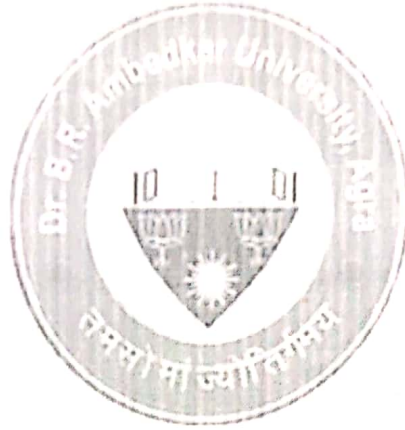DR. BHIMRAO AMBEDKAR UNIVERSITY, AGRA

BACHELOR OF COMPUTER APPLICATION

(B.C.A.)

(THREE YEAR DEGREE COURSE)

with effect from session 2025-26

BACHELOR OF COMPUTER APPLICATION (B.C.A.)
DETAILED SYLLABUS
FIRST SEMESTER
PAPERCODE: C-101
Computer Fundamentals and MS-Office

UNIT-I
Introduction to Computers: Introduction, Characteristics of Computers, Block diagram of computer. Types of computers and features, Mini Computers, Micro Computers, Mainframe Computers, Super Computers. Types of Programming Languages (Machine Languages, Assembly Languages, High Level Languages). Data Organization, Drives, Files, Directories. Types of Memory (Primary and Secondary) RAM ROM, PROM, and EPROM. Secondary Storage Devices (FD, CD, HD, Pen drive) I/O Devices (Scanners, Plotters, LCD, Plasma Display) Number Systems Introduction to Binary, Octal, Hexadecimal system Conversion, Simple Addition, Subtraction, Multiplication.

UNIT-II
Algorithm and Flowcharts Algorithm: Definition, Characteristics, Advantages and disadvantages, Examples Flowchart: Definition, Define symbols of flowchart, Advantages and disadvantages, Examples

UNIT-III
Operating System and Services in O.S., DOS, History, Files and Directories, Internal and External Commands, Batch Files, Types of O.S.

UNIT-IV
Windows Operating Environment Features of MS-Windows, Control Panel, Taskbar, Desktop, Windows Application, Icons, Windows Accessories, Notepad, Paintbrush.

UNIT-V
Editors and Word Processors Basic Concepts, Examples: MS-Word, Introduction to desktop publishing. Spreadsheets and Database packages Purpose, usage, command, MS-Excel, Creation offiles in MS-Access, Switching between application, MS-PowerPoint.

Suggested Books:
1. Fundamental of Computers, By V.Rajaraman B.P.B. Publications
2. Fundamental of Computers, By P.K. Sinha
3. MS-Office 2000(For Windows), By Steve Sagman
4. Computer Networks, By Tennenbum Tata MacGraw Hill Publication

BACHELOR OF COMPUTER APPLICATION (B.C.A.)
DETAILED SYLLABUS
FIRST SEMESTER
PAPERCODE:C-102
Introduction to Programming using C

UNIT-I
C basics: C character set, Identifiers and keywords, Data types, constants, variables and arrays, declarations, expressions statements, symbolic constants, compound statements, arithmetic operators, unary operators, relational and logical operators, assignment operators, conditional operators, bit operators.

UNIT-II
Decision Control Structures: If Statement, If-else statement, Nested if ();If () ladder, Switch, case statement, Iterative statements: For loop ,While loop, Do-while() loop, Conditional statements: Break, Continue, Storage Classes, Array: Declaration of an Array, Initialization of Array, Types of Array: Single Dimension Array, Two-Dimensional Array, Address Calculation of an Element of a 2-D Array

UNIT-III
Functions: Library Functions, User Defined Functions, Function Declaration, Prototype Declaration, Types of Arguments: Actual Arguments, Formal Arguments, Function Definition, Passing Arrays as Parameters, Methods to Call a Function: Call by Value, Call by Reference.

UNIT-IV
String & Pointers: String: Definition, function of string and Maths Functions (Predefined Functions)**Pointers**: Declaration of Pointer Variables, Pointer Arithmetic, Returning Multiple Output Values through a Function Strings. Introduction to dynamic memory allocation (malloc, calloc, realloc, free)

UNIT-V
Structures, Unions, Array of Structures, Enumerations, File Handling: Opening a File, Closing a File, File, Opening Modes, Reading from and Writing to a File, Copying Content of an Existing File to another, Command Line Arguments, argc and argv Parameters, Pre-processor Directives.

Suggested Books:
1. E.Balagurusamy, "Programming in ANSI C", TMH
2. PeterNorton's, "Introduction to Computers", TMH
3. YashwantKanetkar, "Let us C", BPB

BACHELOR OF COMPUTER APPLICATION (B.C.A.)
DETAILED SYLLABUS
FIRST SEMESTER
PAPER CODE: C- 103
Business Communication and Ethical Values

UNIT-I
Means of Communication: Meaning and Definition, Process, Functions, Objectives, Importance, Essentials of good communication, Communication barriers, 7C's of Communication, Types of Communication : Meaning, nature and scope.

UNIT-II
Oral communication: Principle of effective oral communication Techniques of effective speech, Media of oral communication (Face, to, face conversation, Teleconferences, Press Conference, Demonstration, Radio Recording, Dictaphone, Meetings, Rumour, Demonstration and Dramatization, Public address system, Grapevine, Group Discussion, Oral report, Closed circuit TV). The art of listening, Principles of good listening. **Written Communication** Purpose of writing, Clarity in Writing, Principle of Effective writing, Writing Techniques, Electronic Writing Process. **Business Letters & Reports:** Need and functions of business letters, Planning & layout of business letter, Kinds of business letters, Essentials of effective correspondence, Purpose, Kind and Objective of Reports, Writing Reports.

UNIT-III
Drafting of business letters: Enquiries and replies, Placing and fulfilling orders, Complaints and follow, up Sales letters, Circular letters Application for employment and resume. **Information Technology for Communication:** Word Processor, Telex, Facsimile(Fax), E-mail, Voice mail, Internet Multimedia, Teleconferencing, Mobile Phone Conversation, Video Conferencing, SMS, Telephone Answering Machine, Advantages and limitations of these types. **Self Analysis:** SWOT Analysis, Who am I, Attributes, Importance of Self Confidence, Self Esteem. Creativity: Out of box thinking, Lateral Thinking.

