Holy Cross College (Autonomous), Nagercoil

Kanyakumari District, Tamil Nadu.

Nationally Accredited with A^{++} by NAAC V Cycle – CGPA 3.53

Affiliated to

Manonmaniam Sundaranar University, Tirunelveli

DEPARTMENT OF COMPUTER SCIENCE

TEACHING PLAN (PG)

ODD SEMESTER

2025– 2026

Vision

To provide a high-quality undergraduate education in computer science that prepares students for productive careers and lifelong learning.

Mission

1. To demonstrate proficiency in problem-solving techniques using the computer.
2. To demonstrate proficiency in at least two high-level programming languages and two operating systems
3. To show the ability to analyze a problem, and identify and define the computing requirements appropriate to its solution.
4. To show the ability to function effectively on teams to accomplish a common goal.
5. To sensitize the students to the social realities around them with the vision of making them responsible citizen.

Programme Educational Objectives (PEOs)

PEO	Upon completion of UG Degree Programme, the graduates will be able to:
PEO – 1	apply scientific and computational technology to solve socio ecological issues and pursue research.
PEO – 2	continue to learn and advance their career in industry both in private and public sectors.
PEO – 3	develop leadership, teamwork, and professional abilities to become a more cultured and civilized person and to tackle the challenges in serving the country.

Programme Outcomes (POs)

PO	Upon completion of M.Sc. Degree Programme, the graduates will be able to:
PO – 1	apply their knowledge, analyze complex problems, think independently, formulate and perform quality research.
PO – 2	carry out internship programmes and research projects to develop scientific and innovative ideas through effective communication.
PO – 3	develop a multidisciplinary perspective and contribute to the knowledge capital of the globe.
PO – 4	develop innovative initiatives to sustain ecofriendly environment
PO – 5	through active career, team work and using managerial skills guide people to the

	right destination in a smooth and efficient way.
PO – 6	employ appropriate analysis tools and ICT in a range of learning scenarios, demonstrating the capacity to find, assess, and apply relevant information sources.
PO – 7	learn independently for lifelong to execute professional, social and ethical responsibilities promoting sustainable development.

Programme Specific Outcomes (PSOs)

PSOs	**Upon completion of the M.Sc. Degree Programme, the graduates will be able to:**
PSO – 1	apply profound knowledge to analyze and design software and systems containing hardware and software components of varying complexity.
PSO - 2	apply mathematical model, algorithmic principles, and computer science theory in the design of real-time applications
PSO – 3	apply knowledge of computing to produce effective designs and solutions for specific problems.
PSO - 4	identify, analyze, design, optimize and implement system solutions using appropriate algorithms of varying complexity.
PSO - 5	work in multidisciplinary teams in small- and large-scale projects by utilizing modern software tools and emerging technologies to develop complex products for the societal needs.

Department : **Computer Science**

Class : **I M. Sc. Computer Science**

Title of the Course : **Core Course I: Analysis and Design of Algorithms**

Semester : **I**

Course Code : **SP231CC1**

Course Code	L	T	S	P	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SP231CC1	6	-	-	-	5	6	90	25	75	100

Objectives

1. Enable the students to learn the elementary data structures and algorithms.
2. Presents an introduction to the algorithms, their analysis and design.
3. Discuss various methods like basic traversal and search techniques, divide and conquer method, dynamic programming, backtracking.
4. Understood the various design and analysis of the algorithms.

Course Outcomes

Upon completion of this course, the students will be able to:		
1	get knowledge about algorithms and determines their time complexity.	**K2 (U)**
2	gain good understanding of Greedy method and its algorithm.	**K3 (Ap)**
3	able to describe about graphs using dynamic programming technique.	**K4 (An)**
4	demonstrate the concept of backtracking & branch and bound technique.	**K3(Ap)**
5	explore the traversal and searching technique and apply it for trees and graphs.	**K6(C)**

K**1**–Remember**; K2**–Understand**; K3-**Apply**; K4-**Analyze**, K5-** Evaluate**, K6-**Create

Teaching plan

Total Contact hours: 90 (Including lectures, assignments and tests)

Unit	Module	Topic	Teaching Hours	Assessment Hour	Cognitive level	Pedagogy	Student Centric Method	E-Resources	Assessment/ Evaluation Methods
I	**Introduction**								
	1	Introduction about Algorithm, Algorithm Definition	3	1	K1 (R)	Direct Instruction, Explanation with Examples	Think-Pair-Share, Group Brainstorming	NPTEL Lectures, Neso Academy, Class PPTs	MCQs, Oral Quiz, Exit Tickets, CIA I
	2	Algorithm Specification	2		K2 (U)	Conceptual Teaching, Illustrative Examples	Peer Explanation, Mind Mapping	Tutorialspoint, Course Handouts, Lecture Videos	Written Assignments, Concept Mapping
	3	Space complexity, Time Complexity, Asymptotic Notations	2	1	K3 (Ap)	Chalk & Talk, Visual Pedagogy, Tabular Comparison	Group Activity on Code Tracing, Speed-Accuracy Task	GeeksforGeeks, Visualgo.net, Big-O Cheat Sheets	Conceptual Worksheet, Timed Coding Test
	4	Elementary Data Structures, Stacks, and Queues	2		K3 (Ap)	Interactive Coding Demo, Problem Solving Pedagogy	Flashcards, Role Play (Stack/Queue simulation)	Coding Ninjas, Visualgo.net, C++ IDE	Lab Exercise, Trace & Dry Run Evaluation, CIA I

	5	Binary Tree, Binary Search Tree	3	1	K3 (Ap)	Exploratory Teaching, Diagram Analysis	Tree Drawing Activity, In-Class Puzzle Solving	Tree Visualizers, Java Applets	Trace Activity, Tree Construction Test, CIA I
	6	Heap, Heap sort	3		K4 (An)	Black Box Teaching, Live Trace Demo	Sorting Race, Step-Wise Debugging	YouTube Tutorials (Jenny's Lectures), GeeksforGeeks	Sort Result Validation, Output Comparison
	7	Graph	2		K2 (U)	Concept Mapping, Comparative Lecture	Graph Mapping Game, Team-based Graph Design	GraphOnline, TutorialsPoint	Labeling Exercise, Short Test
II	**Traversal And Search Techniques**								
	1	Basic Traversal and Search Techniques	3	1	K3 (Ap)	Algorithm Trace, Dry Run	Pair Programming, Path-Finding Game	Programiz, HackerRank Graph Problems	Code Output, Trace Sheet Submission
	2	Techniques for Binary Trees	3		K4 (An)	Guided Practice, Pseudocode Mapping	Role Play Traversal, Code Walkthrough	Online C++ IDE, Animation Tools	Tree Output Evaluation, Mini Project
	3	Techniques for Graphs	2	1	K5 (E)	Visual Teaching, Whiteboard Mapping	Simulation Activity, Group Algorithm Building	Tinkercad Circuits (Graph Concepts), GFG	Coding Assignment, MCQ + Coding Viva
	4	Divide and Conquer: General Method Binary Search	2		K4 (An)	Strategy Comparison, Visual Flow Mapping	Algorithm Puzzle, Pair Debugging	Pseudocode Simulators, CodeChef Practice	Performance Evaluation, In-lab Coding Test
	5	Merge Sort	3	1	K3 (Ap)	Algorithm Flow with Recursive Visuals	Paper-based Dry Run, Pair Tracing	Animated Sorting Tools, Slide Presentations	Dry Run Table Submission, Quiz

	6	Quick Sort	3		K3 (Ap)	Pictorial Pedagogy, Walkthrough Examples	Code Implementation Task, Speed Test	Sorting Algorithm Animations, Edureka	Performance-Based Evaluation
III	**Greedy Method**								
	1	The Greedy Method Introduction	3	1	K2 (U)	Real-World Analogy, Comparative Strategy	Case Study, Map Coloring Game	YouTube: Simplilearn, Medium Articles	Problem Analysis Task, MCQ Test
	2	General Method	1		K3(Ap)	Comparative Analysis (Greedy vs. Dynamic), Problem-Solving Pedagogy with Worked Examples, Algorithm Construction Method	0020Concept Mapping: Visual representation of greedy decisions, Think-Aloud Protocol: Students verbalize their logic while solving	GeeksforGeeks: Hackerrank / Leetcode:,YouTube (Neso Academy, Jenny's lectures):	Short Tests/Quizzes: Conceptual and output-based, Debugging Exercise
	3	Knapsack Problem	2	1	K4 (An)	Solution Mapping, Live Tracing	Value-Density Sort Simulation	Leetcode Problem Page, Hackerrank	Output with Logic Justification
	4	Minimum Cost Spanning Tree	3		K4 (An)	Step-By-Step Algorithm Instruction	Hands-on Sorting, Graph Edge Mapping	MST Animation Tools, GFG Practice	Trace Submission, Output Snapshot
	5	Single Source Shortest Path	2	1	K4 (An)	Tabular Trace, Path Weight Table	Problem Solving in Pairs, Shortest Route Game	VisuAlgo, GFG	Tabular Answer Sheet, Code Viva
IV	**Dynamic Programming**								

	1	Dynamic Programming General Method	1	1	K5 (E)	Pseudocode Breakdown, Memoization Teaching	Recursive to Iterative Comparison, Code Walkthrough	Dynamic Prog. Visual Tools, EduHub	Tabular DP Explanation, Test Case Validation
	2	Multistage Graphs	3		K6 (C)	Complex Problem Analysis	Step-by-Step Problem Solving in Groups	Advanced Visualizers, Graph Theory Modules	Presentation, Logic Flow Chart
	3	All Pair Shortest Path	2	1	K3 (Ap)	Matrix Trace Pedagogy, Loop-by-Loop Teaching	Interactive Matrix Fill-in	Visual Matrix Tools, Animations	Worksheet Completion, Code Output Check
	4	Optimal Binary Search Trees	3		K6 (C)	Formula Derivation, Tabular Teaching	Dry Run, Cost Matrix Completion	Textbook Scans, YouTube Explanation Videos	Problem Solving Sheet, In-Class Assessment
	5	0/1 Knapsacks	2	1	K4 (An)	Recursion to Table Conversion	Individual Coding, Tabular Fill Task	HackerRank, GFG	Code Debugging Task
	6	Traveling Salesman Problem	2		K6 (C)	Solution Tree, Subset Table Mapping	Team Debugging, Path Mapping Game	TSP Tools, Graph Animations	Project Work, Logic Review
	7	Flow Shop Scheduling	3		K5 (E)	Time Block Diagram, Real World Analogy	Job Assignment Simulations	Industry Use Case PPTs	Scheduling Problem Assignment
V	**Backtracking**								
	1	Backtracking General Method	2	1	K4 (An)	State Space Tree Drawing	Dry Run Boards, Step Tree Simulation	NPTEL, Notes	Output Check, Viva Voce

