

VIGNAN'S INSTITUTE OF INFORMATION TECHNOLOGY: VISAKHAPATNAM
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
PROGRAM STRUCTURE – VR-20

II Year

I Semester

S. No.	Course Code	Course Title	L	T	P	C
1	1005202100	Java Programming	3	0	0	3
2	1000202100	Discrete Mathematical Structures	3	1	0	3
3	1005202101	Operating Systems	3	0	0	3
4	1005202102	Essentials for Competitive Programming	3	0	0	3
5	1005201203	Data Structures	3	0	0	3
6	1005202110	Java Programming Lab	0	0	3	1.5
7	1005202111	Operating Systems Lab	0	0	3	1.5
8	1005201212	Data Structures Lab	0	0	3	1.5
9	1000202180	Digital English	0	0	4	2
10	1000202121	Environmental Science	2	0	0	0
Total Credits						21.5

Detailed Syllabus

II Year- I Semester

I Year – I Semester		L	T	P	C
1005202100	JAVA PROGRAMMING	3	0	0	3

COURSE OBJECTIVES:

1. Implementing program for user interface and application development using core java principles.
2. Comprehension of java programming constructs, control structures in java.
3. Implementing object-oriented constructs such as various class hierarchies, interfaces and exception handling.
4. Understanding of thread concepts and I/O in java.

COURSE OUTCOMES:

CO's	At the end of the course, the student will have the ability to:	POs Mapped	Strength of mapping
CO1	Use the Java programming language for various programming technologies.	PO1 PO2 PO12	3 3 3
CO2	Develop software in the Java programming language.	PO1 PO2 PO12	3 3 3
CO3	Evaluate user requirements for software functionality required to decide whether the Java programming language can meet user requirements.	PO1 PO2 PO3 PO12	3 3 3 3
CO4	Propose the use of certain technologies by implementing them in the Java programming language to solve the given problem.	PO1 PO2 PO3 PO12	3 3 3 3

UNIT- I

INTRODUCTION TO OOPS

Introduction to object-oriented programming -principles of object-oriented languages - procedural languages Vs. OOPs -applications of OOPs -java features - JVM -program structures -Variables -primitive data types –identifiers -naming conventions –keywords – literals –operators –binary -unary and ternary –expression -precedence rules and associativity -primitive type conversion and casting, flow of control. **[6 Hours]**

UNIT-II

PROGRAMMING CONSTRUCTS

Arrays-one dimensional and multidimensional -command line arguments. Introducing classes –class fundamentals –methods -objects -constructors –this keyword –garbage collection- Nested Classes – Polymorphism. **[8 Hours]**

UNIT-III

INHERITANCE, INTERFACE AND EXCEPTIONS

Types of inheritance-Super and Final -Interface-Abstract Classes- Interface vs Abstract classes -Packages-Creating Packages -access protection - Exception handling, importance of try, catch, throw, throws and finally block, user defined exceptions, Assertions. [8 Hours]

UNIT-IV

MULTITHREADING AND I/O

Threads -Thread Life Cycle-Thread priority –multithreading –Synchronization -suspending and resuming threads -communication between threads. Java I/O streaming –filter and pipe streams. [8 Hours]

UNIT-V

COLLECTION FRAMEWORKS

Collection Framework in Java –Introduction to Java Collections, Overview of Java Collection frame work, Generics, commonly used Collection classes–Array List, Vector, Hash table, Stack, Enumeration, Iterator, String Tokenizer, Random, Scanner, calendar and Properties. [10 Hours]

Text Books:

1. The complete Reference Java, 8th edition, Herbert Schildt, TMH.
2. Programming in JAVA, Sachin Malhotra, SaurabhChoudary, Oxford.
3. Introduction to java programming, 7th edition by Y Daniel Liang, Pearson.

Reference Books:

1. Head First Java, Author – Kathy Sierra & Bert Bates, Latest Edition – 2nd Edition, Publisher – Shroff/O’Reilly
2. Effective Java, Author – Joshua Bloch, Latest Edition – 3rd Edition, Publisher – Addison Wesley
3. Core Java: An Integrated Approach, New: Includes All Versions upto Java 8 Paperback – 1 January 2016 by R. Nageswara Rao

E-Books:

<https://docs.oracle.com/en/java/>

NPTEL/MOOC:

<https://nptel.ac.in/courses/106/105/106105191/>

https://onlinecourses.nptel.ac.in/noc20_cs85/preview

II Year – I Semester	DISCRETE MATHEMATICAL STRUCTURES	L	T	P	C
1000202100	(Common for CSE, IT and AI&DS)	3	1	0	3

COURSE OBJECTIVES:

1. To introduce the algorithmic approach to the solution of problems, which is fundamental in discrete mathematics and this approach reinforces the close ties between this discipline and the area of computer science.
2. To introduce basic logical connectives and inference theory.
3. To Familiarize closed form solution of linear recurrence relations by various methods.
4. To perform the operations associated with sets, functions and relations.
5. To Bring awareness of basic concepts of graphs and explaining related algorithms.