UNIT-IV
Attitude: Factors influencing Attitude, Challenges and lessons from Attitude, Etiquette. Motivation: Factors of motivation, Self talk, Intrinsic & Extrinsic Motivators. Goal Setting: Wish List, SMART Goals, Blue print for success, Short Term, Long Term, Life Time Goals. **Interpersonal Skills:** Gratitude: Understanding the relationship between Leadership Networking & Team work. Assessing Interpersonal Skills Situation description of Interpersonal Skill. Team Work: Necessity of Team Work Personally, Socially and Educationally.

UNIT-V

Introduction to Ethics and Values: Basic Concepts: Defining ethics, values, and morality. **Importance of Values:** Understanding the role of values in decision-making and behavior. **Sources of Values:** Exploring different sources of values, including personal, cultural, and societal influences. **Professionalism and Professional Ethics:** Defining professionalism and its ethical dimensions. **Importance of Values:** Discussing the significance of values in professional settings, including integrity, honesty, and respect. **Indian Values and Ethics:** Exploring specific Indian values such as respect for elders, hierarchy, and holistic relationships, and their relevance to the workplace. **Ethics in Work Life:** Analyzing the role of ethics in maintaining a positive and productive work environment. **Values across Cultures:** Examining how values differ across cultures and the implications for globalized IT work. **Impact of Technology on Society:** Examining the social, cultural, and environmental impacts of technology. **Ethical Practices in IT:** Exploring ethical considerations specific to the IT field, such as data privacy, intellectual property, and cybersecurity.

Suggested Books:
1. Business Communication, "K.K.Sinha, Galgotia Publishing Company, New Delhi".
2. Media and Communication Management, "C.S. Rayudu, Hikalaya Publishing House, Bombay".
3. Essentials of Business Communication, "Rajendra Pal and J.S. Korlhalli, Sultan Chand & Sons, New Delhi".

BACHELOR OF COMPUTER APPLICATION (B.C.A.)
DETAILED SYLLABUS
FIRST SEMESTER
PAPERCODE: C-104
Introduction to HTML, CSS- XML

UNIT-I
Basics of Internet and Web The basics of Internet, World Wide Web, Web page, Home page, Web site, Static, Dynamic and Active web page, Overview of Protocols, Client server computing concepts. Web Client and Web Sever Web Browser, Browsers e.g., Netscape navigator, Internet Explorer, Mozilla Firefox, Client, Side Scripting Languages, VB Script and Java Script, Web Server Architecture, Image maps, CGI, API web database connectivity, DBC, ODBC

UNIT-II
Dynamic HTML, Document Object Model, Features of DHTML, CSSP (Cascading Style Sheet Positioning) and JSSS (JavaScript assisted Style Sheet), Layers of Netscape, The ID Attribute, DHTML Events

UNIT-III
Introduction to HTML: Editors, Basics, Element, Attribute, Headings, Paragraphs, Styles, Formatting, Quotations,Comments,CSS,Links,Images,Tables,Lists,Blocks,Classes,ID, frames, File Paths, Head, Layout, Computer Code, Entities, Symbols, Charset, Color and Background of Web Pages, Hypertext, Hyperlink and Hypermedia, Links, Anchors and URLs, Links to External Documents, Different Section of a Page and Graphics, Footnote and E-Mailing, Creating Table, Frame, Form and Style Sheet.

UNIT-IV
CSS: Introduction, Syntax, Colors, Backgrounds, Borders, Margins, Padding, Height/ Width, Box Model, Outline, Text, Fonts, Icons, Links, Lists, Tables, Display, Max, Width, Position, Overflow, Float, Inline, Block, Align, Combinators, Pseudo,Class,Pseudo Elements, Opacity, Navigation Bar, Dropdowns, Image Gallery, Image Sprites, Attr Selectors, Forms, Counters, Website Layout, Units, Specificity.

UNIT-V
XML: Introduction, Tree, Syntax, Elements, Attributes, Namespaces, Display, HTTP request, Parser, DOM, XPath, XSLT, XQuerry, XLink, Validator, DTD, Schema, Server

Suggested Books:
1. Shelley Powers, "Dynamic Web Publishing" 2
2. Html & CSS: The Complete Reference 5th Edition (English, Paperback, Thomas A. Powell)
3. XML: The Complete Reference Book by Heather Williamson

BACHELOR OF COMPUTER APPLICATION (B.C.A.)
DETAILED SYLLABUS
FIRST SEMESTER
PAPERCODE: C-105
Elementary Mathematics

Unit-I

Set Theory, Relations and Functions: Elements of set theory, methods of describing sets, types of sets, Venn diagrams, operations on sets (union, intersection, difference), and applications. Properties of relations, equivalence relations, partial order relations, functions (domain, range, onto, into, one-to-one), composite and inverse functions, trigonometric, logarithmic and exponential functions. Basic Concept of Graph Theory.

Unit-II

Determinants and Matrices: Definition, Minors, Cofactors and Properties of Determinants. Introduction to matrices, types of matrices (row, column, rectangular, square, diagonal, etc.), scalar multiplication, matrix addition and subtraction, matrix multiplication, and transpose of a matrix. Inverse and Rank of Matrix, Linear dependence of Vectors, Eigen Values and Eigen vectors of a Matrix, Cayley-Hamilton Theorem (without proof).

Unit-III

Probability: Introduction, sample space and events, Axioms of probability, Addition and multiplication theorems, conditional probability, Bayes' Theorem, problems.

Unit-IV

Statistics: Classification of data, Tabulation of data, Preparation of frequency distribution, Presentation of data through histogram, frequency polygon and frequency curve. Computation of Arithmetic mean, median and mode for ungrouped data and grouped data.

UNIT-V

Measures of dispersion and Correlation: Computation of Range, Quartile-deviation, mean-deviation and Standard -deviation, coefficient of variation. (Numerical Applications Only). Meaning of Correlation, types of correlation, correlation coefficient, Karl Pearson, spearman's rank correlation coefficient. (Numerical Applications Only)

BACHELOR OF COMPUTER APPLICATION (B.C.A.)
DETAILED SYLLABUS
SECOND SEMESTER
PAPERCODE: C-201
Java Programming

UNIT-I
Introduction, Java Tokens, Java Statements, Command Line Arguments, Programming Style, Constants, Variables, Data Types, Constants, Variables, Declaration of Variables, Scope of Variables, Symbolic Constants, Type Casting, Java Program Structure, Operators, Expressions, Statements, Decision Statements, Control Structure or statement, JDK, JRE, and JVM (Java Virtual Machine), Class-path, Execution process of Java program.