	2	8-Queens Problem	3		K6 (C)	Board Mapping, Position Analysis	Grid Simulation, Solo Coding	GeeksforGeeks 8Q Tool, YouTube Visuals	Accuracy Check, Step Trace
	3	Sum of Subsets	1	1	K5 (E)	Subset Table Logic	Paper-Based Simulation	C++ Online IDEs	Subset Count Task
	4	Graph Coloring	2		K4 (An)	Color Assignment Rules	Paper Coloring with Rules	Graph Coloring Demos	Coloring Assignment
	5	Hamiltonian Cycles	2	1	K5 (E)	Cycle Strategy	Graph Exploration	Visual Graph Explorer	Trace Path & Output Task
	6	Branch And Bound: The Method	3		K6 (C)	Bounding Condition Demo	Tree Pruning Activity	Tree Diagram Tools	BnB Explanation Viva
	7	Traveling Salesperson	2		K6 (C)	Lower Bound Strategy	Simulation with Scenarios	Advanced Solvers, Textbook Examples	Case-based Evaluation

Course Focusing on Employability/Entrepreneurship/Skill Development: Skill Development Activities

1. Develop a recursive and iterative version of classic algorithms (Factorial, Fibonacci, Tower of Hanoi).
2. Create a comparative performance analysis (time and space) of sorting algorithms (Merge, Quick, Heap).

Course Focusing on Cross-Cutting Issues: Environment Sustainability, Professional Ethics

1. **Environment Sustainability:**
   - Design an algorithm to minimize energy usage in a smart grid or IoT-based system.
   - Case study: Algorithmic efficiency and its impact on energy consumption in large-scale cloud systems.
2. **Professional Ethics:**
   Debate: Ethical implications of using optimization algorithms in surveillance or personal data analysis.

Assignments

1. Analyze how optimization algorithms improve logistics and reduce carbon footprint.
   Submission Date: 15-07-2025

2. Develop and evaluate different greedy and dynamic programming solutions to the Knapsack problem.
   Submission Date: 10-08-2025

Sample Questions

Part A – (1 Mark)

1. What is the time complexity of binary search? **(K1–R, CO-1)**
   a) O(n) b) O(log n) c) O(n log n) d) O(1)
2. Which algorithm design technique uses optimal substructure and overlapping subproblems? **(K2–U, CO-2)**
   a) Greedy b) Backtracking c) Dynamic Programming d) Divide and Conquer
3. In heap sort, which data structure is used? **(K1–R, CO-3)**
   a) Queue b) Stack c) Heap d) Tree
4. What is the main idea of the greedy method? **(K2–U, CO-3)**
   a) Consider all possibilities b) Choose the best at each step c) Divide into subproblems d) Repeat
5. What does DFS use to track visited nodes? **(K2–U, CO-2)**
   a) Stack b) Queue c) Linked List d) Set
6. Which of the following is a backtracking problem? **(K1–R, CO-4)**
   a) Dijkstra b) Floyd-Warshall c) 8-Queens d) Prim's Algorithm
7. What is the worst-case time complexity of quick sort? **(K2–U, CO-3)**
   a) O(n log n) b) $O(n^2)$ c) O(n) d) O(log n)
8. Which graph algorithm finds the shortest path from a single source to all others? **(K2–U, CO-2)**
   a) Kruskal b) DFS c) Dijkstra d) BFS
9. What does "branch and bound" do to explore possibilities? **(K2–U, CO-4)**
   a) Trims possibilities with bounds b) Uses stack c) Uses recursion only d) Uses greedy rules

Part B – (6 Marks)

1. Differentiate between Divide and Conquer and Dynamic Programming. **(K3–Ap, CO-2)**
2. Explain the working of Prim's and Kruskal's algorithms. **(K3–Ap, CO-3)**
3. Write a pseudocode for Merge Sort and explain each step. **(K3–Ap, CO-1)**
4. Describe the steps in solving the 0/1 Knapsack problem using Dynamic Programming. **(K4–An, CO-4)**
5. What are the limitations of the Greedy method? Give an example. **(K4–An, CO-4)**
6. Compare brute-force, greedy, and dynamic approaches using the Travelling Salesman Problem. **(K4–An, CO-5)**

Part C – (12 Marks)

1. Explain Divide and Conquer with examples – Binary Search, Merge Sort, and Quick Sort. Include time complexity analysis**. (K4–An, CO-2)**
2. Discuss Greedy Method with applications – Activity Selection, Huffman Coding, and Knapsack. **(K4–An, CO-3)**
3. Analyze Dynamic Programming through 0/1 Knapsack and Matrix Chain Multiplication problems. **(K5–E, CO-4)**
4. Describe Backtracking and apply it to solve 8-Queens and Graph Coloring problems. **(K5–E, CO-5)**
5. Compare Branch and Bound and Backtracking with real-world examples. **(K5–E, CO-5)**

Head of the Department
Dr. V. S.Harilakshmi

Course Instructor
Dr. J Jackulin Reeja

Department : **Computer Science**

Class : **I M.Sc Computer Science**

Title of the Course : **Core Course II: Object Oriented Analysis and Design & C++**

Semester : **I**

Course Code : **SP231CC2**

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SP231CC2	6	-	-	-	4	6	90	25	75	100

Objectives

1. Present the object model, classes and objects, object orientation, machine view and model management view.
2. Enables the students to learn the basic function, principles and concepts of object-oriented analysis and design.
3. Enable the students to understand C++ language with respect to OOAD

Course Outcomes

COs	Upon completion of this course, students will be able to:	
1	understand the concept of object-oriented development and modelling techniques	**K2**
2	gain knowledge about the various steps performed during object design	**K3**
3	abstract object-based views for generic software systems	**K3**
4	link OOAD with C++ language	**K5**
5	apply the basic concept of OOPs and familiarize to write C++ program	**K6**

Teaching plan

Total Contact hours: 90 (Including lectures, assignments and tests)

Unit	Module	Topic	Teaching Hours	Assessment Hour	Cognitive level	Pedagogy	Student Centric Method	E-Resources	Assessment/ Evaluation Methods
I	**The Object Model**								
	1	Evolution of the Object Model	3	1	K1 (U)	Lecture with PPT	Concept Mapping.	Powerpoint slides	Oral Presentation
	2	Elements of the Object Model	2		K2(U)	Flipped Classroom, Problem Solving	Group Discussion	Video Lecture	Quiz
	3	Applying the Object Model	2	1	K3(Ap)	Collaborative Learning	Collaborative Learning, Concept Mapping	E -Content (MS-Word)	Asking Questions
	4	Classes and Objects: Nature of Object	3		K5(E)	Blended Learning	Problem-Based Learning, Case Study Analysis	Youtube Videos	Open book Test
	5	Relationship among Objects	5	1	K5(E)	Concept-based discussion	Problem solving	Online Tutorials	Assignments
II	**Classes and Object**								
	1	Nature of Class	3	1	K4(An)	Lecture using Chalkand talk	Inquiry based Learning	Interactive PPT	Homework

	2	Relationship among Classes	3		K5(E)	Computational thinking	Using computational techniques for solving problems	E-Content (MS-Word)	Questioning in the class room
	3	Interplay of Classes & Objects	3	1	K5(E)	Integrative Teaching	Analyze problem situation	You tube Video	Debates
	4	Classification Importance	2		K4(An)	Reflective Thinking	Skill based course	E-Content (MS-Word)	Group discussion
	5	Identifying Classes/Objects & Abstractions	4	1	K4(An)	Project Based	Practical	Using Cloud server via internet	Open book exam
III		**Introduction to C++**							
	1	Input/Output Statements	2	1	K 2 (U)	Collaborative Learning	Group discussion	Notes and Slides	Observation note
	2	Declarations	3		K3 (Ap)	Conceptual Demonstration	Seminar	PPT	Presentation
	3	Control Structures	4	1	K5(E)	Inquiry based approach	Analyze problem situation	Discussion Forum(Google class room)	Creative writing
	4	Functions in C++	3		K3 (Ap)	Coopeative Learning, Project based	Debates	PPT	Group discussion

	5	Practice & Debugging	3	1	K5(E)	Problem Solving Techniques	Problem based learning	Online Tutorials	Oral Test
IV		**Inheritance and Overloading**							
	1	Inheritance	3	1	K4 (An)	Context Based, Blended Learning	Group discussion, Model making	Using E-Book	Assignment
	2	Overloading	3		K3 (Ap)	Collaborative , Simulation	Peer coding, Group code challenge	C++ Compiler	Code debugging task
	3	Type Conversion	3	1	K4 (An)	Problem Based	Assignment	Submit the assignment in Google Class Room	Online Assignment
	4	Pointers and Arrays	3		K5(E)	Demonstrative, Inquiry-Based	Hands-on practice, Group project	C Compiler	Ask to write a program and presentation
	5	Constructors/Destructors	3	1	K5(E)	Flipped Classroom	Solving problems	Discussion with PPT	Code review
V		**Memory Management Operators**							
	1	Memory Mgmt Operators	3	1	K5(E)	Problem Based, Simulation	Group analysis	PPT	Class test
		Polymorphism & Virtual	3		K3 (Ap)	Case Study, Blended	Peer review, Group	MS-Word	Open Book exam

	2	Functions				Learning	discussion		
	3	Files & Exception Handling	3	1	K4(An)	Context Based, Inquiry-Based	Problem solving, Simulation exploration	You tube videos	Short answer test
	4	String Handling	3		K5(E)	Inquiry - Based	Group Discussion	E-Content (MS-Word)	Slip test
	5	Templates	3	1	K5(E)	Case study method	Solving problems	Powerpoint	Group Presentation

Course Focussing on Employability/ Entrepreneurship/ Skill Development: Activities (Em / En /SD): SkillDevelopment

1. Write C++ programs for Virtual Function..
2. Write C++ programs for Operator overloading

Assignments:

1.Relationship among Objects (Last date to submit :20-07-2025)

2.C++ program for Inheritance (Last date to submit :12-08-2025)

Seminar Topics: Pointers and Arrays, Constructors

Part A (1 mark)