COURSE OUTCOMES:

CO's	At the end of the course, the student will have the ability to:	POs Mapped	Strength of mapping
CO1	Develop reasoning skills using Mathematical Logic concepts.	PO1 PO2 PO3	2 2 3
CO2	Evaluate the solutions for various problems using recurrence relations.	PO1 PO2	1 2
CO3	Construct Hasse diagrams and Understand the concept of Algebraic Structures.	PO1 PO2 PO3	1 2 2
CO4	Apply the concepts of graph theory for a given problem.	PO1 PO2 PO3 PO12	1 2 3 3

UNIT- I

MATHEMATICAL LOGIC

[12 HOURS]

Propositional Logic: Connectives- negation, conjunction, disjunction, conditional and bi-conditional, well-formed formulae, tautologies, equivalence of formulae, tautological implications, Disjunctive and Conjunctive normal forms, Rules of inference and examples, Consistency of premises.

Predicative Logic.: Statement Functions, Variables and Quantifiers, Free and Bounded variables, Inference theory for predicative logic.

UNIT- II

RECURRENCE RELATIONS

[8 HOURS]

Recurrence relations: Recurrence relations, solving homogeneous linear recurrence relations by characteristic roots method, solving non-homogeneous linear recurrence relations.

UNIT- III

SETS, RELATIONS AND ALGEBRAIC STRUCTURES[12 Hours]

Sets: Sets, Operations on Sets, Principles of Inclusion–Exclusion, Pigeonhole Principle and its Application

Relations: Definition, representation, types of relations: equivalence relation, equivalence class, partial order, HasseDiagram and total order relations.

Functions: Definition, types of functions: surjective, injective and bijective.

Algebraic Structures: Binary operations, Algebraic structures, Group, Abelian Group, Subgroups, Lagrange's theorem on finite groups.

UNIT- IV

GRAPH THEORY

[10 HOURS]

Graph theory: Definitions, finite and infinite graphs, incidence and degree, isolated and pendant vertices, isomorphism, sub graphs, connected and disconnected graphs, simple graph, complete graph, bipartite graph, complete bipartite graph, planar graph, Isomorphic Graphs, Euler formula (without proof) and Graph colouring, Walk, path and circuit, Euler graph, Hamiltonian Graph.

UNIT- V

TREES

[10 HOURS]

Trees: Some properties of trees, rooted and binary trees, spanning trees, BFS & DFS Algorithms, Minimal spanning trees, Kruskal's algorithm.

TEXTBOOKS:

1. J.P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill, 1997.
2. Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K. H. Rosen, 7th Edition, Tata McGraw Hill.
3. Joe L. Mott, Abraham Kandel and T. P. Baker, Discrete Mathematics for computer scientists & Mathematicians, 2/e, Prentice Hall of India Ltd, 2012.

REFERENCE BOOKS:

1. S. Santha and E. V. Prasad Mathematical Foundation for Computer Science, Cengage, 2017.
2. Discrete Mathematical Structures, Bernard Kolman, Robert C. Busby, Sharon Cutler Ross, PHI.
3. Discrete Mathematics, S. K. Chakraborty and B.K. Sarkar, Oxford, 2011.
4. Elements of Discrete Mathematics-A Computer Oriented Approach, C. L. Liu and D. P. Mohapatra, 3rd Edition, Tata McGraw.

II Year – I Semester		L	T	P	C
1005202101	OPERATING SYSTEMS	3	0	0	3

COURSE OBJECTIVES:

1. Study the basic concepts and functions of operating systems.
2. Understand the structure and functions of OS.
3. Learn about Processes, Threads and Scheduling algorithms.
4. Understand the principles of concurrency and Deadlocks.
5. Learn various memory management schemes.
6. Study I/O management and File systems.