UNIT-II
Defining a Class, Creating Objects, Accessing Class Members, Constructors, Methods Overloading, Static Members, Nesting of Methods and Inheritance: Extending a Class, interface, super, Overriding & Overloading Methods, final Variables and Methods, Classes, Finalize Methods, Abstract Methods and Classes, Visibility Control. Arrays, One, Dimensional Arrays, Creating an Array, Two Dimensional Arrays, Wrapper Classes.

UNIT-III
Packages: Introduction, Java API Packages, Using system Packages, Naming Conventions, Creating Packages, Accessing a Packages, Adding a Class to a Package, Hiding Classes. **Multithreaded Programming:** Introduction, Creating Threads, Extending the Thread Class, Stopping and Blocking a Thread, Life Cycle of a Thread, Using Thread Methods, Thread Exceptions, Thread Priority, and Synchronization. **Managing Errors and Exceptions:** Introduction, Types of Errors, Exceptions, Syntax of Exception Handling Code, Multiple Catch Statements, Using finally Statement, Throwing Our Own Exceptions, Using Exceptions for Debugging.

UNIT-IV
Functions: String handling and its functions, Maths Functions. **Input/output-basics:** Input/output-basics streams and Byte and character streams, Character Reading from Keyboard by Input Stream Reader, Reading a Line/String from Keyboard by Buffered Reader, Standard I/O Streams Using Data Streams to read/write. **Applet:** Introduction of Applet, How Applets Differ from Application, Preparing to Write Applets, Building Applet Code, Applet Life Cycle, Creating an Executable Applet, Designing a Web Page, Applet Tag, Adding Applet to HTML File, Running the Applet

UNIT-V
Introduction to AWT programming, Graphics, Dialog Boxes, AWT Components/Controls, Layouts, Event Handling. JDBC architecture Establishing connectivity and working with connection interface, Working with statements, Creating and executing SQL statements, Working with Result Set, Socket Programming, Introduction to Swing, Servlet and JSP.

Suggested Books:

1. E. Balagurusamy, Programming with Java, A Primer Second Edition, Tata McGraw Hill, New Delhi.
2. P.Naughton and H. Schildt, JAVA: The Complete Reference, TMH, New Delhi 2005.
3. D.Jana, Java and Object Oriented Programming Paradigm, PHI, New Delhi, 2005

BACHELOR OF COMPUTER APPLICATION (B.C.A.)
DETAILED SYLLABUS
SECOND SEMESTER
PAPERCODE: C-202
Data Base Management System

UNIT-I
Introduction: Database System Concepts, Database Users and Architecture, Introduction to Traditional File Oriented System, Characteristics of the Database Approach, Components of Database System, Advantages and disadvantages of Using a DBMS, Database Schemas and Instances , DBMS Architecture, Data Independence, Database Languages and Interfaces, Classification of Database Management Systems.

UNIT-II
Data Modelling & Relational Database Management System Data Modelling Using the Entity Relationship Model: Entity Types, Entity Sets, Attributes, Keys, Relationships, Relationship Types, Roles, and Structural, Constraints, Weak Entity Types, ER Diagrams, Naming Conventions, Design Issues.

UNIT-III
The Relational Data Model: Relational Constraints and the Relational Algebra: Relational Model Concepts, Relational Constraints and Relational Database Schemas Update Operations and Dealing with Constraint Violations, Basic Relational Algebra Operations, Additional Relational Operations and Examples of Queries in Relational Algebra.

UNIT-IV
SQL: SQL and Database Design Theory and Methodology Structured Query Language the Relational Database Standard: Data Definition, Constraints and Schema Changes in SQL, Types of SQL Commands, SQL Operators and their Procedure, Insert, Delete, and Update Statements in SQL Queries and Sub Queries, Aggregate Functions, Joins, Unions, Intersection, Minus, Views (Virtual Tables) in SQL. Functional Dependencies and Normalization for Relational Databases: Informal Design Guidelines for Relation Schemas, Functional Dependencies, Armstrong Rules, Closure of Attributes, Normal Forms Based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce Codd Normal Form.

UNIT-V
Transaction Processing: Concurrency Control and Distributed Database Transaction Processing Concepts: Introduction to Transaction Processing, Transaction and System Concepts, Desirable Properties of Transactions, Concurrency Control Techniques, Locking Techniques for Concurrency Control, Concurrency Control Based on Timestamp Ordering.

Suggested Books:
1. A.K. Majumdar, P. Bhattacharya, "Database Management Systems", TMH, 1996.
2. Bipin Desai, "An Introduction to database systems",Galgotia Publications, 1991

BACHELOR OF COMPUTER APPLICATION (B.C.A.)
DETAILED SYLLABUS
SECOND SEMESTER
PAPERCODE: C-203
Data Structure Using 'C'

UNIT-I
Classification of Data Structure, Operations on Data Structure, Address Calculation, Application of arrays, Limitation of Array, Application of Arrays, Array as Parameters, Sparse Matrices

UNIT-II
Continuous Implementation (Stack): Array Representation, Operations on Stacks: Push & Pop, Applications of stack, Conversion of Infix to Prefix and Postfix Expressions, Evaluation of postfix expression using stack Recursion: Recursive Definition and Processes, Tower of Hanoi Problem, Recursion Vs. Iteration Continuous. Implementation (Queue): Array representation and implementation of Queues, Operations on Queue: Create, Add, Delete, Full and Empty Queue, Circular Queue, Dequeue and Priority Queue

UNIT-III
Non-Continuous Implementation: Linked Lists: Linear List concept, Linked List Terminology, Representation of Linked List in Memory, Types of Linked List, Single Linked List, Doubly Linked List, Single Circular Linked list, Circular Doubly Linked List, Operations on Linked List: Create List Insert node (empty list, beginning, middle, end), Delete node(first, general case), Traversing node, Searching node, Print list, Count Nodes, Sort Lists

UNIT-IV:
Trees: Introduction to Tree & its Terminology, Binary trees, Types of Binary trees, Representation of Binary Tree, Traversals (Inorder, Preorder, Postorder), Tree Expression, Binary Search Tree, Insertion and Deletion in BST.