1. The object model encompasses ___(**K2-U, CO-1)**
   a) Abstraction b) Encapsulation c) Modularity d) All the above
2. Each class in a program is related with each other (T/F)(**K4-An, CO-2)**
3. _____ is an input object in c++.(**K3-Ap, CO-2)**
4. What is inheritance in C++?
   a) Wrapping of data into a single class b) Deriving new classes from existing classes
   c) Overloading of classes d) Classes with same names
5. Which function is used to compare the two strings(**K3-Ap, CO-5)**

Part B (6 marks)

1. Analyze the object Mode.(**K4-An, CO-1)**
2. Explain about relationship among objects (**K2-U, CO-2)**
3. What are control structures? Explain.(**K3-Ap, CO-2)**
4. Elaborate about Inheritance with example(**K5-E, CO-4)**
5. Discuss with Polymorphism (**K5-E, CO-5)**

Part C (12 marks)

1. Discuss the elements of the Object Model. **(K1-U, CO-1)**
2. Write about Classification: The importance of Classification**(K3-Ap, CO-2)**
3. Discuss with Functions in C++with example **(K3-Ap, CO-3)**
4. Explain about operators overloading with example**(K5-E, CO-4)**
5. List out the string handling functions and explain with example**(K6-C, CO-5)**

Head of the Department
Dr. V. S. Harilakshmi

Course Instructor
Dr. F. Fanax Femy

Department : **Computer Science**
Class : **I M.Sc. Computer Science**
Title of the Course : **CORE LAB COURSE– I: ALGORITHM AND OOPS LAB**
Semester : **I**
Course Code : **SP231CP1**

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SP231CP1	-	-	5	-	3	5	75	25	75	100

Learning Objectives:

1. This course covers the basic data structures like Stack, Queue, Tree, List.
2. This course enables the students to learn the applications of the data structures using various techniques
3. It also enables the students to understand C++language with respect to OOAD concepts

Course Outcomes

On the successful completion of the course, student will be able to:		
1	understand the concepts of object oriented with respect to C++	**K1, K2**
2	able to understand and implement OOPS concepts	**K3, K4**
3	implementation of data structures like Stack, Queue, Tree, List using C++	**K4, K5**
4	application of the data structures for Sorting, Searching using different techniques.	**K5, K6**
5	create an application using inheritance	**K5, K6**

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

Teaching Plan
Total Contact hours: 75 (Including Practical Classes and Assessments)

Unit	Topic	Teaching Hours	Assessment Hours	Cognitive level	Pedagogy	Student Centric Method	E-Resources	Assessment/ Evaluation Methods
1	Write a program to solve the tower of Hanoi using recursion.	5	1	K5(E)	Demonstrative, Problem Solving	Recursive Thinking, Individual Coding	C Compiler, Online IDEs	Code Output Evaluation, Viva

2	Write a program to traverse through binary search tree using traversals.	5		K4(An)	Activity Based, Guided Practice	Tree Visual Tools, Peer Review	Data Structure Visualizer	Lab Task Submission
3	Write a program to perform various operations on stack using linked list.	5		K3(AP)	Demonstration	Practical Implementation	C Compiler, Online C Editor	Lab Evaluation
4	Write a program to perform various operation in circular queue.	5	1	K4(An)	Hands-on Training	Simulation Based Learning	Code::Blocks, TurboC++	Internal Lab Test
5	Write a program to sort an array of an elements using quick sort.	5		K5(E)	Exploratory, Step-by-step Tracing	Peer Programming	YouTube (Trace videos), GeeksforGeeks	Problem Solving Assignment
6	Write a program to solve number of elements in ascending order using heap sort.	5		K5(E)	Interactive Lab Demonstration	Dry Run Practice	C Programming Resources, NPTEL	Problem-Based Evaluation
7	Write a program to solve the knapsack problem using	5		K6(C)	Project-Based, Algorithm Design	Group Coding	Hackerrank / Leetcode	Case-based Assessment

	greedy method							
8	Write a program to search for an element in a tree using divide& conquer strategy.	5	1	K5(E)	Comparative Strategy Based	Divide & Conquer Demonstration	Tree Visualizers, Stack Overflow	Assignment + Viva
9	Write a program to place the 8 queens on an 8X8 matrix so that no two queens Attack.	6		K6(C)	Inquiry-Based, Problem Solving	Algorithm Visualization	Backtracking Videos, Pseudocode Tools	Performance Rubric
10	Write a C++ program to perform Virtual Function	4	1	K4(An)	Demonstrative, Object-Oriented Teaching	Practical with OOP Objects	C++ Compiler, OnlineGDB	Code Review + Viva
11	Write a C++ program to perform Parameterized constructor	4		K3(Ap)	Demonstration, Hands-on	Individual Programming	C++ TutorialsPoint	Lab Performance
12	Write a C++ program to perform Friend Function	4		K4(An)	Object-Oriented Lab Exercise	Peer Assistance	YouTube: C++ Friend Functions	Code Output Verification
13	Write a C++ program to perform	4	1	K3(Ap)	Concept-Oriented Demo	Practice Task Sheets	GeeksforGeeks C++ Overloading	Assessment Through Output

	Function Overloading							
14	Write a C++program to perform Single Inheritance	4		K5(E)	Project-Based	File Handling Exercises	C++ File I/O Tutorials	Project File Evaluation
15	Write a C++program to perform Employee Details using files.	4		K5(E)	Demonstrative, Problem Solving	Recursive Thinking, Individual Coding	C Compiler, Online IDEs	Code Output Evaluation, Viva

Course Focussing on Employability/ Entrepreneurship/ Skill Development: **Employability, Skill Development**

Activities (Em / En /SD): Hands on Training, Project

Course Focusing on Cross Cutting Issues (Professional Ethics/ Human Values/Environment Sustainability/ Gender Equity): NIL

Environment Sustainability activities related to Cross Cutting Issues: NIL

Sample questions

1. Write a program to sort an array of an elements using quick sort.
2. Write a program to solve number of elements in ascending order using heap sort.
3. Write a program to solve the knapsack problem using greedy method
4. Write a program to search for an element in a tree using divide& conquer strategy.
5. Write a program to place the 8 queens on an 8X8 matrix so that no two queens Attack.
6. Write a C++ program to perform Virtual Function
7. Write a C++ program to perform Parameterized constructor

Head of the Department
Dr. V. S. Harilakshmi

Course Instructor
Dr. J. Jackulin Reeja

Department : **Computer Science**

Class : **I M.Sc Computer Science**

Title of the Course : **Elective Course 1: Python Programming**

Semester : **V**

Course Code : **SP231EC1**

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SU231EC1	5	-	-	-	3	5	75	25	75	100

Learning Objectives:

1. Presents an introduction to Python, creation of web applications, network applications and working in the clouds
2. Use functions for structuring Python programs
3. Understand different Data Structures of Python
4. Represent compound data using Python lists, tuples and dictionaries

Course Outcomes

CO	Upon completion of this course, the students will be able to:	PSO addressed	Cognitive level
1	understand the basic concepts of Python Programming	PSO- 1	K1(R)
2	understand file operations, Classes and Objects	PSO- 3	K3(A)
3	acquire Object Oriented Skills in Python	PSO- 2	K4(An)
4	develop web applications using Python	PSO- 4	K6(C)
5	develop Client Server Networking applications	PSO- 5	K6(C)

K1-Remember;**K2** -Understand; **K3**-Apply;**K4** -Analyze;**K5**– Evaluate; **K6**-Create

Teaching Plan

Total Contact hours: 75 (Including lectures, assignments and tests)

Unit	Module	Topic	Teaching Hours	Assessment Hours	Cognitive Level	Pedagogy	Student Centric Method	E-Resources	Assessment/ Evaluation Methods
I	**Introduction**								
	1	Python Introduction, Numbers, Strings	3	1	K2(U)	Lecture Method, Conceptual Teaching	Group Discussion, Q&A	PPTs, You tube Video	Quiz, Oral Questions, CIA I
	2	Variables, Lists	3		K2(U)	Flipped Classroom	Think-Pair-Share	Self made You tube videos	Assignment, MCQ, CIA I
	3	Tuples	2	1	K3(Ap)	Demonstration, Problem Solving	Problem Solving	Interactive PDFs, Geek for geeks	Slip Test, Viva Voce, CIA I
	4	Dictionaries Sets	2		K3(Ap)	Hands-on Training	PyCharm Session	Analytics Vidya, W3Schools,	Lab Evaluation, CIA I
	5	Comparison	2	1	K3(Ap)	Lecture with PPT	Practical exercises	Youtube vidoes	Questioning, CIA I
II	**Code Structures**								
	1.	**Code Structures:** if, elseif, and else Repeat with while Iterate with for	2	1	K2(U)	Demonstrative, Visual Learning	Problem Solving	YouTube, Analytics Vidya	Slip Test, CIA I
	2.	Comprehensions	2		K3(Ap)	Inquiry-Based	Hands-on	PPT, Geek	Activity

						Learning	Exercises	for geeks	Submission, CIA I
	3.	Functions	2	1	K3(Ap)	Problem Solving	Simple exercise solving	Recorded Videos	Evaluation Sheet, CIA I
	4.	Generators Decorators	2		K4(An)	Flipped Class room	Group Discussion, Brain Storming	Geek for geeks	Quiz, CIA I
	5.	Namespaces and Scope	2	1	K4(An)	Interactive PPT Teaching	Problem Solving Exercises	Recorded Lectures	Oral Test, CIA I
	6.	Handle Errors with try and except, User Exceptions	2		K4(An)	Problem-Based Learning	Textbook notes summarisation	Geek for geeks	Group Assignment, CIA I
III	**Modules, Packages and Classes**								
	1.	Modules, Packages, and Programs: Standalone Programs Command Line Arguments , Modules and the import Statement	2	1	K2(U)	Lecture with Examples	Concept Mapping	e-Notes, Schema Diagrams	Quiz, CIA II
	2.	The Python Standard Library	2		K3(Ap)	Demonstrative	Group Discussion	You tube Videos	Online Assessment, CIA II

	3.	Objects and Classes:Define a Class with class	2	1	K3(Ap)	Hands-on SQL Practice	Simple Exercises	You tube videos	Code Evaluation, CIA II
	4.	Inheritance, Override a Method Add a Method, Get Help from Parent with super	2		K3(Ap)	Flipped Classroom	Program writing Challenges	W3Schools	Spot Test, CIA II
	5.	In self Defense Get and Set Attribute Values with Properties	2	1	K4(An)	Simulation	Inquiry based learning	YouTube Tutorials	Online Quiz, CIA II
	6.	Name Mangling for Privacy, Method Types, Duck Typing, Special Methods, Composition	2		K6(C)	Demonstration	Join Task, Brain storming	Pycharm	Task Evaluation, CIA II
IV	**Datatypes and Web**								
	1.	Data Types: Text Strings Binary Data, Storing and Retrieving Data:File Input /Output	2	1	K3(Ap)	Demonstrative, Problem Solving	Demonstration	You tube lecture videos	Slip Test, CIA II
	2.	Structured Text	2	1		Inquiry based	Interactive	NPTEL	Online Quiz,

