Branch: BCA	Semester-III
Subject Code: 3101	Lecture: 04 Credit: 04
Course Opted	Core Course - 7
Subject Title	DATA STRUCTURES

Course objectives:
- To impart basic concepts of data structures and algorithms
- To learn fundamental concepts about arrays, linked list, stack, queue, trees and graphs
- To understand concepts about searching and sorting techniques.
- To gain knowledge about writing algorithm and step by step approach in solving problems with the help of fundamental data structures.
- To find complexity of various algorithmic methods.

Course Outcomes:
- Understand basic data structures such as array, linked list, stack, queue, binary tree and graph along with algorithms.
- Ability to analyze algorithm and algorithm correctness.
- Apply searching and sorting techniques.

Modules	Sr. No.	Topic and Details	No. of Lectures Assigned	Marks Weightage %
UNIT -I	1	**Introduction:** Definition of Data Structures, Data Types vs. Data Structures, Classification of Data Structures, Description of various data structures, Arrays, Lists, Stacks, Queues, Trees and Graphs, Operations performed on Data Structures	4	8
	2	**Arrays:** One dimensional array, its Initialization, Implementation of One dimensional array in memory, Insertion, deletion of an element from one dimensional array, Traversing of an array	4	8
UNIT-II	3	**Linked Lists:** Introduction, Key terms, Advantages & disadvantages, Linear linked lists ( ) - Types (Singly, Doubly, Circular) Operations (Inserting, Deleting nodes)	6	12
	4	**Stack:** Introduction, Stack implementation, Operations on stack (Push Pop), Implementation of stack using pointer, Applications of stack, Infix prefix, postfix notations, Algorithms for converting from one form to another, Recursion	6	12
	5	**Queue:** Introduction and Queue implementation, Operations on queue (Insertion & deletion), Limitations of simple queue, Circular queue, Double ended queue (dequeue), Application queue & its types	6	12
UNIT-III	6	**Trees:** Introduction, terminology, Binary tree,, Strictly Binary tree, Complete Binary tree, Binary tree representation as Array and Linked lists, Traversal	6	12

		(Inorder, Preorder, Postorder), Binary Search Tree, Threaded Binary Tree		
	7	**Graphs:** Introduction, terminology, Graph representation, Applications of graph, Graph traversal (BFS, DFS, Shortest path), Spanning tree, Minimum spanning tree	6	12
UNIT-IV	8	**Sorting:** Bubble Sort , Selection Sort , Quick Sort, Heap Sort, Insertion Sort. **Searching & Hashing:** Searching - Sequential search, Binary Search Hash Function, Hashing Techniques, Collision Resolution	6	12
	9	**Algorithms Complexity:** Performance Analysis, Time –Space Trade off, Big O, Omega and Theta Notation, Analysis of all Sorting Techniques. **Recurrences:** The substitution method, Recursion tree method, Master method	6	12
		Total	50	100

Text Book:

1. S.Sawhney & E. Horowitz, "Fundamentals of Data Structure", Computer Science Press, 1987

References:

1. Trembley&Sorrenson, " Data Structure", 2005
2. Lipschuiz, "Data structures" , (Schaum's Outline Series Mcgraw Hill Publication)
3. Ellis Horowitz and SartajSawhney, "Fundamentals of Computer Algorithms"
4. Aho, Hopcroft and Ullman, "Data Structures and Algorithms"
5. AbhayAbhyankar, "Data Structures and Files"
6. G.S. Baluja, "Data Structures Through C"
7. Mary E. S. Loomis, "Data Management and File Structures", Prentice Hall, 2nd ed. edition (January 1989)
8. Classical Data Structures : D. Samanta, PHI, New Delhi

Branch: BCA	Semester-III
Subject Code: 3201	Lecture: 04 Credit: 02
Course Opted	Core Course Practical - 7
Subject Title	DATA STRUCTURES- LAB

Course Objectives:
- To introduce the concepts of data structures including arrays, linked list, stack and queues.
- To design and implement various data structure algorithms.
- To introduce various techniques for representation of the data in the world.
- To create programs using algorithms and also techniques of sorting and searching.