COURSE OUTCOMES:

CO's	At the end of the course, the student will have the ability to:	POs Mapped	Strength of mapping
CO1	Summarize various concepts of Operating Systems	PO1 PO2	1 2
CO2	Implement and Apply Process Scheduling Algorithms	PO1 PO2 PO4	1 2 2
CO3	Illustrate concepts of Paging, Segmentation and Apply Concurrency, Deadlock Mechanisms in real world	PO1 PO2 PO3	2 2 3
CO4	Analyze the concepts of file systems in operating systems	PO1 PO3 PO12	1 2 3

UNIT- I

INTRODUCTION TO OPERATING SYSTEM CONCEPT

Types of operating systems, operating systems concepts, operating systems services, Introduction to System call, System call types. **[8 Hours]**

UNIT-II

PROCESS MANAGEMENT

Process concept, The process, Process State Diagram ,Process control block, Process Scheduling- Scheduling Queues, Schedulers, Operations on Processes, Inter process Communication, Threading Issues, Scheduling-Basic Concepts, Scheduling Criteria, Scheduling Algorithms. **[8 Hours]**

UNIT-III

MEMORY MANAGEMENT

Swapping, Contiguous Memory Allocation, Paging, structure of the Page Table, Segmentation.

VIRTUAL MEMORY MANAGEMENT

Virtual Memory, Demand Paging, Page-Replacement Algorithms, Thrashing [10 Hours]

UNIT-IV

CONCURRENCY

Process Synchronization, The Critical- Section Problem, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Monitors, Synchronization Examples.

PRINCIPLES OF DEADLOCK

System Model, Deadlock Characterization, Deadlock Prevention, Detection and Avoidance, Recovery form Deadlock [8 Hours]

UNIT-V

FILE SYSTEM INTERFACE

The concept of a file, Access Methods, Directory structure, File system mounting, files sharing, protection. File System implementation- File system structure, allocation methods, free-space management Mass-storage structure overview of Mass-storage structure, Disk scheduling, Device drivers. Introduction to Dockers. [10 Hours]

Text Books:

1. Operating System Concepts, Abraham Silberschatz, Peter Baer Galvin and Greg Gagne 9th Edition, John Wiley and Sons Inc., 2012.
2. Operating Systems – Internals and Design Principles, William Stallings, 7th Edition, Prentice Hall, 2011.
3. Operating Systems-S Halder, Alex A Aravind Pearson Education Second 2016.

Reference Books:

1. Modern Operating Systems, Andrew S. Tanenbaum, Second Edition, Addison Wesley, 2001.
2. Operating Systems: A Design-Oriented Approach, Charles Crowley, Tata Mc Graw Hill Education”, 1996.
3. Operating Systems: A Concept-Based Approach, D M Dhamdhere, Second Edition, TataMc Graw-Hill Education, 2007.

II Year – I Semester		L	T	P	C
1005202102	ESSENTIALS FOR COMPETITIVE PROGRAMMING	3	0	0	3

COURSE OBJECTIVES:

- To improve logical and analytical skills
- To improve programming patterns like recursion

COURSE OUTCOMES:

CO's	At the end of the course, the student will have the ability to:	POs Mapped	Strength of mapping
CO1	Apply bit manipulation techniques to solve problems	PO2	3
CO2	Apply the modular programming techniques to simplify the programs.	PO3	2
CO3	Able to solve problems using strings	PO3	3

UNIT- I

BIT MANIPULATIONS:

Bitwise operators, check if an integer is even or odd, detect if two integers have opposite signs or not, Swap two numbers without using any third variable, count set bits, check kth bit is set or not, check if a positive integer is a power of 2 without using any branching or loop. Find the number that has odd occurrences in array. Power Set of a given Set using bitwise operators, Find the absolute value of an integer without branching, convert given number to binary, Count number of bits to be flipped to convert A to B, Find one extra character in a string, Toggle all even bits of a number, types of errors in competitive coding. **[10 Hours]**

UNIT-II

NUMBER THEORY:

GCD: Binary GCD algorithm, Using prime factorizations, Fermat's Theorem, Euclidean algorithm, Modular Arithmetic, Binary Exponentiation, Modular Exponentiation, Modular multiplicative inverse.

Factorial, Fibonacci Numbers, properties of Fibonacci numbers, Fibonacci divisibility and GCD

Prime numbers: Primality Test, Miller–Rabin, Sieve of Eratosthenes, Sieve of Eratosthenes with Linear Time Complexity, Segmented sieve, prime factors, smallest prime factors. **[8 Hours]**

UNIT-III

RECURSIONS:

Recursion: The nature of recursion, tracing a recursive function, Linear Recursion, Mutual recursion, Recursive Mathematical functions, comparing recursion and iteration.

