory, Cache memory, Virtual **m**emory.

**Input-Output Organization:** Input output interface, I/O bus and interface modules, I/O vs. memory bus, isolated vs. Memory mapped I/O Asynchronous data transfer, handshaking, Programmed I/O, Interrupt-initiated I/O, DMA.

**References:**

1. M.M. Mano, “Computer System Architecture”, Third Edition, Prentice-Hall of India.
2. A.S. Tannenbaum, “Structured Computer Organisation”, Prentice- Hall of India.
3. William Stallings, “Computer Organisation and Architecture", Pearson Education.
4. Computer Architecture and Organization by John P Hayes, Tata McGraw Hill.

**PAPER: MS-114**
**Mathematical Foundation of Computer Science**
**5 CREDITS: 4H (L) +1(T)**

Teaching Hours per week: 5 Internal Assessment: 30 Marks
Time Allowed: 3 Hrs. External Marks: 70 Marks
Pass Marks: 35%

**Instructions for Paper Setter/Examiners**

The Question paper will consist of three sections-A, B & C. Section A and B will have four questions each from the respective units of the syllabus and will carry 10 marks each. Candidates are required to attempt two questions each from section A and B. Section C will consist of 10 short answer type questions covering entire syllabus and will carry 3 marks each. Section C is Compulsory.

**Course Objective:** The purpose of this course is to provide a clear understanding of the concepts that underlying fundamental concepts and tools in discrete mathematics with emphasis on their applications to computer science. It emphasizes mathematical definitions and proofs as well as applicable method. On completion of this course, the students will be able to:

1. Be familiar with the basic terminology of functions, relations, and sets and demonstrate knowledge of their associated operations.
2. Master to solve advanced mathematical problems, apply various methods of mathematical proof, and communicate solutions in writing
3. Master to comprehend advanced mathematics, and present the material orally and in writing
4. Utilize the knowledge of computing and mathematics appropriate to the discipline.
5. Evaluate mathematical principles and logic design

**UNIT - I**

**Logic:** Propositions, Implications, Precedence of Logical Operators, translating English Sentences, System Specifications. Propositional Equivalences, Predicates and Quantifiers, Nested Quantifiers, Order of Quantifiers, Sets, Power Set, Set Operations, Functions, One-to-One Functions and Onto Functions, Inverse and Composition of Functions, Floor Function, Ceiling Function.

Mathematical Induction, The Basic of counting, The Pigeonhole Principle.

**UNIT - II**

Recurrence Relations, solving recurrence relations, Divide and Conquer Algorithms and Recurrence Relations, Generating functions for sorting recurrence relations, Inclusion-Exclusion.

Relations and their properties, n-any relations and their applications, representing relations, closure of relation, equivalence relations, partial ordering.

**Graphs:** Introduction, terminology, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamiltonian Paths, Shortest Path Problems, Planar Graphs.

**References:**

1. Rosen, K.H: Discrete Mathematics and Its Applications, TMH Publications. Discrete and Combinational Mathematics, Ralph P. Grimaldi, Pearson Education.
2. Elements of Discrete Mathematics, C. L. Luie, TMH Publications. Discrete Mathematics, Richard Johnson, Baugh, Pearson Education.
3. Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay& R. P. Manohar, MGH Publications.
4. Discrete Mathematical Structures, B.Kotman, R.C. Busbay, S.Ross, PHI.

**PAPER: MS-115**
**Operating Systems**
**5 CREDITS: 4H (L) +1(T)**

Teaching Hours per week: 5
Time Allowed: 3 Hrs.
Pass Marks: 35%

Internal Assessment: 30 Marks
External Marks: 70 Marks

**Instructions for Paper Setter/Examiners**

The Question paper will consist of three sections-A, B & C. Section A and B will have four questions each from the respective unit of the syllabus and will carry 10 marks each. Candidates are required to attempt two questions each from section A and B. Section C will consist of 10 short answer type questions covering entire syllabus and will carry 3 marks each. Section C is Compulsory.

**Course Objective:** This course is designed to explore the unifying concept of the operating system as a collection of cooperating sequential processes. On completion of this course, the students will be able to:

1. Learn the mechanisms of OS to handle processes and threads and their communication. Use different data types, operators and console I/O function in a computer program.
2. Learn the mechanisms involved in memory management in contemporary OS.
3. Gain knowledge on distributed operating system concepts that includes architecture, deadlock detection algorithms and agreement protocols.
4. Understand different approaches to memory management. Understand the structure and organization of the file system.

