FACULTY OF SCIENCE AND HUMANITIES

ACADEMIC CURRICULA

POSTGRADUATE DEGREE PROGRAMME (REGULATIONS - 2025)

MASTER OF SCIENCE IN COMPUTER SCIENCE WITH SPECIALIZATION IN ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Two Years (Full-Time)

National Education Policy

Learning Outcome-based Curricula Framework

National Credit Framework

Academic Year
2026 - 2027

SRM INSTITUTE OF SCIENCE AND TECHNOLOGY

(Deemed to be University u/s 3 of UGC Act, 1956)

Kattankulathur, Chengalpattu District 603203, Tamil Nadu, India

SRM INSTITUTE OF SCIENCE AND TECHNOLOGY

Kattankulathur, Chengalpattu District 603203, Tamil Nadu, India

1.Applicable Regulation:

Students admitted to the M.Sc. Computer Science with Specialization in Artificial Intelligence and Machine Learning programme shall be governed by the Academic Regulations 2025, as approved in the 70th meeting of the Executive Council held on 29 March 2025 and the 58th meeting of the Academic Council (ACM) held on 22 February 2025.

Approval in ACM:

The M.Sc. Computer Science with Specialization in Artificial Intelligence and Machine Learning programme was approved in the 62nd meeting of the Academic Council held on 7 March 2026. This approval formally endorsed the introduction of the programme in accordance with the decisions of the statutory bodies.

Eligibility Criteria for Admission

B.Sc Computer Science / BCA / B.Sc IT / B.Sc Mathematics / B.Sc Statistics/ B.Sc Physics/ B.Sc Electronics /B.Voc Data Science and Analytics/ B.Sc Computer System and Design/ B.Sc Triple major subjects with Computer Science as one of the Major subjects

Minimum Learning Credits for the award of Degree: The curriculum of any branch of the Postgraduate programme is designed to have option to exit at the end of year of study with credits earned as mentioned below in the table.

Qualification Title	**Credits Requirement**
Postgraduate Diploma (Programme duration: One year or Two semesters)	Total Credits as mentioned in the semester implementation plan of the Semester – I and Semester II in addition to that 2 Additional credits earned through Internship/ Apprenticeship/ Project Report in the respective discipline with the Courses mentioned in R 3.7.1 of the Academic Regulations 2025.
Postgraduate degree (Programme duration: Two years or Four semesters)	80 credits

Title for Award of the Degree/Diploma

The title for the award of a Postgraduate Degree or Postgraduate Diploma can vary depending on the program. The titles can be as per the list given below:

Sl. No.	**Degree**	**Postgraduate Diploma**
1.	M.Sc. (Computer Science with Specialization in Artificial Intelligence and Machine Learning)	Postgraduate Diploma in Computer Science

1. Vision Statement	
Stmt - 1	To reach the goals of expansion and improvement of the department and rank among the top computer science departments in the world for teaching, learning, research, and community involvement
Stmt - 2	Ensure that students have high quality learning experiences by implementing efficient classroom procedures, using active learning techniques, and creating chances for students and faculty to engage in meaningful interactions

2. Mission Statement	
Stmt-1	To create, disseminate, and apply knowledge in all areas of computer science, including interdisciplinary fields that broaden the field's application and advance humankind
Stmt-2	To equip to work both independently and in teams to solve challenging problems across domains and foster the development of communication skills as an integral part of the profession
Stmt-3	To be successful, moral, ethically strong in the diverse society and encourage consistent and constant active learning throughout the life that will positively impact growth of the individual and the country
Stmt-4	To spearhead the progress of computer science by globally acknowledged research and technology transfer
Stmt-5	To be an aspirational, idealized future state for a company, act as inspiration and a roadmap for organizing and making decisions.

3. Program Education Objectives (PEO)	
PEO - 1	Graduates commit to understanding, assessing, and demonstrating their knowledge of AI, ML, and human cognition in relation to real world problems in order to meet future challenges.
PEO - 2	Students will be gaining in depth expertise in computer science, engineering, and related fields to create and build unique products and creative solutions for everyday challenges.
PEO - 3	Opportunity to pursue research studies or to succeed in the AIML related sectors.
PEO - 4	Graduates will prosper in the field of machine learning and artificial intelligence by applying their knowledge and skills to create workable and realistic technical solutions.
PEO - 5	Graduates will be capable of managing resources well and pursuing their vocations with morality, social responsibility, and honesty.

4. Consistency of PEO's with Mission of the Department					
	Mission Stmt. – 1	Mission Stmt. – 2	Mission Stmt. – 3	Mission Stmt. - 4	Mission Stmt. - 5
PEO - 1	3	3	3	1	1
PEO - 2	3	3	3	2	2
PEO - 3	3	3	3	2	2
PEO - 4	2	2	2	3	3
PEO - 5	2	2	2	3	3

3 – High Correlation, 2 – Medium Correlation, 1 – Low Correlation

5. Programme Learning Outcomes (PLO)	
Graduate Learning Attributes	
PLO - 1	Problem Solving, Critical Thinking, Creativity
PLO - 2	Communication Skills, Collaborating Skills
PLO - 3	Independent Thinking, Analytical Reasoning, Learning to Learn, Research Skills
PLO - 4	Leadership Qualities, Professionalism, Autonomy, Accountability
PLO - 5	Digital Technology Skills
PLO - 6	Value Inculcation, Multicultural inclusivity
PLO - 7	Environmental Action, Community Engagement

PLO -8	Entrepreneurial Risk Taking
PSO - 1	Graduates will demonstrate a deep understanding of data science principles, techniques, and methodologies, including statistical analysis, machine learning algorithms, and data visualization.
PSO - 2	Graduates will possess strong analytical and problem-solving skills, allowing them to effectively identify patterns, trends, and correlations within data, and to formulate actionable recommendations based on their findings.

PSO – Programme Specific Outcomes

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO–8	PLO9	PLO10
PEO - 1	3	2	2	1	2	1	2	1	3	3
PEO - 2	3	2	2	1	2	1	2	1	3	3
PEO - 3	3	2	2	1	2	1	2	1	3	3
PEO - 4	3	2	2	1	2	1	2	1	3	3
PEO - 5	3	2	2	1	2	1	2	1	3	3

5. Programme Structure(Total Credits : 80 Credits)

1. Professional Core Courses (C)
(10 Courses)

Course Code	Course Title	Hours/ Week L	T	P	C
PCS25C11J	Data Structures and Algorithms	3	0	2	4
PCS25C12J	Java Programming	3	0	2	4
PCS25C13J	Computer Networks	3	0	2	4
PAI25C21T	Mathematics for AI and ML	4	0	0	4
PCS25C22J	Distributed Operating System	3	0	2	4
PCS25C23J	Database Management	3	0	2	4
PCS25C24T	Software Engineering	4	0	0	4
PFS25C31J	DevOps	3	0	2	4
PAI25C32J	Foundations of Large Language Models	3	0	2	4
PCS25C33J	Big Data Analytics	3	0	2	4
Total Learning Credits					**40**

2. Discipline Elective Courses (D)
(3 Courses)

Course Code	Course Title	Sessions/ Week L	T	P	C
PAI25D11T	Distributed AI	4	0	0	4
PAI25D12J	Natural Language Processing	3	0	2	
PAI25D13J	Computer Vision	3	0	2	
PAI25D21T	Information Retrieval	4	0	0	4
PCS25D22J	Machine Learning	3	0	2	
PAI25D23T	AI Ethics and Governance	4	0	0	
PAI25D31T	Cyber Security and AI	4	0	0	4
PAI25D32J	Deep Learning and Neural Networks	3	0	2	
PAI25D33J	Reinforcement Learning	3	0	2	
Total Learning Credits					**12**

3. Generic Elective Courses (G)
(2 Courses)

Course Code	Course Title	Sessions/ Week L	T	P	C
PAI25G11J	Conversational AI	1	0	2	2
PCS25G12J	Data Analysis using Open Source Tools				
PCS25G13J	Cloud Computing Tools and Techniques				
PSC25G34J	Internet of Things	1	0	2	2
PCS25G35J	Responsible AI				
PCS25G36J	Security and Privacy in Cloud				
Total Learning Credits					**4**

4. Skill Enhancement Courses (S)
(2 Courses)

Course Code	Course Title	Hours/ Week L	T	P	C
PCS25S11J	Information Literacy	3	0	2	4
PCS25S21J	Web Development using AngularJS and Mongo	3	0	2	4
Total Learning Credits					**8**

5. Project Work, Internship in Industry/Higher Technical Institutions (P)
(2 Courses)

Course Code	Course Title	Hours/ Week L	T	P	C
PAI25P31L	Internship	0	0	0	2
PAI25P41L	Project Work	0	0	20	10
Total Learning Credits					**12**

6. Ability Enhancement Courses (AE)
(2 Courses))

Course Code	Course Title	Hours/ Week L	T	P	C
PCD25AE1T	Comprehensive Skills in Quantitative and Logical Reasoning	2	0	0	2
PCD25AE2T	Soft Skills and Verbal Mastery	2	0	0	2
Total Learning Credits					**4**

1. Implementation Plan

Semester – I

Code	Course Title	Hours/ Week			C
		L	T	P	
PCS25C11J	Data Structures and Algorithms	3	0	2	4
PCS25C12J	Java Programming	3	0	2	4
PCS25C13J	Computer Networks	3	0	2	4
PAI25D11T	Distributed AI	4	0	0	4
PAI25D12J	Natural Language Processing	3	0	2	
PAI25D13J	Computer Vision	3	0	2	
PAI25G11J	Conversational AI	1	0	2	2
PCS25G12J	Data Analysis using Open Source Tools				
PCS25G13J	Cloud Computing Tools and Techniques				
PCS25S11J	Information Literacy	3	0	2	4
PCD25AE1T	Comprehensive Skills in Quantitative and Logical Reasoning	2	0	0	2
	Total	29			24

Semester – II

Code	Course Title	Hours/ Week			C
		L	T	P	
PAI25C21T	Mathematics for AI and ML	4	0	0	4
PCS25C22J	Distributed Operating System	3	0	2	4
PCS25C23J	Database Management	3	0	2	4
PCS25C24T	Software Engineering	4	0	0	4
PAI25D21T	Information Retrieval	4	0	0	4
PCS25D22J	Machine Learning	3	0	2	
PAI25D23T	AI Ethics and Governance	4	0	0	
PCS25S21J	Web Development using AngularJS and Mongo	3	0	2	4
PCD25AE2T	Soft Skills and Verbal Mastery	2	0	0	2
	Total	30			26

Semester – III

Code	Course Title	Hours/ Week			C
		L	T	P	
PFS25C31J	DevOps	3	0	2	4
PAI25C32J	Foundations of Large Language Models	3	0	2	4
PCS25C33J	Big Data Analytics	3	0	2	4
PAI25D31T	Cyber Security and AI	4	0	0	4
PAI25D32J	Deep Learning and Neural Networks	3	0	2	
PAI25D33J	Reinforcement Learning	3	0	2	
PSC25G34J	Internet of Things	1	0	2	2
PCS25G35J	Responsible AI				
PCS25G36J	Security and Privacy in Cloud				
PAI25P31L	Internship	0	0	0	2
	Total	22			20

Semester – IV

Code	Course Title	Hours/ Week			C
		L	T	P	
PAI25P41L	Project Work	0	0	20	10
	Total	20			10

Total Number of Subjects: 21
Total Number of Credits: 80

1. Program Articulation Matrix

Course Code	Course Title	Programme Learning Outcomes (PO)									
		Communication Skills, Critical Thinking, Creativity	Communication Skills	Independent Thinking, Analytical Reasoning, Learning to Learn, Research	Leadership Qualities, Professionalism, Autonomy, Accountability	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	Entrepreneurial Risk Taking	PSO - 1	PSO - 2
PCS25C11J	Data Structures and Algorithms	3	3	3	3	3	2	1	3	2	3
PCS25C12J	Java Programming	3	3	3	3	3	2	1	3	2	3
PCS25C13J	Computer Networks	3	3	3	3	3	2	1	3	2	3
PAI25D11T	Distributed AI	3	3	3	3	3	2	1	3	2	3
PAI25D12J	Natural Language Processing	3	3	3	3	3	2	1	3	2	3
PAI25D13J	Computer Vision	3	3	2	3	3	2	1	3	2	3
PAI25G11J	Conversational AI	3	3	2	3	3	2	1	3	2	3
PCS25G12J	Data Analysis using Open Source Tools	3	3	2	3	3	2	1	3	2	3
PCS25G13J	Cloud Computing Tools and Techniques	3	3	2	3	3	2	1	3	2	3
PCS25S11J	Information Literacy	3	3	2	3	3	2	1	3	2	3
PCD25AE1T	Comprehensive Skills in Quantitative and Logical Reasoning	3	3	3	3	3	2	1	3	2	2
PAI25C21T	Mathematics for AI and ML	3	3	3	3	3	2	1	3	2	2
PCS25C22J	Distributed Operating System	3	3	3	3	3	2	1	3	2	3
PCS25C23J	Database Management	3	3	3	3	3	2	1	3	2	3
PCS25C24T	Software Engineering	3	3	3	3	3	2	1	3	2	3
PAI25D21T	Information Retrieval	3	3	3	3	3	2	1	3	2	3
PCS25D22J	Machine Learning	3	3	3	3	3	2	1	3	2	3
PAI25D23T	AI Ethics and Governance	3	3	3	3	2	2	1	3	2	3
PCS25S21J	Web Development using AngularJS and Mongo	3	3	3	3	3	2	1	3	2	3
PCD25AE2T	Soft Skills and Verbal Mastery	3	3	3	3	3	2	1	3	2	3
PFS25C31J	DevOps	3	3	3	3	3	2	1	3	2	3
PAI25C32J	Foundations of Large Language Models	3	3	3	3	3	2	1	3	2	3
PCS25C33J	Big Data Analytics	3	3	3	3	3	2	1	3	2	2
PAI25D31T	Cyber Security and AI	3	3	2	3	3	2	1	3	2	2
PAI25D32J	Deep Learning and Neural Networks	3	3	2	3	3	2	1	3	2	2
PAI25D33J	Reinforcement Learning	3	3	2	3	3	2	1	3	2	3
PSC25G34J	Internet of Things	3	3	2	3	3	2	1	3	2	3
PCS25G35J	Responsible AI	3	3	2	3	3	2	1	3	2	2
PCS25G36J	Security and Privacy in Cloud	3	3	2	3	3	2	1	3	2	3
PAI25P31L	Internship	3	3	3	3	2	2	1	3	2	3
PAI25P41L	Project Work	3	3	3	3	3	2	1	3	2	3
	Program Average	3	3	3	3	3	2	1	3	2	3

Semester - I

Code	PCS25C11J	Title	Data Structures and Algorithms	Category	C	Core	L	T	P	C
							3	0	2	4

Offering Department	Computer Science	Pre-requisite Courses	NIL	Co-requisite Courses	NIL	Progressive Courses	NIL	Data Book / Codes/Standards	NIL

Course Rationale (CR)	The purpose of learning this course is to:
CR-1	Understand the role of data structures in computing
CR-2	Effectively organize and access data that can be used in problem solving
CR-3	Develop the ability of analyzing time and space complexity of algorithms
CR-4	Understand the role of data structures in storage management
CR-5	Applying appropriate data structures to solve real-time applications

Course Outcomes (CO)	At the end of this course, learners will be able to:	Depth				Attainment			Program Outcomes (PO)											PSO - 1	PSO - 2
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10	11		
		Conceive	Design	Implement	Operate	Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity	Communication Skills	Analytical Reasoning,	Learning to Learn, Research	Professionalism, Autonomy,	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	Ethical Practices	Entrepreneurial Risk Taking				
CO-1	Write algorithms to solve simple problems	✓	✓		✓	3	70	65	3	2	3	1	2	-	-	1	-	2	3		
CO-2	Evaluate the efficiency of algorithm based on space and time requirements	✓	✓		✓	3	75	65	3	1	3	1	3	-	-	1	-	2	3		
CO-3	Choose the appropriate data structures for the application	✓	✓	✓	✓	3	80	70	3	1	3	1	2	-	-	1	-	2	3		
CO-4	Transform the mathematical understanding to executable code	✓	✓	✓	✓	3	70	65	3	-	3	1	1	-	-	1	-	2	3		
CO-5	Solve the real world problems	✓	✓	✓	✓	3	85	75	3	2	3	1	3	-	-	1	-	2	3		

Title & Session Outcomes	CO-1	CO-2	CO-3	CO-4	CO-5
Duration (60 minutes)	15	15	15	15	15
SO-1	Introduction	Trees: terminologies	Searching: Linear and Binary	Hash tables	File Organizations
SO-2	What is an algorithm	Binary trees	Insertion Sorting: Insertion sort	Hashing functions	Sequential file organization
SO-3	Writing algorithm in SPARKS	Binary tree traversal	Merge sort	Overflow functions	Random file organization
SO-4	Writing Structured programs	Threaded binary trees	Heap sort	Theoretical evaluation of overflow techniques	Linked organization
SO-5	Analyzing algorithms	Applications of trees	Quick sort	Files: Files, queries	inverted files
SO-6	Elementary Data Structures	Graphs: terminologies	Practical considerations for internal sorting	sequential organizations	cellular partitions
SO-7-8	Practice 1: data types and conditional statements	Practice 3: stack – compare the implementations that use array and list	Practice 5: Binary tree traversal - implementation	Practice 7: linear search	Practice 9: Insertion sort

SO-9	Arrays	Traversals	External Sorting: storage devices	Index techniques: Cylinder surface indexing	Storage management
SO-10	Linked List and Application	connected components	Sorting with disks	Hash Table	Fixed size nodes
SO-11	Stacks, Linked stacks	spanning trees	Sorting with tapes	Tree indexing	Variable size nodes
SO-12	Queue, linked queues	Shortest path and transitive closure	Symbol tables	B trees	Case Study: compare the behavior of linear and binary search through complexity analysis
SO-13	Garbage collection and compaction	Activity Networks, topological sort, critical paths	Static tree tables and dynamic tree tables	Trie indexing	Case Study: Compare the behavior of insertion sort and merge sort through complexity analysis
SO 14-15	Practice 2: finding complexity of a simple algorithm	Practice 4: Queue – compare the implementations that use array and list	Practice 6: implementation of shortest path algorithm	Practice 8: binary search	Practice 10: SDG Mini Project

Evaluation

Level of Thinking	**Continuous Learning Assessment (CLA)** (50 % weightage)								**Final Exam** (50% Weightage)	
	CLA – 1 (10%)		CLA– 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)			
	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Remember										
Understand	20%	20%	15%	15%	15%	15%	20%	20%	20%	20%
Apply										
Analyze	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
Evaluate										
Create	10%	10%	15%	15%	15%	15%	10%	10%	10%	10%
Total	100%		100%		100%		100%		100%	

Strategies					
Technology		**Pedagogy / Andragogy**		**Sustainable Development**	
Simulations	✓	Case Studies		No Poverty	
Emulations		Group Discussion		Zero Hunger	
Prototypes		Hands-on Practice	✓	Good Health & Well Being	
Hands-on Practice Tools	✓	Inquiry Learning	✓	Quality Education	✓
Mathematical Computing Tools	✓	Interactive Lecture	✓	Gender Equality	
Field Visit		Leading Question	✓	Clean Water & Sanitation	
		Mind Map	✓	Affordable & Clean Energy	
		Minute Paper			
		Peer Review			
		Problem Based Learning	✓		

Resources

1	Ellis Horowitz, SartajSahni, " Fundamentals of Data Structutes, , Computer Science Press Inc, US
2	https://www.coursera.org/learn/algorithms-graphs-data-structures

Designers

Professional Experts		**Higher Institution Experts**		**Internal Experts**	
1	Mr. K V Srivallaban, Principal Consultant, Infosys Limited	1	Dr. D I George Amalarthinam, Principal, Associate Professor and Head , Jamal Mohamed College, Tiruchirappalli, Tamil Nadu	1	P. Muthulakshmi, Professor of Computer Science, FSH, SRMIST

Code	PCS25C12J	Title	Java Programming	Category	C	Core	L	T	P	C
							3	0	2	4

Offering Department	Computer Science	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

Rationale (CR)	The purpose of learning this course is to:
CR-1	An overview of Java, Buzz words, object oriented features
CR-2	Create and understand the Java program structure
CR-3	Understand the Java packages and Interfaces
CR-4	Use the multithreading programming scenario
CR-5	Create GUI based applications

Course Outcomes (CO)	At the end of this course, learners will be able to:	Depth				Attainment			Program Outcomes (PO)												
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	
		Conceive	Design	Implement	Operate	Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity	Communication Skills	Analytical Reasoning,	Learning to Learn, Research	Professionalism, Autonomy,	Digital Technology Skills	Value incurcation,	Multicultural Inclusivity	Environmental Action,	Community Engagement	Ethical Practices	Entrepreneurial Risk Taking	PSO - 1	Project Management	Life Long Learning
CO-1	Understand the difference between C++ and Java	✓	✓			3	80	75	3	2	3	2	3	1	1	2	3	2	3	3	
CO-2	Develop Java program, using various kinds of packages and interfaces	✓	✓	✓	✓	3	80	75	3	3	3	3	3	1	1	2	3	2	3	3	
CO-3	Apply the Exception handling methods in Java program.	✓	✓	✓	✓	3	75	75	3	3	3	3	3	1	1	2	3	2	3	3	
CO-4	Create Synchronized Multithreaded applications with Java	✓	✓	✓	✓	3	75	75	3	2	3	3	3	1	1	2	3	2	3	3	
CO-5	Build GUI based applications	✓	✓	✓	✓	3	80	75	3	3	3	3	3	1	1	2	3	2	3	3	

