



*Scheme of Examination*

*&*

*Detailed Syllabus*

*PGDCA*

*(Distance Learning Program)*

**(w.e.f. 2018-19)**

**Faculty of Information Technology, Jagan Nath University**

**University Campus: NH-12, Chaksu Bypass, Tonk Road, Jaipur-303901**

**City Campus: Plot No. IP-2,3, Phase-IV, Sitapura Ind. Area,  
Opp. Choki Dhani, Jaipur.**

\*Approved by AC vide resolution no. ....dated .....



**PGDCA DLP COURSE STRUCTURE**

**SEMESTER I**

<b>CODE NO.</b>	<b>SUBJECT</b>	<b>Credits</b>
PGDCA 101	Computer Fundamentals	3
PGDCA 102	Programming Techniques and C Language	3
PGDCA 103	Introduction to Financial Accounting	3
PGDCA 104	Introduction to Internet and Multimedia	3
<b>PRACTICALS</b>		
PGDCA 105	C Programming Lab	2
PGDCA 106	MS Office Lab	2

**SEMESTER II**

<b>CODE NO.</b>	<b>SUBJECT</b>	<b>Credits</b>
PGDCA 201	Software Engineering	3
PGDCA 202	Discrete Mathematic Structure	3
PGDCA 203	Data Structure and Algorithm	3
PGDCA 204	Object Oriented Programming with C++	3
<b>PRACTICALS</b>		
PGDCA 205	DSA Lab	2
PGDCA 206	OOPs Lab	2



**Examination Scheme-DL PGDCA**

Subject Code	Subject Title	Type of Paper (Theory/Practical/Project/Viva/)	Maximum Marks	Internal Evaluation	End Term Evaluation	Min. Pass Marks
<b>I Semester</b>						
PGDCA 101	Computer Fundamentals	Theory	100	30	70	40
PGDCA 102	Programming Techniques and C Language	Theory	100	30	70	40
PGDCA 103	Introduction to Financial Accounting	Theory	100	30	70	40
PGDCA 104	Introduction to Internet and Multimedia	Theory	100	30	70	40
PGDCA 105	C Programming Lab	Practical	50	0	50	20
PGDCA 106	MS Office Lab	Practical	50	0	50	20
<b>II Semester</b>						
PGDCA 201	Software Engineering	Theory	100	30	70	40
PGDCA 202	Discrete Mathematic Structure	Theory	100	30	70	40
PGDCA 203	Data Structure and Algorithm	Theory	100	30	70	40
PGDCA 204	Object Oriented Programming with C++	Theory	100	30	70	40
PGDCA 205	DSA Lab	Practical	50	0	50	20
PGDCA 206	OOPs Lab	Practical	50	0	50	20
<b>Note: The criteria for passing in a subject is that student should secure minimum of 40% marks in the total of Internal Evaluation and End Term Examination and compulsorily with a minimum of 30% marks in the End-Term Examination.</b>						



**SEMESTER I**

<b>CODE NO.</b>	<b>SUBJECT</b>	<b>Credits</b>
<b>PGDCA 101</b>	<b>Computer Fundamentals</b>	<b>3</b>
<b>PGDCA 102</b>	<b>Programming Techniques and C Language</b>	<b>3</b>
<b>PGDCA 103</b>	<b>Introduction to Financial Accounting</b>	<b>3</b>
<b>PGDCA 104</b>	<b>Introduction to Internet and Multimedia</b>	<b>3</b>
<b>PRACTICALS</b>		
<b>PGDCA 105</b>	<b>C Programming Lab</b>	<b>2</b>
<b>PGDCA 106</b>	<b>MS Office Lab</b>	<b>2</b>

# PGDCA 101: Computer Fundamentals

## Course Objectives:

1. To introduce the basic concepts of computers.
2. To understand and operate MS-Office.
3. To learn about the basic concepts of Networking.
4. To familiarize with computer and its applications in the relevant fields and expose them to other related papers of IT.

## UNIT-I : BASICS OF COMPUTER & ITS EVOLUTION

History and Evolution, Classification, Definitions, Concepts and Features, Data Representation, Error Detecting Codes.

Hardware, Motherboard, Software, Programming Languages, Machine Language, Assembly Language, High Level Language, Fourth Generation Language, Natural Language, Systems Software, BIOS, Operating System, Utility Software, Application Software.