Course Outcomes:
- Select appropriate data structures as applied to specified problem definition.
- Implement operations like traversing, insertion, deletion, searching etc. on data structures.
- Students will be able to implement linear and non - linear data structures.
- Implement appropriate sorting and searching techniques for given problems.

Modules	Sr. No.	Topic and Details	No. of Practicals Assigned	Marks Weightage %
UNIT-I	1	**Arrays:** Implementation & Operations of Array - Insertion, deletion from one dimensional array, Traversing of array	2	4
	2	**Linked Lists: Singular** Implementation of List and Linked List and Operations- Inserting, Deleting of nodes etc	2	4
UNIT-II	3	**Linked Lists:** Implementation of Two way Doubly and Circular Linked List and Operations- Inserting, Deleting nodes	3	6
	4	**Stack:** Stack Implementation, Operations on stack(Push Pop). Implementation of stack using pointer	4	8
UNIT-III	5	**Queue:** Implementation, Operations - Insertion & deletion	3	6
	6	**Trees:** Implementation of tree as Array and Linked lists and Traversal (Inorder, Preorder, Postorder)	4	8
UNIT-IV	7	**Graphs:** Implementation of Graph traversal(BFS,DFS,Shortest path)	3	6
	8	**Searching & Sorting:** Implementation of searching (Sequential, Binary search),Sorting (Bubble sort, Selection sort, Quick sort etc.)	4	8
Total			**25**	**50**

Text Book:

1. S.Sawhney & E. Horowitz, "Fundamentals of Data Structure", Computer Science Press, 1987
References:
1. Lipschuiz, "Data structures" , (Schaum's Outline Series Mcgraw Hill Publication)

Branch: BCA	Semester-III
Subject Code: 3102	Lecture: 04 Credit: 04
Course Opted	Core Course - 8
Subject Title	JAVA PROGRAMMING

Course Objectives:
- To gain knowledge about basic Java language syntax and semantics.
- To write Java programs and use concepts such as variables, conditional and iterative execution methods etc.
- To understand the fundamentals of object-oriented programming in Java, including defining classes, objects, etc.
- To understand the principles of inheritance, packages and interfaces.
- To design and program stand-alone Java applications.
- To learn how to use exception handling in Java applications.

Course Outcomes:
- To teach Object-Oriented programming concepts, techniques, and applications using the Java programming language.
- Problem solving skills – to analyze real life problem, find and develop algorithmic steps to solve it and then implement these steps in JAVA.
- Experience with developing and debugging software in Java.
- To develop real life projects using database connectivity with JDBC.

Modules	Sr. No.	Topic and Details	No. of Lectures Assigned	Marks Weightage %
UNIT-I	1	**Introduction and Programming with java: Introduction to java:** Creation of java, Difference between java & C++. Java's Magic: Byte Code, JVM, Run time Environment, Just-in-time, Compiler, JDK, Buzzwords/Features, OOP Principles, Data Types & Operators, Simple Data Types, Variables, Declaring Variables, Dynamic Initialisation, Scope & Life time, Type conversion & Casting Incompatible Types. Arrays: one, Multi-dimensional, Arithmetic, Modulus Assignment, Increment & Decrement, Relational Boolean – Logical operators. Control Statements- All Control Statements, Jump Statement. Classes & Objects: Class Fundamentals- General form,Simple class, Declaring Objects, Assigning Object reference variables	5	10
	2	**Constructor & Methods:** Introduction to Methods, Constructor, Types of Constructors, This keyword, Garbage Collection, Finalise() method, A stack Class	4	8
UNIT-II	3	**Method Overloading :** Overloading Methods, Using Object as Parameters, Argument Passing, Returning Objects, Recursion, Understanding Static, Introducing to Final, Inner & Nested Classes, Inheritance & Method Overriding, Dynamic Method dispatch, Abstract Classes, Final With Inheritance	6	12