Title & Session Outcomes	CO-1	CO-2	CO-3	CO-4	CO-5
Duration (60 minutes)	15	15	15	15	15
SO-1	The Genesis of Java, Java's Byte Code	Introducing classes- Class fundamentals	Inheritance and its Types	Java Thread model- Creating a Thread	Introduction to Event Handling - Understanding different Events
SO-2	Evolution of Java, Introduction to Object Oriented Concepts of Java	Constructors, its Types and this pointer	Super keyword-Method Overriding	Creating multiple threads, Thread priorities	Listeners – Different Listeners
SO-3	Lexica Issues of Java	Garbage Collection- Finalize() method	Dynamic method dispatch - Abstract keyword- Abstract class	Synchronization- Inter-thread communication	Working with Container Listener, Key Listener & Mouse Listener
SO-4-5	Practice 1: Working with Operators and Datatypes	Practice 4: Classes and Objects	Practice 7: Inheritance, Method Overriding, Abstract classes and methods	Practice 10: Multithreading	Practice 13: Event Handling, AWT Controls
SO-6	Introduction to Data types of Java	Overloading methods- Overloading constructors-Using objects as parameters- Argument Passing- Returning Objects- Recursion	Working with Abstract class and Method & Using final wit inheritance	Introduction to Legacy Classes Vector class, Stack class,	Item Listener, Component Listener
SO-7	Variable-Declaring a variable, dynamic initialization of variables, Scope and lifetime of variables	Access Control- Static variables and methods- Final variables and methods	Creating a Package, Access Protection- Importing packages	Legacy Interfaces Understanding Enumeration Interface,	Introduction AWT Controls Working with Label controls, Buttons controls

SO-8	Introduction to Operators, Operator Types	Working with Nested Class - Inner Class	Introduction to Interfaces How Interfaces are extended	Utility classes Working with String Tokenizer,	Working with Check Box Group controls Working with Choice controls, Lists controls Text Field
SO-9,10	Practice 2: Arrays in Java	Practice 5: Overloading Methods, finalize() method, Constructor	Practice 8: Packages and Interfaces	Practice 11: Utility Classes & Legacy classes	Practice 14: AWT Controls and GUI Components
SO-11	Array &Types of Array	String Class- String array	Exception handling, Working with try and catch, Multiple catches	Working with Date class ,Working with Gregorian Calendar	Layout Manager, Byte Streams classes
SO-12	Control Statements in Java	String Handling Methods	Exception Types, Built-in Exceptions	Random Class	I/O Streams
SO-13	Control Statements in Java	Command Line arguments	User Defined Exceptions	Scanner Class	Character Streams classes
SO-14,15	**Practice 3: Control Statements**	Practice 6: String Handling and Static Members	Practice 9: Exception handling	Practice 12: Working with Date, Calendar, Random, Scanner	Practice 15: SDG Mini Project + I/O Streams

Evaluation

Level of Thinking	**Continuous Learning Assessment (CLA)** (50 % weightage)								**Final Exam** (50% Weightage)	
	CLA – 1 (10%)		CLA– 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)			
	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Remember										
Understand	20%	20%	15%	15%	15%	15%	20%	20%	20%	20%
Apply										
Analyze	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
Evaluate										
Create	10%	10%	15%	15%	15%	15%	10%	10%	10%	10%
Total	100%		100%		100%		100%		100%	

Strategies

Technology		**Pedagogy / Andragogy**		**Sustainable Development**	
Simulations	✓	Case Studies		No Poverty	
Emulations		Group Discussion		Zero Hunger	
Prototypes		Hands-on Practice	✓	Good Health & Well Being	
Hands-on Practice Tools	✓	Inquiry Learning	✓	Quality Education	✓
Mathematical Computing Tools	✓	Interactive Lecture	✓	Gender Equality	
Field Visit		Leading Question	✓	Clean Water & Sanitation	
		Mind Map	✓	Affordable & Clean Energy	
		Minute Paper			
		Peer Review			
		Problem Based Learning	✓		

Resources

1	Herbert Schildt (2007), Java: The Complete Reference, Tata McGraw-Hill, Seventh Edition, New Delhi.
2	Horstmann S., Gray Cornell (2001), Core Java 2 Volume In, Fundamentals, Addition Wesley, NewYork.
3	Arnold and Gosling, J. (2000), The Java Programming Language, Addition Wesley, 2nd Edition, NewDelhi.

Designers

Professional Experts		**Higher Institution Experts**		**Internal Experts**	
1	Mr. K V Srivallaban, Principal Consultant, Infosys Limited	1	Dr. D I George Amalarthinam, Principal, Associate Professor and Head, Jamal Mohamed College, Tiruchirappalli, Tamil Nadu	1	Dr. B. Mahalakshmi, Assistant Professor, Department of Computer Science, SRMIST, FSH,KTR

Code	PCS25C13J	Title	Computer Networks	Category	C	Core	L	T	P	C
							3	0	2	4

Offering Department	Computer Science	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

Course Rationale (CR)	The purpose of learning this course is to:
CR-1	Understand the evolution of computer networks using the layered network architecture
CR-2	Understand how data is framed, transmitted, and managed over a local link using MAC protocols and error control techniques.
CR-3	To explore IP addressing and routing methods that enable data transfer across interconnected network
CR-4	To examine how end-to-end communication is established, managed, and made reliable using transport protocols.
CR-5	To study commonly used application protocols and understand session control, network security.

Course Outcomes (CO)	At the end of this course, learners will be able to:	Depth				Attainment			Program Outcomes (PO)											
		1 Conceive	2 Design	3 Implement	4 Operate	1 Level of Thinking	2 Expected Proficiency (%)	3 Expected Attainment (%)	1 Problem Solving, Critical Thinking, Creativity	2 Communication Skills	3 Analytical Reasoning, Learning	4 Professionalism, Autonomy,	5 Digital Technology Skills	6 Value Inculcation, Multicultural inclusivity	7 Environmental Action, Community Engagement	8 Ethical Practices	9 Entrepreneurial Risk Taking	10 PSO - 1	11 Project Management	12 Life Long Learning
CO-1	Acquire the basics of computer network and its architecture	✓	✓	✓		3	80	70	3	2	2	2	3	1	1	2	2	3	2	3
CO-2	Understand the functionality of the Data Link Layer	✓	✓	✓	✓	3	85	75	3	2	2	2	3	1	1	2	2	3	2	3
CO-3	Ability to design the network routing methods	✓	✓	✓	✓	3	75	70	3	2	2	2	3	1	1	2	2	3	2	3
CO-4	Ability to understand the transport layer functions and components	✓	✓	✓	✓	3	85	80	3	2	2	2	3	1	1	2	2	3	2	3
CO-5	Implement Application Layer Protocols	✓	✓	✓	✓	3	75	70	3	2	2	2	3	1	1	2	2	3	2	3

Title & Session Outcomes	CO-1	CO-2	CO-3	CO-4	CO-5
Duration (60 minutes)	15	15	15	15	15
SO-1	Introduction - Networking Fundamentals	Role of the Data Link layer	Functions of Network Layer	Role of the Transport Layer	Role of Application and Session Layer
SO-2	Evolution of Networks - Types of Network	Framing	IPV4 Addressing	Multiplexing and Demultiplexing	Session Layer Responsibilities
SO-3	Reference models: OSI reference Models,	Error Detection	Subnetting	UDP	DNS – Domain Name System
SO-4-5	**Practice 1:** Familiarizing with Network Commands	**Practice 4** :Establishing a Peer to Peer N/W	**Practice 7:** Connecting Two LAN's Using Static Router	**Practice 10**: Simulate Working of DNS	**Practice 13**: Simulate the working of DHCP
SO-6	TCP/IP Protocol Suit	Error Correction	IPV6 Overview	TCP : Basics	Email Protocol : SMTP
SO-7	OSI Vs TCP/IP Model Compare	Flow Control Methods	Routing – Types and Strategies	TCP : Connection Establishment and Termination	Host Configuration : DHCP
SO-8	Network Topologies	MAC Sublayer – Role in Data Link Layer			Web Protocols : HTTP & HTTPS
SO-9-10	**Practice 2**: Familiarizing with Cisco Packet Tracer.	**Practice 5:** Demonstrate the working of LAN Topologies	**Practice 8**: Multi-routing Connections with Static Route	**Practice 11:** Simulate Working of FTP	**Practice 14:** SMTP Simulation
SO-11	Switching Techniques	Data link layer design issues.	Distance Vector Routing	Flow Control in TCP	Network Management Protocol : SNMP
SO-12	Network Performance Factors	Channel Allocation : FDMA	Link State Routing	Error Control and Reliability Mechanisms	Firewalls
SO-13	Transmission Media : Guided and	Channel Allocation: TDMA	NAT and PAT	Congestion Control in TCP	Network Threats

	Unguided				
SO-14-15	**Practice 3:** IP addressing and device configuration	**Practice 6:** Analyze MAC Address Behavior	**Practice 9:** Working with ARP	**Practice 12:** Simulate Congestion Control	**Practice 15:** SDG Mini Project

Evaluation

Level of Thinking	**Continuous Learning Assessment (CLA)** (50 % weightage)								**Final Exam** (50% Weightage)	
	CLA – 1 (10%)		CLA– 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)			
	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Remember										
Understand	20%	20%	15%	15%	15%	15%	20%	20%	20%	20%
Apply										
Analyze	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
Evaluate										
Create	10%	10%	15%	15%	15%	15%	10%	10%	10%	10%
Total	100%		100%		100%		100%		100%	

Strategies					
Technology		**Pedagogy / Andragogy**		**Sustainable Development**	
Simulations	✓	Case Studies		No Poverty	
Emulations		Group Discussion		Zero Hunger	
Prototypes		Hands-on Practice	✓	Good Health & Well Being	
Hands-on Practice Tools	✓	Inquiry Learning	✓	Quality Education	✓
Mathematical Computing Tools	✓	Interactive Lecture	✓	Gender Equality	
Field Visit		Leading Question	✓	Clean Water & Sanitation	
		Mind Map	✓	Affordable & Clean Energy	
		Minute Paper			
		Peer Review			
		Problem Based Learning	✓		

Resources

2	James F Kurose, Keith W Ross, Computer Networks :A Top Down Approach, 8th Edition, Pearson, 2022
2	Larry L. Peterson, Computer Networks: A Systems Approach, 6th Edition, Morgan Kaufmann Publishers, 2021
3	https://www.netacad.com/

Designers

Professional Experts		**Higher Institution Experts**		**Internal Experts**	
1	Mr. K V Srivallaban, Principal Consultant, Infosys Limited	1	Dr. D I George Amalarthinam, Principal, Associate Professor and Head, Jamal Mohamed College, Tiruchirappalli, Tamil Nadu	1	Dr Arul Leena Rose P J, Professor, Department of Computer Science, FSH, SRMIST

Course Code	PAI25D11T	Course Name	Distributed AI	Course Category	D	Discipline Elective Course	L	T	P	C
							4	0	0	4

Course Offering Department	Computer Science w/s in Artificial Intelligence and Machine Learning	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

Course Rationale (CR)	The purpose of taking this course is to:
CR-1	Understand the fundamental concepts of Distributed AI, MAS, distributed problem solving, communication & environments.
CR-2	Learn distributed coordination mechanisms, auctions, negotiation, logical clocks, synchronization & distributed search.
CR-3	Understand distributed Machine Learning, Federated Learning, Distributed RL, Distributed Evolutionary Models.
CR-4	Learn distributed knowledge representation, uncertainty modeling, consensus & security.
CR-5	Acquire ability to apply Distributed AI in IoT, Robotics, Smart Cities, Sensor Networks & Industry applications.

Course Outcomes (CO)	At the end of this course, learners will be able to:	Depth				Attainment			Programme Outcomes (PO)										
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10	
		Conceive	Design	Implement	Operate	Bloom's Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking,	Communication Skills, Collaborating	Independent Thinking, Analytical Reasoning, Learning to Learn Research Skills	Leadership Qualities, Professionalism,	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	Entrepreneurial Risk Taking	PSO-1	PSO-2	
CO-1	Understand distributed AI foundations, MAS concepts & distributed environments	✓	–	–	–	2	85	80	M	L	M	–	M	–	–	–	M	–	
CO-2	Apply coordination, negotiation, auctions & distributed search techniques	✓	✓	–	–	3	85	80	H	M	M	–	H	–	–	–	M	–	
CO-3	Implement distributed Machine Learning, Federated Learning & Distributed RL techniques	–	✓	✓	–	3	85	80	H	–	H	–	H	–	–	–	H	–	
CO-4	Analyze reasoning, consistency, replication, consensus & distributed security models	–	✓	–	–	4	85	80	M	–	H	–	H	–	–	–	H	–	
CO-5	Develop Distributed AI applications for IoT, robotics, smart cities & large-scale systems	–	✓	✓	✓	3	85	80	H	H	M	M	H	–	–	M	H	–	

Sessions	CO - 1	CO - 2	CO - 3	CO – 4	CO - 5
	Foundations of Artificial Intelligence & Agents	Coordination, Communication & Distributed Problem Solving	Agent Models, Architectures & MAS Engineering	Learning, Distributed AI Systems & Infrastructure	Evaluation, Ethics, Trends & Project
	12	12	12	12	12

SO-1	Introduction to Artificial Intelligence	Inter-agent Communication	Logic based Representation & Reasoning for Agents	Distributed Machine Learning Concepts	Real world Applications of DAI
SO-2	Classical Problem Solving in AI	Coordination & Cooperation	Formal Models for Agents	Introduction to Federated Learning and Federated AI	Agent-based Simulation & Modeling
SO-3	Knowledge Representation & Reasoning	Task Decomposition and Allocation	Implementation of BDI Agents	Distributed Neural Networks & Connectionist Distributed AI	Distributed Reasoning
SO-4	Planning, Decision Making & Search in AI	Distributed Problem Solving Frameworks	Blackboard Systems	Distributed Resource Management & AI in Distributed Systems	Decision Support Systems
SO-5	Limitations of Centralized AI & Motivation for Distributed AI	Constraint Satisfaction Problems in Distributed Settings	Hybrid Architectures	Edge / IoT / Multi-agent Distributed Systems with Learning	Swarm Robotics & Swarm-based Problem Solving
SO-6	Definition of Agent & Intelligent Agent	Distributed Planning & Execution	Cognitive Primitives and Social Behaviors	Distributed Data Processing & Analytics	Integration with ML & Data-driven Systems
SO-7	Multiagent Systems (MAS): Concepts & Need	Distributed Search Algorithms	Swarm Intelligence & Swarm-based MAS	Privacy, Security & Trust in Distributed AI	System Architecture, Middleware & Agent Platforms
SO-8	Architectures of Agents & MAS	Negotiation, Auctions & Contract Nets	Agent Societies & Organizational MAS	Scalability & Fault Tolerance in Distributed AI	Reliability & Robustness in DAI Systems
SO-9	Communication in MAS	Coalition Formation & Group Decision Making	Agent Communication Languages & Standards	Communication Cost & Synchronization	Performance Evaluation & Optimization
SO-10	Organizational Structures in MAS	Trust & Reputation in MAS	Formal Verification Techniques for MAS / DAI	Frameworks & Platforms for Distributed AI	Ethical & Security Aspects
SO-11	Distributed AI vs Parallel AI	Distributed Control & Synchronization	Learning in Multiagent Systems	Evaluation & Performance Metrics	Project Planning & Management
SO-12	Overview of DAI Applications	Challenges & Research Trends in DAI	Tools & Development Frameworks	Case Studies in Distributed AI	**Mini Project / System Design**

Resources

1	Russell & Norvig – Artificial Intelligence: A Modern Approach	3	Shoham & Leyton-Brown – Multiagent Systems, Cambridge.
2	Tanenbaum & van Steen – Distributed Systems	4	O'Hare & Jennings – Distributed Artificial Intelligence, MIT Press

Assessment							Strategies					
Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (50% weightage)				Final Assessmet (50 % weightage)	Technology		Pedagogy/ Andragoy		Sustainable Development	
		CLA– 1	CLA– 2	CLA– 3	CLA 4 *		Simulations	✓	Clarification/Pauses	✓	Good Health & Well Being	✓
		(10%)	(10%)	(20%)	(10%)		Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
		Theory (%)	Theory (%)	Theory (%)	Theory (%)	Theory (%)	Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
1	Remember	15	15	10	10	15			Debate	✓		
2	Understand	15	15	10	10	15			Interactive Lecture	✓		
3	Apply	20	25	25	25	25			Brainstorming	✓		
4	Analyze	20	25	25	25	25						
5	Evaluate	15	10	15	15	10						
6	Create	15	10	15	15	10						
Total (%)		100	100	100	100	100						

* The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Mr. K V Srivallaban, Principal Consultant, Infosys Limited	1	Dr. D I George Amalarthinam, Principal, Associate Professor and Head, Jamal Mohamed College, Tiruchirappalli, Tamil Nadu	1	Dr. L. Thenmozhi, Asst. Prof., Department of Computer Science w/s in Artificial Intelligence and Machine Learning, FSH, SRM IST,RMP.

Course Code	PAI25D12J	Course Name	Natural Language Processing	Course Category	D	Discipline Elective Course	L	T	P	C
							3	0	2	4

Course Offering Department	Computer Science w/s in Artificial Intelligence and Machine Learning	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

Course Rationale (CR):	The purpose of learning this course is to:	Depth				Attainment			Programme Outcomes (PO)									
CR-1:	Provides the foundational techniques for preprocessing text data, essential for further NLP tasks.	1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
CR-2:	Covers methods to transform raw text into numerical representations, enabling its use in machine learning models.																	
CR-3:	Delves into advanced techniques to extract structured information from text.																	
CR-4:	Introduce deep learning methods that are crucial for state-of-the-art NLP applications.																	
CR-5:	Explores practical applications of NLP, along with ethical considerations.																	
Course Outcomes (CO)	At the end of this course, learners will be able to:	Conceive	Design	Implement	Operate	Bloom's Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity	Communication Skills, Collaborating Skills	Independent Thinking, Analytical Reasoning, Learning to Learn	Leadership Qualities,	Digital Technology Skills	Value Inculcation,	Environmental Action, Community Engagement	Entrepreneurial Risk Taking	PSO-1	PSO-2
CO-1 :	Able to preprocess raw text data, implement tokenization, text normalization, lemmatization, stemming, and perform basic text operations like stop word removal.	✓	✓	-	-	2	85	75	3	3	3	3	3	3	-	2	2	1
CO-2 :	Implement text vectorization methods such as TF-IDF, BoW, and word embeddings, and understand feature extraction for text classification tasks.	✓	✓	✓	-	2	85	75	1	3	3	3	3	3	-	2	2	1
CO-3 :	Able to implement advanced NLP techniques such as Named Entity Recognition, dependency parsing, and topic modeling using LDA.	✓	✓	✓	✓	3	85	75	1	3	3	3	3	3	-	2	2	1
CO-4 :	Create graph data structure, evaluate its operations and apply sorting technique in real- time applications	✓	✓	✓	✓	3	85	75	1	3	3	3	3	3	-	2	2	1
CO-5 :	Understand the searching algorithm and various algorithm techniques	✓	✓	✓	✓	3	85	75	1	3	3	3	3	3	-	2	2	1

Sessions	CO-1	CO-2	CO-3	CO-4	CO-5
	Introduction to NLP	**Syntax Analysis and Algorithm**	**Word Level Analysis and Semantic Analysis**	**Advanced NLP Techniques**	**Applications of NLP**
	15	**15**	**15**	**15**	**15**
SO-1	Natural Language processing (NLP): Introduction, Applications or Use cases of NLP	Parsing Natural Language	Unsmoothed N-grams	Named Entity Recognition (NER)	Chatbots and Conversational AI
SO-2	Components of NLP, Steps in NLP	Tree banks: A Data-Driven Approach to Syntax	Evaluating N-grams	Constituency Parsing vs Dependency Parsing	Machine Translation and Statistical Models
SO-3	Finding the Structure of Words, Words and Their Components	Representation of Syntactic Structure: Syntax Analysis using Dependency Graph, Syntax Analysis using Phrase Structure Trees	Smoothing, Interpolation and Backoff , Word Classes, Part-of-Speech Tagging, Rule- based	Sequence Labeling and CRF (Conditional Random Fields), Text Summarization: Extractive and Abstractive	Speech Recognition and NLP, Text Summarization: Extractive vs. Abstractive
SO- 4,5	Practice 1: Tokenization and Text Normalization using NLTK.	Practice 4: Implementing TF-IDF and Bag-of-Words using Scikit learn.	Practice 7: Implementing Named Entity Recognition (NER) with SpaCy.	Practice 10: Building a simple RNN for text classification.	Practice 13: Building a basic chatbot using Rasa or ChatterBot.
SO-6	Lexemes, Morphemes, Morphology ,Problems in morphological processing	Parsing Algorithms: Shift Reduce Parsing ,Hyper Graphs and Chart Parsing (CYK Parsing)	Stochastic and Transformation-based tagging ,Issues in PoS tagging	Topic Modeling with Latent Di richlet Allocation (LDA),Sentiment Analysis and Opinion Mining	Document Retrieval / Search ,Question Answering Systems
SO-7	Typology, Morphological Typology	Models for ambiguity Resolution in Parsing: Probabilistic Context Free Grammar	Hidden Markov and Maximum Entropy models	Evaluation Metrics for NLP Tasks	Information Retrieval and Semantic Search
SO-8	Natural Language Processing with python NLTK package (Text Preprocessing Tasks)	Generative Models	Requirements for representation, First-Order Logic	Introduction to Deep Learning for NLP	Recommendation Systems using NLP
SO- 9,10	Practice 2: Implementing Stemming and Lemmatization using NLTK.	Practice 5: Generating word embeddings using Word2Vec in Gensim.	Practice 8: Sentence parsing and dependency trees using NLTK.	Practice 11: Fine-tuning a pre trained BERT model for sentiment analysis.	Practice 14: Implementing a machine translation model using Seq2Seq.
SO-11	Word Tokenization, Sentence Tokenization	Discriminative models for Parsing	Description Logics , Syntax-Driven Semantic analysis	Neural Networks for NLP: RNNs, LSTMs, and GRUs	Ethical Considerations in NLP
SO-12	Filtering Stop words, Stemming, Tagging Parts of Speech	Language Modeling: Grammar-based LM	Semantic attachments, Word Senses	Attention Mechanism and Transformer Models	Challenges and Future Trends in NLP
SO-13	Lemmatization, Chunking, Chinking, Named Entity Recognition, Term Frequency and Inverse Document Frequency (TF-	Statistical LM, Finite-State Automata, Regular Expressions, Transducers for lexicon and rules	Relations between Senses, Thematic Roles, selection restrictions, Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods	Pre-trained Models: BERT, GPT, Sequence-to-Sequence Models and Applications	Text Generation using Deep Learning Models, Evaluating Deep Learning Models for NLP

	IDF)				
SO-14,15	Practice 3: Stop word removal and N-Gram generation using Scikit learn.	Practice 6: Implementing Latent Semantic Analysis (LSA) for text clustering.	Practice 9: Sentiment Analysis using Naive Bayes Classifier.	Practice 12: Text generation using GPT-2 (or similar transformer based models).	Practice 15: Developing a simple question-answering system using HuggingFace Transformers.
Learning Resources	1 Multilingual natural Language Processing Applications: From Theory to Practice–Daniel M.Bikel and Imed Zitouni, Pearson Publication. 2. Speech and Natural Language Processing-Daniel Jurafsky & James H Martin, Pearson Publications. 3. Manning, C. D., & Schütze, H., Foundations of Statistical Natural Language Processing, 1st Edition, MIT Press, 1999.			1.Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S.Tiwary.	