Problems: Factorial, Fibonacci, GCD, LCM, permutations of a given string, Generate all strings of n bits of binary digits, TOWERS of HANOI, N queens problem, sum of digits of a number. **[6 Hours]**

UNIT-IV

ARRAYS:

Array Problems: Maximum possible difference of two subsets of an array, Program for array rotation, Find the minimum element in a sorted and rotated array, Find Second largest element in an array, Find the largest K elements in an array, First element that appears even number of times in an array, count the number of subarray for a given array , Count Strictly Increasing Subarrays, Count subarrays with same even and odd elements, Elements of an array that are not divisible by any element of another array, Kadane's Algorithm :maximum sum contiguous subarray. **[8 Hours]**

UNIT-V

STRING MANIPULATIONS:

String Problems: Caesar cipher encryption, count vowels and consents and special characters of string, counting consecutive vowels from string, String with maximum number of unique characters in a given set of strings, Anagrams, Panagrams, Generate all Subsequences of a String, KMP Algorithm: Longest Prefix Suffix, Rabin-Karp Algorithm for pattern Matching. **[8 Hours]**

Text Books:

1. Problem Solving and Program Design in C, Jeri R. Hanly, Elliot B. Koffman, 7th Edition, Pearson.
2. 101 Programming puzzle problems solved: High School Junior to Seniors Join us to win Informatics Olympiad, N.B.Venkateswarlu, Feb, 2015.

Reference Books:

1. Programming in C, PradipDey, Manas Ghosh, 2nd Edition, OxfordUniversityPress.
2. How to Solve it by Computer- R.G.Dromey,PHI.

E-Books:

<https://graphics.stanford.edu/~seander/bithacks.html>

NPTEL/MOOC:

https://onlinecourses.nptel.ac.in/noc21_cs99/preview

II Year – I Semester		L	T	P	C
1005201203	DATA STRUCTURES	3	0	0	3

COURSE OBJECTIVES:

1. Basics of data structures including their fundamentals building blocks: arrays and linked list.
2. To solve problems using linear data structures such as linear lists, stacks, queues.
3. To solve problems using searching and sorting techniques.
4. To be familiar with non-linear data structures such as trees.

COURSE OUTCOMES:

CO's	At the end of the course, the student will have the ability to:	POs Mapped	Strength of mapping
CO1	Apply the C language Concepts: Pointers, Structures, Unions and recursion to solve the problems	PO1 PO2 PO3 PO11	2 2 3 1
CO2	Implement Standard Data Structures like Stack, Queue, List, Trees and Graphs	PO1 PO2 PO3 PO11	2 2 3 2
CO3	Choose appropriate data structure while building new application	PO1 PO2 PO3 PO5	2 2 3 3
CO4	Explain the need for data structuring techniques	PO1 PO2	3 3

UNIT- I

ARRAYS AND LINKED LISTS

The Abstract Data Type (ADT), Dynamic allocation of Arrays, Representation of multidimensional Arrays.

Single Linked List, Polynomials, Polynomial Representation- Adding Polynomials- Circular List Representation of Polynomials, Sparse Matrices, Sparse Matrix Representation, Doubly Linked Lists. **[8 Hours]**

UNIT-II

STACKS AND QUEUES

The Stack, Stacks using Dynamic Arrays, Recursion, Linked Stacks, The Queue, Linked Queues, Circular Queues using Dynamic Arrays, De-queue. Application of stacks and queues, Evaluation of Expressions, Expression- Postfix Notation- Infix to Postfix, Towers Of Hanoi Problem. **[8 Hours]**

UNIT-III

SEARCHING AND SORTING

Searching: Linear Search, Binary Search.

Sorting: Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort [8 Hours]

UNIT-IV

TREES:

Introduction, Terminology, Representation of Trees, Binary Trees, The Abstract Data Type, Properties of Binary Trees, Binary Tree Representations, Binary Tree Traversals: Inorder Traversal, Preorder Traversal, Postorder Traversal, Binary Search Trees: Definition, Searching a Binary Search Tree, Insertion into a Binary Search Tree, Deletion from a Binary Search Tree . [10 Hours]

UNIT-V

GRAPHS:

The Graph Abstract Data Type, Introduction, Definition, Graph Representation, Elementary Graph Operation- Depth First Search, Breadth First Search, Connected Components, Spanning Trees, Biconnected Components, Minimum Cost Spanning Trees- Kruskal's Algorithm, Prim's Algorithm, Shortest Paths and Transitive Closure, Single Source/All Destination, All-Pairs Shortest Path. [10 Hours]

Text Books:

1. Fundamentals of Data Structures in C, Ellis Horowitz, S.Sahni, Andrews Freed, University Press (India). Second Edition.
2. Data Structures and Algorithm Analysis in C, Mark Allen Weiss, Pearson Education. Ltd., Second Edition.