**UNIT-I**

**Introduction to Operating System:** Definition, Its need, Services, Early systems.

**Types of Operating Systems:** Batch processing operating system, Multiprogramming operating system, Time Sharing operating system, Multi-tasking operating system, Distributed operating system, Network operating system, Real time operating system, Multi-processor system and Parallel Processing, Mobile Operating System.

**Process Management:** Process concept, types of Process scheduling, basic concepts of CPU Scheduling, Scheduling Criteria, and Scheduling algorithms: FCFS, SJF, Round Robin & Queue Algorithms.

**Deadlocks:** Deadlock Definition and its Characterization.

**UNIT-II**

**Windows: MS-Windows:** Operating system-Definition & functions, basics of Windows. Basic components of windows, icons, types of icons, taskbar, activating windows, using

desktop, title bar, running applications, exploring computer, managing files and folders, copying and moving files and folders.

**Control Panel –** Display properties, adding and removing software and hardware, setting date and time, screensaver and appearance. Using Windows Accessories.

**Linux:** History & Features of Linux, Linux Architecture, File System of Linux, Hardware Requirements of Linux, Various flavours of Linux, Linux Standard Directories, Functions of Profile and Login Files in Linux, Linux Kernel.

**Linux Commands:** bc, cal, cat, cd, clear, cmp, cp,mv, date, find, ls, pwd, mkdir, more, rm, rmdir, chgrp, chmod, chown, tty, wc, who, whois, grep, telnet, overview of vi editor, basics of shell programming.

**Text Books:**

1. Andy Rathbone, "Windows for dummies", Pustak Mahal.
2. Stan Kelly-Bootle, "Understanding UNIX", BPB Publications.
3. Silverschatz , "Operating system concepts", Pearson education India.

**Reference Books:**

1. Tom Adelstein and Bill Lubanovic, Linux System Administration, O'Reilly Media, Inc.
2. Harvey M. Deitel, Operating Systems, Prentice Hall.
3. Andrew S. Tanenbaum, Modern Operating System, Prentice Hall.

**PAPER: MS 116**
**Programming Lab-I (Based on MS-112)**
**2 CREDITS: 4H (P)**

Teaching Hours per week: 4 Internal Assessment: 30 Marks
Time Allowed: 3 Hrs. External Marks: 70 Marks
Pass Marks: 35%

This laboratory course will mainly comprise of exercises based on subject MS-112: Computer Programming Using C. Students are required to develop programs based upon:

1. Various data types in C language
2. Various constructs in the C language
3. Reading/ Writing text files.

The Break-up of Marks for Practical exams (External) will be as under:

| | |
|---|---|
| 1. Viva Voce (External examination) | 20 Marks |
| 2. Program Development and Execution | 30 Marks |
| 3. File Record | 20 Marks |

**PAPER: MS-117 E1**
**Computer Oriented Statistical Methods**
**2 CREDITS: 2H (L)**

Teaching Hours per week: 2 Internal Assessment: 50 Marks
Time Allowed: 3 Hrs.
Pass Marks: 35%

**Instructions for Paper Setter/Examiners**

The Question paper will consist of three sections-A, B & C. Section A and B will have four questions each from the respective unit of the syllabus and will carry 5 marks each. Candidates are required to attempt two questions each from section A and B. Section C will consist of 10 short answer type questions covering entire syllabus and will carry 3 marks each. Section C is Compulsory.

**UNIT-I**

**Statistics:** Diagrammatic and Graphical representation of Numerical Data, Formation of frequency distribution, Histogram, Cumulative Frequency - Polygon and Ogives.

**Measures of Central tendency:** Mean, Median, Mode. Measures of Dispersion: Mean deviation, Standard deviation, variance, Quartile deviation and coefficient of variation, Moments (upto 4th), Measures of Skewness and Kurtosis for grouped and ungrouped data.

**UNIT - II**

**Correlation:** Meaning and types of correlation, correlation and causation, Methods of correlation: product moment correlation coefficient - rank correlation coefficient.

**Regression analysis:** Linear regression - method of least squares for estimation of regression coefficient.

**Concept of sampling and Sampling distributions:** Chi square tests for goodness of fit and test for independence of attributes in contingency table.