Learning Assessment

Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment (50 % weightage)	
		CLA – 1		CLA – 2		CLA – 3		CLA – 4			
		(10 %)		(10 %)		(20 %)		(10%)			
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)
1	Remember	15	15	15	15	10	10	10	10	15	15
2	Understand	15	15	15	15	10	10	10	10	15	15
3	Apply	20	25	25	20	25	25	25	25	25	25
4	Analyze	20	25	25	20	25	25	25	25	25	25
5	Evaluate	15	10	10	15	15	15	15	15	10	10
6	Create	15	10	10	15	15	15	15	15	10	10
Total (%)		100	100	100	100	100	100	100	100	100	100

Strategies

Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

***The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments**

CLA – 4 can be from any combination of these: Assignments, Seminars, Short Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Designers

Professional Experts		Higher Institution Experts		Internal Experts	
1	Mr. K V Srivallaban, Principal Consultant, Infosys Limited	1	Dr. D I George Amalarthinam, Principal, Associate Professor and Head, Jamal Mohamed College, Tiruchirappalli, Tamil Nadu	1	**Mrs. V.DHIVYA, Asst. Prof.,** Department of Computer Science w/s in Artificial Intelligence and Machine Learning, FSH

Course Code	PAI25D13J	Course Name	Computer Vision	Course Category	D	Discipline Elective Course	L	T	P	C
							3	0	2	4

Course Offering Department	Computer Science w/s in Artificial Intelligence and Machine Learning	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

Course Rationale (CR):	The purpose of learning this course is to:	Depth				Attainment			Programme Outcomes (PO)									
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
CR-1:	Foundational Image Processing Competence																	
CR-2:	Understanding Shape, Region & Boundary Analysis																	
CR-3:	Mastery of Hough Transform & Robust Detection																	
CR-4:	3D Vision & Motion Understanding																	
CR-5:	Real-world Computer Vision Application Development																	
CR-6:	Know the algorithms behind the protocols that helps data transfer																	

Course Outcomes (CO)	At the end of this course, learners will be able to:	Conceive	Design	Implement	Operate	Bloom's Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity	Communication Skills, Collaborating Skills	Independent Thinking, Analytical Reasoning, Learning to Learn Research Skills	Leadership Qualities, Professionalism, Autonomy, Accountability	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	Entrepreneurial Risk Taking	PSO-1	PSO-2
CO-1 :	Understand the need for Network and various layers of OSI and TCP/IP reference model.	□	□	-	-	2	85	75	3	3	3	3	3	3	-	2	2	1
CO-2 :	Explain various Data Communications media	□	□	□	-	2	85	75	1	3	3	3	3	3	-	2	2	1
CO-3 :	Identify the different types of network topologies and Switching methods.	□	□	□	□	3	85	75	1	3	3	3	3	3	-	2	2	1
CO-4 :	Identify the different types of network devices and their functions within a network.	□	□	□	□	3	85	75	1	3	3	3	3	3	-	2	2	1
CO-5 :	Analyze and Interpret various Network and Transport Layer protocols.	□	□	□	□	3	85	75	1	3	3	3	3	3	-	2	2	1
CO-6 :	Explain different application layer protocols.	□	□	□	□	3	85	75	1	3	3	3	3	3	-	2	2	1

Sessions		CO 1	CO 2	CO 3	CO 4	CO 5
		15	15	15	15	15
S-1	SO-1	Image acquisition Radiometry & photometry basics	4-connected, 8-connected, m-connected relations	Edge detection for line extraction Gradient-based line detection methods	Pinhole camera model Perspective and orthographic projection	Introduction to face detection Haar Cascade Classifier
	SO-2	Image sensing and camera models Pinhole camera & CCD/CMOS concepts	Connectivity consistency and adjacency Applications in segmentation and region extraction	Hough Transform (HT) basic concept for line representation	Camera intrinsic and extrinsic parameters Projection matrices and transformations	HOG + SVM based detection Preprocessing and normalization for detection

S2	SO-1	Sampling & quantization Spatial and intensity resolution	1-pass, 2-pass, multi-pass algorithms Union–Find based labelling	Standard Hough Transform (SHT) Probabilistic Hough Transform (PHT)	Lambertian reflectance model Shape-from-shading problem formulation	Eigenfaces method using PCA Fisher faces method using LDA
	SO-2	Image interpolation methods Digitization artifacts	Memory-efficient CCL for binary and grayscale images	Differences, advantages, and limitations	Gradient-based and variational methods Applications in depth estimation	Deep learning models for face recognition (CNN, Face Net) Accuracy evaluation and dataset considerations
S3	SO-1	Linear spatial filters Smoothing filters (mean, Gaussian)	Area-based filtering using morphological operations Removal of small unwanted regions (noise blobs)	Line parametrization using foot-of-normal Calculating perpendicular distance for line detection	Shape-from-texture: regular texture patterns and depth cues	Background subtraction techniques Motion detection and foreground extraction Particle filters for tracking multi-camera data fusion
	SO-2	Sharpening filters (Laplacian, high-boost), Frequency domain filtering basics	Granulometry concepts	Application in noisy images	Shape-from-focus: focal stack analysis for depth computation Comparative advantages and limitations	
S4 – S5	SO-1	Lab 1: Apply Gaussian smoothing, sharpening, and median adaptive filtering to an input image.	Lab 4: To label and count connected components in a binary image.	Lab 7: Detect straight lines in an image using Standard Hough Transform.	Lab 10: Compute depth map from a pair of stereo images using block matching.	Lab 13: Detect faces in images or real-time video using Haar Cascade Classifier.
S6	SO-1	Median filtering Bilateral filtering	City-block, chessboard, Euclidean distance transforms Applications in shape analysis, path planning, skeletonization	Random Sample Consensus (RANSAC) algorithm Outlier rejection in line fitting	Estimating surface normals using multiple light sources	Gait feature extraction Silhouette-based analysis Gait recognition for identification Applications in security and healthcare
	SO-2	Adaptive smoothing & noise removal Edge-preserving filters	Efficient computation using raster-scan algorithms	Robust line parameter estimation	Surface reconstruction from intensity variations Lambertian vs non-Lambertian surfaces	
S7	SO-1	Global thresholding Otsu thresholding	Medial axis transforms Thinning algorithms (Zhang–Suen, Guo–Hall) □	Circle detection using Hough Transform Parametric representation of ellipses	Structured light methods Time-of-flight sensors	Edge detection and Hough Transform for lane detection Lane curvature and vehicle positioning Lane departure warning systems
	SO-2	Local/adaptive thresholding Multi-level thresholding	Skeleton pruning and reconstruction properties	Practical applications in industrial vision	Stereo vision for depth measurement 3D scanning applications	

S8	SO-1	Gradient operators (Sobel, Prewitt, Roberts) Canny edge detector	Snakes (Active Contours) Level set methods for evolving boundaries	Methods to refine detected centers of circles and ellipses Subpixel accuracy estimation	Point cloud representation Meshes and volumetric grids	Road sign detection using template matching or deep learning Pedestrian detection using HOG + SVM or YOLO/SSD models Applications in autonomous driving
	SO-2	Laplacian of Gaussian (LoG) Zero-crossing detection	Energy minimization framework and applications	Iterative refinement approaches	Surface and volumetric primitives Storage and visualization methods	
S9-S10	SO-1	Lab 2:. Perform Global, Otsu, and Adaptive Thresholding.	Lab 5: To compute the skeleton of a binary image using morphological thinning.	Lab 8: Detect circles in an image using Hough Circle Transform.	Lab 11: Estimate motion between consecutive frames using sparse optical flow.	Lab 14: Detect road lanes using edge detection and Hough Transform.
	SO-2					
S-11	SO-1	Harris corner detector FAST corner detector	Moore-neighborhood tracking Freeman chain code representation	Reducing computational complexity Voting space reduction	Feature matching in 3D Pose estimation and alignment	Image segmentation (tumor, organ detection) 3D reconstruction in medical scans (CT, MRI) Feature extraction for diagnosis support AI-assisted image analysis
	SO-2	SIFT key points ORB features	Differential chain codes and compression	Probabilistic and gradient-based acceleration techniques	Model-based reconstruction Multi-view geometry principles	
S-12	SO-1	Erosion & dilation Opening & closing	Fourier descriptors for boundary shape representation Region-based descriptors: Area, perimeter, eccentricity, compactness Hu invariant moments	Concept of GHT for arbitrary shapes Template matching and feature collation	Epipolar geometry Triangulation for 3D point estimation	Object detection and tracking from aerial footage Real-time monitoring applications Obstacle detection and autonomous navigation
	SO-2	Hit-or-miss operator Morphological transformations for noise removal and shape refinement	Rotation, scale, translation invariance	Applications in object recognition	Bundle adjustment for minimizing reprojection error Optimization techniques	
S-13	SO-1	Gray Level Co-occurrence Matrix (GLCM) features Local Binary Patterns (LBP)	Partial shape matching Contour completion techniques	Spatial matched filtering for feature enhancement Case study: Iris detection	Optical flow computation (Lucas-Kanade, Horn-Schunck) Layered motion models	Quality control using machine vision Defect detection in manufacturing lines Robotic inspection and automation Feature-based and deep learning approaches
	SO-2	Gabor filters for texture Texture descriptors for classification	Robust feature extraction under occlusion	Integration of HT and filtering for accurate detection	Translational and parametric motion estimation Applications: object tracking, motion segmentation	
S14-15	SO-1	Lab 3: Compute Sobel gradients and apply Canny Edge Detection.	Lab 6: To extract the boundary of a shape and compute its chain code using Freeman's 8-direction method.	Lab 9: Detect ellipses in a binary image and refine their centers.	Lab 12: Visualize a 3D point cloud from a depth map using Open3D.	Lab 15: Track moving objects in video using a simple tracking algorithm.

Learning Resources	1. Rafael C. Gonzalez & Richard E. Woods - Digital Image Processing, 4th Edition, Pearson Education, 2018 2. Richard Szeliski - Computer Vision: Algorithms and Applications, 2nd Edition, Springer, 2022 3. Milan Sonka, Vaclav Hlavac, Roger Boyle - Image Processing, Analysis, and Machine Vision, 4th Edition, Cengage Learning, 2015	4. David A. Forsyth & Jean Ponce - Computer Vision: A Modern Approach, 2nd Edition, Pearson, 2011 5. Bernd Jähne - Digital Image Processing, 6th Edition, Springer, 2005 6. William K. Pratt - Digital Image Processing, 4th Edition, Wiley, 2007 7. Wilhelm Burger & Mark J. Burge - Principles of Digital Image Processing, 2nd Edition, Springer, 2016

Assessment

Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment (50 % weightage)	
		CLA – 1		CLA – 2		CLA – 3		CLA – 4			
		(10 %)		(10 %)		(20 %)		(10%)			
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)
1	Remember	15	15	15	15	10	10	10	10	15	15
2	Understand	15	15	15	15	10	10	10	10	15	15
3	Apply	20	25	25	20	25	25	25	25	25	25
4	Analyze	20	25	25	20	25	25	25	25	25	25
5	Evaluate	15	10	10	15	15	15	15	15	10	10
6	Create	15	10	10	15	15	15	15	15	10	10
	Total (%)	100	100	100	100	100	100	100	100	100	100

Strategies

Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

***The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments**

Designers

Professional Experts	Higher Institution Experts	Internal Experts
1 Mr. K V Srivallaban Principal Consultant Infosys Limited	1 Dr. D I George Amalarthinam , Principal Associate Professor and Head of the Department of Computer Science, Jamal Mohamed College, Tiruchirappalli, Tamil Nadu, India	1 MS S SAMUNDEESWARI, Assistant Professor, Department of Computer Science w/s in Artificial Intelligence and Machine Learning, FSH

Course Code	PAI25G11J	Course Name	Conversational AI	Course Category	G	Generic Elective	L	T	P	C
							1	0	2	2

Course Offering Department	Computer Science w/s in Artificial Intelligence and Machine Learning	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

Course Rationale (CR):	The purpose of learning this course is to:
CR-1:	Understand dialogue principles and chatbot architectures
CR-2:	Analyze dialogue architectures and QA systems
CR-3:	Implement and evaluate dialog management
CR-4:	Develop ML-based conversational models
CR-5:	Design ethical and advanced conversational AI systems

Course Outcomes (CO)	At the end of this course, learners will be able to:	Depth				Attainment			Program Outcomes (PO)											
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12
		Conceive	Design	Implement	Operate	Bloom's Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity	Communication Skills	Independent Thinking, Analytical Reasoning, Learning to Learn, Research Cum	Leadership Qualities, Professionalism, Autonomy, Accountability	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	Ethical Practices	Entrepreneurial Risk Taking	PSO - 1	Project Management	Life Long Learning
CO-1 :	Learn the fundamentals of Conversational AI and dialogue principles.	✓	✓	-	-	2	80	70	3	3	3	3	3	2	1	3	3	2	3	2
CO-2 :	Execution of dialogue system architectures and question answering techniques.	✓	✓	-	-	3	85	75	3	3	3	3	3	2	1	3	3	2	3	3
CO-3 :	Implement and evaluate dialog management and dialogue systems.	✓	✓	-	-	3	75	70	3	3	3	3	3	2	1	3	3	2	3	3
CO-4 :	Apply machine learning methods for conversational AI development.	✓	✓	✓	-	3	85	80	3	3	3	3	3	2	1	3	3	2	3	3
CO-5 :	Design advanced conversational systems considering ethical issues.	✓	✓	✓	✓	3	85	75	3	3	3	3	3	2	1	3	3	2	3	3

Sessions Outcomes	CO 1	CO 2	CO 3	CO 4	CO 5
Duration (60Minutes)	9	9	9	9	9
SO-1	Introduction to Conversational AI	Architecture for dialogue systems: pipelines behind common assistant programs	Dialog management and system evaluation	Intent classification and entity recognition	Large Language Models (LLMs) for conversational AI
SO-2	Principles of dialogue, Common ground, sub-dialogues	Collaborative problem-solving model	Dialog manager architectures	Supervised and unsupervised learning approaches for dialogue systems	Prompt engineering, retrieval-augmented generation
SO3	Computational models of dialogue systems	Dialogue acts, cognitive architectures	Dialogue state tracking, policy learning	Neural network models for conversation	Multimodal conversational systems
SO 4-5	Practice1: Design and analyze Comparative Study of Dialogue Models	Practice 3: Implement dialogue acts classification.	Practice 5: - Implement dialog state tracking.	Practice 7: Implement intent Classification and Entity Recognition Using Machine Learning Techniques	Practice 9: Design of an LLM-Based Conversational Agent with Prompt Engineering
SO-6	Gricean principles of conversation.	Open-domain and closed-domain QA systems	Natural Language Generation, reward propagation	Reinforcement learning for dialogue policy optimization	Multimodal conversational systems
S0-7	Chatbot architectures, Rule-based and corpus-based approaches	Knowledge representation and reasoning in dialogue-based	Evaluation of dialogue system performance	Data annotation, imbalance, and generalization challenges in dialogue	Ethical issues – bias, privacy, fairness, transparency, and responsible AI

		question answering.		learning.	
SO 8-9	Practice 3: Develop a corpus-based chatbot using similarity metrics.	Practice 4: Design of a Knowledge-Driven Question Answering System	Practice 6: Implementation and Evaluation of Natural Language Generation Techniques	Practice 8: Perform Optimization of Dialogue Policies Using Reinforcement Learning	Practice 10:SDG Mini Project

Resources	
1	Seminck, O., Michael McTear."Conversational AI: Dialogue Systems, Conversational Agents, and Chatbots", Computational Linguistics, 2023
2	Tur, G. and De Mori, R., "Spoken language understanding: Systems for extracting semantic information from speech". John Wiley & Sons. 2011
3	KennethA.Lambert,(2011),TheFundamentalsofPython:FirstPrograms,Cengage Learning

Assessment

Level of Thinking	Continuous Learning Assessment (CLA) (100 % weightage)							
	CLA– 1 (20%)		CLA– 2 (20%)		CLA– 3 (40%)		CLA – 4 (20%)	
	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Remember	20%	20%	20%	15%	20%	15%	20%	15%
Understand								
Apply	20%	20%	20%	20%	20%	20%	20%	15%
Analyze								
Evaluate	10%	10%	10%	15%	10%	15%	10%	20%
Create								
Total	100%		100%		100 %		100%	

Strategies

Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations	✓	Case Studies		No Poverty	
Emulations		Group Discussion	✓	Zero Hunger	
Prototypes		Hands-on Practice	✓	Good Health & Well Being	
Hands-on Practice Tools	✓	Inquiry Learning	✓	Quality Education	✓
Mathematical Computing Tools	✓	Interactive Lecture	✓	Gender Equality	
Field Visit		Leading Question	✓	Clean Water & Sanitation	
		Mind Map		Affordable & Clean Energy	
		Minute Paper			
		Peer Review			
		Problem Based Learning	✓		

Designers

Professional Experts	Higher Institution Experts	Internal Experts
1 *Mr. K V Srivallaban* *Principal Consultant* *Infosys Limited*	1 *Dr. D I George Amalarthinam , Principal* Associate Professor and Head of the Department of Computer Science, Jamal Mohamed College, Tiruchirappalli, Tamil Nadu, India	1 Mrs. K. Sindhuja, Assistant Professor, Department of Computer Science w/s in Artificial Intelligence and Machine Learning, FSH

Code	PCS25G12J	Title	Data Analysis using Open Source Tools	Category	G	Generic Elective	L	T	P	C
							1	0	2	2

Offering Department	Computer Science	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

Course Rationale (CR):	The purpose of learning this course is to:
CR-1	Understand the fundamentals of data analysis and its importance in decision making processes.
CR-2	Learn how to collect, clean, and preprocess data for analysis
CR-3	Understanding statistical data analysis
CR-4	Develop skills in data visualization using library and other visualization libraries
CR-5	Exploratory data analysis (EDA) techniques and statistical methods for deriving insights from data.