UNIT-V:
Sorting & Searching Techniques: Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort, Sequential Search, Binary Search. *Graph: Introduction and types of graph, graph representation, Shortest path problem.*

Suggested Readings:
1. S. Lipschutz,"Data structures",Mc,Graw,Hill International Editions,1986.
2. A. Michael Berman,"Data Structures via C++",Oxford University Press,2002.
3. M. Weiss,"Data Structures and Algorithm Analysis in C++",Pearson Education

BACHELOR OF COMPUTER APPLICATION (B.C.A.)
DETAILED SYLLABUS
SECOND SEMESTER
PAPER CODE: C-204
Principles of Management

UNIT-I
Nature of Management: Meaning, Definition, it's nature purpose, importance & Functions, Management as Art, Science & Profession- Management as social System Concepts of management, Administration, Organization, Evolution of Management.

UNIT-II
Functions of Management: Planning - Meaning - Need & Importance, type's levels, advantages & limitations. Forecasting - Need & Techniques Decision making – Types, Process of rational decision making & techniques of decision-making Organizing.

UNIT-III
Elements of organizing & processes: Types of organizations, Delegation of authority - Need, difficulties in delegation - Decentralization Staffing - Meaning & Importance Direction, Nature, Principles Communication, Types & Importance Motivation, Importance, theories, Leadership - Meaning - styles, qualities & functions of leaders

UNIT-IV
Functions of Management: Controlling - Need, Nature, importance, Process & Techniques Coordination - Need – Importance, Strategic Management Definition, Classes of Decisions, Levels of Decision, Strategy, Role of different Strategist, Relevance of Strategic Management and its Benefits Strategic Management in India.

UNIT-V
Recent Trends in Management: Social Responsibility of Management – environment friendly management, Management of Change Management of Crisis Total Quality Management Stress Management International Management

Suggested Books:
1. Essential of Management - Horold Koontz and Iteinz Weibrich–McGrawhills International
2. Management Theory & Practice - J.N.Chandan
3. Essential of Business Administration - K.Aswathapa Himalaya Publishing House

BACHELOR OF COMPUTER APPLICATION (B.C.A.)
DETAILED SYLLABUS
SECOND SEMESTER
PAPER CODE: C-205
Mathematics -I

UNIT-I
Basic concept of Trigonometry:
Basic trigonometric functions, Evaluating trigonometric functions for common angles, trigonometrical identities (Sum, difference and double angle formulas) and their applications.

UNIT-II
Limits & Continuity: Limit at a Point, Properties of Limit, Computation of Limits of Various Types of Functions, Continuity at a Point, Continuity Over an Interval, Intermediate Value Theorem, Type of Discontinuities

UNIT-III
Differentiation: Derivative, Derivatives of Sum, Differences, Product & Quotients, Chain Rule, Derivatives of Composite Functions, Logarithmic Differentiation, Rolle's Theorem, Mean Value Theorem, Expansion of Functions (Maclaurin's & Taylor's), Indeterminate Forms, L-Hospitals Rule, Maxima & Minima, Curve Tracing, Successive Differentiation & Leibnitz Theorem (definition only).

UNIT-IV
Integration: Integral as Limit of Sum, Fundamental Theorem of Calculus (without proof), Indefinite Integrals, Methods of Integration Substitution, By Parts, Partial Fractions, Reduction Formulae for Trigonometric Functions, Gamma and Beta Functions (definition only).

UNIT-V
Vector Algebra: Definition of a vector in 2 and 3 Dimensions, Double and Triple Scalar and Vector Product and physical interpretation of area and volume.

Suggested Books:
1. B.S. Grewal, "Elementary Engineering Mathematics", 34th Ed., 1998.
2. Shanti Narayan, "Integral Calculus", S. Chand & Company, 1999
3. H.K. Das, "Advanced Engineering Mathematics", S. Chand & Company, 9th Revised Edition, 2001.

BACHELOR OF COMPUTER APPLICATION (B.C.A.)
DETAILED SYLLABUS
THIRD SEMESTER
PAPER CODE: C-301
Digital Electronics

UNIT-I
Number System & Boolean Algebra: Number System: Binary, Octal, Decimal, Hexadecimal, Conversion of Number System, Binary Arithmetic & Complement (1's and 2's), Binary Codes: Weighted & Non-Weighted, Gray Code, Excess-3 Code, Cyclic codes, Hamming Code, Boolean Function, Boolean Postulates, De-Morgan's Theorem
Boolean Expressions: Sum of Product, Product of Sum, Minimization of Boolean Expressions using K- Map, Logic Gates: AND, OR, NOT, NAND, NOR, XOR, XNOR, Implementations of Logic Functions using Gates, NAND, NOR Implementations.

UNIT-II
Combinational Circuits: Adders &Subtractors: Half Adder, Full Adder, Binary Adder, Half Subtractor, Full Subtractor, Magnitude Comparator: Two Bit Magnitude Comparator, Three Bit Magnitude Comparator, Multiplexer & De-Multiplexer: 4*1 Multiplexer, 8*1Multiplexer, Decoder & Encoder.

UNIT-III
Sequential Circuit: Introduction to Flip Flops: SR, JK, T, D, Master Slave Flip Flops, Characteristic Table & Equation, Edge Triggering & Level Triggering, Excitation Table, State Diagram, State Table, State Reduction, Design of Sequential Circuits.

UNIT-IV:
Registers: Introduction of Registers, Classification of Registers, Register with Parallel Load, Shift Registers, Bidirectional Shift Register with Parallel Load.

UNIT-V:
Counters: Introduction of Counter, Asynchronous/Ripple Counters, Synchronous Counters, BCD Counter, 4-bit Binary Counter with Parallel Load, Design of Synchronous Counters, Ring Counter, Johnson Counter

Suggested Books:
1. Digital Logic and Computer design (PHI) 1998 : M.M. Mano
2. Computer Architecture (PHI) 1998 : M.M. Mano
3. Digital Electronics (TMH) 1998 :Malvino and Lea

BACHELOR OF COMPUTER APPLICATION (B.C.A.)
DETAILED SYLLABUS
THIRD SEMESTER
PAPER CODE: C-302
Python Programming

UNIT-I
Basic of Python, Features, Application, Python interpreter, Interpreters vs Compilers, Data Types, Identifiers and keywords, Literals, Strings, Assigning Values to Variables, Multiple Assignment Basic Operators in Python: Arithmetic, Comparison, Assignment, Bitwise ,Logical ,Membership Operators (in, not in) ,Identity Operators (is, is not), Operators Precedence.