	4	**Special Features of java:**Interface& packages, Packages access Protection, Importing Package, Interface.	3	6
	5	**Exception Handling:** Fundamentals, Exception Types Uncaught Exception, Using try catch, Multiple Catch, Nested try, throw, throws, finally, java's Built-in-exception, creating own exception subclasses, chained exception, using exception	4	8
UNIT-III	6	**Threading:** Thread Model, Thread priorities, synchronization, Messaging, The thread class and the runnable interface. The main Thread, Creating a thread, Implementing Multi thread, using isAlive() & join().	5	10
	7	**I/O Applets:** The I/O Classes, I/O Basics, Streams, Byte Streams and character streams, Byte stream, classes and character stream classes, Byte Stream class, Buffered InputStream, BufferedOutputStream, ByteArrayInput, ByteArrayOutput, DataInput, Data Output, PrintStream, Character Stream Class, BufferedReader, BufferedWriter, InputStreamReader, OutputStreamWriter, PrintWriter, Reading Console Input, Writing Console output, Applet Initialisation and Termination, Init(), Start(), Paint(), Stop(), Destroy(), Overriding update(), Simple Applet Display Methods(), Repainting, Using Status window, The HTML Applet tag, Passing parameters to Applets.	7	14
UNIT-IV	8	**The Java Library:** String Handling- length(),equals(), charAt(), toString(), getchar(), compareTo(), indexOf(), lastIndexOf(), concat(), valueOf(), substring(), replace(), trim(), toUpperCase(), toLowerCase(), Networking- Networking Basics, Socket overview, Client/Server, Reserved Socket, Internet Addressing, DNS, Java & The Net, Networking classes and interfaces- InetAddress, Factory Methods, Instance Methods, TCP/IP client sockets, whois URL, Format URL connection, TCP/IP Server sockets, Datagrams, DatagramPacket, Datagram server and client, The Collections Framework, Collections Overview, Collections Interfaces, The collection Interface, The list Interface, Set Interface, Sorted Set Interface.	6	12
	9	**Basics of AWT and Swing:** Control fundamentals, Adding & Removing controls, Responding to controls, Using Buttons, ActionListener, itemsStateChanged(), Choice Control, Handling choice Lists, Using Lists, Handling Lists, Managing Scroll bar, Textfield, Using TextArea, Panels, Checkbox, Dialogs and frames, Using menus, Using the adapter class,LayOut Manager-Flow, Border Grid, Card Using Insets, Event Handling –Events, Event Sources, Event Listeners, Event Classes(In details)-	6	12
	10	**Database Connectivity:** Database connectivity with JDBC, Java Security.	4	8

Total		**50**	**100**

Text Book:

1. Herb Schildt, "Java 2 the Complete Reference J2se", 5TH Edition , 2003.

References:

1. Jim Farley, William Crawford, David Flanagan,"Java Enterprise in a Nutshell: A Desktop Quick Reference": (Nutshell Handbook).
2. Elliot B. Koffman, "Problem Solving with Java", Temple University Ursula Wolz, College of New Jersey, Copyright 1999, 848 pp. ISBN 0201357437.
3. Jan Skansholm, "Java from the Beginning", Chalmers University of Technology, Sweden, Copyright 2000, 540 pp. ISBN 0201398125.

Branch: BCA	Semester-III
Subject Code: 3202	Lecture: 04 Credit: 02
Course Opted	Core Course Practical - 8
Subject Title	JAVA PROGRAMMING - LAB

Course Objectives:

- To develop software skills for developing real world applications using Java Programming language.
- To enable implementation of frontend and backend of an application.
- To implement classical problems using Java programming.
- To be able to use the Java SDK environment to create, debug and run simple Java programs.

Course Outcomes:

- Basic knowledge of programming in JAVA.
- Experience with developing and debugging software in Java.
- Implementation of AWT.
- Able to develop real life projects using database connectivity with JDBC.