Outcomes (CO)	At the end of this course, learners will be able to:	Depth				Attainment			Program Outcomes (PO)												
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	
		Conceive	Design	Implement	Operate	Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Disciplinary Knowledge	Problem Solving	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment Sustainability	Ethical Practices	Individual & Team Work	Communication	Project Management	Life Long Learning	
CO-1	Handle big data for data analysis	✓	✓	✓		3	80	70	3	2	2	2	3	1	1	2	2	3	2	3	
CO-2	Visualize the data	✓	✓	✓	✓	3	80	70	3	2	2	2	3	1	1	2	2	3	2	3	
CO-3	Handle single or two variable	✓	✓	✓	✓	3	75	70	3	2	2	2	3	1	1	2	2	3	2	3	
CO-4	Perform statistical analysis	✓	✓	✓	✓	3	80	75	3	2	2	2	3	1	1	2	2	3	2	3	
CO-5	Work on real world data	✓	✓	✓	✓	3	75	70	3	2	2	2	3	1	1	2	2	3	2	3	

Title & Session Outcomes	CO-1	CO-2	CO-3	CO-4	CO-5
Duration (60 minutes)	9	9	9	9	9
SO-1	Introduction: Data Analysis	Introduction: Data Visualization	Advanced Data Analysis Techniques	Introduction: Statistical Analysis	Advanced Data Cleaning Techniques
SO-2	Open Source Tools for Data Analysis	Basic Plots, Customizing Plots	Grouping and Aggregation	Basic concepts of Data statistical analysis	Handling Large Dataset
SO-3	Data Analysis : Python and PERL	Exploratory Data Analysis	Time Series Analysis	Hypothesis Testing	Advanced Statistical Data Analysis
SO 4-5	Practice 1: Setting up environment for basic data analysis.	Practice 3: Data Visualization	Practice 5:Program for aggregation	Practice 7:Program using statistical analysis	Practice 9: Program to handle large dataset
SO-6	Data Analysis : Python and PERL	Descriptive Analysis, Correlation Analysis	ML for Data Analysis	Model Fitting, Under fitting, Over Fitting	Handling Large Dataset
SO-7	Data Collection Methods: Web Scraping, APIs and Databases	Descriptive Analysis, Correlation Analysis	Array Creation and Manipulation	Regression Analysis	ML Concepts: Supervised and Unsupervised Learning
SO 8-9	Practice 2:Data collection and cleaning	Practice 4: Program using Mathematical operation and statistical functions	Practice 6:Implementation of Data preprocessing methods , and plotting	Practice 8: Program to implement under fitting and over fitting	Practice 5:SDG Mini Project

Assessment									
Level of Thinking		Continuous Learning Assessment (CLA) (100 % weightage)							
		CLA – 1 (20%)		CLA – 2 (20%)		CLA – 3 (40%)		CLA – 4 (20%)	
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
	Remember	20%	20%	20%	15%	20%	15%	20%	15%
	Understand								
	Apply	20%	20%	20%	20%	20%	20%	20%	15%
	Analyze								
	Evaluate	10%	10%	10%	15%	10%	15%	10%	20%
	Create								
	Total	100%		100%		100 %		100%	

Strategies					
Technology		**Pedagogy / Andragogy**		**Sustainable Development**	
Simulations	✓	Case Studies		No Poverty	
Emulations		Group Discussion	✓	Zero Hunger	
Prototypes		Hands-on Practice	✓	Good Health & Well Being	
Hands-on Practice Tools	✓	Inquiry Learning	✓	Quality Education	✓
Mathematical Computing Tools	✓	Interactive Lecture	✓	Gender Equality	
Field Visit		Leading Question	✓	Clean Water & Sanitation	
		Mind Map		Affordable & Clean Energy	
		Minute Paper			
		Peer Review			
		Problem Based Learning	✓		

Resources	
1	Philipp K. Janert, "Data Analysis with Open Source Tools", O'Reilly Media Inc.
2	Wes Meckenny, "Python for Data Analysis"

Designers					
Professional Experts		**Higher Institution Experts**		**Internal Experts**	
1	Mr. K V Srivallaban, Principal Consultant, Infosys Limited	1	Dr. D I George Amalarthinam, Principal, Associate Professor and Head, Jamal Mohamed College, Tiruchirappalli, Tamil Nadu	1	Dr. M. Ramesh, Assistant Professor, Department of Computer Science, FSH, SRM IST

Code	PCS25G13J	Title	Cloud Computing Tools and Techniques	Category	G	Generic Elective	L	T	P	C
							1	0	2	2

Offering Department	Computer Science	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses		Data Book / Codes/Standards	

Course Rationale (CR):	The purpose of learning this course is to:
CR-1	Understand the fundamental ideas behind Cloud Computing, the evolution of the paradigm and its benefits
CR-2	Learn cloud enabling technologies and get exposure to advanced clouds
CR-3	Explore cloud storage technologies and relevant distributed file systems, NoSQL databases and object storage
CR-4	Understand the cloud security threats and protective mechanism for cloud computing
CR-5	Know the algorithms behind the protocols that helps data transfer

Course Outcomes (CO)	At the end of this course, learners will be able to:	Depth				Attainment			Program Outcomes (PO)											
		1 Conceive	2 Design	3 Implement	4 Operate	1 Level of Thinking	2 Expected Proficiency (%)	3 Expected Attainment (%)	1 Disciplinary Knowledge	2 Problem Solving	3 Design & Development	4 Analysis, Design, Research	5 Modern Tool Usage	6 Society & Culture	7 Environment Sustainability	8 Ethical Practices	9 Individual & Team Work	10 Communication	11 Project Management	12 Life Long Learning
CO-1	Explain terms used in secured software development and life cycle process	✓	✓	✓		3	70	65	3	3	3	3	3	2	1	3	3	2	3	2
CO-2	Apply fundamental concepts in cloud infrastructures to understand the cloud system	✓	✓	✓	✓	3	75	65	3	3	3	3	3	2	1	3	3	2	3	3
CO-3	Illustrate the fundamental concepts of cloud storage and demonstrate their use in storage systems such as Amazon S3 and HDFS	✓	✓	✓	✓	3	80	70	3	3	3	3	3	2	1	3	3	2	3	3
CO-4	Evaluate the security issues related to cloud computing and handle the security threats and construct different cloud delivery design models	✓	✓	✓	✓	3	70	65	3	3	3	3	3	2	1	3	3	2	3	3
CO-5	Describe the Cloud Security i.e., Risks, Privacy and Privacy impacts assessments	✓	✓	✓	✓	3	85	75	3	3	3	3	3	2	1	3	3	2	3	3

Title & Session Outcomes	CO-1	CO-2	CO-3	CO-4	CO-5
Duration (60 minutes)	9	9	9	9	9
SO-1	The cloud ecosystem Introduction to Cloud Computing, Evolution of cloud computing	Parallel processing and distributed computing	Cloud data storage -Introduction to Cloud Data Storage	Cloud Security - Introduction , Security—the top concern for cloud users	Cloud applications - development and architectural styles
SO-2	Network- Centric Computing, Origin of loud Computing	Grand architectural complications, ARM architecture, SIMD architectures	Storage Models, Solid-state disks	Cloud security risks , Cloud Security Mechanisms	Coordination based on a state machine model— zookeeper
SO-3	Basic Concepts and Terminology	Graphics processing units , Tensor processing units	File Systems and databases, General parallel file system	Digital Signature, Public Key Infrastructure	MapReduce programming model
SO 4-5	Practice 1: Create a virtual machine	Practice 3: Create a drop box using Google APP	Practice 5: Encryption and Decryption of Text	Practice 7: Develop a HelloWorld application using Google App Engine	Practice 9: Create a Warehouse Application in Sales force.Com
SO-6	Cloud Service Models , Cloud Deployment Models	Modularity. Soft modularity versus enforced modularity, Layering and hierarchy	Google file system , Locks , Chubby—a locking service	Identity and Access Management Single Sign-On: Kerberos authentication	Current cloud applications and new applications opportunities

SO-7	Cloud Service	Peer-to-peer systems, Large-scale systems	NoSQL databases	Basic cloud data security mechanisms	Social computing, digital content,
SO8-9	Practice 2: installation of Platforms	Practice 4: Transfer Data using Google App	Practice 6: Simple Experiments in Cloud Sim	Practice 8: Develop Guestbook App Engine	Practice 10: SDG Mini Project

Assessment

Level of Thinking		Continuous Learning Assessment (CLA) (100 % weightage)							
		CLA– 1 (20%)		CLA– 2 (20%)		CLA– 3 (40%)		CLA – 4 (20%)	
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
	Remember	20%	20%	20%	15%	20%	15%	20%	15%
	Understand								
	Apply	20%	20%	20%	20%	20%	20%	20%	15%
	Analyze								
	Evaluate	10%	10%	10%	15%	10%	15%	10%	20%
	Create								
Total		100%		100%		100 %		100%	

Strategies

Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations	✓	Case Studies		No Poverty	
Emulations		Group Discussion	✓	Zero Hunger	
Prototypes		Hands-on Practice	✓	Good Health & Well Being	
Hands-on Practice Tools	✓	Inquiry Learning	✓	Quality Education	✓
Mathematical Computing Tools	✓	Interactive Lecture	✓	Gender Equality	
Field Visit		Leading Question	✓	Clean Water & Sanitation	
		Mind Map		Affordable & Clean Energy	
		Minute Paper			
		Peer Review			
		Problem Based Learning	✓		

Resources

1	Dan C. Marinescu, "Cloud Computing Theory andPractice", Third Edition Copyright © 2023 Elsevier Inc. ISBN: 978-0-323-85277-7 Unit (I – V)
2	homasErl, ZaighamMahmood, and RichardoPuttini, "Cloud Computing: Concepts, Technology & Architecture", Prentice Hall/PearsonPTR, Fourth Printing, 2014, ISBN: 978013338752
3	Dan C. Marinescu, "Cloud Computing Theory and Practice", Third Edition Copyright © 2023 Elsevier Inc. ISBN: 978-0-323-85277-7 Unit (I – V

Designers

Professional Experts		Higher Institution Experts		Internal Experts	
1	Mr. K V Srivallaban, Principal Consultant, Infosys Limited	1	Dr. D I George Amalarthinam,Principal,Associate Professor and Head, Jamal Mohamed College, Trichirappalli, Tamil Nadu	1	Dr. Pavithra. Assistant Professor Computer Science, SRMIST, KTR

Code	PCS25S11J	Title	Information Literacy	Category	S	SKILL ENHANCEMENT	L	T	P	C
							3	0	2	4

Offering Department	Computer Science	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

Course Rationale (CR):	The purpose of learning this course is to:
CR-1	To recognize when information is needed.
CR-2	To Understand the economic, legal, and social issues surrounding the use of information ethically and legally
CR-3	To have the ability to locate valuate and use effectively.
CR-4	To have the ability to locate valuate and use effectively.
CR-5	To have the ability to locate valuate and use effectively.

Course Outcomes (CO)	At the end of this course, learners will be able to:	Depth				Attainment			Program Outcomes (PO)												
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12
		Conceive	Design	Implement	Operate	Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Disciplinary Knowledge	Problem Solving	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment Sustainability	Ethical Practices	Individual & Team Work	Communication	Project Management	Life Long Learning
CO-1	Analyze a research need	3	2	2	2	3	80	70	3	2	2	2	3	1	1	2	2	3	2	3
CO-2	Find information effectively and efficiently by using a variety of search techniques	3	2	3	3	3	85	75	3	2	2	2	3	1	1	2	2	3	2	3
CO-3	Access needed information in multiple publication formats	3	2	2	2	3	75	70	3	2	2	2	3	1	1	2	2	3	2	3
CO-4	Evaluate the quality and relevance of information sources	3	3	3	3	3	85	80	3	2	2	2	3	1	1	2	2	3	2	3
CO-5	Recognize several ethical and legal issues related to the use of information	3	3	3	3	3	75	70	3	2	2	2	3	1	1	2	2	3	2	3

Title & Session Outcomes	CO-1	CO-2	CO-3	CO-4	CO-5
Duration (60 minutes)	15	15	15	15	15
SO-1	An introduction to Information literacy, understanding practical	Special interest organizations, media	Switch	Arithmetic, relational and logical operations on matrices.	**Automating Tasks in MATLAB**: Writing scripts and using functions to automate repetitive processes
SO-2	Aspects of information literacy such as Matlab Environment	Data types	Break	Polynomial evaluations, roots of polynomial and arithmetic operations on polynomials.	**Data Modeling and Curve Fitting**: Using polyfit, interp1, and regression tools
SO-3	Getting familiarized with command window, program using matlab	Constants, Variables	Continue statement	Graphics:2Dplots	**Plagiarism Detection Tools**: Understanding Turnitin, Grammarly, and other academic integrity tools
SO-4-5	Practice 1: practice simple libraries	Practice 4: write a program involving data types and constants	Practice 7: write a program to demonstrate the functions of switch case statement	Practice 10: write a programtoplot2d graphs	Practice13: Create interactive applications using uicontrol and callbacks
SO-6	community resources	Character constants	Multiple media, Input functions	Printing labels, Grid & Axesbox	**Evaluating Social Media as an Information Source**: Bias, credibility, and influence
SO-7	Current directory	Operators	Output functions, Reading data	Text in plot, Barchart	**Ethics in Artificial Intelligence and Data Use**: Legal and social responsibility of algorithms
SO-8	Figure Window Edit Window	Assignment statements	Statement, Storing data	Pie chart	**Real-Time Data Visualization**: Plotting dynamic graphs using animatedline,

					drawnow
SO-9,10	Practice 2: write a simple program in matlab using the basic tools	Practice 5: write a program using variables and operators.	Practice 8: write a program to demonstrate the functions of break	Practice 11 :Working with histograms, scatter plots, and real-world data sets	**Practice 14:**Analyze an open dataset (e.g., COVID-19, education stats) and report
SO-11	Exploring Matlab Environment	Control Structures, For loop	Vectors, Graphical, aural, textual	**Data Cleaning and Preprocessing**: Handling missing data, outliers, and normalization	Matlab - Load, display,
SO-12	Digital Media Literacy	While loop, Do-while	Commands to operate on vectors and matrices	**Statistical Analysis using MATLAB**: Mean, median, mode, standard deviation, regression	Manipulate images
SO-13	Compare Search Techniques on Google Scholar vs Academic Databases	If control structures	Matrix Manipulations	**MATLAB File Handling**: Reading from and writing to text/CSV files	**Simulating Mathematical Models in MATLAB**: Solving equations, modeling systems using ode45
SO-14,15	Practice 3: Evaluate How Information Overload Affects Decision Making in Academic Settings	Practice 6: write a program using for loop and while loop.	Practice 9: write a program to demonstrate the commands operated on vectors	**Practice12: Working with Real-World Datasets in MATLAB**: Importing CSV, Excel, and live data sources	Practice 15: SDG Mini Project

Evaluation

Level of Thinking	**Continuous Learning Assessment (CLA)** (50 % weightage)								**Final Exam** (50% Weightage)	
	CLA – 1 (10%)		CLA– 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)			
	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Remember										
Understand	20%	20%	15%	15%	15%	15%	20%	20%	20%	20%
Apply										
Analyze	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
Evaluate										
Create	10%	10%	15%	15%	15%	15%	10%	10%	10%	10%
Total	100%		100%		100%		100%		100%	

Strategies					
Technology		**Pedagogy / Andragogy**		**Sustainable Development**	
Simulations	✓	Case Studies		No Poverty	
Emulations		Group Discussion		Zero Hunger	
Prototypes		Hands-on Practice	✓	Good Health & Well Being	
Hands-on Practice Tools	✓	Inquiry Learning	✓	Quality Education	✓
Mathematical Computing Tools	✓	Interactive Lecture	✓	Gender Equality	
Field Visit		Leading Question	✓	Clean Water & Sanitation	
		Mind Map	✓	Affordable & Clean Energy	
		Minute Paper			
		Peer Review			
		Problem Based Learning	✓		

Resources

1	Luz Chourio-Acevedo, Jacqueline Köhler, “Information literacy development and assessment at school level: a systematic review of the literature", 2024
2	Amelia Hassoun, Ian Beacock, Sunny Consolvo"Practicing Information Sensibility: How Gen Z Engages with Online Information", 2023
3	BansalR.K,GoelA.K.,SharmaM.K.,“MATLABanditsApplicationsinEngineering”,PearsonEducation,2012

Designers

Professional Experts		**Higher Institution Experts**		**Internal Experts**	
1	Mr. K V Srivallaban, Principal Consultant, Infosys Limited	1	Dr. D I George Amalarthinam, Principal, Associate Professor and Head, Jamal Mohamed College, Tiruchirappalli, Tamil Nadu	1	Dr. Revathi.S, Assistant Professor, Department of Computer Science Faculty of Science and Humanities, SRMIST,KTR.

Code	PCD25AE1T	Title	Comprehensive Skills in Quantitative and Logical Reasoning	Category	AE	Ability Enhancement Course	L	T	P	C
							2	0	0	2

Offering Department	Career Guidance	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

Course Rationale (CR)	The purpose of learning this course is to:
CR-1	Build a strong foundation in numerical concepts and arithmetic techniques, enabling learners to solve mathematical problems accurately and efficiently.
CR-2	Equip learners with essential skills for understanding and solving financial and proportional reasoning problems relevant to real-life scenarios and career needs.
CR-3	Develop problem-solving skills in time, work, speed, distance, and ratio-based applications, enabling learners to tackle real-world mathematical challenges efficiently.
CR-4	Enhance learners' logical reasoning and data interpretation skills, enabling them to solve real-life problems involving clocks, calendars, directions, relationships, and data analysis.
CR-5	Sharpen learners' logical thinking and problem-solving abilities, helping them develop skills in tackling number puzzles, logical puzzles, reasoning-based problems, and coding challenges.

Course Outcomes (CO)	At the end of this course, learners will be able to:	Depth				Attainment			Program Outcomes (PO)												
		Conceive	Design	Implement	Operate	Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Disciplinary Knowledge	Problem Solving	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	EthicalpractiCes&SocialResponsibility	Individual & Team Work	Communication	Project Management & Finance	Life Long Learning
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	
CO-1	Apply numerical methods to solve problems involving number classification, divisibility tests, progressions, HCF & LCM, simplification techniques, and vinculum-based calculations.	✓	✓	✓	✓	1	85	75	-	3	1	3	1	-	-	-	2	-	-	-	
CO-2	Calculate interest, analyze profit and loss, and solve problems related to percentages, discounts, permutations, combinations, and probability, enhancing their quantitative reasoning skills.	✓	✓	✓	✓	3	85	75	-	3	1	3	1	-	-	-	2	-	-	-	
CO-3	Solve problems related to time and work, speed and distance, boats and streams, mixtures and alligations, height and distance, and age-based calculations with accuracy and efficiency.	✓	✓	✓	✓	4	85	75	-	3	1	3	1	-	-	-	2	-	-	-	
CO-4	Solve problems related to clocks, calendars, directions, blood relations, and interpret data from various graphical representations, including tables, bar charts, pie charts, and line graphs, with accuracy and clarity.	✓	✓	✓	✓	4	85	75	-	3	1	3	1	-	-	-	2	-	-	-	
CO-5	Solve number puzzles, logical puzzles, sequential output tracing, and reasoning problems, as well as alphanumeric series and coding/decoding problems, with precision and speed.	✓	✓	✓	✓	5	85	75	-	3	1	3	1	-	-	-	2	-	-	-	

Title & Session Outcomes	Numbers and Basic Arithmetic	Business Mathematics and Applications	Applied Arithmetic Problems	Logical Reasoning and Data Interpretation	Reasoning and Puzzle Solving
Duration (hour)	6	6	6	6	6
SO-1	Classification of Numbers & Tests of Divisibility	Problems on Averages and Percentage	Time and work - Problems	Clock - Problems	Number Puzzles - Problems
SO-2	Unit Digit &Trailing Zeroes	Problems on Discount	Time, Speed and Distance Problems	Problems on Calendar	Logical Puzzles –Problems
SO-3	Arithmetic Progression Geometric Progression	Problems on Simple Interest and Compound Interest	Boats and Streams - Problems	Direction Sense - Problems	Sequential Output Tracing - Problems

SO-4	Highest Common Factor (HCF) Least Common Multiples (LCM)	Profit and Loss – Problems	Mixtures and Alligations - Problems	Blood relation-Problems	Inductive, Logical, Abstract and Diagrammatic Reasoning - Problems
SO-5	Simplification – Problems	Permutation and Combination – Problems	Height and Distance - Problems	Data Interpretation – Table and Bar chart	Alphanumeric Series - Problems
SO-6	Virnaculum – Problems	Problems on Probability	Problems based on Ages	Data Interpretation – Pie Chart and Line graph	Coding and Decoding - Problems

Assessment

Level of Thinking		Continuous Learning Assessment (CLA) (100 % weightage)							
		CLA– 1 (20%)		CLA– 2 (20%)		CLA– 3 (30%)		CLA – 4 (30%)	
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
1	Remember	40%	-	40%	-	40%	-	40%	-
2	Understand								
3	Apply	40%	-	40%	-	40%	-	40%	-
4	Analyze								
5	Evaluate	20%	-	20%	-	20%	-	20%	-
6	Create								
Total		100 %		100 %		100 %		100%	

Strategies

Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations	✓	Case Studies		No Poverty	
Emulations		Group Discussion	✓	Zero Hunger	
Prototypes		Hands-on Practice	✓	Good Health & Well Being	
Hands-on Practice Tools	✓	Inquiry Learning	✓	Quality Education	✓
Mathematical Computing Tools	✓	Interactive Lecture	✓	Gender Equality	
Field Visit		Leading Question	✓	Clean Water & Sanitation	
		Mind Map		Affordable & Clean Energy	
		Minute Paper			
		Peer Review			
		Problem Based Learning	✓		

Resources

1	Dr. Agarwal.R.S, Quantitative Aptitude for Competitive Examinations, S. Chand and Company Limited, 2018 Edition	2	Archana Ram, PlaceMentor: Tests of Aptitude for Placement Readiness, Oxford University Press, Oxford, 2018
3	AbhijitGuha, Quantitative Aptitude for Competitive Examinations, Tata McGraw Hill, 5th Edition	4	Edgar Thrope, Test Of Reasoning for Competitive Examinations, Tata McGraw Hill, 6th Edition

Designers

Professional Experts		Higher Institution Experts		Internal Experts	
1	Mr. VaradhaRajan M (External Expert), Assistant Manager – Human Resources, Justdial Limited, Chennai – 600015 varadha1723@gmail.com	1	Dr. Premavathy M, Associate Professor , Department of English Center for Distance and Online Education, Bharathidasan University, Tiruchirappalli – 620024 drmpremavathy@bdu.ac.in	1	Dr. Deepa Lakshmi S, HoD, Department of Career Guidance Cell, FSH, SRMIST
				2	Dr. Sathish K, Assistant Professor, Department of Career Guidance Cell, FSH, SRMIST
				3	Dr. Aarthi S, Assistant Professor, Department of Career Guidance Cell, FSH, SRMIST

SEMESTER – II

Code	PAI25C21T	Title	Mathematics for AI and ML	Category	C	Core	L	T	P	C
							4	0	0	4

Offering Department	Computer Science w/s in Artificial Intelligence and Machine Learning	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

Rationale (CR)	The purpose of learning this course is to:	Depth				Attainment			Program Outcomes (PO)											
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12
CR-1	To apply the numerical techniques to solve the system of linear equations.	Conceive	Design	Implement	Operate	Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Disciplinary Knowledge	Problem Solving	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethical Practices & Social	Individual & Team Work	Communication	Project Management & Finance	Life Long Learning
CR-2	To apply the basic concepts and theorems of Matrices.																			
CR-3	To learn the basic concepts of vector spaces and its applications.																			
CR-4	To learn the basic concepts of vector calculus and its applications.																			
CR-5	To understand the basic concept of integral calculus and its applications.																			
Outcomes (CO)	At the end of this course, learners will be able to:																			
CO-1	Understanding the numerical methods to solve the equations					5	85	75	1	-	-	3	-	2	-	2	3	3	-	3
CO-2	Gaining knowledge in basic concepts of matrix method and its applications					4	85	75	3	-	-	3	3	-	-	-	3	3	-	3
CO-3	Understanding the concepts of vector spaces.					6	85	75	3	-	-	3	-	-	-	-	3	3	-	3
CO-4	Understanding the concept of vector calculus and its applications					3	85	75	3	1	2	3	3	-	-	-	3	3	-	3
CO-5	Getting the knowledge of vector integration and its real life application					2	85	75	3	3	2	3	-	3	3	3	3	3	-	3

Title & Session Outcomes	System of linear Equations	Matrices	Vector spaces	Vector calculus	Integral calculus
Duration (hour)	12	12	12	12	12
SO-1	Introduction to system of linear equations	Definition and Types of Matrix with Examples	Introduction to Vector Space	Gradient, Divergence and Curl	Introduction to Integration
SO-2	Matrix form of System of Linear Equations	Characteristic Equation	Definition and Examples	Problems based on Gradient	Definite and Indefinite Integrals

SO-3	Direct Method and Indirect Method	Eigen values and Eigen vectors of a Real Matrix	Vector Space-Simple Properties	Problems based on Curl	Definite and Indefinite Integrals
SO-4	The Gaussian Elimination Method	Properties of Eigen values and Eigenvectors	Vector Space - Problems	Directional Derivatives and problems based on directional derivative	Area of Double Integral
SO-5	Inverse using Gaussian Elimination	Minimal Polynomial	Subspaces	Directional Derivatives and problems based on directional derivative	Area of Double Integral
SO-6	Inverse using Gaussian Elimination	Cayley - Hamilton Theorem (Problems only)	Subspaces: Definition and Examples	Problems on Irrotational and Solenoidal Vector	Volume of the Integral for Cube
SO-7	Gauss Jordan Method	Cayley - Hamilton Theorem and Problems	Linear Combination and Span	Definition-Line integrals	Volume of the Integral for Cube
SO-8	Gauss Jordan Method	Cayley - Hamilton Theorem and Problems	Linear Independence and Dependence	Vector integration problems on Line integrals	Volume of the Integral -Cuboid
SO-9	Gauss Jacobi Method	Matrix Diagonal forms	Linear Independence And Dependence - Properties & Problems	Vector integration problems on Line integrals	Volume of the Integral -Cuboid
SO-10	Gauss Jacobi Method	Matrix Triangular forms & Triangular forms	Linear Transformation	Gauss Divergence Theorem statement	Integration using Bernoulli s formula
SO-11	Gauss Seidel Method	Diagonalization of Matrices using Orthogonal Transformation .	Linear Transformation -- Basis and Dimension of a Vector Space	Vector integration - problems on Gauss Divergence Theorem	Beta and Gamma functions.
SO-12	Gauss Seidel Method	Diagonalization of Matrices using Orthogonal Transformation .	Change of Basis	Problems on Gauss Divergence Theorem	Beta and Gamma functions.