		Files , Structured Binary Files				learning	PPTs	video lectures	CIA II
	3.	Relational Databases, No SQL Data stores	2		K3(Ap)	Lecture cum Demonstration	Query Formation Activities	Geek for Geeks,	Assignment, CIA II
	4.	Web: Web Clients Web Servers	3	1	K3(Ap)	Activity-Based	Exercise Solving Practice, Brainstorming	Analytics vidya, geek for geeks	Task Sheet Evaluation, CIA II
	5.	Web Services and Automation	3		K4(An)	Simulation, Chalk and Talk	Exercises	You tube videos	Slip test, CIA II
V	**Systems and Networks**								
	1.	Systems: Files Directories, Programs and Processes Calendars and Clocks	2	1	K2(U)	Lecture Method	Peer Teaching	Videos lectures, geek for geeks	Quiz – Near Pod, CIA II
	2.	Networks:Patterns, Internet Services, The Publish Subscribe Model TCP/IP Sockets, Zero MQ	2	1	K2(U)	Demonstrative	Data Type Exercise	You tube videos	MCQ Test, CIA II
	3.	Concurrency:	3	1	K3(Ap)	Problem Solving	Activity,	Analytics	Lab

		Queues Processes Threads Green Threads and event Twisted Redis					Brainstorming, peer activity	vidya Tutorials	Evaluation, CIA II
	4.	Web Services and APIs Remote Processing Big Fat Data and Map Reduce	2		K4(An)	Hands-on Practice	Scenario based tasks	Video Demos, Sample Codes	Slip Test, CIA II
	5.	Working in the Clouds	3		K2(U), K3(Ap)	Blended Learning	Group discussion, Peer teaching	PDF Guides, Blog Articles	Online Quiz, CIA II

Course Focussing on Employability/ Entrepreneurship/ Skill Development: **Skill Development**

Activities (Em/ En/SD): 1. Develop programs using Object Oriented Concepts.

2. Creating interactive web pages using forms.

Course Focussing on Cross Cutting Issues(Professional Ethics/ Human Values/Environment Sustainability/ Gender Equity): Nil

Activities related to Cross Cutting Issues: Nil

Assignment:

1. Different data types in Python and a comparison with C and C++ data types (Submission date 25.07.2025)
2. Compare two Files line by line in Python. (Submission date 17.09.25)

Seminar Topic:

1. Generators
2. Concurrency Control

Sample questions (minimum one question from each unit)

Part A (1 Mark)

1. ___ is the maximum length of a Python identifier. **(K1-R,CO1)**
   a) 32 b)16 c)128 d) No fixed length
2. Which of the following is used for exception handling in Python? **(K1-R,CO1)**
   a) try b) except c) finally d) All the above
3. As what datatype are the *args stored, when passed into a function? **(K2-U,CO2)**
   a) List b) Tuple c) Dictionary d) None
4. Which of the following keywords is not reversed keyword in python? **(K2-U,CO1)**
   a) Class b) goto c) and d) None
5. Python supports the creation of anonymous functions at run time using a construct called ____.**(K2-U,CO2)**
   a) lambda b)pi c) anonymous d) None

Part B (6 Marks)

1. Write the features of Python. **(K2-U,CO1)**
2. Explain why Python is considered as an Interpreted Language. **(K2-U,CO1)**
3. Write notes on Name Mangling for Privacy. **(K3-An,CO2)**
4. Write a Python program to display Fibonacci sequence for n terms. **(K3-An,CO2)**
5. What do you understand about Redis? **(K4-Ap,CO5)**

Part C (12 Marks)

1. Explain about tuples, lists and dictionaries in Python with example. **(K3-Ap,CO2)**
2. Explain in detail about Exception Handling. **(K4-An,CO2)**
3. Elaborate Inheritance concepts with examples. **(K4-An,CO3)**
4. Describe Web Services and automation. **(K5-Ev,CO4)**
5. Write in detail about TCP/IP model. **(K6-C,CO5)**

Head of the Department **Course Instructor**

Dr. V. S. Harilakshmi Dr. V. S. Harilakshmi

Department : **Computer Science**

Class : **I M.Sc Computer Science**

Title of the Course : **ELECTIVE LAB COURSE I: Python Programming Lab**

Semester : **I**

Course Code : **SP231EP1**

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SP231EP1	-		3	-	2	3	45	25	75	100

Prerequisite:

Basics of any OO Programming Language.

Learning Objectives:

1. Presents an overview of elementary data items, lists, dictionaries, sets and tuples
2. To understand and write simple Python programs.

Course Outcomes

On the successful completion of the course, student will be able to:		
1	write programs in Python using OOPS concepts	**K1, K2**
2	to understand the concepts of File operations and Modules in Python	**K3, K4**
3	implementation of lists, dictionaries, sets and tuples as programs	**K4, K5**
4	to develop web applications using Python	**K5, K6**
5	develop the programs using polymorphism	**K6**

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

Teaching Plan

Total Contact hours: 45 (Including Practical Classes and Assessments)

Unit	Topic	Teaching Hours	Assessment Hours	Cognitive level	Pedagogy	Student Centric Method	E-Resources	Assessment/ Evaluation Methods
1	Elementary data items, lists, dictionaries and tuples	4	1	K2	Demonstration Practice-Based	Pycharm Execution Practice	Matlab Image Processing toolbox	Lab Task Evaluation

							Youtube videos	
2	Histogram Equalization	4		K3	Problem Solving, Hands-on Learning	Algorithm decoding task, Pair Programming	Self made Youtube videos	Test, Viva
3	Image Restoration	4	1	K3	Activity-Based	Visual Analysis Activities	NPTEL	Output Analysis
4	Image Filtering	4		K3	Demonstrative	Peer programming	Tutorials point	Slip Test, Student Explanation
5	Edge detection using Operators	4	1	K4	Simulation	Collaborative coding	Youtube videos	Code Debugging Evaluation
6	Image Compression	4		K4	Problem Solving	Algorithm decode, Problem Solving	Matlab Central practical examples	Code Review, Oral Test
7	Image Subtraction	4	1	K3	Hands-on practice	Student explanation of differences	Geeks for geeks	Output-Based Evaluation
8	Boundary Extraction using Morphology	4		K5	Practice-Based	Problem Solving exercise	YouTube Tutorials	Final Output Verification

9	Image Segmentation	4	1	K6	Demonstration	Mini project in pairs	You tube videos	Oral questioning, demo execution verification
10	Dynamic and interactive web pages	4						

Course Focussing on Employability/ Entrepreneurship/ Skill Development: Employability, Skill Development

Activities (Em / En /SD): Hands on Training, Project

Course Focusing on Cross Cutting Issues (Professional Ethics/ Human Values/Environment Sustainability/ Gender Equity): NIL

Environment Sustainability activities related to Cross Cutting Issues: NIL

Sample questions

1. Write a program to implement elementary data items, lists, dictionaries and tuples.
2. Write a program to implement conditional branches
3. Write a program to implement loops.
4. Write a program to implement functions.
5. Write a program to implement Exceptional handling.
6. Write a program to implement inheritance.
7. Write a program to implement polymorphism.
8. Write a program to implement file operations.
9. Write a program to implement modules.
10. Write a program to create dynamic and interactive web pages using forms.

Head of the Department
Dr. V. S. Harilakshmi

Course Instructor
Dr. V. S. Harilakshmi

Department : **Computer Science**
Class : **I M.Sc. Computer Science**
Title of the Course : **Elective Course II :c) Critical Thinking, Design Thinking and Problem Solving**
Semester : **I**
Course Code : **SP231EC6**

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SP231EC6	**5**	**-**	–	–	**3**	**5**	**75**	**25**	**75**	**100**

Learning Objectives:

1. Learn critical thinking and its related concepts.
2. Learn design thinking and its related concepts.
3. Develop thinking patterns, problem-solving and reasoning skills.

Course Outcomes

On the successful completion of the course, students will be able to:		
1	Understand the concepts of critical thinking and its related terminology.	**K1,K2**
2	Focus on the development of critical thinking and problem-solving skills.	**K2,K3**
3	Apply design thinking in solving real-world problems.	**K3,K4**
4	Make decisions and take actions based on logical analysis.	**K4,K5**
5	Analyze thinking patterns and reasoning in real-time scenarios.	**K5,K6**

K1 - Remember; **K2** - Understand; **K3**- Apply;**K4** - Analyze; **K5** – Evaluate;**K6 -** Create

Teaching plan

Total Contact hours: 75 (Including lectures, assignments and tests)