Modules	Sr. No.	Topic and Details	No. of Practicals Assigned	Marks Weightage %
UNIT-I	1	**Introduction and Programming with java:** Implementation of Data Types, Type conversion & Casting, Java Automatic Conversions, Casting Incompatible Types, Arrays: one, Multi-dimensional, Arithmetic, Modulus Assignment, Increment & Decrement, Relational Boolean – Logical operators. Control Statements- All Control Statements, Jump Statement. Classes & Objects: Class Fundamentals- General form, Simple class, Declaring Objects, Assigning Object reference variables.	2	4
	2	**Implementation of Constructor & Methods:** Constructors, This keyword, Garbage Collection, Finalise() method, A stack Class	2	4
UNIT-II	3	**Implementation of Method Overloading:** Overloading Recursion, Static, Inheritance& Method Overriding: Basics, Using Super, Multilevel, Overriding, Dynamic Method dispatch, Abstract Classes.	3	6
	4	**Special Features of java:** Interface & packages, Packages Access Protection, Importing Package, Interface.	3	6
UNIT-III	5	**Exception Handling:** Implementation of try catch, Multiple catch , Nested Try, throw, throws, finally statements Java's Built-in- Exception	3	6
	6	**Implementation of threading:** Single and Multiple thread	2	4
	7	**I/O Applets:** Implementation of I/O functions, Implementation of Applet- Initialisation and Termination, Init(), Start(), Paint(), Stop(), Destroy(), Overriding update(), Simple Applet Display Methods(),	3	6

		Repainting, Using Status window, The HTML Applet tag, Passing parameters to Applets.		
UNIT-IV	8	**The Java Library:** Implementations String Handling functions	2	4
	9	**Implementation of AWT& Layout Managers:** Control fundamentals, Adding & Removing controls, Responding to controls, Basic of Swings: Panels, Checkbox, Dialogs and frames, Using menus, Using the adapter class , Using Buttons, Listeners.	3	6
	10	**Database Connectivity:** Database connectivity with JDBC	2	4
Total			**25**	**50**

Text Book:

1. Herb Schildt, "Java 2 the Complete Reference J2se", 5TH Edition , 2003.

References:

1. Jim Farley, William Crawford, David Flanagan,"Java Enterprise in a Nutshell: A Desktop Quick Reference": (Nutshell Handbook).
2. Elliot B. Koffman, "Problem Solving with Java", Temple University Ursula Wolz, College of New Jersey, Copyright 1999, 848 pp. ISBN 0201357437.
3. Jan Skansholm, "Java from the Beginning", Chalmers University of Technology, Sweden, Copyright 2000, 540 pp. ISBN 0201398125.

Branch: BCA	Semester-III
Subject Code: 3103	Lecture: 04 Credit: 04
Course Opted	Core Course - 9
Subject Title	**MATHEMATICS II**

Course objectives:

- To provide suitable and effective methods called numerical methods for obtaining approximate numerical results of the problems.
- To deal with various topics like finding roots of the equations, solving systems of linear algebraic equations, interpolation, numerical integration and differentiation, solution of differential equations and solution of matrix problems.
- To facilitate numerical computing.

Course Outcomes:

- Apply numerical methods to find solutions of algebraic equations using different methods viz. Bisection method, Regula - Falsi, Newton Raphson's, Ramanujan's method, Matrix Inversion and Gauss Elimination
- Apply Least squares Curve fitting procedures.
- Derive numerical methods for various mathematical operations and tasks such as interpolation, differentiation, integration, the solution of linear and non linear equations and solution of differential equations.

Modules	Sr. No.	Topic and Details	No. of Lectures Assigned	Marks Weightage %
UNIT-I	1	**Floating Point Arithmetic and Errors:** Floating Point Representation, Sources of Errors . Propagated Errors	4	8
	2	**Roots of non-linear equations** a)Bisection Method b)Regula-falsi Method c)Newton-Raphson Method d)Ramanujan's Methods	6	12
	3	**Direct solution of linear equation** a) Matrix Inversion, b) Gauss-Elimination Method c) Gauss Jordan Method	6	12
UNIT-II	4	**Interpolation:** Finite Differences, a) Newton-Gregory Forward and Backward Formula b) Lagrange's Interpolation Formula for unequal Intervals c) Newton divided difference formula for unequal intervals	8	16
UNIT-III	5	**Numerical Integration** a) Trapezoidal Rule b) Simpson's 1/3 Rule c) Simpson's 3/8 Rule Error estimation for all above 3 methods	6	12