Assessment											
Level of Thinking		Continuous Learning Assessment (CLA) (50 % weightage)								Final Exam (50% Weightage)	
		CLA – 1 (10 %)		CLA– 2 (10%)		CLA– 3 (20%)		CLA– 4 (10%)			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
1	Remember	40%	-	40%	-	40%	-	40%	-	40%	-
2	Understand										
3	Apply	40%	-	40%	-	40%	-	40%	-	40%	-
4	Analyze										
5	Evaluate	20%	-	20%	-	20%	-	20%	-	20%	-
6	Create										
Total		100 %		100 %		100 %		100 %		100 %	

Strategies					
Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations	✓	Case Studies	✓	No Poverty	
Emulations	✓	Group Discussion		Zero Hunger	
Prototypes		Hands-on Practice	✓	Good Health & Well Being	
Hands-on Practice Tools		Inquiry Learning	✓	Quality Education	✓
Mathematical Computing Tools		Interactive Lecture	✓	Gender Equality	
Field Visit		Leading Question		Clean Water & Sanitation	
		Mind Map		Affordable & Clean Energy	
		Minute Paper			
		Peer Review			
		Problem Based Learning			

Resources

1	B S Grewal, Higher Engineering Mathematics, 42nd edition, Khanna Publishers, 2012	2	A Singaravelu, Allied Mathematics, 7th edition, A.R.S. Publications, 2015.
3	Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2016.	4	nptel.ac.in/courses/127106019, Numerical methods for science and engineering.
5	T Veerarajan, Engineering Mathematics – I, 12th edition, Mc Graw Hill Education, 2018.	5	nptel.ac.in/courses/111105122, Vectors and integration
6	Srimanta Pal, Subodh C Bhunia, "Engineering Mathematics", 3rd edition, Oxford University Press, 2015	7	nptel.ac.in/courses/111105160, Advanced calculus for Data Scientists.

Designers

Professional Experts		Higher Institution Experts		Internal Experts	
1	Mr. K V Srivallaban, Principal Consultant, Infosys Limited	1	Dr. D I George Amalarthinam,Principal,Associate Professor and Head, Jamal Mohamed College, Trichirappalli, Tamil Nadu	1	Dr. Harikrishnan. Assistant Professor, Department of Mathematics, FSH, SRMIST, Ramapuram
				2	Dr. Priyadarshini, Assistant Professor, Department of Mathematics, FSH, SRMIST, Ramapuram

Code	PCS25C22J	Title	Distributed Operating System	Category	C	Core	L	T	P	C
							3	0	2	4

Offering Department	Computer Science	Pre-requisite Courses	Operating System	Co-requisite Courses	NIL	Progressive Courses	NIL	Data Book / Codes/Standards	

Course Rationale (CR):	The purpose of learning this course is to:	Depth				Attainment			Program Outcomes (PO)												
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12
		Conceive	Design	Implement	Operate	Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity	Communication Skills	Analytical Reasoning, Learning to Learn, Research	Professionalism, Autonomy,	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	Ethical Practices	Entrepreneurial Risk Taking	PSO - 1	Project Management	Life Long Learning
CR-1	To strengthen the knowledge in Operating Systems																			
CR-2	To examine the fundamental principles of distributed systems.																			
CR-3	To comprehend about the communication that takes place in Distributed systems.																			
CR-4	To realize the necessity of synchronization, consistency and Fault tolerance in a Distributed System																			
CR-5	To acquire apparent scheme regarding distributed object-oriented based systems																			
Course Outcomes (CO)	At the end of this course, learners will be able to:																			
CO-1	Categorize layered protocol sand comprehend the communications in distributed systems.	✓	✓	✓	✓	3	70	65	3	3	3	3	3	2	1	3	3	2	3	2
CO-2	List the principles of distributed systems and describe the problems and challenges associated with these principles.	✓	✓	✓	✓	3	75	65	3	3	3	3	3	2	1	3	3	2	3	3
CO-3	Understand Distributed Computing techniques, Synchronous and Processes.	✓	✓	✓	✓	3	80	70	3	3	3	3	3	2	1	3	3	2	3	3
CO-4	Understand Distributed File Systems and Distributed Shared Memory.	✓	✓	✓	✓	3	70	65	3	3	3	3	3	2	1	3	3	2	3	3
CO-5	Apply Distributed web-based system.	✓	✓	✓	✓	3	85	75	3	3	3	3	3	2	1	3	3	2	3	3

Title & Session Outcomes	CO-1	CO-2	CO-3	CO-4	CO-5
Duration (60 minutes)	**15**	**15**	**15**	**15**	**15**
SO-1	Introduction :Overview of operating system concepts, Process management	Synchronization in distributed systems, Clock synchronization	Distributed File Systems: Introduction,	Resource Management in DOS , Types of resources	Distributed Web-based Systems, Architecture ,Processes
SO-2	Scheduling: CPU Scheduling, Disk Scheduling	Events, Time In distributed systems, ,	Features and goal of distributed file system	Issues of resource sharing , Task assignment	Communication ,Naming, Synchronization
SO-3	Memory management, Device and File management	Concurrency control mechanism in DOS	File models, File sharing semantics	Types of Distributed Load Balancing Algorithms,	Consistency and Replication, WebProxy Caching
SO-4-5	Practice 1:Virtual Machines ,System Design And Implementation	Practice 4 : :Basic calculator program using RMI	Practice 7:Programto implement token/non token based algorithm	Practice 10:Implement Network File System	Practice 13::Study of Web Service Programming
SO-6	Introduction to distributed Systems,	Mutual exclusion in distributed environment.	File caching scheme, File replication, Fault tolerance	Load estimation policy Location policy,	Replication for Web Hosting Systems,
SO-7	Definition and goals Design Issues,	Deadlock in distributed systems	Fault tolerance, Trends in Distributed File System, Distributed Shared Memory	State information exchange policy, Priority assignment policy	Replication of Web Applications
SO-8	Communication in Distributed System,	Transactions in distributed environment, Processes	General architecture of DSM,	Process migration and case studies, Identifiers	Security in Distributed OS: Introduction, Importance of security,
SO-9,10	Practice 2:Program to implement Remote procedure call	Practice 5 :Implement process strategies: creation of child, zombie, orphan process	Practice 8: Program to Implement locking algorithm	Practice 11 :Implement Load Balancing Algorithm	Practice 14: Implement a clock synchronization algorithm

SO-11	Message passing and related issues, ATM Networks,	Processes and processors in, Distributed systems, Threads	Advantages& challenges of DSM	,Addresses, Name Resolution, System oriented names,	Types of External attacks, Basic elements of Information System security and policy
SO-12	Client Server model, Remote Method Invocation	System model, Processor al location, Scheduling in distributed systems	Design and implementation issues of DSM, Memory coherence,	Object locating mechanisms	Trust Management, Access Control Models, Cryptography,
SO-13	Case Studies: SUNRPC,DEC RPC	Load balancing and sharing approach, Fault tolerance, Real time distributed systems, Process migration and related issues	Granularity ,structure of shared memory space, Replacement strategy, Thrashing	Issues in designing human oriented names, Name caches. Naming and security, DNS	Case Study: Sun Network File System, Andrew Network file system
SO-14,15	Practice 3:Set up a client-server architecture using socket programming	Practice 6: Implement a simple Remote Procedure Call (RPC) mechanism.	Practice 9: Write a program to simulate mutual exclusion using Lamport's algorithm.	Practice 12: Demonstrate inter-process communication (IPC) between distributed processes	Practice 15: SDG Mini Project

Evaluation

Level of Thinking	**Continuous Learning Assessment (CLA)** (50 % weightage)								**Final Exam** (50% Weightage)	
	CLA – 1 (10%)		CLA– 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)			
	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Remember										
Understand	20%	20%	15%	15%	15%	15%	20%	20%	20%	20%
Apply										
Analyze	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
Evaluate										
Create	10%	10%	15%	15%	15%	15%	10%	10%	10%	10%
Total	100%		100%		100%		100%		100%	

Strategies

Technology		**Pedagogy / Andragogy**		**Sustainable Development**	
Simulations	✓	Case Studies		No Poverty	
Emulations		Group Discussion		Zero Hunger	
Prototypes		Hands-on Practice	✓	Good Health & Well Being	
Hands-on Practice Tools	✓	Inquiry Learning	✓	Quality Education	✓
Mathematical Computing Tools	✓	Interactive Lecture	✓	Gender Equality	
Field Visit		Leading Question	✓	Clean Water & Sanitation	
		Mind Map	✓	Affordable & Clean Energy	
		Minute Paper			
		Peer Review			
		Problem Based Learning	✓		

Resources

1	PradeepK.Sinha,"DistributedOperatingSystem ConceptsandDesign",PHI,NewDelhi,2007.
2	AndrewS.Tanenbaum,"DistributedOperating Systems"PearsonEducation,2011.
3	Internet soruces

Designers

Professional Experts		**Higher Institution Experts**		**Internal Experts**	
1	Mr. K V Srivallaban, Principal Consultant, Infosys Limited	1	Dr. D I George Amalarthinam,Principal,Associate Professor and Head, Jamal Mohamed College, Trichirappalli, Tamil Nadu	1	Dr. S.R.K.JuhiReashma. Assistant Professor, Department of Computer Science, SRMIST

Code	PCS25C23J	Title	Database Management	Category	C	Core	L	T	P	C
							3	0	2	4

Offering Department	Computer Science	Pre-requisite Courses	NIL	Co-requisite Courses	NIL	Progressive Courses		Data Book / Codes/Standards	

Course Rationale (CR):	The purpose of learning this course is to:	Depth				Attainment			Program Outcomes (PO)												
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12
		Conceive	Design	Implement	Operate	Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity	Communication Skills	Analytical reasoning,	Learning to Learn, Research	Professionalism, Autonomy,	Digital Technology Skills	value incurcation,	Multicultural Inclusivity	Environmental Action,	Community Engagement	Ethical Practices	Entrepreneurial Risk Taking	PSO - 1	Project Management	Life Long Learning
CR-1	Understand the basics of Database Management Systems, their architecture, and languages.																				
CR-2	Gain insight into the database design process using the ER Model and Relational Model.																				
CR-3	Design logical database schemas and map them to implementation-level schemas using database language features.																				
CR-4	Learn to write and execute queries using Structured Query Language (SQL) and PL/SQL.																				
CR-5	Enhance database design by applying normalization techniques and optimize queries for better performance.																				
Course Outcomes (CO)	At the end of this course, learners will be able to:																				
CO-1	Understand the basic concepts of DBMS, including data models, schemas, and architecture.	✓	✓	✓	✓	3	80	75	3	3	3	3	3	2	1	3	3	2	3	2	
CO-2	Implement relational database design using ER diagrams and normalization.	✓	✓	✓	✓	3	75	65	3	3	3	3	3	2	1	3	3	2	3	3	
CO-3	Use SQL to create, manipulate, and query databases.	✓	✓	✓	✓	3	75	65	3	3	3	3	3	2	1	3	3	2	3	3	
CO-4	Manage transactions, concurrency control, and recovery techniques in a database.	✓	✓	✓	✓	3	75	65	3	3	3	3	3	2	1	3	3	2	3	3	
CO-5	Apply advanced concepts like indexing, cloud databases, and Big Data management.	✓	✓	✓	✓	3	80	75	3	3	3	3	3	2	1	3	3	2	3	3	

Title & Session Outcomes	CO-1	CO-2	CO-3	CO-4	CO-5
Duration (60 minutes)	**15**	**15**	**15**	**15**	**15**
SO-1	Overview of Database Systems and DBMS	Relational Model: Tables, Keys, Relationships	Database Design: Conceptual, Logical, and Physical Design	Concept of Transactions in DBMS	NoSQL Databases: Types (Key-Value, Document, Column-Family, Graph)
SO-2	Types of Databases (Relational, Hierarchical, Network, Object-Oriented)	Introduction to SQL: Data Definition Language (DDL), Data Manipulation Language (DML)	Normalization: First Normal Form (1NF), Second Normal Form (2NF), Third Normal Form (3NF)	ACID Properties: Atomicity, Consistency, Isolation, Durability	Introduction to Big Data and Data Warehousing
SO-3	Components of DBMS (DBMS Architecture, Data Models, Database Languages)	Data Retrieval with SELECT, WHERE, ORDER BY, GROUP BY	Boyce-Codd Normal Form (BCNF)	Transaction States and Schedules	OLAP vs. OLTP Systems
SO-4-5	Practice 1: Design an ER diagram for a library management system.	Practice 4: Write SQL queries to retrieve student information based on specific conditions.	Practice 7: Normalize a given Un-Normalize table to 3NF.	Practice 10: Simulate transactions and demonstrate the effect of concurrency control mechanisms.	Practice 13: Implement a NoSQL database using MongoDB to store and retrieve documents.
SO-6	Entity-Relationship (ER) Model: Entities, Attributes, Relationships	QL Joins: Inner, Outer, Self, and Cross Join	Multivalued and Join Dependencies	Concurrency Control: Locks, Timestamp Ordering	Indexing: B-trees, Hashing, and Bitmap Indexes
SO-7	Keys in DBMS: Primary, Foreign, Candidate, Super Keys	Subqueries: Nested Queries and Correlated	Denormalization and its Use Cases	Deadlock Detection and Prevention	Query Optimization Techniques
SO-8	Data Independence: Logical and Physical Data Independence	Constraints in SQL (Primary, Foreign, Unique, Check, Not Null)	Functional Dependencies and their Role in Normalization	Recovery in DBMS: Log-based Recovery, Checkpoint	Cloud Databases and Database as a Service (DBaaS)
SO-9,10	Practice 2: Create a simple database using SQL to store student details and course	Practice 5: Create a database and perform operations like insert, update, and delete	Practice 8: Create a relational schema for a hospital management system and	Practice 11: Implement a simple recovery mechanism using logging for database	Practice 14: SDG Mini Project

	enrollments.	using SQL.	normalize	operations.	
SO-11	Relational Algebra: Operations	Views, Indexes, and Sequences	Design Considerations in Database Development	Write-Ahead Logging Protocol	Ethical and Legal Issues in Database Management
SO-12	Storage Structure and File Organization	Stored Procedures, Functions, and Triggers	Case Study: Database Design for an Online Shopping System	Introduction to Distributed Databases and Concurrency in Distributed Systems	Case Study: Big Data Application in E-Commerce
SO-13	Overview of Data Models and Schemas	Transactions in SQL: COMMIT, ROLLBACK, SAVEPOINT	Tools for Database Design: MySQL Workbench / dbdiagram.io	Isolation Levels in SQL (READ COMMITTED, SERIALIZABLE, etc.)	Ethical Issues: Privacy, Security, and Legal Compliance
SO-14,15	Practice 3: List different types of keys in a table and identify each in a sample dataset.	Practice 6: Write a query using GROUP BY and HAVING clause on employee salary data.	Practice 9: Use a design tool to draw an ER diagram and convert it into a schema	Practice 12: Write SQL queries to demonstrate COMMIT and ROLLBACK behavior.	Practice 15: Use a cloud-based tool to create a small database application.

Evaluation

Level of Thinking	**Continuous Learning Assessment (CLA)** (50 % weightage)								**Final Exam** (50% Weightage)	
	CLA – 1 (10%)		CLA– 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)			
	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Remember										
Understand	20%	20%	15%	15%	15%	15%	20%	20%	20%	20%
Apply										
Analyze	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
Evaluate										
Create	10%	10%	15%	15%	15%	15%	10%	10%	10%	10%
Total	100%		100%		100%		100%		100%	

Strategies

Technology		**Pedagogy / Andragogy**		**Sustainable Development**	
Simulations	✓	Case Studies		No Poverty	
Emulations		Group Discussion		Zero Hunger	
Prototypes		Hands-on Practice	✓	Good Health & Well Being	
Hands-on Practice Tools	✓	Inquiry Learning	✓	Quality Education	✓
Mathematical Computing Tools	✓	Interactive Lecture	✓	Gender Equality	
Field Visit		Leading Question	✓	Clean Water & Sanitation	
		Mind Map	✓	Affordable & Clean Energy	
		Minute Paper			
		Peer Review			
		Problem Based Learning	✓		

Resources

1	Abraham Silberschatz, Henry F. Korth, and S. Sudarshan, "Database System Concepts"
2	RamezElmasri and Shamkant B. Navathe, "Fundamentals of Database Systems"
3	W3Schools SQL Tutorial: https://www.w3schools.com/sql/

Designers

Professional Experts		**Higher Institution Experts**		**Internal Experts**	
1	Mr. K V Srivallaban, Principal Consultant, Infosys Limited	1	Dr. D I George Amalarthinam, Principal, Associate Professor and Head, Jamal Mohamed College, Tiruchirappalli, Tamil Nadu	1	Dr. S. Kanchana Assistant Professor, Department of Computer Science, SRM Institute of Science and Technology, Kattankulathur.

Code	PCS25C24T	Title	Software Engineering	Category	C	Core	L	T	P	C
							4	0	0	4

Offering Department	Computer Science	Pre-requisite Courses	NIL	Co-requisite Courses	NIL	Progressive Courses	NIL	Data Book / Codes/Standards	NIL

Course Rationale (CR):	The purpose of learning this course is to:
CR-1	Familiarize the software lifecycle models and software development process
CR-2	Understand the various techniques for requirements, planning and managing a technology project
CR-3	Examine basic methodologies for software design, development, testing, closure and implementation
CR-4	Understand manage users expectations and the software development team
CR-5	Acquire the latest industry knowledge, tools and comply to the latest global standards for project management

Course Outcomes (CO)	At the end of this course, learners will be able to:	Depth				Attainment			Program Outcomes (PO)												
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12
		Conceive	Design	Implement	Operate	Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity	Communication Skills	Analytical reasoning,	Learning to Learn, Research	Professionalism, Autonomy,	Digital Technology Skills	value incrucation,	Multicultural Inclusivity	Environmental Action,	Community Engagement	Ethical Practices	Entrepreneurial Risk Taking	PSO - 1	Project Management	Life Long Learning
CO-1	Identify the process of life cycle model and process project	✓	✓	✓	✓	3	80	75	3	3	3	3	3	2	1	3	3	2	3	2
CO-2	Analyze and specify software requirements through a productive working Relationship with project stakeholders	✓	✓	✓	✓	3	75	65	3	3	3	3	3	2	1	3	3	2	3	3
CO-3	Design the system based on Functional Oriented and Object Oriented Approach for Software Design.	✓	✓	✓	✓	3	75	65	3	3	3	3	3	2	1	3	3	2	3	3
CO-4	Develop the correct and robust code for the software products	✓	✓	✓	✓	3	75	65	3	3	3	3	3	2	1	3	3	2	3	3
CO-5	Perform by applying the test plan and various testing techniques	✓	✓	✓	✓	3	80	75	3	3	3	3	3	2	1	3	3	2	3	3

Title & Session Outcomes	CO-1	CO-2	CO-3	CO-4	CO-5
Duration (60 minutes)	12	12	12	12	12
SO-1	Introduction to software Engineering Characteristics of software	System Engineering Components of System Engineering	Introduction to Testing Definition , Characteristics of Testing	Project Management Spectrum Four P’s	Risk Management Reactive and Proactive Risk Strategies
SO-2	The Changing Nature of software Legacy Software	Requirements Engineering Tasks Process, Initiating and Eliciting requirements.	Testing Strategies for Conventional Software Unit and Integration Testing	The People and the Product Role of People	Software Risks Risk Identification and Risk Projection
SO-3	A Generic view of process Software Engineering layered Technology	Building the Analysis Model Analysis Modeling Approaches	Validation Testing Verification Vs. Validation	The Process and the Project Role of Process	Risk refinement Risk Mitigation
SO-4	A process framework Capability Maturity Model Integration	Data Modeling Concepts Example Diagram Scenario based Modeling	System Testing on-Functional testing	Metrics for Process and Projects-Estimation	Monitoring and Management Example
SO-5	Software Myths	Class - based Modeling	Debugging Process	LOC, FP, Object Oriented, Estimation	Quality Concepts, Criteria
SO-6	Process Models Water fall , RAD model	USE-CASE Diagram Flow Oriented Modeling	Testing Tactics White Box Testing, Basic-Path Testing	Estimation models The Project Planning Process Resources	SQA Activities Software Reviews and FTR