Unit	Module	Topic	Teaching Hours	Assessment Hours	Cognitive level	Pedagogy	Student Centric Method	E-Resources	Assessment/ Evaluation Methods
I	**Critical Thinking**								
	1	Definition, Conclusions and Decisions, Beliefs and Claims	2	1	K1(R), K2(U)	Lecture with Concept Mapping	Think-Pair-Share	Stanford CT Tools	Quiz, Self-check worksheet, CIA I
	2	Evidence – finding, evaluation, Inferences	2		K1(R), K5(E)	Visual Explanation, Diagram-based Analysis	Guided Practice	YouTube Critical Thinking Series	Diagram interpretation quiz,CIA I
	3	Facts – opinion, probable truth, probably false, Venn diagram	2		K2(U)	Case-Based Teaching	Case Study Discussion	TEDx, NPTEL	Case Study Rubric,CIA I
	4	Applied critical thinking: Inference, Explanation, Evidence, Credibility, Two Case Studies	3	1	K4(A), K5(E)	Collaborative Analysis, Case Study Method	Group Work, Case Study	Online Case Library	Peer Review and Reflection Log, CIA I
	5	Critical thinking and science, critical	3	1	K3(Ap),	Inquiry-Based	Think Aloud	Coursera	Analytical Writing Task,CIA

		evaluation, self assessment.			K5(E)	Learning	Exercises, Seminar		I
II	**Design Thinking**								
	1	Introduction, Need of Design Thinking	2	1	K1(R), K2(U)	Problem Framing Lecture	Real-World Mapping	IDEO Toolkit	Problem Identification Worksheet, CIA I
	2	Problem to question - design thinking process,	2		K2(U)	Storyboarding and Flowcharting	Collaborative Mind Mapping	Coursera Design Thinking	Process Mapping Assignment, CIA I
	3	Traditional Problem Solving versus Design Thinking	2		K3(Ap)	Visual Learning & Templates	Group Design Cycle	LinkedIn Learning	Process Evaluation Rubric, CIA I
	4	Phases of Design Thinking, problem exploration, Stake holder assessment	3	1	K4(A)	Role-Play Activities	Stakeholder Role Simulation	HBR Cases	Scenario-based Role Cards, CIA I
	5	Design thinking for manufacturers, smart Idea to implementation.	3	1	K4(A)& K5(E)	Structured Problem Solving	Seminar	MIT OpenCourseWare	Implementation Plan Presentation,CIA I
III	**CASE STUDY**								
	1	Thinking to confidence, fear management	3	1	K2(U), K3(A)	Reflective Pedagogy	Self-Awareness Tasks	TED Talks	Reflective Journal Submission,CIA I
	2	Duty Vs Passion, Team	2		K3(Ap),	Team Exercises &	Group	NPTEL Soft	Team Rubric

		management			K4(A)	Tools Exploration	Project	Skills	Evaluation,CIA I
	3	Tools for Thinking, Prototype design	1		K4(A)	Product-Based Learning	Rapid Prototyping	Stanford Design Lab	Prototype Demo & Peer Feedback, CIA I
	4	Relevance of Design and Design Thinking in engineering, human centered design	3	1	K4(A)	Interdisciplinary Discussion	Industry Application Examples	Case Study, Seminar	Application Notes Review, CIA II
	5	Case study: apply design thinking in problem.	3		K4(A), K5(E)	Flipped Classroom, Case Study Method	Case Study	EdX, Casebooks	Case Evaluation Checklist, CIA II
IV	**Problem solving**								
	1	Problem definition, problem solving methods	2	1	K2(U), K3(Ap)	Conceptual Demonstration , Group Discussion	Group work	Khan Academy	Map, CIA II
	2	selecting and using information, data processing	3		K3(Ap)	Data-Based Learning	Data Puzzle Activities	MIT OCW	Data Interpretation Tasks,CIA II
	3	Solution methods, solving problems by searching	2		K3(Ap)	Simulation & Visualization	Algorithmic Solving	Stanford Algorithms Course	Problem Solving Drill, CIA II
	4	Recognizing patterns, spatial reasoning	2	1	K4(A)	Visual Thinking	Diagram Solving	Design Thinking	Spatial Skills Assessment, CIA

		necessity and sufficiency				Strategy		Resources	II
	5	Closing and using models, making choice and decisions	3	1	K5(E)	Decision Tree Mapping	Role-Based Scenarios	Seminar	Decision Making Rubric, CIA II
V	**Problem solving**								
	1	Deductive and hypothetical reasoning	1	1	K5(E)	Logical Frameworks	Guided Logic Puzzles	Khan Academy	Reasoning Skills Test, CIA II
	2	Computational problem solving, generating, implementing	3		K3(Ap)	Coding for Logic	Flowchart to Code	HackerRank	Code & Logic Evaluation, CIA II
	3	Evaluating solutions, interpersonal problem solving	2		K4(A), K5(E)	Discussion-Based Learning	Role Play Challenge	Coursera Soft Skills	Peer Evaluation, CIA II
	4	Advanced problem solving: Combining skills – using imagination, developing models, Carrying out investigations, Data analysis and inference.	4	1	K5(E)	Project-Based Thinking	Seminar	Design Thinking Tools	Prototype & Explanation Submission, CIA II

	5	Graphical methods of solution, Probability, tree diagrams and decision trees	2	1	K5(E), K6(C)	Visualization & Simulation	Group Mapping Exercise	Decision-Making MOOCs	Tree Diagram Interpretation Test,CIA II

Activities (Em/ En/SD):Case studies,Role-play

Course Focussing on Employability, Problem Solving, Analytical and Design Thinking Skills

Assignment: Two CaseStudies, Case study: apply design thinking in Problem (Last date to submit – 15-08-2025)

Seminar Topics: Self Assessment, Smart Idea to implementation, Human Centered design, Making choice and Decisions, Data Analysis and Inference

Sample questions
Part A (1 mark)

1. Which of the following is an element of critical thinking?**(K2 – U, CO - 1)**
   a) Memorizing facts
   b) Avoiding evidence
   c) Evaluating arguments
   d) Copying information

2. Which phase of design thinking involves idea generation?**(K3 – Ap, CO- 2)**
   a) Define
   b) Empathize
   c) Ideate
   d) Prototype

3. Which of the following best describes human-centered design?**(K4 – A, CO - 3)**
   a) Focuses on financial viability
   b) Centers on user needs and experiences
   c) Based only on technical feasibility

d) Ignores user feedback

4. Pattern recognition in problem solving helps with:**(K4 – A, CO - 4)**
   a) Memorizing codes
   b) Identifying recurring solutions
   c) Guessing randomly
   d) Avoiding structured thinking

5. In a decision tree, branches represent:**(K5 – E,CO - 5)**
   a) Unrelated events
   b) Sequential memory steps
   c) Possible choices or outcomes
   d) Dead-end loops

Part B (6 Marks)

1..Distinguish between belief and inference with an example. **(K2-U, CO1)**

2. Explain how stakeholder analysis helps in Design Thinking. **(K3-Ap, CO2)**

3. Write a note on fear management and team motivation. **(K3-Ap, CO3)**

4. Describe the use of models in problem solving. **(K4-An, CO4)**

5. What is the role of decision trees in evaluating alternatives? **(K5-E, CO5)**

Part C (12 Marks)

1. Explain Venn diagrams and their role in analyzing claims**. (K2-U, CO1)**
2. Describe the five phases of Design Thinking with suitable examples. **(K3-Ap, CO2)**
3. Analyze a case study applying human-centered design. **(K4-An, CO3)**
4. Explain pattern recognition and spatial reasoning with real-life cases. **(K4-An, CO4)**
5. Discuss how problem-solving can be enhanced through imagination and modeling. **(K6-Cr, CO5)**

Head of the Department
Dr. V.S. Harilakshmi

Course Instructor
Ms. Nitha Justin

Department : **Computer Science**

Class : **II M. Sc Computer Science**

Title of the Course : **Core Course V: Digital Image Processing**

Semester : **III**

Course Code : **SP233CC1**

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SP233CC1	6	-	-	-	5	6	90	25	75	100

Objectives

1. To learn basic image processing techniques for solving real problems.
2. To learn image compression and Segmentation procedures.

Course Outcomes

Upon completion of this course, the students will be able to:		
1	understand the fundamentals of Digital Image Processing	**K2 (U)**
2	understand the mathematical foundations for digital image representation, image acquisition, image transformation, and image enhancement	**K2(U)**
3	apply, design and implement and get solutions for digital image processing problems	**K3(Ap), K4(An)**
4	apply the concepts of filtering and segmentation for digital image retrieval	**K3(Ap), K5(E)**
5	explore the concepts of Multi-resolution process and recognize the objects in an efficient manner	**K5(E), K6(C)**

Teaching plan

Total Contact hours: 90 (Including lectures, assignments and tests)

Unit	Module	Topic	Teaching Hours	Assessment Hours	Cognitive level	Pedagogy	Student Centric Method	E-Resources	Assessment/ Evaluation Methods
I	**Introduction**								
	1	What is Digital image processing – the origin of DIP Examples of fields that use DIP	2	1	K2 (U)	Lecture Instruction, Explanation with Examples	Lecture, Group Discussion, Brainstorming	NPTEL Lectures, Self made You-Tube videos, PPTs	MCQs, Oral Quiz, CIA I
	2	Fundamentals steps in DIP – Components of an image processing system	3		K3 (Ap)	Conceptual Teaching, Illustrative Examples	Peer Explanation, Mind Mapping	Tutorials point, Course Handouts, Videos	Short Essay, Concept Mapping, CIA 1
	3	Digital Image Fundamentals: Elements of Visual perception	3	1	K4 (An)	Chalk & Talk, Visual Pedagogy, Tabular Comparison	Interactive Discussion, Case Analysis	Geeks for Geeks	Conceptual Worksheet, Slip Test, CIA 1
	4	Light and the electromagnetic spectrum – Image sensing and acquisition	2		K3 (Ap)	Interactive PPT, Tabular Comparison	Lecture and demonstration	Geek for Geeks, NPTEL Videos	Quiz, Diagram Analysis, CIA I
	5	Image sampling and Quantization	2	1	K3 (Ap)	Blended Learning, Inquiry based	Lecture with PPT Interactive Sessions	Self made You tube videos	Assignment, CIA I

						learning			
	6	Some Basic relationship between Pixels, Linear and Nonlinear operations.	3		K4 (An)	Flipped Classroom, PPT	Interactive Demonstration	Self made You Tube Video Tutorials, Geeks for Geeks	Quiz, Assignment, CIA 1
II	**Image Enhancement**								
	1	Image Enhancement in the spatial domain: Background	2	1	K3 (Ap)	Chalk and Talk, Group Discussion	Interactive PPT	Analytics vidya, Tutorial point	Oral Quiz, CIA 1
	2	Basic Gray level Transformations – Histogram Processing	2		K4 (An)	Step-by step Algorithm Instruction	Hands on practice	Video lecture	Assignment, Quiz, CIA I
	3	Histogram Equalization	2	1	K5 (E)	Interactive Software Demonstration	Software lab practice, Group Discussion	Self made You tube videos	Lab evaluation, CIA I
	4	Enhancement using Arithmetic / Logic operations: Image Subtraction - Image Averaging	3		K3 (Ap)	Interactive PPT, Real-World Application: Discussion	Use case demonstration, Pair programming	Self made You tube videos	Practical Test, Output Review, CIA I
	5	Basics of spatial filtering, Smoothing spatial filters:	3	1	K2 (U)	Comparative analysis with examples	Visual Comparison	Geek forgeeks	Assignment, CIA I
	6	Smoothing spatial filters: Smoothing Linear Filters – Sharpening spatial filters, Combining spatial enhancement methods	3		K3 (Ap)	Project based Learning	Problem Solving exercise, Lab Task division	Real time Analysis video lecture	Lab exercise output evaluation, CIA I
III	**Image Restoration**								