UNIT-II
Creating Python Programs: Input and Output Statements, Conditional Statement- if...else, Difference between break, continue and pass, Control statements (Looping- while Loop, for Loop, Loop Control, nested loops).

UNIT-III
Python Strings, Accessing Values in Strings, String Special Operators, String Formatting Operator, Triple Quotes, Indexing and Slicing, Built-in String functions. **Python Lists** -Accessing Values in Lists, Updating Lists, Basic List Operations, Indexing, Slicing, and Matrixes, Built-in List Functions & Methods. **Python Tuples** - Accessing Values in Tuples, Updating Tuples, Delete Tuple Elements, Basic Tuples Operations, Indexing, Slicing, Built-in Tuple Functions.

Python Dictionary - Accessing Values in Dictionary, Updating Dictionary Python Programming, Delete Dictionary Elements, Built-in Dictionary Functions & Methods.

Unit-IV
Functions: Defining a Function, Syntax, calling a Function, call by value and call by reference, pass by reference vs value, Function Arguments, required arguments, Keyword arguments, Default arguments, Variable-length arguments, The return Statement, Scope of Variable.

Unit-V
File Manipulation, Opening Text File, Working with a File on Python, The open function, File modes, The file object attributes, close() method, write() method, read() method, Files: Input, Files: Output, Reading files, Renaming & deleting files, Writing into a file, remove() method.

Suggested Books:

1. Guido Van Rossum , Learning Python: Crash Course Tutorial Paperback – 22 July 2020
2. Mark Lutz, Python Pocket Reference, 5th edition Feb. 2014
3. 3. G van Rossum ,An Introduction to Python

BACHELOR OF COMPUTER APPLICATION (B.C.A.)
DETAILED SYLLABUS
THIRDSEMESTER
PAPER CODE: C- 303
Software Engineering

UNIT-I
Introduction: Definition of Software, Type of Software, Characteristic of Software, Attributes of Good Software, Definition of Software Engineering. Software Engineering Costs, Key Challenges that Software Engineering Facing, System Engineering and Software Engineering. Requirements Definition - Software Requirements Specification - Specification Techniques - Languages and Processors for Requirements.

UNIT-II
System Development Life Cycle: The Waterfall Model, Verification & Validation Model, Spiral Model, Iterative Incremental Model, Big Bang Model, Rapid Application Model, Agile Model, Extreme Programming, Prototype Model: Evolutionary Development of Software.

UNIT-III
Design Concept: Abstraction, Architecture, Patterns, Modularity: Cohesion, coupling, Information Hiding, Functional Independence Model, User Interface Design: Information Presentation, Interface Evaluation, Design Notation

UNIT-IV
Software Testing and Quality Assurance: Verification and Validation, Techniques of Testing: Black-Box and White Box Testing, Inspections. Level of Testing: Unit Testing, Integration Testing, Interface testing, System Testing, Alpha and Beta Testing, Regression Testing. Design of test Cases, Quality Management activities, Product and process quality, capability Maturity Model (CMM)

UNIT-V
Software Cost Estimation: Introduction - Software Cost Factors - Software Cost Estimation Techniques - Stating Level estimation - Estimating Software Maintenance Costs Software.

Suggested Books:
1. Ian SommerVille, Pearson , Software Engineering, 10 th Edition.
2. Amiya Kumar Rath, Fundamental of Software Engineering.
3. Roger S. Pressman, McGrewHill, Software Engineering a practitioner Approach.

BACHELOR OF COMPUTER APPLICATION (B.C.A.)
DETAILED SYLLABUS
THIRD SEMESTER
PAPER CODE: C-304
Computer Network

UNIT I
Data Communications: Introduction: Theoretical basis for communication, Fourier analysis, Band limited signals, Maximum data rate of a channel: Transmission impairments, Attenuation distortion, Delay distortion, Dispersion, Noise: Data transmission modes, Serial & Parallel, Simplex, Half duplex & full duplex, Synchronous & Asynchronous transmission.
Transmission Medium: Introduction: Transmission medium, Guided & Unguided ,Twisted pair, Coaxial cable, Optical fiber, Comparison of fiber optics and copper wire: Wireless transmission.

UNIT II
Computer Network: Introduction: Definition of a Computer Network, Components of a computer network, Types of Network: (LAN, MAN, WAN). Network topologies, **OSI Reference Model, TCP /IP Model,** Multiplexing, FDM, Frequency division multiplexing, WDM, Wavelength division multiplexing, TDM, Time division multiplexing.

UNIT III
Data Link Layer: Services provided to the Upper Layer, Framing, Error Control, Flow Control, sliding window protocols. **Medium Access Sub Layer:** Medium access sub layer - channel allocations, LAN protocols – aloha protocols.

UNIT IV
Network Layer: Introduction, Services provided to the Upper Layer: Routing Algorithms (Centralized, Distributed), Congestion Control (Token Based and Non-Token Based), Internet working, IP packet, IP address, IPv4 and IPV6. **Transport Layer:** Introduction, Design, connection management, UDP.

UNIT V
Session Layer: Introduction, Design and remote procedure call.
Presentation Layer: Introduction, Design.
Application Layer: Introduction, File transfer, access and management, electronic mail, virtual terminals, other application.

Suggested Books:
1. W. Stallings, "Data and Computer Communication", Pearson Education.
2. A. S. Tanenbaum, "Computer Network", 4th, Edition, Pearson Education.
3. Forouzan, "Data Communication and Networking", 2nd Edition, Tata McGraw Hill.

BACHELOR OF COMPUTER APPLICATION (B.C.A.)
DETAILED SYLLABUS
THIRD SEMESTER
PAPER CODE: C-305
Numerical Methods

UNIT I
Classification of data, Tabulation of data, Preparation of frequency distribution, Presentation of data through histogram, frequency polygon, frequency curve

UNIT II
Measures of Central Tendency: Computation of Arithmetic mean, median and mode for ungrouped data and grouped data, Verification of median through ogives.