	6	**Numerical Differentiation** Differentiating Newton's Forward and Backward formula	6	12
UNIT-IV	7	**Numerical solution of Differential equation** Taylor's Series, Euler's Method, Runge-Kutta Method	8	16
	8	**Curve Fitting** Least Square regression Fitting, Multiple linear regression, m conditioning in Least square	6	12
Total			**50**	**100**

Text Book:

1. S.S. Shastri "Introductory methods of numerical analysis" Vol-2, PHI, SECOND edition, 1994.

Reference:

1. Numerical Methods: V. Rajaraman "Computer oriented numerical methods (third edition) 1993.
2. Gupta and Kapoor Fundamental of Mathematical Statistics.
3. E. Balaguruswamy, Numerical Methods - Tata McGraw Hill Publication.

Branch: BCA	Semester-III
Subject Code: 3104	Lecture: 04 Credit: 04
Course Opted	Core Course - 10
Subject Title	COMPUTER ORGANISATION AND ARCHITECTURE

Course Objectives:

- To introduce fundamental concepts of Boolean algebra, logic gates and combinational circuits
- To give a basicunderstanding of concepts and structure of computers.
- To understand the organization of Cache memory and memory management hardware.
- To study the working of different interrupts & Mapping Techniques.
- To study register organization.
- To understand the different addressing modes.
- To Demonstrate the working of central processing unit and RISC and CISC Architecture.

Course Outcomes:
- Understand the architecture and functionality of central processing unit.
- Analyze some of the design issues in terms of speed, technology, cost, performance.
- Learn the concepts of parallel processing, pipelining and inter-processor communication.
- Exemplify the I/O and memory organization.

Modules	Sr. No.	Topic and Details	No. of Lectures Assigned	Marks Weightage %
UNIT –I	1	**Basic Structure of computers:** Comparison of Computer Organization & Architecture, Structure and function, evolution of Intel x86 Architecture, Basic Measures of Computer Performance, Computer Components, Computer Function (Instruction Cycle, Interrupts), Interconnection Structures, Bus Interconnection, Peripheral Component Interconnection (PCI).	8	16
UNIT – II	2	**Memory Organization:** **Cache Memory:** Computer Memory System Overview, Cache Memory Principles, Elements of cache design (Size, Mapping, Replacement, Write policies, Block size) **Internal Memory:** Semiconductor Main memory, Error detecting & correcting codes	7	14
	3	**Input/Output:** External devices, I/O Modules, Programmed I/O, Interrupted-Driven I/O, Direct Memory Access	7	14
UNIT – III	4	**Arithmetic and Logic:** Computer Arithmetic, Integer representation, Floating point representation **Digital Logic :** Boolean algebra, Gates	8	16

	5	**Central Processing Unit:** Instruction sets : Instruction characteristics, Types of operands, Types of operations, addressing modes Processor Organization, Register organization, Instruction cycle.	12	24
UNIT –IV	6	**RISC:** Instruction Execution Characteristics, RISC characteristics and RISC Pipelining, RISC Vs.CISC **Parallel organization:** Multiple processor organizations (SISD, SIMD, MISD and MIMD)	8	16
Total			**50**	**100**

Text Book:

1. William Stallings "Computer Organization and Architecture" , Prentice Hall, 10th Edition

References:

1. Douglas V. Hall, "Microprocessor and Interfacing", Tata McGraw-Hill 2nd Edition
2. Barry B. Brey, "The Intel Microprocessors 8086/8088…", PHI, 4th Edition
3. Morris Mano, "Computer System Architecture", Pearson Custom Publishing, 2001
4. Hwang, "Advanced Computer Architecture", Tata McGraw Hill Education, 2003
5. Michael J. Flynn, "Computer Architecture", Narosa Publishing, 1995
6. P.R. Devale, "Computer Organisation and Architecture", 2004