**References:**

1. Rajaraman, "Computer Oriented Numerical Methods", PHI, New Delhi.
2. Murray R Spiegel, Larry J. Stephens - "Statistics" Schaum's Outlines
3. J.H. Mathews," Numerical Methods for Computer Science, Engineering and Mathematics", PHI.
4. M K. Jain, S.R.K. Iyengar and R.K. Jain," Numerical Methods for Scientific and Enginerring Computation", Wiley Eastern Limited, New Delhi.

**PAPER: MS-117 E2**
**Quantitative Aptitude & Reasoning**
**2 CREDITS: 2H (L)**

Teaching Hours per week: 2 Internal Assessment: 50 Marks
Time Allowed: 3 Hrs.
Pass Marks: 35%

**Instructions for Paper Setter/Examiners**

The question paper will consist of two sections with multiple choice questions. Section A and B will have 25 multiple choice questions from each respective unit of the syllabus. Candidates are required to attempt all the questions.

**Course Objectives:**

1. This course provides the students with an understanding of deductive and inductive reasoning
2. To make students understand both Verbal and Non Verbal Reasoning.
3. To practice various quantitative aptitude question.

**UNIT- I**

**Verbal Reasoning:** Number series, Letter & symbol series, Logical Reasoning problems, Alphabet test, Blood relations, Direction sense test, Input output, Coding-decoding, Number Ranking

**Non-verbal Reasoning:** Making series/analogy, Classification, Series test, Odd figures.

**UNIT- II**

**Quantitative aptitude:** whole numbers problems, Problems on Trains, Numbers and Ages, Percentage Problems, Boats and Streams, Ratio & Proportion, Square roots, Averages, Interest, Heights and Distances, Time and distance, Series, Time & Work, Data Interpretation.

**References:**

1. R.S Aggarwal, “Quantitative aptitude”.
2. R.S Aggarwal , “Verbal and non-verbal Reasoning”.

**PAPER: MS-121**
**Object Oriented Programming Using C++**
**5 CREDITS: 4H (L) +1(T)**

Teaching Hours per week: 5 Internal Assessment: 30 Marks
Time Allowed: 3 Hrs. External Marks: 70 Marks
Pass Marks: 35%

**Instructions for Paper Setter/Examiners**

The Question paper will consist of three sections-A, B & C. Section A and B will have four questions each from the respective unit of the syllabus and will carry 10 marks each. Candidates are required to attempt two questions each from section A and B. Section C will consist of 10 short answer type questions covering entire syllabus and will carry 3 marks each. Section C is Compulsory.

**Course Objective:** This course is designed to explore computing and to show students the art of computer programming. Students will be able to learn Understand object oriented programming and advanced C++ concepts for writing good programs. On completion of this course, the students will be able to:

1. Write, compile and debug programs in C++ language.
2. Use different data types, operators and console I/O function in a computer program.
3. Design programs involving decision control statements, loop control statements and case control structures.
4. Understand the implementation of arrays, pointers and functions and apply the dynamics of memory by the use of pointers.
5. Comprehend the concepts of structures and classes: declaration, initialization and implementation.
6. Apply basics of object oriented programming, polymorphism and inheritance.
7. Use the file operations, character I/O, string I/O, file pointers, pre-processor directives and create/update basic data files.

**UNIT- I**

**Evolution of OOP:** Procedure Oriented Programming, OOP Paradigm, Advantages and disadvantages of OOP over its predecessor paradigms. Characteristics of Object Oriented Programming.

**Introduction to C++:** Identifier, Keywords, Constants. Operators: Arithmetic, relational, logical, conditional and assignment. Size of operator, Operator precedence and associativity. Type conversion, Variable declaration, expressions, statements, manipulators. Input and output statements, stream I/O, Conditional and Iterative statements, breaking control statements. Storage Classes, Arrays, Arrays as Character Strings, Structures, Unions, Bit fields, Enumerations and User defined types.

**Pointers:** Pointer Operations, Pointer Arithmetic, Pointers and Arrays, Multiple indirections,

Pointer to functions.

**Functions:** Prototyping, Definition and Call, Scope Rules. Parameter Passing by value, by address and by reference, Functions returning references, Const functions, recursion, function overloading, Default Arguments, Const arguments, Pre-processor, Type casting.