	1	A model of the Image Degradation / Restoration Process	3	1	K2 (U)	Real-World Analogy, Group Discussion	PPT, Visual Analysis	YouTube Videos, Simpli learn,	Problem Analysis Task, MCQ Test
	2	Noise models – Restoration is the process of noise only	1		K3(Ap)	Analytical teaching with examples	Demonstration	Geeks for Geeks, you tube videos	Short Tests/Quizzes: Conceptual and output-based, Problem solving exercises, CIA II
	3	Spatial Filtering – Periodic Noise reduction by frequency domain filtering – Linear, Portion.	2	1	K4 (An)	Live filtering demo	Hands on filtering practice	Video demo	Output with Logic Justification, CIA II
	4	Invariant Degradations – Estimating the degradation function	3		K5 (E)	Step-By-Step Algorithm Instruction	Worksheet evaluation	Analytics vidya, Video lectures	Slip test, CIA II
	5	Inverse filtering – Minimum mean square Error Filtering	2	1	K3 (Ap)	White board illustration	Group calculation, Concept quiz	Analytics vidya, Video lectures	Problem solving exercise, CIA II
	6	Constrained least squares filtering, Geometric mean filter – Geometric Transformations.	3	1	K4 (An)	Application based teaching	Real Case study	Analytics vidya, Video lectures	Quiz, CIA II
IV	**Dynamic Programming**								
	1	Image Compression Fundamentals–Coding Redundancy – Inter	1	1	K2 (U)	Lecture and Visual Aids (diagram)	Recursive to Iterative Comparison,	Interactive PPT, Open CV demo	MCQ test, CIA II

		pixel Redundancy					Code Walkthrough		
	2	Image compression models: The source encoder and decoder	2		K2 (U)	Computational Thinking	Step-by-Step Problem Solving in Groups	NPTEL video lectures	Slip test, CIA II
	3	Channel Encoder and Decoder	2	1	K3 (Ap)	PPT	Discussion	Geek for Geeks	Quiz, CIA II
	4	Elements of Information Theory - Measuring Information - The Information Channel	3		K2 (U)	Lecture with PPT Interactive Sessions	Brain storming	Geek for geeks	Oral Questioning, CIA II
	5	Fundamental Coding Theorems – Error Free compression – Visible length Coding - LZW Coding	2	1	K4 (An)	Lecture using videos	Problem solving task	Youtube videos	Problem solving exercises, CIA II
	6	Lossy compression- Lossy Predictive Coding	2	1	K6 (C)	Video lecture and discussion	Problem solving	Youtube videos	Problem solving exercises, CIA II
	7	Image compression standards	2		K5 (E)	Demonstration	Task Assignment Simulations	Geek for geeks	Questioning, CIA II
V	**Image Segmentation**								
	1	Segmentation - Detection and Discontinuities	2	1	K2 (U)	Develop Practical Programs	Simulation output analysis	NPTEL, Self made Lecture Videos	Matlab Visualization output evaluation, CIA II
	2	Point detection Line Detection - Edge Detection	2		K4 (An)	Case Studies, Group Discussions	Hands on analysis and discussion	NPTEL video lectures	Scenario Analysis, CIA II

	3	Edge Linking and Boundary deduction – Local Processing- Global Processing	2	1	K5 (E)	Lecture with PPT	Hands on analysis and discussion	NPTEL video lectures	Practical simulation, CIA II
	4	Region-Based segmentation – Basic Formulation	2		K3 (Ap)	Interactive PPT	Hands on Demonstration	You tube videos	Problem Solving exercises, CIA II
	5	Region Growing, Splitting and Merging	2	1	K3 (Ap)	Demonstration with examples.	Problem-solving Sessions, Discussion	Youtube videos	Practical Output review, CIA II
	6	Color fundamentals- color models- RGB color model	2	1	K6 (C)	Demonstration with examples.	PPT discussion	Analytics vidya tutorials	Questioning, CIA II
	7	CMY and CMYK color models	2		K6 (C)	Lecture using PPT	PPT discussion, brain storming	Analytics vidya tutorials, Visualisation tools	Quiz, CIA II

Course Focussing on Employability/ Entrepreneurship/ Skill Development: **Employability, Skill Development**

Activities (Em/ En/SD): 1. Employability: Image sampling and Quantization, Mini project using COVID – 19 dataset

2. Skill Development: Implementing Histogram Equalization to Enhance Image Contrast using MATLAB.

Assignment: Basics of Spatial Filtering, Image Compression Models,

Seminar Topic: Spatial Enhancement Methods, Channel Encoder and Decoder

Sample questions

Part A (1 Mark)

1. What is the primary objective of Digital Image Processing? **(K2(U), CO1)**

   a) To create new images

   b) To improve the quality of an image or extract useful information

   c) To store images efficiently

   d) To compress images without any loss

2. Which technique is used to improve the contrast of an image in the spatial domain? **(K3(Ap), CO2)**

   a) Fourier Transform b) Histogram Equalization

   c) Edge Detection d) Noise Reduction

3. Which filter is specifically designed to minimize the mean square error between the restored and the original image? **(K4(An), CO3)**

   a) Median Filter b) Gaussian Filter

   c) Minimum Mean Square Error (MMSE) Filter d) Sobel Filter

4. Which of the following is a lossless image compression technique? **(K3(Ap), CO5)**

   a) JPEG b) LZW Coding c) MPEG d) JPEG 2000

5. Which method is commonly used for detecting edges in an image? **(K3(Ap), CO4)**

   a) Region Growing b) K-means Clustering

   c) Canny Edge Detection d) Principal Component Analysis (PCA)

Part B (6 Marks)

1. Explain the fundamental steps involved in a digital image processing system. **(K2(U), CO1)**
2. Describe the process of histogram equalization. How does it improve the contrast of an image? Illustrate with an example. **(K3(Ap), CO2)**
3. Discuss the different types of noise that can affect digital images. **(K4(An), CO3)**
4. What are the differences between lossless and lossy image compression techniques. **(K4(An), CO5)**

5. Explain the concept of edge detection in image segmentation. **(K3(Ap), CO4)**

Part C (12 Marks)

1. Discuss the components of an image processing system in detail. Explain how each component contributes to the overall functioning of the system. **(K2(U), CO1)**
2. Explain in detail the various techniques used for image enhancement in the spatial domain. **(K3(Ap), CO2)**
3. Describe the image degradation/restoration process model. **(K4(An), CO3)**
4. Elaborate on the fundamentals of image compression. **(K5(E), CO5)**
5. Discuss color fundamentals and color models. **(K6(C), CO5)**

Head of the Department
Dr. V. S. Harilakshmi

Course Instructor
Dr. V. S. Harilakshmi

Department : Computer Science
Class : II M.Sc. Computer Science
Title of the Course : Core Course VI: Cloud Computing
Semester : III
Course Code : SP233CC2

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SP233CC2	6	–	–	–	5	6	90	25	75	100

Learning Objectives:

1. Gain knowledge on cloud computing, cloud services, architectures and applications.
2. Enable the students to learn the basics of cloud computing with real time usage.

Course Outcomes

On the successful completion of the course, students will be able to:		
1	Understand the concepts of cloud and its architecture	**K1, K2**
2	Use and analyse the architecture and services of cloud	**K3**
3	Manage schedules, events and projects	**K4**
4	collaborate cloud for Event & Project Management	**K5**
5	Apply and create the cloud simulator tool sand virtual machines	**K6**

Teaching plan

Total Contact hours: 90 (Including lectures, assignments and tests)

Unit	Module	Topic	Teaching Hours	Teaching Hours	Cognitive level	Pedagogy	Student Centric Method	E-Resources	Assessment/ Evaluation Methods
I	**Introduction**								
	1	Beyond the desktop:An Introductionto Cloud Computing	3	1	K1 (U)	Lecture with Visual Aids such as PPT	Concept Mapping.	Notes/Slides	Oral Presentation
	2	Workingof Cloud Computing	2		K3(Ap)	Conceptual Demonstration	Inquiry-Based Learning	Video Lecture	Quiz
	3	Companiesin the Cloud, Essential characteristics	2	1	K2 (U)	Concept-based discussion , Problem-solving sessions using real-world applications	Collaborative Learning, Concept Mapping	PowerPoint	Case Discussion
	4	Architectural Influences, Technological Influences,and Operational Influences	3		K4(An)	Blended Learning	Problem-Based Learning, Case Study Analysis	Youtube Videos	Open book Test
	5	Cloud Computing	5	1	K3 (Ap)	Concept-based discussion ,	Problem solving	Online Tutorials and	Assignments

		Security challenges: Security Policy Implementation, Policy Types, and CSIRT				Problem-solving sessions using real-world applications		Notes	
II		**Cloud Architecture**							
	1	Layers in Cloud Architecture	3	1	K4(An)	Lecture using Chalkand talk	Inquiry based Learning	Interactive PPT	Class test
	2	Software as a Service (SaaS):Features and Benefits	3		K3(Ap)	Computational thinking	Using computational techniques for solving problems	E-Content (MS-Word)	Questioning in the class room
	3	Platform as a Service(PaaS):Features and Benefits	2	1	K3 (Ap)	Integrative Teaching	Analyze problem situation	You tube Video	Debates
	4	Infrastructure as a Service(IaaS):Features and Benefits	2		K3 (Ap)	Reflective Thinking	Skill based course	E-Content (MS-Word)	Group discussion
	5	Cloud Deployment Models: Public, Private, Community, Hybrid	3	1	K3 (Ap)	Project Based	Practical	Using Cloud server via internet	Open book exam
	6	Pros and Cons of Cloud computing	2		K4(An)	Case study method	Concept Mapping	Powerpoint Presentation	Oral Quiz
III		**CloudComputingfor Everyone**							

	1	Cloud Computingfor the Family	1	1	K2 (U)	Collaborative Learning	Group discussion	Notes and Slides	Observation note
	2	Centralizing Email Communications	3		K3 (Ap)	Conceptual Demonstration	Seminar	PPT	Presentation
	3	Cloud Computingfor the Community	2	1	K3 (Ap)	Inquiry based approach	Analyze problem situation	Discussion Forum(Google class room)	Creative writing
	4	Collaborating on Schedules and Group Projects	3		K4 (An)	Coopeative Learning, Project based	Debates	PPT	Group discussion
	5	Cloud Computingfor Corporations: Managing Schedules, Projects, Contact Lists	3	1	K4 (An)	Problem Solving Techniques	Problem based learning	Online Tutorials	Oral Test
	6	Collaborations-Presenting and accessing on the road.	3		K3 (Ap)	Flipped Class room	Computational techniques for solving problems	You tube videos	Peer Review
IV		**Using Cloud Services**							
	1	Collaborating on Calendars, Schedules,and Task Management	3	1	K2 (U)	Lecture using Chalkand talk	Powerpoint Presentation	Using E-Book	Asking Questions
	2	Exploring Online Scheduling andPlanning	3		K3 (Ap)	Computational Thinking	Project based	E-Content-MS-Word	Debate