SO-7	Unified process, History, phases	Data Flow Diagram-Levels of DFD	Cyclomatic complexity	Specialized estimation techniques	Statistical Quality Assurance
SO-8	Iterative Process Models Incremental, Prototype and Spiral	Design Engineering Example	Black Box Testing Equivalence Partitioning	Decomposition Techniques calculations of Decomposition techniques	SCM Repository
SO-9	Prescriptive models Phases of the model An agile view of Process	Software Design process, Quality Guide Line and Attribute.	BVA , Error Guessing Cause-Effect Graphing	Empirical Estimation Models COCOMO model	Business Process Reengineering,
SO -10	Dynamic Systems Development Method (DSDM)	Software Design Concepts Example Diagrams.	Testing for Specialized Environments	Estimation For Object Oriented Project.	Reengineering Diagram and Example. Reverse Engineering.
SO-11	Specialized Process Models and its types	The Design Models.	object-oriented Testing Strategies	Project Scheduling Concepts	Forward Engineering
SO-12	Case study on Best SDLC selection based on the Scenario.	Examples for all designs	Preparation of Test case plan and report	Performing Testing and Debugging for a sample code	Restructuring and its Types

Assessment

Level of Thinking		Continuous Learning Assessment (CLA) (50 % weightage)								Final Exam (50% Weightage)	
		CLA – 1 (10 %)		CLA – 2 (10 %)		CLA – 3 (20 %)		CLA – 4 (10 %)			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
1	Remember										
2	Understand	40%	--	30%	--	30%	--	40%	--	40%	--
3	Apply										
4	Analyze	40%	--	40%	--	40%	--	40%	--	40%	--
5	Evaluate										
6	Create	20%	--	30%	--	30%	--	20%	--	20%	--
	Total	100 %		100 %		100 %		100 %		100 %	

Strategies

Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations	✓	Case Studies	✓	No Poverty	
Emulations		Group Discussion		Zero Hunger	
Prototypes	✓	Hands-on Practice	✓	Good Health & Well Being	
Hands-on Practice Tools	✓	Inquiry Learning	✓	Quality Education	✓
Mathematical Computing Tools	✓	Interactive Lecture	✓	Gender Equality	
Field Visit		Leading Question	✓	Clean Water & Sanitation	
		Mind Map	✓	Affordable & Clean Energy	
		Minute Paper			
		Peer Review	✓		
		Problem Based Learning			

Resources

1	Roger, S. Pressman,Software Engineering: APractitioner Approach, McGraw Hill InternationalEdition, Sixth Edition, New Delhi(2004),
2	RohitKhurana, Software Engineering-Principles and Practices, Vikas PublishingHouse Pvt. Ltd., Second Edition, New Delhi. (2011),
3	https://www.geeksforgeeks.org/software-engineering/

Designers

Professional Experts		Higher Institution Experts		Internal Experts	
1	Mr. K V Srivallaban, Principal Consultant, Infosys Limited	1	Dr. D I George Amalarthinam,Principal,Associate Professor and Head, Jamal Mohamed College, Trichirappalli, Tamil Nadu	1	Dr. D. ELANGOVAN, Assistant Professor, Department of Computer Science FSH, SRM IST,KTR

Course Code	PAI25D21T	Course Name	Information Retrieval	Course Category	D	Discipline Elective Course	L	T	P	C
							4	0	0	4

Course Offering Department	Computer Science w/s in Artificial Intelligence and Machine Learning	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

Course Rationale (CR)	The purpose of taking this course is to:
CR-1	Learn the basic ideas of Information Retrieval, such as indexing, search methods, and evaluation.
CR-2	Understand and use text processing methods like tokenization, stemming, and lemmatization.
CR-3	Analyse different retrieval models (Boolean, Vector Space, Probabilistic) and compare how they work.
CR-4	Evaluate the performance of IR systems and advanced applications like web search and recommender systems.
CR-5	Develop and create simple Information Retrieval systems or search-based applications using modern tools.

Course Outcomes (CO)	At the end of this course, learners will be able to:	Depth				Attainment			Programme Outcomes (PO)									
		1 Conceive	2 Design	3 Implement	4 Operate	1 Bloom's Level of Thinking	2 Expected Proficiency (%)	3 Expected Attainment (%)	1 Problem Solving, Critical Thinking,	2 Communication Skills, Collaborating Skills	3 Independent Thinking, Analytical Reasoning, Learning to Learn ,Research Skills	4 Leadership Qualities, Professionalism,	5 Digital Technology Skills	6 Value Inculcation, Multicultural inclusivity	7 Environmental Action, Community Engagement	8 Entrepreneurial Risk Taking	9 PSO-1	10 PSO-2
CO-1	Explain the components, architecture, and capabilities of Information Retrieval Systems.	✓	–	–	–	2	85	80	2	1	2	–	2	–	–	–	2	–
CO-2	Apply indexing, cataloging, and data structures for efficient text retrieval.	✓	✓	–	–	3	85	80	3	2	2	–	3	–	–	–	2	–
CO-3	Implement automatic indexing, clustering, and language models for document analysis.	–	✓	✓	–	3	85	80	3	–	3	–	3	–	–	–	3	–
CO-4	Use search techniques, similarity measures, and visualization tools for effective retrieval.	–	✓	–	–	4	85	80	2	–	3	–	3	–	–	–	3	–
CO-5	Design IR solutions for text and multimedia content using modern search algorithms.	–	✓	✓	✓	3	85	80	3	3	2	2	3	–	–	2	3	–

Sessions	CO - 1	CO - 2	CO - 3	CO – 4	CO – 5
	Foundations of Information Retrieval and Indexing	Text Processing, Data Structures, and Search Algorithms	Retrieval Models, Ranking, and Clustering	Multimedia Information Retrieval and Visualization	Advanced Search Capabilities and Case Studies
	12	12	12	12	12

SO-1	Definition and Scope of Information Retrieval (IR) Systems Objectives and Functions of IR Systems	History and Evolution of Indexing in IR Objectives of Indexing and Cataloging	Automatic Indexing: Definition and Importance Syntactic Automatic Indexing	User Search Behaviour: Principles Models of Information Searching	Basics of Text Search and Pattern Matching Exact Text Matching Techniques
SO-2	Architecture and Components of IR Systems, Comparison Between IR Systems and Database Systems	Manual Indexing Techniques Automatic Indexing Techniques	Semantic Automatic Indexing, Statistical Automatic Indexing	Search Statements and Binding Rules Query Formulation Strategies	Approximate Matching Techniques KMP Algorithm
SO-3	Role of IR Systems in Knowledge Management Relationship Between IR Systems and Digital Libraries	Indexing Process: Token Extraction Indexing Process: Term Selection	Term Distributions and Probabilistic Models NLP Techniques for IR	Similarity Measures: Cosine Similarity Similarity Measures: Jaccard, Dice, Euclidean	Boyer–Moore Algorithm Rabin–Karp Algorithm
SO-4	Information Retrieval in Data Warehouses IR System Capabilities Overview	Index Weighting Techniques Information Extraction Techniques	POS Tagging for Indexing Concept Indexing and Semantic Networks	Ranking Techniques in IR Probabilistic Scoring Methods	Hardware Accelerators for Text Search (FPGAs, ASICs) Definition and Scope of Multimedia Retrieval
SO-5	Search Capabilities: Basic Search Search Capabilities: Advanced Search	Named Entity Recognition (NER) Introduction to Data Structures for IR	WordNet and Ontology-Based Indexing Hypertext Link Analysis Methods	Relevance Feedback Mechanisms Pseudo-Relevance Feedback	Challenges in Multimedia IR Speech Indexing: Spoken Language Retrieval
SO-6	Search Capabilities: Semantic Search Browse Capabilities: Navigation-Based Browsing	Stemming Algorithms: Porter Stemmer Stemming Algorithms: Lovins Stemmer	Document Clustering: Definition Types of Document Clustering	Selective Dissemination of Information (SDI) Weighted Boolean Retrieval	Music and Non-Speech Audio Retrieval Graph Retrieval and Structural Pattern Matching
SO-7	Browse Capabilities: Metadata-Based Browsing Query Languages for IR	HMM-Based Stemming and Linguistic Approaches Inverted File Structure: Construction	Thesaurus Generation & Semantic Grouping K-Means Clustering Algorithm	Web Search Principles Search Engine Architecture and Algorithms	Image Retrieval: CBIR Concepts Feature Extraction: SIFT
SO-8	Query Formulation Techniques User Needs and Information-Seeking Behaviour	Inverted File Structure: Maintenance N-Gram Data Structures for Text Retrieval	Hierarchical Clustering Algorithms Term Clustering and Co-occurrence Models	Searching in Hypertext Systems Introduction to Information Visualization	Feature Extraction: SURF Feature Extraction: Color Histograms
SO-9	User-Centric Design in IR Systems Miscellaneous IR Capabilities: Filtering, Alerting, User Profiling	PAT Trees and Tries for Efficient Pattern Matching Signature Files, XML Structures & Hidden Markov Models	Cluster Evaluation Measures Hierarchical Cluster Structures for Browsing	Human Cognition for Visual Interpretation Advanced Visualization Tools: Graphs, Heatmaps, Timelines	Video Retrieval Techniques Applications of Multimedia IR in Healthcare, Surveillance & Media
SO-10	Discuss Case Study on Digital Library Search System for a University	Discuss Case Study on Library Catalog Modernization Using MARC and Inverted Indexing	Discuss Case Study on News Organization Using Automatic Indexing & NLP for Topic Classification	Discuss Case Study on Government Open Data Portal Using Visual Search Dashboards	Discuss Case Study on Legal Document Search System Using Advanced Text Search Algorithms
SO-11	Discuss Case Study on E-Commerce Product Search Engine Enhancement	Discuss case study on Corporate Document Management System Using Hierarchical Indexing	Discuss case study on E-Learning Platform Using NLP and Document Clustering for Personalized Learning	Discuss case study on Academic Research Portal Using Visual Citation Networks & Advanced Search	Discuss case study on: Healthcare Multimedia Retrieval System for Radiology & Clinical Text
SO-12	Discuss case study on Medical Research Retrieval System for Hospitals	Discuss case study on Medical Image Repository with Advanced Indexing and Data Structures	Discuss case study on Healthcare Research Repository Using NLP for Automatic Indexing & Cluster-Based Retrieval	Discuss case study on E-Commerce Platform Using Visual Product Browsing & Intelligent Search	Discuss case study on Video Streaming Platform Using Multimedia IR & Subtitle Text Search

Learning Resources	1. Manning, C. D., Raghavan, P., & Schütze, H. (2020). Introduction to Information Retrieval (2nd Edition). Cambridge University Press. 2. Croft, W. B., Metzler, D., & Strohman, T. (2015). Search Engines: Information Retrieval in Practice (1st Edition). Pearson Education.	**3.Baeza-Yates, R., & Ribeiro-Neto, B. (2011). Modern Information Retrieval (2nd Edition). Addison-Wesley.** **4. Jurafsky, D., & Martin, J. H. (2023). Speech and Language Processing (3rd Edition). Pearson.**

Assessment							Strategies					
Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (50% weightage)				Final Assessment (50 % weightage)	Technology		Pedagogy / Andragogy		Sustainable Development	
		CLA – 1	CLA – 2	CLA – 3	CLA – 4 *		Simulations	✓	Clarification/Pauses	✓	Good Health & Well Being	✓
		(10%)	(10%)	(20%)	(10%)		Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
		Theory (%)	Theory (%)	Theory (%)	Theory (%)	Theory (%)	Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
1	Remember	15	15	10	10	15			Debate	✓		
2	Understand	15	15	10	10	15			Interactive Lecture	✓		
3	Apply	20	25	25	25	25			Brainstorming	✓		
4	Analyze	20	25	25	25	25						
5	Evaluate	15	10	15	15	10						
6	Create	15	10	15	15	10						
Total (%)		100	100	100	100	100						

* The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Mr. K V Srivallaban, Principal Consultant, Infosys Limited	1	Dr. D I George Amalarthinam, Principal, Associate Professor and Head, Jamal Mohamed College, Tiruchirappalli, Tamil Nadu	1	Dr. K. Kalaiselvi, Professor, Department of Computer Science w/s in Artificial Intelligence and Machine Learning, FSH, FSH,. SRMIST Ramapuram

Code	PCS25D22J	Title	Machine Learning	Category	D	Discipline Elective	L	T	P	C
							3	0	2	4

Offering Department	Computer Science	Pre-requisite Courses		Co-requisite Courses		Progressive Courses		Data Book / Codes/Standards	

Course Rationale (CR):	The purpose of learning this course is to:
CR-1	Gain knowledge in the areas of Machine Learning.
CR-2	Understand algorithms for analyzing data
CR-3	Learn advanced algorithms for analytics
CR-4	Discover patterns in the user data
CR-5	To make predictions and intricate patterns

Course Outcomes (CO)	At the end of this course, learners will be able to:	Depth				Attainment			Program Outcomes (PO)												
		Conceive	Design	Implement	Operate	Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity	Problem Analysis	Design &Development	Professionalism,	Digital Technology Skills	value incucation, Multicultural Inclusivity	Environment &Sustainability	Ethics	Entrepreneurial Risk Taking	PSO - 1	Project Mgt. & Finance	Life Long Learning	
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	
CO-1	Understand Machine Learning and concept learning	✓	✓	✓	✓	3	80	75	3	3	3	3	3	2	1	3	3	2	3	2	
CO-2	Develop a Learning System	✓	✓	✓	✓	3	75	65	3	3	3	3	3	2	1	3	3	2	3	3	
CO-3	Understand and Apply Machine Learning inreal time problem	✓	✓	✓	✓	3	75	65	3	3	3	3	3	2	1	3	3	2	3	3	
CO-4	Learn the basics of data collection	✓	✓	✓	✓	3	75	65	3	3	3	3	3	2	1	3	3	2	3	3	
CO-5	Knowledge about analysis and inference	✓	✓	✓	✓	3	80	75	3	3	3	3	3	2	1	3	3	2	3	3	

Title & Session Outcomes	CO-1	CO-2	CO-3	CO-4	CO-5
Duration (60 minutes)	15	15	15	15	15
SO-1	Introduction to Machine Learning, Types of learning	Support vector machine, K-Nearest Neighbors H	Euclidean Distance, Euclidean Distance Manhattan Distance	Role of Distance Measures, Information Retrieval and Extraction	Implementing any one classification algorithm
SO-2	Supervised learning, Unsupervised learning	Classification accuracy, Introduction to Decision trees	Minkowski Distance, Similarity Functions,	Categorization, Clustering, Border increment text mining algorithm	Model Selection, Tree model
SO-3	Issues in Machine Learning, Perspectives	Gini Impurity, Information Gain, Chi-square	Error measures, K-Means algorithm	compare the various distance calculation methods,	Boosting ,Tensorflow, keras
SO-4-5	Practice 1:Concept Learning task	Practice 4:Extract the data from database	Practice7:Implement k-nearest neighbours classification	Practice 10: Learn Waikato Environment for Knowledge Analysis tool to pre-process the data	Practice 13: POS Tagging, Text Cleaning Script
SO-6	Concept Learning as a search,	Classification by decision tree induction,	Fuzzy C Means algorithm,	Implement K-Means Algorithm ,Hierarchial Clustering,	Advanced Regression,
SO-7	Issues regarding classification	Tree pruning methods	Expectation approach	Extended decision trees	Timeseries Processing,
SO-8	Issues regarding Prediction, Various types of classifications,	Cost complexity pruning , Implementation of learning models for real time problem	Maximization approach, Probabilistic clustering algorithms	Linear Regression, Logistic Regression	Transformer Networks, Semantic Segmentation
SO-9,10	Practice 2:Design a Learning System	Practice 5:Implement Bayesian classification	Practice 8:Implement decision tree algorithm	Practice 11:Foundations of NLP	Practice 14: Text Classification (e.g., Spam vs Ham)
SO-11	Bayesian Classification C, Classification by back propagation, :	Implement k-nearest neighbours classification, Issues in decision trees	Introduction to text analytics, Chi square pruning	Naive Bayes, Implement various operations of text analytics	Generative Models,Model Interpretation

SO-12	Reinforcement Learning, Classification based on concepts from association rule mining	Extended Decision Trees, Fuzzy decision trees	AI in text mining, Pre-processing techniques	Implement NLP	Introduction to Convolutional Neural Networks
SO-13	Goals and applications of machine learning, Logistic Regression	Hierarchical clustering algorithm, Mixture of Gaussian algorithm	Feature selection using dimensionality reduction, Foundations of NLP	Explore NLP, Over fitting, validation dataset	Benefits of CNN, Recurrent Neural Networks, Drawbacks of RNN
SO-14,15	Practice 3:Load and explore a dataset	Practice 6: Perform Logistic Regression on a binary classification problem	Practice 9: Build a Decision Tree classifier for a dataset and visualize it	Practice 12:Tokenization and Stopword Removal	Practice 15: SDG Mini Project

Evaluation

Level of Thinking	**Continuous Learning Assessment (CLA)** (50 % weightage)								**Final Exam** (50% Weightage)	
	CLA – 1 (10%)		CLA– 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)			
	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Remember										
Understand	20%	20%	15%	15%	15%	15%	20%	20%	20%	20%
Apply										
Analyze	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
Evaluate										
Create	10%	10%	15%	15%	15%	15%	10%	10%	10%	10%
Total	100%		100%		100%		100%		100%	

Strategies					
Technology		**Pedagogy / Andragogy**		**Sustainable Development**	
Simulations	✓	Case Studies		No Poverty	
Emulations		Group Discussion		Zero Hunger	
Prototypes		Hands-on Practice	✓	Good Health & Well Being	
Hands-on Practice Tools	✓	Inquiry Learning	✓	Quality Education	✓
Mathematical Computing Tools	✓	Interactive Lecture	✓	Gender Equality	
Field Visit		Leading Question	✓	Clean Water & Sanitation	
		Mind Map	✓	Affordable & Clean Energy	
		Minute Paper			
		Peer Review			
		Problem Based Learning	✓		

Resources

1	EthemAlpaydin, Introduction to Machine Learning, Third edition, The MIT Press Cambridge.
2	Tom M Mitchell, Machine Learning, McGraw Hill Education
3	Machine Learning Mastery – https://machinelearningmastery.com

Designers

Professional Experts		**Higher Institution Experts**		**Internal Experts**	
1	Mr. K V Srivallaban, Principal Consultant, Infosys Limited	1	Dr. D I George Amalarthinam,Principal,Associate Professor and Head, Jamal Mohamed College, Trichirappalli, Tamil Nadu	1	DR. SRK. JuhiReashma, Assistant Professor, SRMIST

Course Code	PAI25D23T	Course Name	AI Ethics and Governance	Course Category	D	Discipline Elective Course	L	T	P	C
							4	0	0	4

Course Offering Department	AI & ML	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

CLR	The purpose of learning this course is to:	Depth				Attainment			Programme Learning Outcomes (PLO)										
CLR-1:	Understand ethical concepts in AI – including fairness, accountability, transparency, and explainability.	1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10	
CLR-2:	Analyze the societal impacts of AI – such as employment, human rights, inequality, and privacy.	Conceive	Design	Implement	Operate	Bloom's Level of	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity	Communication Skills, Collaborating Skills	Independent Thinking, Analytical Reasoning	Leadership Qualities, Professionalism,	Digital Technology Skills	Value Inculcation, Multicultural	Environmental Action, Community Engagement	Entrepreneurial Risk	PSO-1	PSO-2	
CLR-3:	Evaluate governance frameworks and policies – national, international, and organizational mechanisms to ensure responsible AI deployment.																		
CLR-4:	Develop critical thinking skills – to assess risks, ethical dilemmas, and biases in AI applications.																		
CLR-5:	Apply ethical reasoning to real-world scenarios – fostering decision-making that prioritizes human welfare, societal benefit, and compliance with legal and regulatory standards.																		
CLO	At the end of this course, learners will be able to:																		
CLO-1 :	Understand the concepts of machine learning	□	□	-	-	2	85	75	1	2	3	2	2	1	3	2	3	2	
CLO-2 :	Learn and understand machine tools and libraries of machine learning	□	□	□	-	2	85	75	1	1	2	1	2	1	3	2	3	2	
CLO-3 :	Learn and understand the linear learning models and classification in machine learning	□	□	□	□	3	85	75	1	1	1	1	2	1	3	2	1	2	
CLO-4 :	Understand the clustering techniques and their utilization in machine learning	□	□	□	□	3	85	75	1	1	2	1	3	1	3	2	3	1	
CLO-5 :	Study the tree based machine learning techniques and to appreciate their capability	□	□	□	□	3	85	75	1	1	2	1	1	1	3	2	3	1	

Sessions		CLO 1	CLO 2	CLO 3	CLO 4	CLO 5
		12	12	12	12	12
S-1	SLO-1	Introduction to Artificial Intelligence – Definition, types, and applications	Introduction to Ethical AI Principles – Overview of FATE (Fairness, Accountability, Transparency, Explainability)	Introduction to AI Governance – Definition, scope, and importance	Introduction to AI and Society – Overview of societal impacts of AI	Introduction to Emerging AI Trends – Overview of latest AI technologies and innovations
S-2	SLO-2	**What is AI Ethics?** – Concept, scope, and importance	Fairness in AI – Understanding bias and discrimination	Objectives of AI Governance – Ensuring safe, ethical, and accountable AI	AI and Human Rights – How AI can affect fundamental rights	Generative AI – Deepfakes, AI-generated content, and ethical concerns
S-3	SLO-3	Historical Evolution of AI – Key milestones and lessons	Techniques for Mitigating Bias – Pre-processing, in-processing, post-processing methods	National AI Policies – Overview of policies like the US AI Bill of Rights	Employment and Workforce Impact – Job displacement, automation, and inequality	AI and Misinformation – Detection, spread, and societal impact
S-4	SLO-4	Ethical Dilemmas in AI – Bias, discrimination, privacy issues	Accountability in AI Systems – Responsibility of developers, organizations, and policymakers	International AI Policies – EU AI Act, UNESCO AI Ethics Guidelines	AI in Decision-Making – Impacts on governance, justice, and business decisions	AI in Surveillance and Security – Ethical dilemmas in monitoring and defence
S-5	SLO-5	Fairness in AI – Equal treatment and eliminating bias	Transparency in AI – Explainable AI (XAI) and interpretability techniques	Corporate AI Governance Models – Ethics boards, AI oversight committees	Autonomous Systems and Ethics – Self-driving cars, drones, and robots	AI in Healthcare – Emerging applications and associated ethical challenges
S-6	SLO-6	Accountability in AI – Responsibility of developers and organizations	Explainability in AI Models – Understanding model decisions and outputs	Regulatory Compliance in AI – Legal frameworks, standards, and certifications	AI in Healthcare – Ethical challenges, patient safety, and privacy	AI in Finance – Automation, algorithmic trading, and ethical considerations