## UNIT- II

**Classes and Objects:** Class Declaration and Class Definition, Defining member functions, making functions inline, Nesting of member functions, Members access control. THIS pointer. Objects: Object as function arguments, array of objects, functions returning objects, Const member. Static data members and Static member functions, Friend functions and Friend classes.

**Constructors:** properties, types of constructors, Dynamic constructors, multiple constructors in classes. Destructors: Properties, Virtual destructors. Destroying objects, Rules for constructors and destructors. Array of objects. Dynamic memory allocation using new and delete operators, Scopes: Local, Global, Namespace and Class.

**Inheritance:** Defining derived classes, inheriting private members, single inheritance, types of derivation, function redefining, constructors in derived class, Types of inheritance, Types of base classes, Code Reusability.

**Polymorphism:** Methods of achieving polymorphic behavior.

**Operator overloading:** overloading binary operator, overloading unary operators, rules for operator overloading, operator overloading using friend function. Function overloading: early binding, Polymorphism with pointers, virtual functions, late binding, pure virtual functions and abstract base class.

**Templates:** Generic Functions and Generic Classes, Overloading of template functions.

**Exception Handling:** Exception Handling catching class types, handling derived class exceptions, catching exceptions

**Files and streams:** Open/ Close Files commands. Read/write operations on files.

**References:**


1. Herbert Schildt, “The Complete Reference C++”, Tata McGraw-Hill.
2. Deitel and Deitel, “C++ How to Program”, Pearson Education.
3. Robert Lafore, “Object Oriented Programming in C++”, Galgotia Publications.
4. BjarneStrautrup, “The C++ Programming Language”, Addition- Wesley Publication Co. Stanley B. Lippman, JoseeLajoie, “C++ Primer”, Pearson Education.
5. E. Balagurusamy, “Object Oriented Programming with C++”, Tata McGraw-Hill.

**PAPER: MS-122**
**Data and File Structures**
**5 CREDITS: 5H (L)**

Teaching Hours per week: 5 Internal Assessment: 30 Marks
Time Allowed: 3 Hrs. External Marks: 70 Marks
Pass Marks: 35%

**Instructions for Paper Setter/Examiners**

The Question paper will consist of three sections-A, B & C. Section A and B will have four questions each from the respective unit of the syllabus and will carry 10 marks each. Candidates are required to attempt two questions each from section A and B. Section C will consist of 10 short answer type questions covering entire syllabus and will carry 3 marks each. Section C is Compulsory.

**Course Objective:** This course is designed to explore computing and to show students the art of practical implementation and usage of Algorithms and Data Structures. On completion of this course, the students will be able to:

1. Be familiar with basic data structure of algorithms. Design and analyze programming problem statements
2. Choose appropriate data structures and algorithms and use it to design algorithms for a specific problem.
3. Handle operations like searching, insertion, deletion and traversing mechanism
4. Come up with analysis of efficiency and proofs of correctness

## UNIT- I

**Data Structure:** Introduction to data structure and algorithm, Algorithm analysis: Time space trade off algorithms and Big O notation.

**Arrays:** Introduction, one dimensional and multidimensional arrays, memory representation of arrays, operations on arrays, sparse arrays and sparse matrices and their implementation, Advantages and limitation of arrays.

**Stacks**: Introduction; Operation on stacks; Implementation of stacks, Application of stacks: matching parenthesis, evaluation of arithmetic expressions, conversion from infix to postfix, recursion.

**Queues**: Introduction, operation on queues, circular queue, memory representation of queues, dequeues, priority queues, application of queues.

**Linked List**: Introduction; operation on linked list, circular linked list, doubly linked list, header linked list, implementation of linked list, application of linked lists.