UNIT III
Measures of dispersion: Computation of Range, Quartile deviation, mean deviation and Standard deviation, coefficient of variation. (Numerical Applications Only)

UNIT IV
Concept of Skewness, Karl Pearson's and Bowley's Coefficients of Skewness(Numerical Applications Only)

UNIT V
Meaning of Correlation, types of correlation, correlation coefficient, Karl Pearson, spearman's rank correlation coefficient. (Numerical Applications Only)

Suggested Books:
1. Statistical Methods,"Dr.S.P. Gupta,SultanChand&Sons".
2. Quantitative Techniques by "C. Sathyadevi,S. Chand".
3. Fundamental of Mathematical Statistics,"S.C.Gupta&V.K.Kapoor,SultanChand"
4. Statistical Methods,"SnedecorG.W.&CochranW.G.oxford&+DII"
5. Elements of Statistics,"Mode.E.B.,PrenticeHall"

Suggested Books:

1. RK Jain and SRK Iyengar "Advanced Engineering Mathematics", Narosa Publication.
2. Ray, Sharma and Chaudhary "Mathematical Statistics", Ram Prasad Publication.
3. Satinder Bal Gupta, "Discrete Mathematics and Structures" Laxmi Publication.
4. D.K. Gupta, Kedar Nath,"Statistical Method and Application" Ram Nath Publication.

BACHELOR OF COMPUTER APPLICATION (B.C.A.)
DETAILED SYLLABUS
FOURTHSEMESTER
PAPER CODE: C-401
Web Technology with PHP & MySQL

UNIT I
PHP: Introduction to PHP Evaluation of PHP, Basic Syntax, Defining variable and constant, PHP Data type, Operator and Expression. Decisions and loop Making Decisions, Doing Repetitive task with looping, Mixing Decisions and looping with Html. Function: Define a function, Call by value and Call by reference, Recursive function, String Creating and accessing, String Searching & Replacing String, Formatting String, String Related Library function.

UNIT II
Array: Anatomy of an Array, Creating index based and Associative array Accessing array, Element Looping with Index based array, Looping with associative array using each () and foreach(), Some useful Library function. Handling Html Form with PHP Capturing Form, Data Dealing with Multi-value filed, and Generating File uploaded form, redirecting a form after submission.

UNIT III
Working with file and Directories: Understanding file& directory, Opening and closing, a file, Coping, renaming and deleting a file, working with directories, Creating and deleting folder, File Uploading & Downloading.

UNIT IV
Session and Cookie: Introduction to Session Control, Session Functionality What is a Cookie, Setting Cookies with PHP. Using Cookies with Sessions, Deleting Cookies, Registering Session variables, Destroying the variables and Session. 8. Database Connectivity with

UNIT V
MySQL: Introduction to RDBMS, Connection with MySQL Database, Performing basic database operation (DML) (Insert, Delete, Update, Select), Setting query parameter, Executing query Join (Cross joins, Inner joins, Outer Joins, Self joins.) Exception Handling Understanding Exception and error, Try, catch, throw. Error tracking and debugging.

Suggested Books:
1. Learning PHP, MySQL, books by "O riley Press".
2. Beginning PHP and My SQLby" W. Jason Gilmore"

DR. BHIMRAO AMBEDKAR UNIVERSITY, AGRA

BACHELOR OF COMPUTER APPLICATION (B.C.A.)
DETAILED SYLLABUS
FOURTH SEMESTER
PAPER CODE: C-402
Operating System

UNIT-I

Introduction: What is an operating system, Simple Batch Systems, Multi, programmed Batch systems, Time, Sharing Systems, Personal, Computer Systems, Parallel systems, Distributed systems, Real, Time Systems. **Process Management:** Process Concept, Process Scheduling, Cooperating Processes, Threads, Inter process Communication, CPU Scheduling Criteria, Scheduling Algorithms, Multiple-Processor Scheduling.

UNIT-II

Process Synchronization and Deadlocks: The Critical-Section Problem, Synchronization Hardware, Semaphores, Classical Problems of Synchronization, Critical Regions, Monitors, **Deadlocks:** System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock .

UNIT-III
Memory Management: Logical and Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation with Paging, Virtual Memory, Demand Paging and its performance, Page Replacement Algorithms, Allocation of Frames, Thrashing, Page Size and other considerations, Demand Segmentation.

UNIT-IV
File Management: File Systems, Secondary Storage Structure, File concept, Access methods, Directory implementation, Efficiency and performance, Recovery.

UNIT-V
Disk Management: Disk Structure, Disk scheduling, Disk scheduling algorithm: FCFS, SSTF, SCAN, Recovery, Swap-Space Management, Disk Reliability.

Suggested Books:
1. Silbersachatz and Galvin, "Operating System Concepts", Person, 5th Ed. 2001
2. Madnick E., Donovan J., "Operating Systems:, Tata McGraw Hill, 2001

BACHELOR OF COMPUTER APPLICATION (B.C.A.)
DETAILED SYLLABUS
FOURTHSEMESTER
PAPERCODE: C- 403
Cloud Computing

UNIT I
Introduction: Introduction to Cloud Computing, Definition of Cloud , Evolution of Cloud Computing, Underlying Principles of Parallel and Distributed Computing ,Cloud Characteristics, Elasticity in Cloud, On-demand Provisioning.

UNIT II
Cloud enabling technologies: Service Oriented Architecture , Basics of Virtualization, Types of Virtualization, Implementation Levels of Virtualization ,Virtualization Structures ,Tools and Mechanisms, Virtualization of CPU, Memory – I/O Devices , Virtualization Support and Disaster Recovery

UNIT III
Cloud architecture, services and storage: Layered Cloud Architecture Design , Cloud Architecture ,Public, Private and Hybrid Clouds ,IaaS ,PaaS ,SaaS ,Architectural Design Challenges ,Cloud Storage: Storage as-a-Service, Advantages of Cloud Storage , Cloud Storage Providers – S3.

UNIT IV
Resource management and security in cloud: Inter Cloud Resource Management, Resource Provisioning and Resource Provisioning Methods ,Security Overview ,Cloud Security Challenges, Software-as-a Service Security ,Security Governance

UNIT V
Cloud technologies and advancements: Hadoop , MapReduce ,Virtual Box ,Google App Engine – Programming Environment for Google App Engine

Suggested Books:
1. RajkumarBuyya, Christian Vecchiola, S. ThamaraiSelvi, ─Mastering Cloud Computing, Tata Mcgraw Hill, 2013.

2. Rittinghouse, John W., and James F. Ransome, ─Cloud Computing: Implementation, Management and Security, CRC Press, 2017.