**Data processing:** Input, Processing and output, Architecture of Computer System, The Control Unit (CU), The Immediate Access Store (IAS), ALU stands for Arithmetic and Logic Unit, Concepts of Files, Protecting Files, Storing files, File Terminology, Data Capturing, Verification.

## UNIT-II : INPUT & OUTPUT DEVICE

Components, Input Devices, Keyboard, Pointing Devices, Pen Input Devices, Video Input Devices, Central Processing Unit, Arithmetic Logic Unit (ALU), Control Unit (CU), Primary Memory, Output Devices, Data Storage, Auxiliary Storage/Secondary Storage, Magnetic Disk, Optical Disks, Flash Memory, USB Drives, Removable Hard Drives, Smart Cards, Optical Cards.

## UNIT-III : COMMUNICATION AND NETWORKS

Computer Networks, Goals of Networks, Communication Channels, Wired Channels, Wireless Channels, Transmission Technology, Broadcast Networks, Point-to-Point or Switched Networks, Bandwidth, Network Configuration, Client-Server Network, Peer-to-peer Network, Network Models, Network Topologies, Types of Networks.

## UNIT-IV : INTRODUCTION TO OPERATING SYSTEMS

History of Operating System, Disk Operating System, UNIX, Batch Files, Batch System, Time Sharing Systems, Multiprogramming, Spooling, Essential Properties of the Operating System Batch, Time Sharing, Interactive, Real time system, Distributed.

**Introduction to MS-Word:** Introduction to Word processing, Features of Word Processors, Getting started with MS-Word, Starting MS-Word, Contents of the Word Window, Formatting Documents, List, Tabs and Tables, Finding, Replacing and proofing Text, Mail Merge, Printing and Getting Help.

**Unit-V Introduction to MS-Excel:** Introduction to Electronic Spreadsheets, Applications of Electronic Spreadsheets, Types of Spreadsheets, Features of MS-Excel, Contents of the MS-Excel Window, cell Referencing, Ranges and Functions, Formatting Worksheets and Creating Charts, Data Forms and Printing.

**Introduction to MS-Power Point:** Introduction to MS-PowerPoint, What is a Presentations? Slides, Working with Slides, Slides Show and Printing Presentation.

## Text/ Reference Books:

1. Sinha, Kr. Pradeep and PreetiSinha; *Foundations of Computing*, BPB Publication.
2. Special edition using Ms-Office 2007 by Ed.Bott, WoodyLeonhard, Pearson education
3. Leon and Leon: Introduction to Information Technology, Leon Tech World.
4. Microsoft Office-2007 by Greg Perry , SAMS Teach yourself Techmedia.publication

# PGDCA 102: Programming Techniques and C Language

## Course Objectives:

1. To gain experience about structured programming.
2. To help students to understand the implementation of C language.
3. To understand various features in C.

## UNIT-I : 'C' FUNDAMENTALS

Introduction to 'C', Low Level Languages, High Level Languages, Identifier and Keywords, Data Types and Constants, Basic Data Types, Type Qualifiers, Variables, Operators and Expressions, Arithmetic, Rational, Logical, Comma, Conditional, Bitwise, Assignment, Increment and Decrement Operators, Preprocessor Directives.

Getchar Functions, Puchar Function, Scanf() Function, Printf() Function, Gets () and Puts () Functions.

## UNIT-II : CONTROL STATEMENTS

Loops, The Break Statement, Continue Statement, 'If' Statement, 'If Else' Statement, Switch Statement, 'If Else If Ladder', Nested If, Iteration Statement, Nested For, Goto Statement, Conditional Goto, Unconditional Goto.

## UNIT-III : ARRAYS AND STRINGS

Declaration of An Array, Initialisation of Array, Drawbacks of Initialising An Array, Dimensions of An Array, Single Dimensional Arrays, Declaration of Single Dimensional Arrays, Initialisation of One-Dimensional Array, Two Dimensional Arrays, Elements of Multidimensional Array, Strings, Passing Array to Functions.

## UNIT-IV : FUNCTIONS AND STRUCTURES

Elements of User Defined Functions, Scope and Lifetime of Variables, Return Values, Function Categories, Recursion, Introduction to Structure, Array of Structures, Additional Features of Structures, Uses of Structures, Unions.

### Pointers

Pointer Declaration, Reference Operator, Dereference Operator, Pointer Arithmetic, Pointers with Function, Function Pointer Syntax, Initialising Function Pointer, Using Function Pointer, Arrays and Pointer, Array of Pointers, Pointers with Structures, Pointers on Pointer.