Reference Books:

1. Classic Data Structures, Debasis Samanta, PHI. (Second Edition)
2. Data Structures using C and C++, Langsam, Augenstein and Tanenbaum, PHI.
3. Data Structures using C, Reema Thareja, Oxford Home Publications, Second Edition

E-Books:

1. <https://www.cs.bham.ac.uk/~jxb/DSA/dsa.pdf>
2. <https://vardhaman.org/wp-content/uploads/2018/12/Data%20Structures.pdf>
3. <https://www.ncertbooks.guru/data-structures/>

NPTEL/MOOC:

<https://nptel.ac.in/courses/106/102/106102064/>

II Year – I Semester		L	T	P	C
1005202110	JAVA PROGRAMMING LAB	0	0	3	1.5

COURSE OBJECTIVES:

1. Implementing program for user interface and application development using core java principles.
2. Comprehension of java programming constructs, control structures in java.
3. Implementing object-oriented constructs such as various class hierarchies, interfaces and exception handling.
4. Understanding of thread concepts and I/O in java
5. To understand computer programming and application software, package/ suites.

CO's	At the end of the course, the student will have the ability to:	POs Mapped	Strength of mapping
CO1	Use the Java programming language for various programming technologies.	PO1	3
		PO2	3
		PO12	3
CO2	Develop software in the Java programming language.	PO1	3
		PO2	3
		PO12	3
CO3	Evaluate user requirements for software functionality required to decide whether the Java programming language can meet user requirements.	PO1	3
		PO2	3
		PO3	3
		PO12	3
CO4	Propose the use of certain technologies by implementing them in the Java programming language to solve the given problem.	PO1	3
		PO2	3
		PO3	3
		PO12	3

LIST OF EXPERIMENTS

S.No.	Name of the experiment	Skill
1.	<p>Exercise – 1 (Basics)</p> <p>a) Write a JAVA program to display default value of all primitive data type of JAVA</p> <p>b) Write a java program that display the roots of a quadratic equation $ax^2+bx=0$. Calculate the discriminate D and basing on value of D, describe the nature of root.</p> <p>c) Five Bikers Compete in a race such that they drive at a constant speed which may or may not be the same as the other. To qualify the race, the speed of a racer must be more than the average speed of all 5 racers. Take as input the speed of each racer and print back the speed of qualifying racers.</p> <p>d) Write a case study on public static void main (250 words)</p>	Basic Programming
2.	<p>Exercise – 2</p> <p>a) Write a JAVA program to search for an element in a given list of elements using binary search mechanism.</p> <p>b) Write a JAVA program to sort for an element in a given list of elements using bubble sort.</p> <p>c) Write a JAVA program to sort for an element in a given list of elements using merge sort.</p> <p>d) Write a JAVA program using String Buffer to delete, remove character.</p>	Sorting
3.	<p>Exercise – 3</p> <p>a) Write a JAVA program to implement class mechanism. – Create a class, methods and invoke them inside main method.</p> <p>b) Write a JAVA program to implement constructor</p>	Constructor
4.	<p>Exercises –4</p> <p>a) Write a JAVA program to implement constructor overloading.</p> <p>b) Write a JAVA program implements method overloading.</p>	Constructor Overloading
5.	<p>Exercise -5</p> <p>a) Write a JAVA program to implement Single Inheritance</p> <p>b) Write a JAVA program to implement multi-level Inheritance</p> <p>c) Write a java program for abstract class to find areas of different shapes</p>	Inheritance

6.	<p>Exercise -6</p> <p>a) Write a JAVA program give example for “super” keyword.</p> <p>b) Write a JAVA program to implement Interface. What kind of Inheritance can be achieved?</p>	Programming using “super” Keyword
7.	<p>Exercise -7</p> <p>a) Write a JAVA program that describes exception handling mechanism</p> <p>b) Write a JAVA program Illustrating Multiple catch clauses</p>	Exception Handling
8.	<p>Exercise -8</p> <p>a) Write a JAVA program that implements Runtime polymorphism</p> <p>b) Write a Case study on run time polymorphism, inheritance that implements in above problem</p>	Runtime Polymorphism
9.	<p>Exercise -9</p> <p>a) Write a JAVA program for creation of Illustrating throw</p> <p>b) Write a JAVA program for creation of Illustrating finally</p> <p>c) Write a JAVA program for creation of Java Built-in Exceptions</p> <p>d) Write a JAVA program for creation of User Defined Exception Write a Program to implement set and set Operations.</p>	Exceptions
10.	<p>Exercise -10</p> <p>a) Write a JAVA program that creates threads by extending Thread class. First thread display “Good Morning “every 1 sec, the second thread displays “Hello “every 2 seconds and the third display “Welcome” every 3 seconds, (Repeat the same by implementing Runnable)</p> <p>b) Write a program illustrating is Alive and join</p> <p>c) Write a Program illustrating Daemon Threads.</p>	Threads
11.	<p>Exercise -11</p> <p>a) Write a JAVA program for Producer Consumer Problem</p> <p>b) Write a case study on thread Synchronization after solving the above producer consumer problem</p>	Synchronization