**Trees**: Introduction; Binary Tree; Threaded Binary Trees; Binary Search Tree; Balanced Trees; B- Trees; Heap

## UNIT- II

**Graphs**: Introduction Graph: Graph terminology, Memory Representation of Graphs: adjacency matrix representation of graphs, adjacency list or linked representation of graphs, Operations performed on graphs, Application of graphs Sorting: Selection Sort, Insertion Sort, Merge Sort, Bucket Sort, Radix Sort, Quick Sort and Heap Sort

**Hashing**: Hashing techniques; Collision resolution; Deleting items from a hash table; Application of hashing

**File Organization**: Introduction, External Storage Device: Sequential Access Storage Device (SASD), Direct Access Storage Device (DASD) Sequential File Organization: processing sequential files, operations on sequential files, advantages and disadvantages of sequential file organization Direct File Organization: introduction, processing of direct files, advantages and disadvantages of direct organization Indexed Sequential Organization: introduction, processing of indexed sequential files, advantages and disadvantages of indexed sequential organization

**References:**

1. Tanenbaum, Y. Lanhgsam and A.J. Augenstein, "Data Structures Using C", PHI.
2. Loomis, Marry,“Data Management and File Structures”, PHI
3. Seymour Lipschultz, “Theory and Practice of Data Structures", McGraw-Hill.
4. E. Horowitz and S. Sahni, “Data Structures with Pascal", Galgotia.
5. M. J. Folk, B. Zoellick, G Riccardi, “File Structures”, Pearson Education.

**PAPER: MS-123**
**Software Engineering**
**5 CREDITS: 4H (L) +1(T)**

Teaching Hours per week: 5
Time Allowed: 3 Hrs.
Pass Marks: 35%

Internal Assessment: 30 Marks
External Marks: 70 Marks

**Instructions for Paper Setter/Examiners**

The Question paper will consist of three sections-A, B & C. Section A and B will have four questions each from the respective unit of the syllabus and will carry 10 marks each. Candidates are required to attempt two questions each from section A and B. Section C will consist of 10 short answer type questions covering entire syllabus and will carry 3 marks each. Section C is Compulsory.

## UNIT- I

**Software Engineering**: History, Definition, Goal; The role of the Software Engineer, The Software Life Cycle, The relationship of Software Engineering to other areas of Computer Science, Classification of Software Qualities, Representative Qualities, Software process models: Waterfall model, prototyping, spiral; Tools and techniques for process modeling, Management of software engineering management functions, project planning and organization.

**Requirement Analysis**: The requirement process, types of requirements, Characteristics and components of SRS, Data flow Diagrams, Data Dictionary, UML diagrams for specifying behaviors, metrics, verification of SRS.

**Design and Software architecture**: The Software design activity and its objectives, Abstraction, Modularity, Coupling-Cohesion criteria, Object-Oriented Design: generalization and specialization, associations and aggregations.

## UNIT- II

**Coding**: Programming standards and procedures, programming guidelines, documentation, and Code verification techniques.

**Verification and validation**: Approaches to verification, testing goals, principles,

Equivalence class partitioning, Boundary value analysis, mutation testing, graph based testing, cyclomatic complexity, test planning ,automated testing tools, features of Object-Oriented testing.

**Software maintenance**: The nature of maintenance, maintenance problems, maintenance techniques and tools.

Software re-engineering, reverse engineering, forward engineering: forward Engineering for

Object- oriented and client/server architecture, Building blocks for CASE, CASE tools and applications.

**References:**

1. Carlo Ghezzi, Mehdi Jazayeri, Dino Mandrioli, “Fundamentals of Software Engineering”, 2nd edition Pearson Education. 2003.
2. Shari Lawrence Pfleeger, “Software Engineering : Theory and Practice”, 2nd edition, Pearson Education, 2003.
3. P.Jalota, “An Integrated Approach to Software Engineering”, Narosa Publications.
4. Roger.S.Pressman,” Software Engineering-A practitioner’s Approach”, 3rd edition, McGraw-Hill.

**PAPER: MS-124**
**RDBMS and Oracle**
**5 CREDITS: 5H (L)**

Teaching Hours per week: 5 Internal Assessment: 30 Marks
Time Allowed: 3 Hrs. External Marks: 70 Marks
Pass Marks: 35%

**Instructions for Paper Setter/Examiners**

The Question paper will consist of three sections-A, B & C. Section A and B will have four questions each from the respective unit of the syllabus and will carry 10 marks each. Candidates are required to attempt two questions each from section A and B. Section C will consist of 10 short answer type questions covering entire syllabus and will carry 3 marks each. Section C is Compulsory.

**Course Objective:** This course is designed to explore computing and to show students the art
of design and creation of relational databases. On completion of this course, the students will be able to:

1. Gain the knowledge and understanding of Database analysis and design. Understand the use of Structured Query Language(SQL) and learn SQL syntax.
2. Gain the knowledge of the processes of Database Development and Administration using SQL and PL/SQL.
3. Understand the functional dependencies and design of the database. Understand the concept of Transaction and Query processing.