## UNIT-V : DYNAMIC MEMORY ALLOCATION

Stack and Heap, Sizeof, Malloc(), Managing Strings with Malloc(), Freeing Memory, Working with Memory Segments, Calloc() and Realloc().

### File Input and Output

Bits and Bytes, Fields, Records and Files, File Streams, Opening and Closing Files, Reading Data, Writing Data, Appending Data, Goto and Error Handling, A Brief History of Goto, Usage of Goto.

## Text/ Reference Books:

1. Balaguruswamy E., "Programming in ANSI C", Third Edition, Tata Mc Graw Hill Publishing Company Limited.
2. Yashwant Kanetkar, "Let us C", BPB Publications, 2002.
3. B. Kernighan and D. Ritchie, "The ANSI C Programming Language", PHI., 2000
4. Herbert Schildt, Turbo C: The Complete Reference, Mc Graw-Hill, 1998, ISBN: 9780078813467

# **PGDCA 103: Introduction to Financial Accounting**

## **Course Objectives**

The primary objective of the course is to familiarize the students with the basic accounting principles and technique of preparing and presenting the accounts for user of accounting for user of accounting information.

## **UNIT-I : MEANING AND SCOPE OF ACCOUNTING**

Need, Development and Definition of Accounting; Book-keeping and Accounting Persons interested in Accounting; Disclosures; Branches of Accounting; Objectives of Accounting.

## **UNIT-II : ACCOUNTING PRINCIPLES & ACCOUNTING TRANSACTIONS**

International Accounting Standards (Only Outline): Accounting Principles; Accounting Standards in India. Accounting Cycle; Journal; Rules of Debit and Credit; Compound Journal Entry; Opening Entry; Relationship between Journal and Ledger, Rules Regarding Posting; Trial Balance Sub Division of Journal.

## **UNIT-III : CAPITAL AND REVENUE**

Classification of Income; Classification of Expenditure; Classification Receipts. Accounting Concept of Income; Accounting Concepts and Income Measurement Expired Cost and Income Measurement.

Final Accounts: Profit and Loss Account; Balance Sheet: Adjustment Entries.

Rectification of Errors; Classification of Errors; Location of Errors; Suspense Account: Effect on Profit.

## **UNIT-IV : DEPRECIATION PROVISIONS AND RESERVES**

Concept of Depreciation; Causes of Depreciation; Depreciation, Depletion, Amortization and Dilapidation, Depreciation Accounting; Methods of Recording Depreciation; Methods for Providing Depreciation; Depreciation of Different Assets; Depreciation of Replacement Cost; Depreciation Policy as per Accounting Standard; Depreciation Accounting; Provisions and Reserves.

## **UNIT-V : ACCOUNTS OF NON-TRADING INSTITUTIONS**

Not for Profit Organisation, Financial Statements, Income and Expenditure Account Balance Sheet.

## **Text Books/Reference Books**

1. Introduction to Accounting T. S. Grewal ,S. Chand& Co.
2. Advanced Accountancy S.N. Maheshwari
3. Accountancy Shukla & Shukla . S. Chand & Co
4. Financial Accounting , Shah, Oxford Press
5. Financial Accounting Needles, Powar, Cengage learning

# **PGDCA 104 : Introduction to Internet & Multimedia**

## **Course Objectives:**

The main objective of the course is to introduce the Basic Internet Concepts as well as whole range of web technologies starting from HTML, DHTML, Java Script, VBScript, and Dreamweaver. It also gives a brief description on Internet. Through the various examples the course will describe how to design specific page, dynamic web page, forms and frames. It also focuses on the practical aspects of these technologies. It also covers basics of MS-office tool.

## **UNIT I : INTRODUCTION TO INTERNET & WEB DESIGN**

Introduction to Internet, History of Internet, Internet Standards, Practical uses of Internet. Introduction to Intranet, Difference B/W Internet & intranet. Networking Hardware and Software Components: Network Interface Cards, Network Cables, Network Connecting Devices etc. Component of the Internet: Connection requirements and options, Internet addressing, Internet standards, Web browser basics.

### **Basics of Web Designing**

What is Web Designing, Web Design Basics, Elements of Good Design , The Elements of , Design , The Principles of Design , The Web is Not Print.