12.	Exercise -12 a) Write a JAVA program illustrates class path b) Write a case study on including in class path in your os environment of your package. c) Write a JAVA program that import and use the defined your package in the previous Problem	Package
13.	Exercise -13 a) What is the difference between List and Set? Implement a Program to show the differences. b) What is the difference between HashSet and TreeSet? Implement a Program to show the differences. c) What is the difference between Set and Map? Implement a Program to show the differences.	Set and Map

Text Books:

1. The complete Reference Java, 8th edition, Herbert Schildt, TMH.
2. Programming in JAVA, Sachin Malhotra, SaurabhChoudary, Oxford.
3. Introduction to java programming, 7th edition by Y Daniel Liang, Pearson.

Reference Books:

1. Head First Java, Author – Kathy Sierra & Bert Bates, Latest Edition – 2nd Edition, Publisher – Shroff/O’Reilly
2. Effective Java, Author – Joshua Bloch, Latest Edition – 3rd Edition, Publisher – Addison Wesley
3. Core Java: An Integrated Approach, New: Includes All Versions upto Java 8 Paperback – 1 January 2016 by R. Nageswara Rao

II Year – I Semester		L	T	P	C
1005202111	OPERATING SYSTEMS LAB	0	0	3	1.5

COURSE OBJECTIVES:

- To provide an understanding of the design aspects of operating system.
- To provide practical knowledge on the different concepts of operating systems.
- To familiarize students with the Linux environment.

COURSE OUTCOMES:

CO's	At the end of the course, the student will have the ability to:	POs Mapped	Strength of mapping
CO1	Stimulate CPU scheduling algorithms in operating system.	PO1 PO2 PO12	3 3 3
CO2	Evaluate memory management techniques in operating system.	PO1 PO2 PO12	3 3 3
CO3	Implement page replacement algorithms in operating system	PO1 PO2 PO3 PO12	3 3 3 3
CO4	Implement file allocation strategies used in operating system.	PO1 PO2 PO3 PO12	3 3 3 3

LIST OF EXPERIMENTS

S.No.	Name of the experiment	Skill
1.	Exercise -1 Study of Unix/Linux general purpose utility command list man,who,cat, cd, cp, ps, ls, mv, rm, mkdir, rmdir, echo, more, date, time, kill, history, chmod, chown, finger, pwd, cal, logout, shutdown.	Unix/Linux Commands
2.	Exercise – 2 Simulate the following CPU scheduling algorithms a) Round Robin b) SJF c) FCFS d) Priority	CPU Scheduling
3.	Exercise – 3 Simulate MVT and MFT	Multi Programming

4.	Exercise – 4 Simulate Bankers Algorithm for Dead Lock Avoidance	Dead Lock Avoidance
5.	Exercises –5 Simulate Bankers Algorithm for Dead Lock Prevention	Dead Lock Prevention
6.	Exercise -6 Simulate all page replacement algorithms. a) FIFO b) LRU c) LFU	Page Replacement
7.	Exercise -7 Simulate all File allocation strategies a) Sequenced b) Indexed c) Linked	File Allocation
8.	Exercise -8 C program to emulate the UNIX ls -l command.	ls -l command
9.	Exercise -9 C program that illustrates how to execute two commands concurrently with a command pipe.	Command Pipe
10.	Exercise -10 C program that illustrates two processes communicating using shared memory	Shared Memory

Text Books:

1. Operating System Concepts, Abraham Silberschatz, Peter Baer Galvin and Greg Gagne 9th Edition, John Wiley and Sons Inc., 2012.
2. Operating Systems – Internals and Design Principles, William Stallings, 7th Edition, Prentice Hall, 2011.
3. Operating Systems-S Halder, Alex A Aravind Pearson Education Second 2016.