S-7	SLO-7	Transparency in AI – Explainable AI and decision-making clarity	Privacy in AI – Data protection, anonymization, and ethical data usage	**Algorithmic Audits** – Purpose, processes, and methodologies	AI in Finance – Bias in lending, credit scoring, and financial decision-making	AI in Criminal Justice – Predictive policing, sentencing, and fairness issues
S-8	SLO-8	Privacy and Data Protection – Personal data, GDPR, consent	Human-centered AI Design – Designing AI systems with human well-being in mind	Risk Assessment in AI Systems – Identifying and mitigating risks	Algorithmic Accountability – Responsibility of AI systems and developers	Bias and Discrimination in Emerging AI – New risks with advanced models
S-9	SLO-9	AI in Society – Social, economic, and cultural impacts	AI for Social Good – Examples in healthcare, education, and environment	Ethical Guidelines for AI Deployment – Principles for responsible AI adoption	Risk Management in AI – Identifying, assessing, and mitigating AI risks	Cross-Cultural Perspectives on AI Ethics – How ethics vary across countries and societies
S-10	SLO-10	Ethical Failures in AI – Real-world examples (facial recognition, recruitment tools)	Ethical Trade-offs in AI – Balancing accuracy, fairness, privacy, and transparency	**Governance Failures in AI** – Real-world examples and lessons	Liability in AI Systems – Legal responsibility for AI errors and failures	Regulatory Challenges for Emerging AI – Governance gaps and policy issues
S11	SLO-11	Frameworks for Ethical Decision-Making – Principles, codes of conduct, FATE framework	Tools for Ethical AI Evaluation – IBM AI Fairness 360, Google What-If Tool, auditing frameworks	Practices in AI Governance – Policies, monitoring, and accountability measures	Real-world examples of ethical breaches and societal impact	Ethical Guidelines for New AI Technologies – Applying FATE principles to modern AI systems
S12	SLO-12	Key learnings and discussion	Applying principles to real-world AI scenarios	Monitoring and Evaluation of AI Systems	Evaluating ethical dilemmas and accountability measures	Debates on emerging AI risks and ethical solutions

Assessment

Bloom's Level of Thinking	**Continuous Learning Assessment (CLA) (50% weightage)**				**Final Assessment (50 % weightage)**
	CLA – 1	**CLA – 2**	**CLA – 3**	**CLA – 4 ***	
	(10%)	**(10%)**	**(20%)**	**(10%)**	
	Theory (%)	**Theory (%)**	**Theory (%)**	**Theory (%)**	**Theory (%)**
Remember	15	15	10	10	15
Understand	15	15	10	10	15
Apply	20	25	25	25	25
Analyze	20	25	25	25	25
Evaluate	15	10	15	15	10
Create	15	10	15	15	10
Total (%)	100	100	100	100	100

Strategies

Technology		**Pedagogy / Andragogy**		**Sustainable Development**	
Simulations	✓	Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

Designers

Professional Experts		Higher Institution Experts		Internal Experts	
1	Mr. K V Srivallaban, Principal Consultant, Infosys Limited	1	Dr. D I George Amalarthinam,Principal,Associate Professor and Head, Jamal Mohamed College, Trichirappalli, Tamil Nadu	1	MS S SAMUNDEESWARI, Asst Prof, Department of Computer Science w/s in Artificial Intelligence and Machine Learning, FSH, SRM IST, RMP

Code	PCS25S21J	Title	Web Development using AngularJS and Mongo	Category	S	Skill Enhancement	L	T	P	C
							3	0	2	4

Offering Department	Computer Science	Pre-requisite Courses	HTMLBASICS	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

Course Rationale (CR):	The purpose of learning this course is to:
CR-1	Create single page applications and understand the functional behavior of dynamic webpages
CR-2	Understand and presentation components that look like HTML elements
CR-3	Build corner to corner interactive components in dynamic web pages
CR-4	Understand MVC framework/architecture of web programming/client-server architecture
CR-5	Build synchronized objects across view and model components

Course Outcomes (CO)	At the end of this course, learners will be able to:	Depth				Attainment			Program Outcomes (PO)											
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12
		Conceive	Design	Implement	Operate	Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment &Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning
CO-1	Make use of expressions, do data binding with external components	✓	✓	✓	✓	3	80	75	3	3	3	3	3	2	1	3	3	2	3	2
CO-2	Distinguish the role of MVC in creating dynamic web applications	✓	✓	✓	✓	3	75	65	3	3	3	3	3	2	1	3	3	2	3	3
CO-3	Understand the role of reusability and data encapsulation in the form of objects	✓	✓	✓	✓	3	75	65	3	3	3	3	3	2	1	3	3	2	3	3
CO-4	Distinguish RDBMS and schema design of MongoDB	✓	✓	✓	✓	3	75	65	3	3	3	3	3	2	1	3	3	2	3	3
CO-5	Perform query operations using MongoDB	✓	✓	✓	✓	3	80	75	3	3	3	3	3	2	1	3	3	2	3	3

Title & Session Outcomes	CO-1	CO-2	CO-3	CO-4	CO-5
Duration (60minutes)	15	15	15	15	15
SO-1	Introduction of JavaScript, Need of Scripting Language	Looping Statements	AngularJS Objects	AngularJS Scope, Perform Query Operation for the following situations i) Query on nested documents ii)Query an array	Document with different types of values ii) Document with Documents CRUD operation: Insert Operation I) insert One() and ii) insertMany() with examples
SO-2	Data Types, Primitive Types	Function Definition, Function Parameters	Arrays, Difference between client and server-side scripting Script tag in HTML	ii)Query an array of nested documents iv) Geospatial Queries Query Operation Examples	i)Document with Scalar Values, ii) Document with Documents as values iii) Document with Array as values
SO-3	JavaScript statements, Comments and Variables.	Function Return Types	Role of a Controller, Controllers & Modules	Using filters ,iii) find OneAndDelete() Delete operation Examples	Working with CURD operations
SO-4-5	Practice 1: Java Script Input and Output	Practice 4: Looping Statements	Practice 7: Modules In Files	Practice 10: Sorting an Array based on User input	Practice 13: Update Operation: updateOne(),updateMany() Aggregation in MongoDB: i) aggregate() method
SO-6	JavaScript Operators -	Angular Environment setup–windows	Controllers in Files Using controllers	Custom Filters	replaceOne(),find And Modify() Update operation: Examples

SO-7	Logical	AngularJS Framework	AngularJS Controller	Introduction to entities of MongoDB : i) Databases ii) Collections	Monitoring Deployment using MongoDB: i) mongo stat,
SO-8	Bitwise Arithmetic	Features of Angular JS, Model-View-Controller	Controller Methods	Database: i) create Database() method with example	ii)server Status iii) dbStats
SO-9,10	Practice 2: Java Script Operators and Conditions	Practice 5: Functions	Practice 8: Data binding: controllers and External files	Practice 11: creating a database in MongoDB	Practice 14: SDG Mini Project
SO-11	Array Properties: index, input length	AngularJS directives	Nested Controllers	MongoDB Operators	Introduction to MongoDB Shell
SO-12	Array Basic Methods	AngularJS Strings Handling	Using Filters in Controllers: Uppercase, Lowercase, currency	Aggregation Commands	Shell Collection Methods
SO-13	Array Functional Methods, Multidimensional arrays	Additional Built-in Filters	Filter, order by filter	Advanced Pipeline operators	CRUD Operations in Shell
SO-14,15	Practice 3: Java Script Array methods	Practice 6: String Filters	Practice 9: Angular JS Filters	Practice 12: Aggregation commands	Practice 15: Security configuration

Evaluation

Level of Thinking	**Continuous Learning Assessment (CLA)** (50 % weightage)								**Final Exam** (50% Weightage)	
	CLA – 1 (10%)		CLA– 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)			
	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Remember										
Understand	20%	20%	15%	15%	15%	15%	20%	20%	20%	20%
Apply										
Analyze	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
Evaluate										
Create	10%	10%	15%	15%	15%	15%	10%	10%	10%	10%
Total	100%		100%		100%		100%		100%	

Strategies					
Technology		**Pedagogy / Andragogy**		**Sustainable Development**	
Simulations	✓	Case Studies		No Poverty	
Emulations		Group Discussion		Zero Hunger	
Prototypes		Hands-on Practice	✓	Good Health & Well Being	
Hands-on Practice Tools	✓	Inquiry Learning	✓	Quality Education	✓
Mathematical Computing Tools	✓	Interactive Lecture	✓	Gender Equality	
Field Visit		Leading Question	✓	Clean Water & Sanitation	
		Mind Map	✓	Affordable & Clean Energy	
		Minute Paper			
		Peer Review			
		Problem Based Learning	✓		

Resources

1	1. KenWilliamson(2015),“LearningAngularJS:AGuidetoAngularJSDevelopment”, O’REILLY
2	2..URL:https://docs.AngularJS.org/api
3	3. URL:https://docs.mongodb.com/manual/tutorial/

Designers

Professional Experts		**Higher Institution Experts**		**Internal Experts**	
1	Mr. K V Srivallaban, Principal Consultant, Infosys Limited	1	Dr. D I George Amalarthinam,Principal,Associate Professor and Head, Jamal Mohamed College, Trichirappalli, Tamil Nadu	1	Dr.T.NathiyaAssistant Professor,Department of Computer Science

Code	PCD25AE2T	Title	Soft Skills and Verbal Mastery	Category	AE	Ability Enhancement	L	T	P	C
							2	0	0	2

Offering Department	Career Guidance	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	

Rationale (CR)	The purpose of learning this course is to:	Depth				Attainment			Program Outcomes (PO)											
CR-1	Help individuals develop key skills for personal and professional growth	1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12
CR-2	Prepares individuals to navigate daily challenges with confidence, professionalism, and a positive mindset																			
CR-3	Create a strong resume, participate in group discussions, and perform well in interviews																			
CR-4	Enhance vocabulary and verbal reasoning skills																			
CR-5	Develop the skills needed for effective communication and critical thinking in both written and spoken language																			

Outcomes (CO)	At the end of this course, learners will be able to:	Conceive	Design	Implement	Operate	Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Disciplinary Knowledge	Problem Solving	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethical practices & Social Responsibility	Individual & Team Work	Communication	Project Management & Finance	Life Long Learning
CO-1	Gain a deeper understanding of self, including emotional intelligence and career aspirations	✓	✓	✓	✓	3	85	75	1	-	3	-	3	3	-	-	3	3	2	3
CO-2	Apply effective presentation skills for clear, engaging communication	✓	✓	✓	✓	6	85	75	1	3	3	-	3	2	-	-	3	3	2	3
CO-3	Participate confidently and effectively in group discussions and interviews	✓	✓	✓	✓	3	85	75	1	3	1	-	3	2	-	-	3	3	2	3
CO-4	Enhance their ability to understand and use language effectively in different contexts	✓	✓	✓	✓	2	85	75	1	-	-	-	1	-	-	-	-	3	2	2
CO-5	Improve language comprehension and accuracy	✓	✓	✓	✓	5	85	75	1	-	-	-	1	-	-	-	-	3	2	2

Title & Session Outcomes	Personal Development	Mastering Workspace Dynamics	Career Essentials	Verbal Ability	Verbal Reasoning and Comprehension
Duration (hour)	6	6	6	6	6
SO-1	Self-analysis through SWOT, The JohariWindow	Personal, Professional and Social Etiquette	Resume Preparation and Activity	Synonyms and Antonyms	Statement and Assumption
SO-2	Goal Setting Importance, Goal Setting based on the Principle of SMART	Professional Communication - Presentation Skills	E-mail Drafting and Practice	One Word Substitution	Paragraph Summary
SO-3	Emotional Intelligence (Identifying, Managing and Understanding Emotions)	Presentation for Internal and External Communication - online & offline	Techniques to Follow in Group Discussion	Word Analogy	Idioms and Phrases

		Meetings			
SO- 4	Process of Career Exploration	Time Management and Planning Tools	Mock Group Discussion	Verbal Classification	Cloze Test
SO-5	STAR Technique (situation, task, approach and response) for Facing an Interview	Decision Making Skills	Interview Techniques	Spotting Errors	Theme Detection
SO-6	Professional Attitude – Entrepreneurial, Rational, Optimistic Attitude	Teamwork in Workspace - Resilience and Stress Management	Mock Personal Interview	Sentence Correction	Reading Comprehension

Assessment

Level of Thinking		Continuous Learning Assessment (CLA) (100 % weightage)							
		CLA – 1 (20 %)		CLA – 2 (20 %)		CLA – 3 (30 %)		CLA – 4 (30%)	
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
7	Remember	25%	-	20%	-	30%	-	50%	-
8	Understand								
9	Apply	50%	-	50%	-	40%	-	25%	-
10	Analyze								
11	Evaluate	25%	-	30%	-	30%	-	25%	-
12	Create								
Total		100 %		100 %		100 %		100 %	

Strategies

Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations	✓	Case Studies	✓	No Poverty	
Emulations	✓	Group Discussion	✓	Zero Hunger	
Prototypes		Hands-on Practice	✓	Good Health & Well Being	
Hands-on Practice Tools	✓	Inquiry Learning	✓	Quality Education	✓
Mathematical Computing Tools		Interactive Lecture	✓	Gender Equality	
Field Visit		Leading Question	✓	Clean Water & Sanitation	
		Mind Map	✓	Affordable & Clean Energy	
		Minute Paper			
		Peer Review	✓		
		Problem Based Learning	✓		

Resources

5	"The Johari Window: A Model for Self-awareness and Personal Growth" by Joseph Luft& Harrington Ingham	6	Campus Recruitment complete Reference , Praxis Groups
7	"The 7 Habits of Highly Effective People" by Stephen R. Covey	8	A Modern Approach to Verbal and Non Verbal Reasoning – Dr A S Agarwal
9	"SMART Goals: How to Set and Achieve Your Personal and Professional Goals" by S.J. Scott	10	Verbal Ability & Reading Comprehension for CAT - Arun Sharma

Designers

Professional Experts		Higher Institution Experts		Internal Experts	
1	Mr. VaradhaRajan M (External Expert), Assistant Manager – Human Resources, Justdial Limited, Chennai – 600015 varadha1723@gmail.com	1	Dr. Premavathy M, Associate Professor , Department of English Center for Distance and Online Education, Bharathidasan University, Tiruchirappalli – 620024 drmpremavathy@bdu.ac.in	1	Dr. Deepalakshmi S, HoD, Department of Career Guidance Cell, FSH, SRMIST
				2	Dr. MuthuDeepa M, Assistant Professor, Department of Career Guidance Cell, FSH, SRMIST
				3	Dr. Sam Israel S, Assistant Professor, Department of Career Guidance Cell, FSH, SRMIST
				4	DrElamathiyan E, Assistant Professor, Department of Career Guidance Cell, FSH, SRMIST

SEMESTER - III

Code	PFS25C31J	Title	DevOps	Category	C	Core	L	T	P	C
							3	0	2	4

Offering Department	Computer Science	Pre-requisite Courses	NIL	Co-requisite Courses	NIL	Progressive Courses	NIL	Data Book / Codes/Standards	NIL

Rationale (CR)	The purpose of learning this course is to:	Depth			
		1	2	3	4
CR-1	The course provides hands-on experience in DevOps methodologies and cloud platforms.				
CR-2	The syllabus covers build automation tools (Maven & Gradle) to automate compilation, testing, and artifact creation, reducing manual effort and human errors in software development.				
CR-3	Students learn Jenkins for CI/CD, enabling faster software releases, automated testing, and better deployment strategies.				
CR-4	By mastering Ansible, students can automate IT infrastructure management, making deployment, scaling, and configuration more efficient and error- free.				
CR-5	Using Azure DevOps, students learn to create CI/CD pipelines, automating the development lifecycle in a cloud-based environment.				

Outcomes (CO)	At the end of this course, learners will be able to:	Conceive	Design	Implement	Operate
CO-1	Understand the fundamentals of DevOps, version control systems, and cloud computing platforms.	✓	-	-	-
CO-2	Implement and manage build automation using Maven and Gradle.	✓	✓	✓	-
CO-3	Set up and configure Jenkins for continuous integration and automated builds.	✓	✓	✓	-
CO-4	Apply Ansible for configuration management and infrastructure automation.	✓	✓	✓	✓
CO-5	Build, deploy, and manage DevOps pipelines using Azure DevOps.	✓	✓	✓	✓

Attainment			Program Outcomes (PO)											
1	2	3	1	2	3	4	5	6	7	8	9	10	11	12
			Disciplinary Knowledge	Problem Solving	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethical Practices & Social	Individual & Team Work	Communication	Project Management & Finance	Life Long Learning
3	80	75	3	2	2	3	3	3	2	1	3	3	2	3
3	80	75	3	2	2	3	3	3	2	1	3	3	2	3
3	80	75	3	2	2	3	3	3	2	1	3	3	2	3
3	80	75	3	2	2	3	3	3	2	1	3	3	2	3
3	80	75	3	2	3	3	3	3	2	1	3	3	2	3

Title & Session Outcomes	CO-1	CO-2	CO-3	CO-4	CO-5
Duration (60 minutes)	15	15	15	15	15
SO-1	Introduction to DevOps, DevOps Essentials and Cloud Platforms	Compile and Build Using Maven & Gradle.	Continuous Integration Using Jenkins	Configuration Management Using Ansible	Building DevOps Pipelines Using Azure
SO-2	Introduction to DevOps and its need.DevOps lifecycle and core principles	Build Automation Tools. Introduction to build automation and dependency management	Automating CI/CD with Jenkins. Introduction to Continuous Integration (CI) and Continuous Deployment (CD)	Infrastructure Automation with Ansible. Introduction to Configuration Management in DevOps.	Azure DevOps and CI/CD Pipelines. Introduction to DevOps Pipelines and Automation
SO-3	Benefits of DevOps in software development.DevOps tools and technologies overview	Introduction to Apache Maven and Gradle, Installing and setting up Maven.	Overview of Jenkins and its importance in DevOps	What is Ansible? Why use Ansible? Installing and setting up Ansible.	Creating a GitHub account and repository setup Introduction to Azure DevOps and its components
SO 4-5	Practice 1: Set up Git and GitHub, create a repository, commit and push code.	Practice 4: Install Maven, create a sample Java project, configure POM.xml, and build the project.	Practice 7: Install Jenkins, create and configure a simple job to execute a shell script.	Practice 10:: Install Ansible, set up an inventory file, and execute basic ad-hoc commands.	Practice 13: Create an Azure DevOps organization, set up a project, and connect it to a GitHub repository.
SO-6	Introduction to AWS cloud platform Introduction to Google Cloud Platform (GCP).	Understanding POM.xml (Project Object Model). Maven build lifecycle overview.	Installing and configuring Jenkins on different platforms. Jenkins architecture and working principles.	Understanding Ansible master-slave architecture. Basics of YAML for writing Ansible playbooks.	Setting up an Azure Organization and project Creating a new DevOps pipeline in Azure

SO-7	Introduction to Microsoft Azure	Build phases: compile, test, package, install, deploy. Maven profiles and configurations	Creating a simple Jenkins job, Configuring and triggering builds in Jenkins.	Ansible modules and their applications. Ansible inventory management,	Understanding pipeline YAML structure Writing and modifying an azure-pipelines.yaml file
SO-8	Comparing AWS, GCP, and Azure for DevOps	Managing dependencies with Maven repositories (local, central, remote). Maven plugins and their applications.	Understanding Jenkins plugins and their importance, Installing and managing Jenkins plugins.	Writing and executing Ansible playbooks, Using Ansible roles for structured automation	Building and deploying sample code using Azure pipelines. Configuring triggers for CI/CD workflows.
SO 9-10	Practice 2: Install and configure AWS CLI, create an S3 bucket, and upload a file.	Practice 5: Install Gradle, create a basic build script,	Practice 8: Configure Jenkins with GitHub	Practice 11: Write an Ansible playbook to install and configure Apache Web Server on a remote machine.	Practice 14: SDG Mini Project
SO-11	Basics of version control systems (VCS)	Creating and building artifacts using Maven.	Commonly used Jenkins plugins (Git, HTML Publisher, Copy Artifact), Configuring Jenkins with Git and Maven.	Running ad-hoc Ansible commands	Managing pipeline artifacts and build outputs.
SO-12	Introduction to Git and GitHub Git operations: commit, push, pull, merge	Introduction to Gradle and installation setup .	Setting up Jenkins workspace and pipeline jobs,	Debugging and troubleshooting Ansible configurations,	Security and access management in Azure DevOps.
SO-13	Collaborative development with GitHub	Understanding Gradle build scripts	Monitoring builds and debugging issues in Jenkins.	Integrating Ansible with Jenkins for automation.	Monitoring and troubleshooting pipeline execution.
S0-14,15	Practice 3: Create a simple collaborative project in GitHub	Practice 6: compile a Java program using Gradle.	Practice 9: Trigger a build upon a code commit.	Practice 12: Deploy a simple web application to AWS using Terraform and configure auto-scaling.-	Practice 15: SDG Mini Project

Evaluation

Level of Thinking	Continuous Learning Assessment (CLA) (50 % weightage)								Final Exam (50% Weightage)	
	CLA – 1 (10%)		CLA– 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)			
	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Remember	20%	20%	15%	15%	15%	15%	20%	20%	20%	20%
Understand										
Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
Analyze										
Evaluate	10%	10%	15%	15%	15%	15%	10%	10%	10%	10%
Create										
Total	100%		100%		100%		100%		100%	