Objectives, Introduction , Methodology, Getting Started with Web Designing , STEP 1: HTML, Step 2: WYSIWYG Editors, Recommendations for Software and Tool for Designing Web, Step 3: Hosting , Free Host Servers , Paid Host Servers, Step 4: Publish (Upload)

## **UNIT II : INTRODUCTION TO MULTIMEDIA**

Objectives, Introduction , Elements of Multimedia System , Text , Graphics , Audio , Video , Animation, Features of Multimedia, Applications of Multimedia, Stages of Multimedia Application Development, Multimedia on the Web, Plugins, Media Players, and Multimedia Types

### **Text and Image**

Objectives, Introduction, Multimedia Building Blocks, Text in Multimedia , Fonts and Faces , Selecting Text Fonts , Computers and Text ,Character Set and Alphabets, Font Editing and Design Tools, Digital Image., Digital Image Format, Captured Image Format, Stored Image Format, Capturing and Editing Images, How Vector Drawing Works

## **UNIT III : DOCUMENT, HYPERTEXT AND HYPERMEDIA**

Objectives, Introduction, Documents , Document Architecture , Document Architecture – SGML, SGML and Multimedia, Open Document Architecture ODA, Hypertext , Hypermedia, Hypertext and Hypermedia, Hypertext, Hypermedia and Multimedia, Hypertext System, Multimedia System, Hypermedia System, Hypertext and the World Wide Web.

## **UNIT-IV : AUTHORING TOOLS AND MULTIMEDIA WORKSTATION**

Objectives, Authoring , Authoring Tools , Card Based Authoring Tool , Page Based Authoring Tool , Icon Based Authoring Tool , Time Based Authoring Tool , Object Oriented Authoring Tool, Multimedia System, Communication Architecture, Hybrid Systems , Integrated Device Control , Integrated Transmission , Control, Integrated Transmission, Digital Systems, Multimedia Workstation , Bus , Multimedia Devices , Primary Storage , Secondary Storage , Processor , Operating System, Preference of Operating System for Workstation, The Macintosh Platform , The Windows Platform , Networking Macintosh and Windows Computers

## **UNIT-V : BASIC TOOLS FOR MULTIMEDIA OBJECTS**

Objectives, Introduction, Text Editing and Word Processing Tools, OCR Software, Image-Editing Tools, Painting and Drawing Tools, Sound Editing Tools, Animation, Video and Digital Movie Tools , Video Formats , Common Organisation of Video Formats , QuickTime , Linking Multimedia Objects , OLE , DDE , Net DDE.



## **Multimedia Operating System**

Objectives, Learning outcome, Introduction, Multimedia Operating System, Real Time Process , Characteristics of Real Time Systems , Real Time and Multimedia , Resource Management ,Resources, Requirements , Components of the Resources , Phases of the Resource Reservation and Management Process , Resource Allocation Scheme.

### **Text Books/ Reference Books:**

1. Internet Complete Reference by TataMcgrawhill
2. MS-Office, by Nellie Kankan. Office 2007
3. Word 2003, 2004 by David Rivers,



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<b>PGDCA 202</b>	<b>Discrete Mathematic Structure</b>	<b>3</b>
<b>PGDCA 203</b>	<b>Data Structure and Algorithm</b>	<b>3</b>
<b>PGDCA 204</b>	<b>Object Oriented Programming with C++</b>	<b>3</b>
<b>PRACTICALS</b>		
<b>PGDCA 205</b>	<b>DSA Lab</b>	<b>2</b>
<b>PGDCA 206</b>	<b>OOPs Lab</b>	<b>2</b>

# PGDCA 201: Software Engineering

## Course Objective:

Course is intended to help students to develop skills that will enable them to construct software of high quality – software that is reliable, and that is reasonably easy to understand, modify and maintain. The concept covered in syllabus are:

- The software development process.
- Software requirements and specifications.
- Software design techniques.
- Techniques for developing large software systems.
- CASE tools and software development environments.
- Software testing, documentation and maintenance.

## UNIT-I : INTRODUCTION

Introduction to software engineering, Importance of software, The evolving role of the software, Software characteristics, Software components, Software application, Software crisis, Software engineering problems, Software development life cycle, Software process.

## UNIT-II : SOFTWARE REQUIREMENT SPECIFICATION

Analysis principles, Water fall model, The incremental model, Prototyping, Spiral model, Role of management in software development, Role of matrices, and measurement, Problem analysis, Requirement specification, Monitoring and Control.