	3	Collaborating on Event Management,Collaborating on Contact Management	3	1	K4 (An)	Demonstration	Assignment	Submit the assignment in Google Class Room	Online Assignment
	4	Collaborating on Project Management	3		K5(E)	Problem-solving	Collaborative Learning	PPT	Class test
	5	Collaborating on word processing, spreadsheets, and databases.	3	1	K3 (Ap)	Integrative Teaching	Solving problems	Discussion in Whatsapp Poll	Online assessment in quiz Questioning
V		**Cloud Simulators**							
	1	CloudSim and GreenCloud Introduction to Simulator, understanding CloudSim simulator	3	1	K2 (U)	Lecture Method using Chalkand talk	Group discussion	PPT	MCQ
	2	CloudSim Architecture(User code, CloudSim, GridSim, SimJava) Understanding	3		K2(U)	Conceptual Demonstration	Project Based	MS-Word	Open Book exam
	3	Working Platformfor CloudSim,Introduction to GreenCloud	3	1	K3 (Ap)	Problem-solving	Practical	Solving problem in Cloud Platform	To write a program for accessing cloud server
	4	Basics of VMWare-Advantages of	3		K4 (An)	Inquiry - Based	Group Discussion	E-Content (MS-Word)	Slip test

		VMware virtualization							
	5	Using Vmware workstation-creating virtual machines-understanding VM	3	1	K3 (Ap)	Case study method	Solving problems	Solving problem in Cloud Platform	Group Discussion

Course Focussing on Employability/ Entrepreneurship/ Skill Development: Activities (Em / En /SD): SkillDevelopment

3. Applyingcloudservicesformanagingpersonalandprofessionalschedules.
4. Creating and managing virtual machines using VMware.

Course Focusing on Cross Cutting Issues (Professional Ethics/ Human Values/Environment Sustainability/ Gender Equity): - Environment Sustainability activities related to Cross Cutting Issues:-

Assignments:

1 .Cloud Computing Security challenges(Last date to submit :14-07-2025)

2. Collaborating on Event Management, Collaborating on Contact Management(Last date to submit : 05-09-2025)

Seminar Topics: Pros and Cons of Cloud computing, Centralizing Email Communications, Collaborating on word processing, spreadsheets, anddatabases.

Part A (1 mark)

1. What type of cloud is designed for exclusive use by a single organization?(**K4-An, CO-3)**
   a) Public Cloud b)Private Cloud c)Community Cloud)Hybrid Cloud
2. Identify the essential characteristic of cloud computing.(**K2-U, CO-1)**
   a) Scalability b)Fixed Cost c)Local Storage d)Manual Configuration
3. Which cloud computing model offers software applications over the internet?(**K3-Ap, CO-2)**
   a) IaaS b)PaaS c)SaaS d) DaaS
4. Which of the following is a benefit of using Platform as a Service(PaaS)?(**K2-U, CO-2)**
   a)Complete control overhardware b)Reduced coding time
   c)Physical security management d)Unlimited datastorage

5. Name thesimulator provides an environment for modeling and simulating cloud computing infrastructures?(**K3-Ap, CO-5)**

a)VMWare b)Hyper-V c)GreenCloud d) CloudSim

Part B (6 marks)

1. Explain the working of cloud computing and its essential characteristics.(**K4-An, CO-3)**
2. What are the benefits and features of Software as a Service (SaaS)? (**K3-Ap, CO-2)**
3. Describe the different layers in cloud architecture and the irrespective functions.(**K5-E, CO-2)**
4. Describe how cloud computing can be used for managing projects and schedules in a corporation. (**K3-Ap, CO-3)**
5..Discuss with cloud simulators (**K4-An, CO-5)**

Part C (12 marks)

1. Discuss the essential characteristics and Architectural influences of cloud computing. **(K1-U, CO-1)**
2. Explain theconceptofIaaSindetail,includingitsfeatures,benefits,andtypicaluse**(K3-Ap, CO-2)**
3. Analyse the use of cloud computing for the family and community. **(K4-An, CO)**
4. Evaluate the collaborating on project management**(K5-E, CO-4)**
5. Describe the Cloudsim Architecture and virtual machine**(K6-C, CO-5)**

Head of the Department
Dr. V. S. Harilakshmi

Course Instructor
Dr. F. Fanax Femy

Department : **Computer Science**

Class : **II M.Sc Computer Science**

Title of the Course : **CORE LAB COURSE III: Digital Image Processing using Matlab**

Semester : **III**

Course Code : **SP233CP1**

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SP233CP1	-		6	-	5	6	90	25	75	100

Pre-requisite:

Basic Programming of Image Processing and introduction to MATLAB

Learning Objectives:

1. To understand the basics of Digital Image Processing fundamentals, image enhancement and image restoration techniques
2. To enable the students to learn the fundamentals of image compression and segmentation

Course Outcomes

On the successful completion of the course, student will be able to:		
1	write programs in MATLAB for image processing using the techniques	**K1, K2**
2	able to implement image enhancements and restoration techniques	**K2, K3**
3	capable of using compression techniques in an Image	**K3, K4**
4	able to manipulate the image and segment it	**K4, K5**
5	able to implement the image processing techniques using MATLAB	**K5, K6**

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

Teaching Plan

Total Contact hours: 90 (Including Practical Classes and Assessments)

Unit	Topic	Teaching Hours	Assessment Hours	Cognitive level	Pedagogy	Student Centric Method	E-Resources	Assessment/ Evaluation Methods
1	Image Enhancement Techniques	9	1	K2	Demonstration Practice-Based	Matlab Execution Practice	Matlab Image Processing toolbox Youtube videos	Lab Task Evaluation
2	Histogram Equalization	9	1	K3	Problem Solving, Hands-on Learning	Algorithm decoding task, Pair Programming	Self made Youtube videos	Test, Viva
3	Image Restoration	9	1	K3	Activity-Based	Visual Analysis Activities	NPTEL	Output Analysis
4	Image Filtering	9	1	K3	Demonstrative	Peer programming	Tutorials point	Slip Test, Student Explanation
5	Edge detection using Operators	9	1	K4	Simulation	Collaborative coding	Youtube videos	Code Debugging Evaluation
6	Image Compression	9	1	K4	Problem Solving	Algorithm decode, Problem Solving	Matlab Central practical examples	Code Review, Oral Test

7	Image Subtraction	9	1	K3	Hands-on practice	Student explanation of differences	Matlab docs, Geeks for geeks	Output-Based Evaluation
8	Boundary Extraction using Morphology	9	1	K5	Practice-Based	Problem Solving exercise	YouTube Tutorials	Final Output Verification
9	Image Segmentation	9	1	K6	Demonstration	Mini project in pairs	You tube videos	Oral questioning, demo execution verification

Course Focussing on Employability/ Entrepreneurship/ Skill Development: Employability, Skill Development

Activities (Em / En /SD): Hands on Training, Project

Course Focusing on Cross Cutting Issues (Professional Ethics/ Human Values/Environment Sustainability/ Gender Equity): NIL

Environment Sustainability activities related to Cross Cutting Issues: NIL

Sample questions

1. Write a program to implement Image enhancement Technique.
2. Write a program to implement Histogram Equalization
3. Write a program to implement image Restoration.
4. Write a program to implement image Filtering.
5. Write a program to implement Edge detection using Operators
   (Roberts, Prewitts and Sobels operators)
6. Write a program to implement image compression.

7. Write a program to implement image Subtraction
8. Write a program to implement Boundary Extraction using morphology.
9. Write a program to implement image Segmentation

Head of the Department
Dr. V. S. Harilakshmi

Course Instructor
Dr. V. S. Harilakshmi

Department : Computer Science
Class : II M.Sc. Computer Science
Title of the Course : Elective Course V: Data Science and Analytics
Semester : III
Course Code : SP233EC2

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SP233EC2	4	-	-	-	3	4	60	25	75	100

Learning Objectives

1. Introduce the students to data science, big data and its ecosystem.
2. To explore the programming language R, with respect to the data mining algorithms

Course Outcomes

On the successful completion of the course, students will be able to:		
1	understand the concept to data science and its techniques	**K1, K2**
2	review data analytics	**K2, K3**
3	Apply and determine appropriate Data Mining techniques using R to real time applications	**K3, K4**
4	analyze and evaluate clustering algorithms	**K5, K6**
5	create a machine learning environment using AI	**K6**

K1 - Remember; **K2** - Understand; **K3** – Apply; **K4** – Analyse; **K5** – Evaluate; **K6** – Create

Teaching plan

Total Contact hours: 60 (Including lectures, assignments and tests)

Unit	Module	Topic	Teaching Hours	Assessment Hours	Cognitive level	Pedagogy	Student Centric Method	E-Resources	Assessment/ Evaluation Methods
I		**Introduction**							
	1	Introduction of Data Science: Benefits and uses of data science and big data	2	1	K1 (R)	Lecture with Case Study	Think-Pair-Share	YouTube (Data Science Intro), Kaggle Blogs	Quiz, Concept Map
	2	Facets of Data – Data Science Process	1		K2 (U)	Visual Mapping, Flowchart-based Teaching	Brain storming	IBM Data Science YouTube Series	Flowchart Assessment
	3	Big Data Ecosystem and data science	1	1	K2 (U)	Analogy-based Teaching	Role Play (Data Pipeline Simulation)	Big Data Articles, NPTEL Videos	Quiz, Concept Mapping
	4	The Data Science process: Defining research goals and creating a project charter -	1		K3 (Ap)	Process-Oriented Teaching	Case Study Discussion	TutorialsPoint, Coursera Labs	Case Report
	5	retrieving data-cleansing, integrating and transforming data	2		K3 (Ap)	Demonstration, Hands-on Lab	Problem-Based Learning, Pair	Kaggle Datasets, Pandas/Numpy,	Lab Evaluation, Viva