BACHELOR OF COMPUTER APPLICATION (B.C.A.)
DETAILED SYLLABUS
FOURTH SEMESTER
COURSE CODE: C-404
Computer Organization and Architecture

UNIT I

Von Neumann Architecture, Basic structure of Computers Operational concepts, Introduction to Binary Arithmetic, Booths Algorithm, IEEE Standards, Floating Point Arithmetic , The accumulator, Shifts, Carry and Overflow. Instruction Characteristics, CPU with Single BUS, Types of Operands, Types of Operations, Addressing Modes, Instruction Formats.

UNIT II

Processor Organization: Parallelism and Computer arithmetic, Computer arithmetic associatively. Floating Point in the 8086, Programmers Model of 8086, Register Organization, 8086 Registers, Instruction Cycles, Addressing Modes. Micro operations, The Instruction cycle, Control of the CPU, Functional Requirements, Single, Two, Three bus structure, Execution of a complete instruction, Branching, Sequencing of Control Signals, Hardwired Control Unit, Micro-Programmed Control.

UNIT III

Memory Organization: Concept of Memory: Memory system considerations, Design of memory subsystem using Static, Dynamic Memory Chips, Memory interleaving **High Speed Memories:** Cache Memory, Structure of cache and main memory, Elements of Cache Design, Mapping functions, Replacement algorithms, External Memory.

UNIT IV

I/O Organization: Input / Output Module: Need, Techniques, Interrupt Driven I/O, Basic concepts of an Interrupt , Response of CPU to an Interrupt, Design Issues, Priorities, Interrupt handling, Types of Interrupts. Data Transfer Techniques, Data Memory Access, Buses, Types of buses, I/O Interface, Synchronous and Asynchronous Data Transfer, Serial I/O, Input Devices, Output Devices, Multiprogramming vs. Multiprocessing, Comparison between closely coupled and loosely coupled Multiprocessor

UNIT V

Microprogramming: Basic Principles, Features , Hardwired vs. micro programmed computers, Applications and advantages of microprogramming, Limitations of microprogramming, Computer Clock. Parallel Organization, Instruction Set Architecture (ISA), RISC and CISC, Characteristics of CISC, Characteristics of RISC, RISC versus CISC.

Suggested Books:

1. Computer Organization & Architecture– by Stallings
2. Computer Organization and Architecture: Designing for Performance by William Stallings
3. Computer Architecture and Organization by John Hayes

DR. BHIMRAO AMBEDKAR UNIVERSITY, AGRA

BACHELOR OF COMPUTER APPLICATION (B.C.A.)
DETAILED SYLLABUS
FOURTHSEMESTER
PAPER CODE: C-405
Optimization Techniques

UNIT-I
Basics of operation research (OR): Characteristics of OR, Necessity of OR in industry ,OR and decision making, role of computers in OR. Linear Programming: Formulations and graphical solution of (2 variables) canonical and standard terms of linear programming problem.

UNIT-II
Algebraic solution: Simplex methods, Charnes method of penalties, two phase simplex method.

UNIT-III
Transportation Model: Definition, formulation and solution of transportation models, The row, minima, column, minima, matrix, minima and Vogel's approximation methods. Assignment model: Definition of assignment model, comparison with transportation model, formulation and solution of assignment model.

UNIT-IV
Sequencing Problem: Processing of n jobs through 2 machines, processing n jobs through 3 machines, processing 2 jobs through m machines.

UNIT-V
Game Theory: Characteristics of games, maxima, minimax criteria of optimality, dominance property, algebraic and graphical method of solution of solving 2 x 2 games.

Suggested Books:

1. Introduction to Management Science Operations Research,"KantiSwarup".
2. Operations Research Quantitative Techniques For Management,"V. K. Kapoor".
3. Nonlinear Programming: Theory and Algorithms"byMokhtar S Bazara and C M Shetty".

BACHELOR OF COMPUTER APPLICATION (B.C.A.)
DETAILED SYLLABUS
FIFTH SEMESTER
PAPER CODE: C-501
Network Security

UNIT-I
Network Security: Introduction: OSI Security Architecture-Classical Encryption techniques Cipher Principles, Data Encryption Standard, Block Cipher Design Principles and Modes of Operation.

UNIT-II
Introduction to Number Theory: modular arithmetic, prime and relative prime numbers, Extended Euclidean Algorithm, Fermat's and Euler's theorem, Primarily testing, Chinese Remainder theorem, Discrete Logarithmic Problem .Public Key Cryptography: Key Management, Diffie Hellman key Exchange-Elliptic Curve . Confidentiality using Symmetric Encryption, Public Key Cryptography and RSA.

UNIT-III
Authentication and Hash Function: Authentication requirements, Authentication functions– Message Authentication Codes, Hash Functions, Security of Hash Functions and MACs, MD5 message Digest algorithm, Secure Hash Algorithm, RIPEMD, HMAC Digital Signatures, Authentication Protocols, Digital Signature Standard

UNIT-IV
Network Security: Authentication Applications: Kerberos, X.509 Authentication Service, Electronic Mail Security, PGP, S/MIME, IP Security, Web Security.

UNIT-V
System Level Security: Intrusion detection, password management, Viruses and related Threats, Virus Counter measures, Firewall Design Principles, Trusted Systems.

Suggested Books:
1. William Stallings, "Cryptography and Network Security, Principles and Practices ", Prentice Hall of India, Third Edition,2003.
2. AtulKahate-"Cryptography and Network Security & quot;,Tata McGraw,Hill,2003.

BACHELOR OF COMPUTER APPLICATION (B.C.A.)
DETAILED SYLLABUS
FIFTH SEMESTER
PAPER CODE: C-502
Visual Basic .NET

UNIT-I
Visual Basic .NET and the .NET Framework: Introduction to .net framework , Features, Common Language Runtime (CLR), Framework Class Library(FCL). Visual Studio.Net – IDE, Languages Supported, Components, Visual Programming, VB.net, Features, IDE, Menu System, Toolbars, Solution Explorer, Object Browser, Toolbox, Class View Window, Properties Window, Server Explorer, Task List, Output Window, Command Window.

UNIT-II
Programming in Visual basic .net: Data Types, Keywords, Declaring Variables and Constants, Operators, Understanding Scope and accessibility of variables, Conditional Statements, If- then, If- then- else, Nested If, Select Case, Looping Statement, Do loop, For Loop, For Each, Next Loop, While Loop, Arrays, Static and Dynamic.