**Software Design:** Design principles, Problem portioning, Abstraction, Top down and Bottom up-Design, Structured approach, Functional versus object-oriented approach, Design specification and Verification, Monitoring and control, Cohesiveness, Coupling, Forth generation techniques, Functional independences, Software architecture, Transaction and Transform mapping, Component-Level Design, Forth generation techniques.

## UNIT-III : CODING

Top-Down and Bottom-Up programming, Structured programming, Information hiding, Programming style and internal documentation.

**Testing:** Testing principles, Levels of testing, Functional testing, Structural testing, test plane, test case specification, Reliability assessment, Software testing strategies, Verification and Validation testing, Integration testing, Alpha & Beta testing, System testing and debugging.

## UNIT-IV : SOFTWARE PROJECT MANAGEMENT

The management spectrum (The people, the product, the process, the project), Cost estimation, Project scheduling, Staffing, Software configuration management, Structured Vs Unstructured maintenance, Quality assurance, Project monitoring risk management.

## UNIT-V : SOFTWARE RELIABILITY & QUALITY ASSURANCE

Reliability issues, Reliability metrics, Reliability growth modelling, Software quality, ISO 9000 certification for software industry, SEI capability maturity model, Comparison between ISO & SEI CMM.

## Text Books/ Reference Books:

1. R. S. Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.
2. Ian Sommerville, Software Engineering, Addison Wesley.
3. Rajib Mall, Fundamentals of Software Engineering, PHI Publication.

# PGDCA 202: Discrete Mathematics Structure

## Course Objectives:

This course covered the mathematical topics most directly related to computer science. Learning Outcome of this course is to prepare students to take courses related with Data Structure, Algorithm analysis and Cryptography. This course develops ability to write independent mathematical Proofs.

## Course Contents

### UNIT-I : FUNCTIONS

Types of Function, Composite, Even and Odd, Inverse.

#### Mathematical Induction and Recurrence

Principle of Mathematical Induction, Induction Example, Recursive Definitions, Recurrence, Solving Recurrence, Linear Recurrence.

#### Relation

Properties of Relation, Diagraphs, Using Digraphs to Model Information, Cartesian Product.

### UNIT-II : SET THEORY

Types of Set, Venn Diagrams, Set Operation, Set Identities.

### UNIT-III : BOOLEAN ALGEBRA AND LOGIC GATES

Boolean Algebra, Basic Logical Operations (Logic Variables), NOT Operator (Inversion), AND Operator, OR Operator, Logic Gates, Universal Gates, Constructing Gates, Fundamentals of Boolean Algebra, Boolean Operators, Laws of Boolean Algebra, Commutative Laws, Associative Laws, Distributive Laws, Switches and Inverter, Boolean Algebra Rules.

### UNIT-IV : GRAPHS

Terminologies, Representation, Uses of Graphs, Some Important Graphs, Degree Sequence, Graphical Degree Sequence, Isomorphism in Graphs, Isomorphism by Using Adjacency Matrix, Applicability of Graphs.

#### Connected and Disconnected Graphs

Connected and Disconnected Graph, Walk, Trail, Path, Cycle (Circuit), Connected Graph, Weight Graph, Connectivity.

### UNIT-V : LOGIC

Statement/Proposition, Truth Value, Venn Diagrams, Compound Statements and Logical Connectives, Truth Tables, Tautology, Contradiction and Contingency, Logical Equivalence, Negation of a Compound Statement, Some Standard Equivalent Statements in Logic, The Use of Logic in Circuits, Quantifiers.

## Text/ Reference Books:

1. Kenneth Bogart Clifford and Stein Robert Drysdale, "Discrete Mathematics for computer science" Springer, 2006.
2. J. P. Tremblay and R. Manohar, "Discrete Mathematical Structure with Application to Computer Science", TMH, New Delhi, 2000.
3. David J. Hunter "Essentials of Discrete Mathematics" Johns and Bertlett, 2008.
4. Kolman, Busby and Ross "Discrete Mathematical Structures" PHI/Pearson., 6<sup>th</sup> Ed., 2009.
5. D. S. Malik and M. K. Sen, "Discrete Mathematical Structures", Cengage Publication, 2006.
6. Swapan Kumar Sarkar, "Discrete Mathematics", S. Chand, 4<sup>th</sup> Ed., 2006.
7. Kenneth H. Rosen, "Discrete Mathematics & Applications", TMH, 6<sup>th</sup> Ed., 2007.

# **PGDCA 203: Data Structure & Algorithms**

## **OBJECTIVE:**

In this course student will become familiar with Algorithm analysis: Trees, Graphs, searching and sorting and files.