**UNIT- I**

**Introduction**: Database Approach, Characteristics of a Database Approach, Database System Environment. Roles in Database Environment: Database Administrators, Database Designers, End Users, Application Developers. Database Management Systems: Definition, Characteristics, Advantages of Using DBMS Approach, Classification of DBMSs. Architecture: Data Models, Database Schema and Instance, Three Schema Architecture, Data Independence – Physical and Logical data Independence. Database Conceptual Modelling by E-R model: Concepts, Entities and Entity Sets, Attributes, Mapping Constraints, E-R Diagram, Weak Entity Sets, Strong Entity Sets.

**Relational Data Model**: Concepts and Terminology. Constraints: Integrity Constraints, Entity and Referential Integrity constraints.

**Keys**: Super Keys, Candidate Keys, Primary Keys, Secondary Keys and Foreign Keys. Relational Algebra: Basic Operations, Additional Operations, Example Queries. Relational Calculus: Tuple and Domain Relational Calculus, Example Queries.

**Database Design**: Problems of Bad Database Design. Normalization: Functional Dependency, Full Functional Dependency, Partial Dependency, Transitive Dependency, Normal Forms– 1NF, 2NF, 3NF, BCNF, Multi-valued Dependency, Join Dependency and

Higher Normal Forms- 4NF, 5NF.

## UNIT- II

**Transaction Processing Systems**: Batch, On-line, Real time, Transaction ACID Properties. Database Protection: Security Issues, Discretionary Access Control-Granting and Revoking Privileges. Database Concurrency: Problems of Concurrent Databases, Serializability and Recoverability, Concurrency Control Methods-Two Phase Locking, Time Stamping.

**Database Recovery**: Recovery Concepts, Recovery Techniques-Deferred Update, Immediate Update, Shadow Paging.

**Overview of the following**: Data Mining, Data Warehousing and OLAP, Mobile Databases, Multimedia Databases, Temporal Database, Spatial Database.

**References:**

1. Elmasry Navathe, “Fundamentals of Database System”, Pearson Education, 2013
2. Oracle SQL Complete Reference”, Tata McGraw-Hill.
3. T. Connolly, C Begg, “Database Systems”, Pearson Education.
4. Jeffrey D. Ullman, "Principles of Database Systems", Galgotia Publications.
5. Henry F. Korth, A. Silberschhatz, “Database Concepts," Tata McGraw Hill.
6. C.J. Date, "An Introduction to Database Systems”, Pearson Education.
7. Naveen Parkash, “Introduction to Database Management”, Tata McGraw Hill.
8. Bobrowski, “Client Server Architecture and Introduction to Oracle 7”.

**PAPER: MS-125**
**Programming Lab-II (Based on MS-121 and MS- 122)**
**2 CREDITS: 4H (P)**

Teaching Hours per week: 4 Internal Assessment: 30 Marks
Time Allowed: 3 Hrs. External Marks: 70 Marks
Pass Marks: 35%

This laboratory course will mainly comprise of exercise based on subject MS-121: Object Oriented Programming Using C++ and MS-122: Data & File Structures.

Maximum Marks for Continuous Assessment: 30

Maximum Marks for University Examination: 70

The Break-up of Marks for Practical exams (External) will be as under:

1. Viva Voce (External examination) 20 Marks
2. Program Development and Execution 30 Marks
3. File Record 20 Marks

**PAPER: MS-126**
**Programming Lab-III (Based on MS-124)**
**2 CREDITS: 4H (P)**

Teaching Hours per week: 4 Internal Assessment: 30 Marks
Time Allowed: 3 Hrs. External Marks: 70 Marks
Pass Marks: 35%

This laboratory course will mainly comprise of exercise based on subjects MS-124: RDBMS and Oracle. In this topics to be covered are:

Structure of Oracle, Background Processes. Data Objects: Tables, Views, Synonyms, Indexes, Snapshots, Sequences, Creation and Manipulation of Data Objects. SQL Queries. Applying Integrity Constraints. Functions, Procedures and Packages. Using Cursors and Triggers.