Reference Books:

1. Modern Operating Systems, Andrew S. Tanenbaum, Second Edition, Addison Wesley, 2001.
2. Operating Systems: A Design-Oriented Approach, Charles Crowley, Tata Mc Graw Hill Education”, 1996.
3. Operating Systems: A Concept-Based Approach, D M Dhamdhare, Second Edition, TataMc Graw-Hill Education, 2007.

II Year – I Semester		L	T	P	C
1005201212	DATA STRUCTURES LAB	0	0	3	1.5

COURSE OBJECTIVES:

- To develop skills to design and analyze simple linear and non-linear data structures
- To Strengthen the ability to identify and apply the suitable data structure for the given real-world problem
- To gain knowledge in practical applications of data structures

COURSE OUTCOMES:

CO's	At the end of the course, the student will have the ability to:	POs Mapped	Strength of mapping
CO1	Implement the programs on arrays and linked lists	PO1 PO2 PO3 PO11	2 3 3 2
CO2	Implement Standard Data Structures like Stacks and Queue	PO1 PO2 PO3 PO11	2 3 3 3
CO3	Analyze the time and space efficiency of the data structure be capable to identify the appropriate data structure for given problem	PO1 PO2 PO3	2 3 3
CO4	Have practical knowledge on the application of data structures	PO1 PO2 PO3	2 3 3

LIST OF EXPERIMENTS

S.No.	Name of the experiment	Skill
1.	Exercise – 1 a) Write a program to implement dynamic arrays b) Write a program to implement sparse matrices using arrays	Arrays
2	Exercise – 2 Write a program to implement a Single Linked List and its operations.	Single Linked List
3.	Exercise – 3 Write a program to implement a Doubly Linked List and its operations.	Doubly Linked List
4.	Exercise – 4 Write a program to implement the following using arrays and linked list a) Stack b) Queue	Linear Data Structures

5.	Exercise – 5 Write a program to do the following a) Infix to postfix conversion. b) Evaluation of postfix expression.	Applications of Stack
6.	Exercise – 6 Write a program to implement: a) Linear Search b) Binary Search	Searching Strategies
7.	Exercise – 7 Develop a Program to find number of comparisons and swapping for a given list of numbers a) Bubble Sort b) Selection Sort	In-Place Sorting techniques
8.	Exercise – 8 Write a program for the following a) Merge Sort b) Quick Sort	Divide and Conquer
9.	Exercise – 9 a) Write a program that use non-recursive functions to traverse the given binary tree in i. Pre-order ii. In-order iii. Post-order. b) Implementation of Binary Search trees.	Trees
10.	Exercise – 10 Write a program for the following modules a) To implement Prim’s algorithm to generate a min-cost spanning tree. b) To implement Kruskal’s algorithm to generate a min-cost spanning tree. c) To implement Dijkstra’s algorithm to find shortest path in the graph. d) Implement Depth First Search	Graphs

Text Books:

1. Fundamentals of Data structures in C, S.Sahni, University Press (India) Pvt.Ltd, 2nd edition, Universities Press, Pvt. Ltd.
2. Data structures and Algorithm Analysis in C, Mark Allen Weiss, Pearson Education. Ltd., Second Edition

Reference Books:

1. Classic Data Structures, Debasis Samantha, PHI. (Second Edition)
2. Data Structures using C and C++, Langsam, Augenstein and Tanenbaum, PHI.
3. Data Structures using C, Reema Thareja, Oxford Home Publications, Second Edition.

II Year – I Semester	SKILL ORIENTED COURSE - I	L	T	P	C
1000202180	DIGITAL ENGLISH	0	0	4	2

COURSE OBJECTIVES:

The student will be able to:

1. Practice professional writing skills and upload the articles in digital media
2. Access digital platforms and create blog.

COURSE OUTCOMES:

CO's	At the end of the course, the student will have the ability to:	POs Mapped	Strength of mapping
CO1	Write effectively by using proper vocabulary	PO-10 PO-12	3 3
CO2	Prepare cover letter and resume properly and upload in linkedin and other platforms	PO-10 PO-12 PO-5	3 3 3
CO3	create articles and upload in digital media	PO-10 PO-12 PO-5	3 3 3

LIST OF EXPERIMENTS / PROGRAMS / ACTIVITIES

S.No.	Name of the experiment / List of Programs / List of Activities (hands-on)	Skill
1	Professional Email Writing	Professional writing
2	Cover Letter and Resume Preparation	Professional writing
3	Writing Blogs	Creativity and Writing
4	Creative Writing	Creativity and Writing
5	Abstract Writing	Professional writing

Reference Books:

1. How to Write Great Blog Posts that Engage Readers (Better Blog Booklets Book 1) by Steve Scott.
2. Content Writing Step-By-Step: Learn How To Write Content That Converts And Become A Successful Entertainer Of Online Audiences-Joseph Robinson.
3. Resumes Cover Letters: How to Write a Cover Letter: Step-by-Step Tips- Razaq Adekunle.