## **Course Contents**

### **UNIT-I**

Characteristics of a Good Program, Techniques of a Problem Solving, Structured Programming, Modular Programming, Top-Down Programming, Bottom-Up Programming.

#### **Concept of Data Types and Data Structures**

Concept of Data, Data Types, Data Structure, Primitive Data Type, Logical Versus Physical Representation, Primitive and Data Structures, Operations on the Data Structures.

### **UNIT-II : CONCEPTS OF POINTERS**

Declaring and Initializing a Pointer, Accessing a Variable Using Pointer, Static Variable.

### **UNIT-III : ARRAYS, STACKS, QUEUES AND LINKED LIST**

Arrays, One-Dimensional Array, Two-Dimensional Arrays, Records, Defining a Structure, Stack, Stack as an Array, Operation on Stack, Stack as a Limited List, Recursion, Queue, Operation on Queue, Queue as an Array, Linked Implementation of a Queue, Implementation of a Queue as a Circular Linked List, Dequeue, Priority Queue, Linked List, Advantages of Linked List Over Arrays, Types of Linked List, Operations on Singly Linked List, Circular Linked List, Application on Linear Linked List, Doubly Linked List or Two Chains, Operation on a Doubly Linked List.

### **UNIT-IV : TREES**

General Trees, Binary Tree, Properties of Binary Trees, Implementation of Binary Trees, Binary Tree Traversal, Methods, Binary Tree Traversal Algorithms using Stacks, Binary Search Tree.

### **UNIT-V : SEARCHING AND SORTING**

Searching, Algorithm for Linear Search in an Unsorted Array, Algorithm for Linear Search in a Sorted Array, Algorithm Binary Search on Array given in Ascending Order, Sorting, Algorithm Insertion Sort, Algorithm Selection Sort for Ascending Order, Algorithm Bubble Sort for Ascending Order.

#### **Text/ Reference Books:**

1. Horowitz and Sahani, "Fundamentals of data Structures", Galgotia Publication Pvt. Ltd., New Delhi.
2. R. Kruse etal, "Data Structures and Program Design in C", Pearson Education Asia, Delhi-2002
3. A. M. Tenenbaum, "Data Structures using C & C++", Prentice-Hall of India Pvt. Ltd., New Delhi.
4. K Loudon, "Mastering Algorithms With C", Shroff Publisher & Distributors Pvt. Ltd.

# **PGDCA 204 : Object Oriented Programming using C++**

## **Course Objectives**

1. To familiarize with Programming paradigms
2. To introduce the basic concepts of Object Oriented Languages like class, object, data hiding, encapsulation, and abstraction.
3. To understand and implement concepts like message passing, inheritance, polymorphism, exception handling and generic programming.

## **UNIT-I**

OOP paradigm, advantages of OOP, Comparison between functional programming and OOP approach, characteristics of Object-oriented Language objects, Class, Inheritance, Polymorphism, and abstraction, encapsulation, Dynamic Binding, Message passing. Introduction to C++, Identifier and Keywords, constants, C++ Operators, Type conversion, variable declaration, Statement, expressions, User defined data types, Conditional expression (For, While, Do-while) loop statements, breaking control statements (Break, Continue).

## **UNIT-II**

Defining a function, types of functions, inline functions, Call by value and Call by reference, Pre-processor, Header file and standard functions, Structures, Pointers and structures, Unions, Enumeration.

## **UNIT-III**

Classes, Member functions, Objects, Array of objects, Nested classes, Constructors, Copy constructors, Destructors, Inline member functions, Static class member, friend functions, Dynamic memory allocation.

## **UNIT-IV**

Inheritance: Single inheritance, Multi-level inheritance, Hierarchical, Virtual base class, Abstract classes, Constructors in Derived classes, Nesting of classes.

## **UNIT-V**

Function overloading, Operator overloading, Polymorphism, Early binding, Polymorphism with pointers, Virtual functions, Late binding, Pure virtual functions, Opening and closing of files, Stream member functions, Binary file operations. Structures and file operations, classes and file operations, Random access file processing.

## **Text/ Reference Books:**

1. K R Venugopal, Rajkumar, T Ravishankar, Mastering C++, Tata McGraw Hill.
2. E. Balagurusamy, Object Oriented programming, Tata McGraw Hill.
3. C. Thomas Wu, An Introduction to OOP with Java, McGraw Hill.