UNIT-III
Functions, Built-In Dialog Boxes, Menus and Toolbar: Menus and toolbars, Menu Strip, Tool Strip, Status Strip, Built-In Dialog Boxes –Open File Dialogs, Save File Dialogs, Font Dialogs, Color Dialogs, Print Dialogs, Input Box, Msg box, Interfacing with End user, Creating MDI Parent and Child, Functions and Procedures, Built-In Functions, Mathematical and String Functions, User Defined Functions and Procedures.

UNIT-IV
Elements of Visual Basic .Net: Properties, Events and Methods of Form, Label, Text Box, List Box, Combo Box, Radio Button, Button, Check Box, Progress Bar, Date Time Picker, Calendar, Picture Box, HScroll bar, VScroll Bar, Group Box, ToolTip, Timer.

UNIT-V
Advanced Concepts in VB.Net: Object Oriented Programming, Creating Classes, Objects, Fields, Properties, Methods, Events, Constructors and destructors, Exception Handling, Models, Statements, File Handling, Using File Stream Class, File Mode, File Share, Opening or Creating Files with File Stream Class, Reading and Writing Text using Stream Reader and Stream Writer Classes, Data Access with ADO.Net – What are Databases? Data Access with Server Explorer, Data Adapter and Data Sets, ADO.NET Objects and Basic SQL. Creating Windows/Web Applications with the help of databases.

Suggested Books:
1. Jesse liberty :"Learning Visual Basic.net"
2. Steven Holzner: " VB.NETBlackBook "
3. Chuck Easttom: " Learn VB.NET"

BACHELOR OF COMPUTER APPLICATION (B.C.A.)
DETAILED SYLLABUS
FIFTHSEMESTER
PAPERCODE: C-503
Computer Graphics

UNIT I
Introduction: Concept of Computer Graphics, Interactive Graphics, Advantages of Interactive Graphics, Uses of Computer Graphics, Hardcopy Technologies, Display Technologies, Raster Scan Display System, Video Controller, Random, Scan Display processor, Image Scanners.

UNIT II
Scan Conversion: Scan Converting Lines, Scan Converting Circles, Scan Converting Ellipses. **Line Clipping:** Point clipping, Cohen-Sutherland line clipping Algorithm, Midpoint Subdivision Algorithm, Cyrus Beck Algorithm.

UNIT III
Geometrical Transformation: Introduction, types of transformation, **2D Transformation:** (translation, rotation, scaling, reflection and shearing), Homogeneous Coordinates and Matrix Representation of 2D Transformations, Successive and composition of 2D Transformations, the Window to Viewport Transformations, Introduction to 3D Transformations Matrix.

UNIT IV
Curves & Surfaces: Polygon Surfaces and polygon meshes, Quadratic and super quadrics surfaces, Spline curve and representation. **Solid Modeling:** Characteristics, Representation, primitive Instancing, Sweep Representations, Boundary Representations, Constructive Solid Geometry, Spatial Partitioning Representations: Cell Decomposition, Enumeration of Space Occupation, Octree representation

UNIT V
Computer Animation: Introduction, Application of animation, Morphing, Keyframe system, Motion specifications in Animation, Types of animation, Sequencing of Animation Design and Fundamental principles of animation.

Suggested Books:
1. Foley, Van Dam,Feiner, Hughes, Computer Graphics Principles& practice,2000.
2. D.J. Gibbs & D.C. Tsichritzs: Multimedia programming Object Environment & Frame work, 2000.
3. D.Haran& Baker. Computer Graphics Prentice Hall of India, 1986

BACHELOR OF COMPUTER APPLICATION (B.C.A.)
DETAILED SYLLABUS
FIFTH SEMESTER
PAPERCODE: C-504
Artificial Intelligence & Machine Learning

UNIT-I
AI Concepts, Various definitions of AI, Knowledge, Knowledge Pyramid, Characteristics of AI Problems, Problem Representation in AI, Application Areas of AI.

UNIT-II
Expert System: Components of Expert System: Knowledge Base, Inference Engine, User Interface, Features of Expert System, Expert System Life Cycle, Advantages/Limitations of Expert System, Application Areas of Expert System.

UNIT-III
AI and Search Process: Brute Force Search, Depth First/Breadth First Search, Heuristic Search: Hill Climbing, Constraint Satisfaction, Mean End Analysis, Best First Search, A* Algorithm, AO* Algorithm, Beam Search.

UNIT-IV
Natural Language Processing: Introduction, Need, Goal, Fundamental Problems in Natural Language Understanding, Text and Speech Recognition: Introduction, Advantages and Approaches.

UNIT-V
Machine Learning: Introduction, Supervised, Unsupervised and Reinforcement Learning, Decision Tree, KNN, Support Vector Machines (SVM), Bayes theorem, Clustering: K-Means, K-Medoids

Suggested Books:

1. V S Janakiraman, "Foundation of Artificial Intelligence and Expert Systems"
2. Dan W. Patterson, "Introduction to Artificial Intelligence and Expert Systems"

BACHELOR OF COMPUTER APPLICATION (B.C.A.)
DETAILED SYLLABUS
FIFTH SEMESTER
PAPER CODE: C-505
Design and Analysis of Algorithm

UNIT-I
Basic Concepts of Algorithms: Definition of algorithm, Characteristic of algorithm, Complexity Analysis techniques, Asymptotic Notations (Growth of Functions). Master theorem, Substitution Method, Iteration Method

UNIT-II
Sorting: Divide and conquer Approach: Maximum &Minimum, Merge Sort, Quick Sort, Heap Sort with time complexity.

UNIT-III
Greedy method: General method, Knapsack Problem, Huffman Codes.
Dynamic Programming: Matrix, Chain Multiplications, Longest Common Subsequence-Backtracking: General method, N Queens Problem, Sum of subsets.

UNIT-IV
Analysis of Graph Algorithms: Elementary Graph Algorithms, Multistage Graphs, Basic Traversals and search techniques, techniques of graphs: BFS, DFS.
Minimum Spanning Trees: Kruskal's & Prim's Algorithm, Single Source Shortest Path, Dijkstra's& Bellman Ford, All Pairs Shortest Path: Warshal Algorithm.

UNIT-V
Introduction to Complexity Theory: The class P and NP, Polynomial reduction, NP- Complete Problems, NP-Hard Problems.

Suggested Books:

1. Thomas H. Coremen, "Introduction to Algorithms", PHI.
2. Horowitz&Sahani,"Fundamental of Algorithms", Galgotia.
3. Aho,"Design & Analysis of Computer Algorithms", Pearson.
4. Johnsonbaugh, "Algorithms", Pearson.