II Year – I Semester	AUDIT COURSE - I	L	T	P	C
1000202121	ENVIRONMENTAL SCIENCE	2	0	0	0

COURSE OBJECTIVES:

1. Classify, describe and explain the concepts of Ecosystems and environmental Studies.
2. Overall understanding of different types of natural resources and its conservation.
3. Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities.
4. An understanding of the environmental impacts of developmental activities and the importance of environmental management.
5. Awareness on the social issues, environmental legislations and global treats.

COURSE OUTCOMES:

CO's	At the end of the course, the student will have the ability to:	POs Mapped	Strength of mapping
CO1	Gain a higher level of personal involvement and interest in understanding and solving environmental problems.	PO1 PO 6 PO 7	2 2 2
CO2	Comprehend environmental problems from multiple perspectives with emphasis on human modern lifestyles and developmental activities.	PO1 PO 6 PO 7	2 2 2
CO3	Learn the management of environmental hazards and to mitigate disasters and have a clear understanding of environmental concerns and follow sustainable development practices.	PO1 PO 6 PO 7	2 2 2

UNIT I

[8 Hours]

Multidisciplinary nature of Environmental Studies:

Definition Scope and its importance, Multidisciplinary nature of Environmental science.

Ecosystems: Concept of an ecosystem. – Structure and function of an ecosystem – Energy flow in the ecosystem – Ecological pyramids - Ecological succession.

Social Issues and the Environment: Impacts of microbial toxins on human health. Urban problems related to energy- Water conservation, rain water harvesting and watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions. Climate change, Global warming, Acid rain, Ozone layer depletion.

UNIT II

[8 Hours]

BIODIVERSITY AND ITS CONSERVATION: Definition: genetic, species and ecosystem diversity – Value of biodiversity, Hot-spots of biodiversity, Threats to biodiversity, Endangered and endemic species of India – Conservation of biodiversity.

UNIT III

[8 Hours]

Natural Resources: Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources

UNIT IV

[8 Hours]

ENVIRONMENTAL POLLUTION: Definition, Cause, effects and control measures of:

- a. Air Pollution.
- b. Water pollution
- c. Soil pollution
- d. Noise pollution
- e. Nuclear hazards

Role of an individual in prevention of pollution – Pollution case studies

Environmental Laws: Wildlife Protection Act 1972 – Water pollution prevention and control Act 1974 - Forest Conservation Act 1980n – Air pollution prevention and control Act 1981. Environmental Protection Act 1986 and 2006 - – Public awareness

SOLID WASTE MANAGEMENT: Causes, effects and control measures of urban and industrial wastes.

Sustainable Development: Goals of Sustainability, Conferences, Carbon credits and carbon footprints.

UNIT V

[4 Hours]

Environmental Management:

EIA and EA: Introduction, definition, scope, objectives and methodology.

Disaster management: Definition, floods, earthquake, cyclone and landslides.

Ecotourism: Definition, principles, advantages and disadvantages

Environmental Diary

Field Trip

Field work/Environmental Visit: Visit to a local area to document environmental assets – reserve forest/ eco-tourist spot : Visit to a local polluted site - Study of local environment - common plants, insects, birds - Study of simple ecosystems –pond, river, hill slopes etc - Visit to industries/water treatment plants/effluent treatment plants.

Text Books:

1. Text book of Environmental Studies for Undergraduate courses by ErachBharuncha for University Grants Commission, Universities Press.
2. Environmental Studies by Palaniswamy – Pearson Education.
3. Environmental Studies by Dr. S. Azeem Unnisa, Academic Publishing Company

Reference Books:

1. Textbook of Environmental Science by Deeksha Dave and E. Sai Baba Reddy, Cengage Publications.
2. Text of Environmental Sciences and Technology by M. Anji Reddy, BS Publications.
3. Comprehensive Environmental studies by J.P Sharma, Laxmi Publications.
4. Environmental sciences and Engineering – J Glynn Henry and Gary W Heinke – Prentice hall of India Private Limited.
5. A textbook of Environmental Studies by G.R Chatwal, Himalaya Publishing house.
6. Introduction to Environmental engineering and science by Gilbert M Masters and Wendell P Ela – Prentice hall of India private limited.