Maximum Marks for Continuous Assessment: 30

Maximum Marks for University Examination: 70

The Break-up of Marks for Practical exams (External) will be as under:

| | |
|---|---|
| 1. Viva Voce (External examination) | 20 Marks |
| 2. Program Development and Execution | 30 Marks |
| 3. File Record | 20 Marks |

**PAPER: MS-127 E1**
**Workshop on Corel Draw**
**2 CREDITS: 4H (P)**

Teaching Hours per week: 4 Internal Assessment: 50 Marks
Time Allowed: 3 Hrs.
Pass Marks: 35%

**Introduction to Corel draw**: Creating your first New Document , Exploring the user interface of Corel Draw, Device Central, working with Templates, Import, Export, Tools of Corel draw, pick tool, crop tool, text tool, freehand tool, rectangular tool(circle, star, Polygon), Interactive tool, Eyedropper tool, outline tool, Fill tool, interactive Fill tool.

Working with text and lines in Corel draw, Artistic text, Formatting text, changing shape of the text, Paragraph text, Working with Lines, Fitting text to a path, Applying effects to text.

**Working with shapes**: Creating Rectangle and Squares, Creating Circles and Ellipse, Drawing Polygons, Creating Star, Rotating shapes, Selecting fill and outline color

**Working with object**: Handling Objects in Corel draw, Positioning objects, Aligning and distributing objects, sizing and scaling objects, rotating and mirroring objects, combining and breaking objects, Grouping, Creating Graphical special effects.

**Working with curves**: Drawing with Freehand Tool, Drawing Closed Curves, Bezier tool, Drawing with the Artistic Media tool, Pen tool, 3-Point Curve tool, Special Effect of corel draw, Blending tool, Contouring the Object, Distorting Objects, Envelope tool, Extruding of the Object, Drop Shadow, Applying Transparency Effect.

**Working with Colors and Bitmaps**: Color Slider, Color viewers, Fixed Pallets, Color Pallete Browser Docker, Using Color style Dockers, Converting Objects to Bitmap, 3D Effect, Art Effect,Blur Effect, Color Transformation Effect, Contour Effect, Creative Effect, Distort Effect, Noise Effect

**Working with tables**: Selecting, moving and navigating table components, Inserting and deleting table rows and columns, Resizing table cells, rows, and columns, formatting tables and cells, working with text in tables, Merging and splitting tables and cells, Corel Draw and Web, Saving the file as webpage, publishing your drawing as a webpage, Creating Rollover Buttons.

**References:**

1. Corel Draw X5 in simple steps by Kogent Learning Solutions.
2. Corel Draw X5 The Official Guide by Tata McGraw Hill written by Gary David Bouton.

**PAPER: MS-127 E2**

**Workshop on Adobe Photoshop**
**2 CREDITS: 4H (P)**

Teaching Hours per week: 4 Internal Assessment: 50 Marks
Time Allowed: 3 Hrs.
Pass Marks: 35%

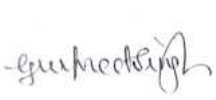
**Introduction to Photoshop**: Basics of Adobe Photoshop. Understanding pixels & resolution. Exploring menus, panels and toolbox. Creating new image files and opening existing files in Photoshop. Understanding and handling different image file formats, changing the resolution, color, greyscales and size of the images. Zooming & panning an image. Working with multiple images, rulers, guides & grids. Creating multicolor images and using brushes, adjusting color using the panel. Cropping, rotating, overlapping and superimposingphotos on a page. Undoing Steps with History

**Working with selections, layers and channels**: Understanding selection tools, refining the selection and edges. Understanding layers, creating, selecting, editing, locking and grouping layers. Layer styles, consolidating layers. Manipulating layer mask. Understanding color channels, working with channels panel.
**Working with filters**: Basics of Filters, constructive filters, blur filters, destructive filters, effects filters, render filters, liquify filter and other filters required for artistic effects.
Creating images for the web: understanding web image formats, preparing and slicing images for the web use. Adding transparency to the web, previewing images in a browser.

**References:**

1. Adobe Photoshop CS6, Bible the comprehensive, tutorial resource – Lisa Danae Dayley, Brad Dayley - Wiley India
2. Photoshop 7 Savvy – Steve Romaniello – BPB Publications.

**Members of Board of Studies**

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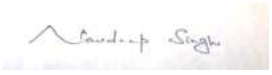


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**APPROVED**
Board of Studies Meeting held on 23rd June 2021