						Sessions	Programming	Google Dataset Search	
	6	Exploratory data analysis	2	1	K3 (Ap)	Demonstration and Comparison Charts	Peer Teaching	Analytics Vidhya, Scikit-learn Docs	Worksheet, CIA I
	7	Build the models	1		K4 (An)	Case Studies, Guided Model Building	Collaborative Coding, Peer Feedback	scikit-learn, Google Colab, TensorFlow, PyTorch	Model Accuracy Test, Group Assignment, Internal Lab Test
	8	Presenting findings and building applications on top of them	1		K5 (E)	Project-Based Learning	App Showcases, Student Presentations	Streamlit, Tableau, Power BI, GitHub	Capstone Project, Peer Review, Rubric-Based Evaluation
	9	Types of Machine learning	1		K2 (U)	Interactive Lectures with Visuals	Concept Mapping, Think-Pair-Share	StatQuest, Simplilearn, Blogs (Medium)	Concept Quiz, MCQ, Short Answers
II		**Basics of Data Analytics**							
	1	Introduction to Big Data Analytics-Overview	1	1	K2 (U)	Video-Based Teaching	Quick Summary Game	YouTube (Simplilearn), Javatpoint	Quiz
	2	Phases of Life Cycle	1		K3 (Ap)	Diagram-based Pedagogy	Infographic Design	NPTEL, Google Cloud Blog	Flow Diagram, Assignment
	3	review of data analytics	1		K1 (R)	Recap and Group Discussion	Brainstorming, Quiz Bowl	Course Notes, NPTEL, SWAYAM	Oral Quiz, Recap Activity, Written Test
	4	Advanced data Analytics	2	1	K3 (Ap)	Comparative	Group Presentation	Gartner Analytics	Rubric-Based Evaluation

						Learning		Reports	
	5	technology and tools Database Analytics: SQL Essentials, Text Analytics	1	1	K4 (An)	Hands-on Coding Sessions	Pair Programming	W3Schools, Mode Analytics	Lab Exercise
	6	Advanced SQL	2		K4 (An)	Code-Based Explanation	Debugging Challenge	SQLZoo, HackerRank	Query Output Evaluation
III		**Data Analytics using R**							
	1	Basic Data Analytics using R: R Graphical User Interfaces	1	1	K3 (Ap)	Tool-Based Teaching	Lab Walkthrough	RStudio, CRAN, Kaggle	Lab Tasks, Viva
	2	Data Import and Export	1		K3 (Ap)	Practical Demo	Code Debugging Race	RDocumentation.org	Code Output
	3	Attribute and Data Types	2	1	K4 (An)	Visualization Pedagogy	Data Challenge	ggplot2 Tutorials, Medium Articles	Chart Analysis
	4	Descriptive Statistics	1		K3 (Ap)	Problem-Solving Sessions	Real Dataset Analysis	Tidyverse Docs	Cleaning Log Sheet
	5	Exploratory Data Analysis	2	1	K4 (An)	Data Storytelling	Peer Review	TowardsDataScience Blogs	Report Evaluation
	6	Visualization Before Analysis	1		K3 (Ap)	Visualization-Centric Teaching	Tool Practice, Poster Presentation	matplotlib, seaborn, Tableau Public	Visualization Assignments, Dashboard Task
	7	Dirty Data – Visualizing a Single Variable	1		K4 (An)	Exploratory Visual Teaching	Data Wrangling Challenges, Solo Projects	Jupyter Notebook, Real Datasets	Cleaning Report, Visualization Analysis
	8	Examining Multiple Variables – Data	1		K4 (An)	Comparative Case-	Data Storytelling,	seaborn (pairplots,	EDA Report, Chart

		Exploration Versus Presentation.				Based Learning	Group Analysis	heatmaps), Excel Power Query	Comparison, Peer Evaluation
IV		**CLUSTERING**							
	1	Overview of Clustering: K-means – Use Cases	1	1	K4 (An)	Case-Based Teaching	Code Simulation	R Bloggers, Analytics Vidhya	Lab Report
	2	Overview of the Method – Perform a K-means Analysis using R – Classification	1		K5 (E)	Algorithm Walkthrough	Tool Comparison	Scikit-learn Docs	Evaluation Matrix
	3	Decision Trees – Overview of a Decision Tree – Decision Tree Algorithms – Evaluating a Decision Tree – Decision Tree in R	2	1	K5 (E)	Live Coding	Pair Programming	RStudio Tutorials	Code Evaluation
	4	Bayes' Theorem – Naive Bayes Classifier	2		K5 (E)	Probability Mapping	Mini-Project	YouTube, IBM ML Toolkit	Classifier Output
	5	Naïve Bayes in R	1	1	K6 (C)	Mathematical Derivation and Coding	Peer Coding	StatQuest	Assessment Quiz
V		**ARTIFICIAL INTELLIGENCE**							
	1	Machine Learning and deep learning in data science	2	1	K2 (U)	Comparative Charts	Mind Map Creation	Google AI vs ML Page	Quiz
	2	Clustering, association rules	2		K3 (Ap)	Interactive Problem Solving	Graph Plotting	sklearn.linear_model Docs	Assignment
	3	. Linear regression-logistic regression	2	1	K4 (An)	Mathematical Concept Mapping	Use-case Discussion	YouTube (StatQuest), Coursera	Concept Map

	4	Additional regression methods	1		K4 (An)	Demo & Code Teaching	Prediction Game	Towards Data Science, NPTEL	Model Output Test
	5	K Nearest Neighbour algorithm	1	1	K6 (C)	Project-Based Learning	End-to-End Project	Google Colab, TensorFlow	Mini Project, CIA II

Course Focussing on Employability/ Entrepreneurship/ Skill Development: Activities (Em / En /SD): SkillDevelopment

1. R Programming Labs
2. Data Science Case Studies
3. ML Model Building in Python

Course Focusing on Cross Cutting Issues (Professional Ethics/ Human Values/Environment Sustainability/ Gender Equity): - Environment Sustainability activities related to Cross Cutting Issues:-

Assignments:

1. Build an R script for descriptive and predictive analysis on a COVID-19 dataset. (Due: 08-08-2025)
2. Create a dashboard visualizing clustering results from any real dataset. (Due: 10-09-2025)

Seminar Topics: **The Role of Data Science in E-Commerce, Ethics and Bias in Machine Learning Models**

Part A (1 Mark)

1. What is the primary goal of data science? (**K1, CO1)**
2. Which language is used in this course for data mining? **(K1, CO3)**
3. What is K-means clustering used for? **(K2, CO4)**
4. Name any two types of Machine Learning**. (K2, CO1)**
5. What is Naive Bayes based on? **(K2, CO4)**

Part B (6 Marks)

1. Explain the data science process with suitable examples. **(K2, CO1)**
2. Discuss any three tools used in data analytics. **(K3, CO2)**

3. Describe the use of decision trees in classification. **(K3, CO4)**
4. Explain the steps involved in data cleaning. **(K4, CO3)**
5. Differentiate between supervised and unsupervised learning. **(K4, CO5)**

Part C (12 Marks)

1. Describe how clustering and classification are implemented in R. **(K5, CO4)**
2. Analyze the entire data science workflow with an example. **(K4, CO1)**
3. Explain and evaluate any two regression methods used in ML. **(K5, CO5)**
4. Create a machine learning pipeline using K-NN for a dataset. **(K6, CO5)**

Head of the Department
Dr. V. S. Harilakshmi

Course Instructor
Dr. J. Jackulin Reeja

Department : Computer Science
Class : II M.Sc. Computer Science
Title of the Course : SKILL ENHANCEMENT COURSE II : CLOUD COMPUTING LAB
Semester : III
Course Code : SP233SE1

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
SP233SE1	-	-	3	-	2	3	45	25	75	100

Learning Objectives:

1. Be familiar with developing web services/Applications in grid framework
2. Learn to run virtual machines of different configuration.

Course Outcomes

On the successful completion of the course, students will able to:		
1.	configure various virtualization tools such as Virtual Box, VMware workstation.	**K1, K2**
2.	design and deploy a web application in a PaaS environment.	**K2, K6**
3.	learn how to simulate a cloud environment to implement new schedulers.	**K4**
4.	install and use a generic cloud environment that can be used as a private cloud.	**K5, K6**
5.	manipulate large data sets in a parallel environment.	**K3,K6**

K**1**–Remember**; K2**–Understand**; K3**-Apply**; K4-**Analyze**, K5-** Evaluate**, K6-**Create

Teaching Plan
Total Contact hours: 30 (Including Practical Classes and Assessments)

Unit	Topic	Teaching Hours	Assessment Hours	Cognitive level	Pedagogy	Student Centric Method	E-Resources	Assessment/ Evaluation Methods
1	Working with Google Drive to make spreadsheet and notes.	6	1	K5	Inquiry-Based Learning, Project-Based Learning	Computational techniques for solving problems	*Google drive*	Offering problem solving tasks at varying levels of complexity

2	Install a C compiler in the virtual machine and execute a sample program.	6	1	K3	Demonstrative	Practical	*C Compiler*	Project based Evaluation
3	Install Virtual box/VMware Workstation with different flavours of Linux or Windows OS on top of windows7	6	1	K6	Blended Learning, Demonstration method	Online simulation	Virtualization software (VirtualBox, VMware)	Case Discussion
4	Launch the web application using the launcher.	6	1	K3	Project based	Skill based	Web browser- Google Chrome	Develop a web application
5	Transfer files/folders from the host machine to the virtual machine.	6		K5	Demonstrative	Practical	VMware Tool	lab evaluation
6	Install Google App Engine. Develop simple web application using Python/Java.	5	1	K6	Project-Based Learning,	Using Computational Techniques for Solving problems	Google Cloud Platform(GCP),Java(JDK)	Ask to develop a simple web application
7	Simulate a cloud scenario using CloudSim	5		K5	Project Based	Practical	CloudSim Toolkit	Presentation

Course Focussing on Employability/ Entrepreneurship/ Skill Development: Employability, Skill Development

Activities (Em / En /SD): Hands on Training , Project

Course Focusing on Cross Cutting Issues (Professional Ethics/ Human Values/Environment Sustainability/ Gender Equity): NIL

Environment Sustainability activities related to Cross Cutting Issues: NIL

Sample questions

1. To Work with Google Drive, make spreadsheet and notes.
2. Install a C compiler in the virtual machine and execute a sample program.
3. Install Virtual box/VMware Workstation with different flavours of Linux or Windows OS on top of windows7 or 8.
4. To Launch the web application using the launcher.
5. Transfer files/folders from the host machine to the virtual machine.
6. Install Google App Engine. Develop simple web application using Python/Java

Head of the Department
Dr. V. S. Harilakshmi

Course Instructor
Dr. F. Fanax Femy