Strategies

Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations		Case Studies		No Poverty	
Emulations		Group Discussion		Zero Hunger	
Prototypes		Hands-on Practice	☐	Good Health & Well Being	
Hands-on Practice Tools	☐	Inquiry Learning	☐	Quality Education	☐
Mathematical Computing Tools	☐	Interactive Lecture	☐	Gender Equality	
Field Visit		Leading Question	☐	Clean Water & Sanitation	
		Mind Map	☐	Affordable & Clean Energy	
		Minute Paper			
		Peer Review			
		Problem Based Learning	☐		

Resources

	"The DevOps Handbook: How to Create World-Class Agility, Reliability, & Security in Technology Organizations" Authors: Gene Kim, Jez Humble, Patrick Debois, John Willis
2	"Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation" Authors: Jez Humble, David Farley
3	"Ansible for DevOps: Server and Configuration Management for Humans" Author: Jeff Geerling

Designers

Professional Experts		Higher Institution Experts		Internal Experts	
1	Mr. K V Srivallaban Principal Consultant Infosys Limited	1	Dr. D I George Amalarthinam Principal Associate Professor and Head of the Department of Computer Science, Jamal Mohamed College, Tiruchirappalli, Tamil Nadu, India	1	Dr Arul Leena Rose P J Professor, Department of Computer Science FSH, SRMIST

Course Code	PAI25C32J	Course Name	Foundations of Large Language Models	Course Category	C	*Core*	L	T	P	C
							3	0	2	4

Offering Department	Computer Science	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

Course Rationale (CR):	*The purpose of learning this course is to:*	Depth				Attainment			Program Outcomes (PO)												
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12
CR-1	Understand the shift from specialized NLP systems to large-scale pre-training foundation models																			
CR-2	Master the architectural foundations of Transformers, specifically encoder-only, decoder-only, and encoder-decoder variants.																			
CR-3	Explore the mechanics of generative models, scaling laws, and long-sequence modeling.																			
CR-4	Develop proficiency in prompt engineering, including Chain-of-Thought and in-context learning.																			
CR-5	Implement alignment techniques such as Supervised Fine-tuning (SFT) and Reinforcement Learning from Human Feedback (RLHF)..																			
Course Outcomes (CO)	*At the end of this course, learners will be able to:*	*Conceive*	*Design*	*Implement*	*Operate*	*Level of Thinking*	*Expected Proficiency (%)*	*Expected Attainment (%)*	*Problem Solving, Critical*	*Communication Skills*	*Independent Thinking,*	*Leadership Qualities,*	*Digital Technology Skills*	*Value Inculcation,*	*Environmental Action,*	*Ethical practices &Social*	*Entrepreneurial Risk*	*PSO - 1*	*PSO - 2*	*Life Long Learning*	
CO-1	Explain pre-training paradigms and model architectures like BERT and Transformers.	✓	✓	✓	✓	3	80	75	3	2	1	3	3	1	1	1	2	2	2	3
CO-2	Implement generative LLMs and optimize training at scale using scaling laws.	✓	✓	✓	✓	3	60	85	3	3	2	3	3	2	1	2	3	2	2	3
CO-3	Design advanced prompts using problem decomposition and self-refinement strategies.	✓	✓	✓	✓	3	85	80	3	3	2	3	3	2	2	2	3	2	3	3
CO-4	Build aligned models through instruction fine-tuning and preference optimization (DPO/RLHF).	✓	✓	✓	✓	3	80	75	3	3	3	3	3	2	2	2	3	3	3	3
CO-5	Evaluate long-context modeling capabilities and external tool integration (RAG).	✓	✓	✓	✓	3	85	80	3	3	3	3	3	3	2	2	3	3	3	3

Title & Session Outcomes	CO-1	CO-2	CO-3	CO-4	CO-5
Duration (60 minutes)	15	15	15	15	15
SO-1	Pre-training NLP Models	Fine-tuning LLMs	General Prompt Design- Basics	An Overview of LLM Alignment-	Improved Human Preference Alignment
SO-2	Un supervised,Supervised and Self-supervised Pre-training	Aligning LLMs with the World	In-context Learning	Instruction Alignment- Supervised Fine-tuning	Better Reward Modeling- Supervision Signals
SO-3	Adapting Pre-trained Models .	Prompting LLMs	Prompt Engineering Strategies	Fine-tuning Data Acquisition-	Sparse Rewards vs. Dense Rewards

SO-4,5	**lab 1:** Implement a **BERT-style Masked Language Modeling (MLM)** task, involving random token masking (80%), replacement (10%), and unchanged tokens (10%)	**Lab 4:** Construct a **Decoder-only Transformer block** with causal masking to ensure the model cannot access right-context during training	*Lab 7: Implement a Sliding Window Attention mechanism to manage KV-cache memory footprints for long sequences*	***Lab 10:** Demonstrate **Linear Positional Interpolation** to extend the context window of a pre-trained LLM*	***Lab 13:** Develop a **Supervised Fine-tuning (SFT)** script that sets input loss to zero and computes loss only for the response sequence*
SO-6	Self-supervisedPre-trainingTasks	Training at Scale	*Advanced Prompting Methods-Chain of Thought*	*Fine-tuning with Less Data*	Fine-grained Rewards
SO-7	BERT- The Standard Model .	Distributed Training	**Problem Decomposition**	Instruction Generalization	Combination of Reward Models
SO-8	More Efficient Models	Scaling Laws	Self-refinement	***Using Weak Models to Improve Strong Models***	*Direct Preference Optimization*
SO-9,10	Lab 2: Program a script to generate token, positional, and segment embeddings and visualize their summation for input to a Transformer encoder.	**Lab 5:** Develop a simulation to plot **LLM Scaling Laws**, calculating test loss as a power-law function of model parameters and dataset size	**Lab 8:** Program a **Rotary Positional Embedding (RoPE)** function using element-wise products and additions in complex space	**Lab11:** Design **Few-shot Prompt Templates** for mathematical reasoning using the GSM8K format and calculation annotations	**Lab 14::** Implement a **Pairwise Ranking Loss** function for training a reward model based on the Bradley-Terry probabilistic model
SO-11	Multi-lingual Models	Long Sequence Modeling-	Ensembling	Human Preference Alignment: RLHF- Basics of Reinforcement Learning	***Automatic Preference Data Generation***
SO-12	Applying BERT Models	Efficient Architectures	RAG and Tool Use	Training Reward Models	Step-by-step Alignment
SO-13	Generative Models- A Brief Introduction to LLMs, Decoder-only Transformers, Training LLMs	Sharing across Heads and Layers, Position Extrapolation and Interpolation	Learning to Prompt- Prompt Optimization, Soft Prompts	Training LLMs,Models of LLMS	Inference-time Alignment
SO-14,15	Lab 3: Implement BERT-based Sequence Labeling for Named Entity Recognition (NER) using a Softmax prediction network	Lab 6: Implement Tensor Parallelism logic for splitting large parameter matrices across simulated worker nodes	Lab 9: Demonstrate Linear Positional Interpolation to extend the context window of a pre-trained LLM	***Lab 12:** Implement **Self-Consistency Ensembling** by sampling multiple CoT reasoning paths and selecting the majority vote answer*	***Lab 15:** Program a **Direct Preference Optimization (DPO)** loss function to align a policy directly with human preference labels*

Evaluation											
Level of Thinking		**Continuous Learning Assessment (CLA)** (50 % weightage)								**Final Exam** (50% Weightage)	
		CLA – 1 (10%)		CLA– 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
	Remember										
	Understand	20%	20%	15%	15%	15%	15%	20%	20%	20%	20%
	Apply										
	Analyze	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Evaluate										
	Create	10%	10%	15%	15%	15%	15%	10%	10%	10%	10%
Total		100%		100%		100%		100%		100%	

Strategies					
Technology		**Pedagogy / Andragogy**		**Sustainable Development**	
Simulations	✓	Case Studies		No Poverty	
Emulations		Group Discussion		Zero Hunger	
Prototypes		Hands-on Practice	✓	Good Health & Well Being	
Hands-on Practice Tools	✓	Inquiry Learning	✓	Quality Education	✓
Mathematical Computing Tools	✓	Interactive Lecture	✓	Gender Equality	
Field Visit		Leading Question	✓	Clean Water & Sanitation	
		Mind Map	✓	Affordable & Clean Energy	
		Minute Paper			
		Peer Review			
		Problem Based Learning	✓		

Resources	
1	***Foundations of Large Language Models- Tong Xiao and Jingbo Zhu***
2	Hands-On Large Language Models: Language Understanding and Generation (Full Colour Edition)- by Jay Alammar (Author), Maarten Grootendorst (Author)
3	. Introduction to Large Language Models Generative AI for Text - Tanmoy Chakraborty.

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	*Mr. K V Srivallaban, Principal Consultant, Infosys Limited*	*1*	*Dr. D I George Amalarthinam, Principal, Associate Professor and Head, Jamal Mohamed College, Tiruchirappalli, Tamil Nadu*	1	Dr. K.S.SagayaPriya, Assistant Professor, Department of Computer Science w/s in Artificial Intelligence and Machine Learning, FSH, SRM IST, RMP

Code	PCS25C33J	Title	Big Data Analytics	Category	C	Core	L	T	P	C
							3	0	2	4

Offering Department	Computer Science	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

Course Rationale (CR):	The purpose of learning this course is to:	Depth				Attainment			Program Outcomes (PO)												
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12
		Conceive	Design	Implement	Operate	Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical	Communication Skills	Independent Thinking,	Leadership Qualities,	Digital Technology Skills	Value Inculcation,	Environmental Action,	Ethical practices &Social	Entrepreneurial Risk	PSO - 1	PSO - 2	Life Long Learning
CR-1	Understand the fundamental concepts, characteristics, and challenges of Big Data.																			
CR-2	Learn and apply clustering algorithms such as K-Means for data segmentation and pattern recognition																			
CR-3	Learn and apply Big Data storage and processing techniques using Hadoop, MapReduce																			
CR-4	Learn the processing techniques using Hadoop, MapReduce using clustering methods.																			
CR-5	Explore real-world applications of Big Data across different industries																			
Course Outcomes (CO)	At the end of this course, learners will be able to:																			
CO-1	Acquire the basics of computer network and its architecture	✓	✓	✓	✓	3	80	75	3	2	1	3	3	1	1	1	2	2	2	3
CO-2	Acquire the knowledge of various networks devices and addressing methods	✓	✓	✓	✓	3	60	85	3	3	2	3	3	2	1	2	3	2	2	3
CO-3	Design the network routing methods	✓	✓	✓	✓	3	85	80	3	3	2	3	3	2	2	2	3	2	3	3
CO-4	Find the error type that may happen during data transportation	✓	✓	✓	✓	3	80	75	3	3	3	3	3	2	2	2	3	3	3	3
CO-5	Understand the physical layer functions and components	✓	✓	✓	✓	3	85	80	3	3	3	3	3	3	2	2	3	3	3	3

Title & Session Outcomes	CO-1	CO-2	CO-3	CO-4	CO-5
Duration (60 minutes)	**15**	**15**	**15**	**15**	**15**
SO-1	Introduction: Big Data	Analytical Theory and Methods	Introduction: Hadoop	Setting up a Hadoop Cluster	Applications of Big Data
SO-2	Challenges of Conventional Systems	Overview of Clustering	The Hadoop Distributed File System	Cluster specification	Data Processing operators
SO-3	Analytic process an overview	K-Means	Components of Hadoop	Cluster Setup and Installation	Hive QL,Tables
SO-4-5	Practice 1: Elementary mathematical operations and control statements	Practice 4: Create subplots and color plots	Practice 7: Implementation of spam and non-spam classification problem.	Practice 10: Develop a MapReduce program to find the grades of student's.	Practice 13: Write queries to sort and aggregate the data in a table using HiveQL.
SO-6	Analysis Vs Reporting	Use case	Analyzing the Data with Hadoop Scaling Out- Hadoop Streaming	Hadoop Configuration	Structure of Hbase, Hbase QL

SO-7	Model Data Analytics Tools	Determining the number of Clusters	How Map Reduce Works	Security in Hadoop	Comparing base with Relational Database
SO-8	Analysis Vs Reporting	Classification: Decision Trees	Job scheduling shuffle and sort	Administering Hadoop -HDFS	Structure of Zoo Keeper
SO-9-10	Practice 2: Operations on Matrices and Vectors	Practice 5:Implementation of Linear regression with multiple regression	Practice 8: Implementation of K-Means cluster	Practice 11: Install, configure and run Hadoop and HDFS.	Practice 14: Implement and Perform Streaming Data Analysis using HIVE for data analysis of twitter data.
SO-11	Sampling Distribution	Evaluating Decision Tree	Task Execution Map read& Map write anatomy	Monitoring	The Zoo keeper services
SO-12	High Performance Architecture: Overview	Examples of Decision Tree	Map reduce features	Maintenance	Case study - I
SO-13	Background and Overview of Data Analytics Lifecycle	Naive Bayes – Theorem	Examples of Map reduce	Applications of HDFS	Case study - II
SO-14-15	Practice 3: Creating Various types of plots /charts from various data source	Practice 6:Implementation of Data preprocessing methods , Correlation matrix	Practice 9: Write a program to implement word count program using MapReduce	Practice 12: Implement an application that stores big data in MongoDB / Pig using Hadoop	Practice 15: SDG Mini Project

Evaluation

Level of Thinking	**Continuous Learning Assessment (CLA)** (50 % weightage)								**Final Exam** (50% Weightage)	
	CLA – 1 (10%)		CLA– 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)			
	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Remember										
Understand	20%	20%	15%	15%	15%	15%	20%	20%	20%	20%
Apply										
Analyze	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
Evaluate										
Create	10%	10%	15%	15%	15%	15%	10%	10%	10%	10%
Total	100%		100%		100%		100%		100%	

Strategies					
Technology		**Pedagogy / Andragogy**		**Sustainable Development**	
Simulations	✓	Case Studies		No Poverty	
Emulations		Group Discussion		Zero Hunger	
Prototypes		Hands-on Practice	✓	Good Health & Well Being	
Hands-on Practice Tools	✓	Inquiry Learning	✓	Quality Education	✓
Mathematical Computing Tools	✓	Interactive Lecture	✓	Gender Equality	
Field Visit		Leading Question	✓	Clean Water & Sanitation	
		Mind Map	✓	Affordable & Clean Energy	
		Minute Paper			
		Peer Review			
		Problem Based Learning	✓		

Resources	
2	Michael Berthold, David J. Hand, (2007), “Intelligent Data Analysis”, Springer.
2	RSN Pillai, Bagavathi, “Statistics Theory and Practice”, S.Chand
3	Tom White (2012), “Hadoop:The Definitive Guide” Third Edition, O’reilly Media

Designers					
Professional Experts		**Higher Institution Experts**		**Internal Experts**	
1	Mr. K V Srivallaban, Principal Consultant, Infosys Limited	1	Dr. D I George Amalarthinam,Principal,AssociateProfessor and Head, Jamal Mohamed College, Tiruchirappalli, Tamil Nadu	1	Dr. M. Ramesh, Assistant Professor, Department of Computer Science, FSH, SRM IST

Course Code	PAI25D31T	Course Title	Cyber Security and AI	Category	D	Discipline Elective Course	L	T	P	C
							4	0	0	4

Course Offering Department	Computer Science in specialization with AI&ML	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

CLR	The purpose of learning this course is to:	Depth				Attainment			PLO									
CLR-1	To Understand core concepts of Cyber Security and Artificial Intelligence.	1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
CLR-2	TO Analyze cyber threats, vulnerabilities, and attacks in AI-enabled systems.	Conceive	Design	Implement	Operate	Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving	Critical Thinking	Creativity	Communication Skills	Analytical Reasoning	Research Skills	Collaborating Skills	Leadership Qualities	Learning to Learn	Digital Technology
CLR-3	To Apply AI techniques for intelligent cyber defense and security analytics..																	
CLR-4	To Design secure, privacy-aware, and trustworthy AI systems.																	
CLR-5	To Evaluate ethical, legal, and regulatory issues in Cyber Security and AI..																	
CLO	**At the end of this course, learners will be able to:**																	
CLO-1	Identify fundamental concepts of Cyber Security and Artificial Intelligence.	✓	✓	✓	–	2	85	75	3	–	–	1	–	3	–	2	2	1
CLO-2	Analyze cyber threats and security risks in AI-driven systems.	✓	✓	✓	–	2	85	75	3	2	1	2	2	3	–	1	2	1
CLO-3	Apply AI and machine learning techniques for cyber defense.	✓	✓	✓	✓	3	85	75	3	1	3	1	3	3	–	1	1	2
CLO-4	Design secure and privacy-preserving intelligent systems.	✓	✓	✓	✓	3	85	75	3	3	2	3	3	3	–	2	3	3
CLO-5	Evaluate ethical, legal, and regulatory issues in Cyber Security and AI.	✓	✓	✓	✓	3	85	75	3	3	2	3	3	3	–	3	3	3

Sessions	CLO – 1	CLO – 2	CLO – 3	CLO - 4	CLO - 5
	12	12	12	12	12
SLO-1	Introduction to Cyber Security: objectives, importance, and challenges	Network architecture and security requirements	Role of AI in cyber security	Security challenges in AI systems	Cyber security in IoT and smart systems
SLO-2	Security concepts: CIA triad, authentication, authorization, and non-repudiation	Secure communication protocols (SSL/TLS, HTTPS)	Machine learning fundamentals for security applications	Data privacy and protection techniques	AI for IoT security
SLO-3	Types of cyber threats: malware, phishing, ransomware, and social engineering	Wireless network security and attacks	Data collection and preprocessing for security analytics	Privacy-preserving machine learning	Blockchain and cyber security
SLO-4	Cyber attack lifecycle and threat modeling	Cloud security fundamentals	Supervised learning for intrusion detection	Federated learning and security issues	AI-driven security automation
SLO-5	Vulnerabilities, exploits, and risk assessment	Virtualization and container security	Unsupervised learning for anomaly detection	Model theft and inversion attacks	Cyber security in critical infrastructures
SLO-6	Cryptography basics: symmetric and asymmetric encryption	Intrusion detection and prevention systems Digital forensics tools and techniques	Deep learning techniques in cyber security	Adversarial examples and defenses	Secure AI for healthcare and finance
SLO-7	Hash functions and digital signatures	Security monitoring and incident response	AI-based malware detection Evaluation metrics for AI-based security systems	Explainable AI (XAI) for security	Threat hunting using AI
SLO- 8	Network security fundamentals: firewalls, IDS, IPS	Identity and access management (IAM)	AI-driven phishing detection systems	Trustworthy and ethical AI Security testing of AI applications	Cyber warfare and national security Mini project / case study integration

SLO-9	Web security issues: SQL injection, XSS, CSRF	Endpoint security mechanisms	Behavioral analytics using AI	Bias, fairness, and accountability in AI	Ethical hacking and penetration testing overview
SLO-10	Operating system security concepts, Cyber security frameworks and models	Malware analysis basics	Threat intelligence and prediction using AI	Secure deployment of AI models Privacy impact assessment	Cyber security metrics and performance evaluation
SLO-11	Secure software development lifecycle (SSDLC)	System hardening techniques Security auditing and compliance	Security information and event management (SIEM) with AI	AI governance and risk management	Security operations center (SOC) and AI
SLO-12	security policies, standards, and best practices Introduction to cyber forensics	Patch management and vulnerability scanning Case studies on network security breaches	Adversarial machine learning attacks Robust and secure AI models	Regulatory standards for AI and data protection	Future trends in cyber security and AI industry use cases and best practices

Resources

1 Ian Goodfellow, Yoshua Bengio, Aaron Courville, *Deep Learning*, MIT Press.

2. Nina Godbole, Sunit Belapure, *Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives*, Wiley.

Assessment

Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (50% weightage)				Final Assessment (50 % weightage)
		CLA – 1	CLA – 2	CLA – 3	CLA – 4 *	
		(10%)	(10%)	(20%)	(10%)	
		Theory (%)	Theory (%)	Theory (%)	Theory (%)	Theory (%)
1	Remember	15	15	10	10	15
2	Understand	15	15	10	10	15
3	Apply	20	25	25	25	25
4	Analyze	20	25	25	25	25
5	Evaluate	15	10	15	15	10
6	Create	15	10	15	15	10
Total (%)		100	100	100	100	100

Strategies

Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations	✓	Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

* The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article,(vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers

Professional Experts	Higher Institution Experts	Internal Experts
1 Mr. K V Srivallaban Principal Consultant Infosys Limited	1 Dr. D I George Amalarthinam , Principal Associate Professor and Head of the Department of Computer Science, Jamal Mohamed College, Tiruchirappalli, Tamil Nadu, India	1 Ms. G PREETHA, Department of Computer Science w/s in Artificial Intelligence and Machine Learning, FSH, SRM IST, RMP

Course Code	PAI25D32J	Course Name	Deep Learning and Neural Networks	Course Category	D	Discipline Elective Course	L	T	P	C
							3	0	2	4

Course Offering Department	Computer Science w/s in Artificial & Machine Learning	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

Course Rationale (CR):	The purpose of learning this course is to:	Depth				Attainment			Programme Outcomes (PO)									
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
CR-1 :	Understand the core concepts, principles, and foundations of deep learning and neural network models	Conceive	Design	Implement	Operate	Bloom's Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity	Communication Skills, Collaborating Skills	Independent Thinking, Analytical Reasoning,	Leadership Qualities, Professionalism, Autonomy,	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	Entrepreneurial Risk Taking	PSO-1	PSO-2
CR-2 :	Build, train, and evaluate neural network architectures for solving fundamental learning tasks																	
CR-3 :	Apply convolutional neural networks effectively for various image classification and computer vision applications																	
CR-4 :	Implement and analyze sequence-based models, including RNN, LSTM, GRU, for NLP and time-series tasks																	
CR-5 :	Utilize modern deep learning frameworks and hardware accelerators to develop efficient, scalable AI solutions																	

Course Outcomes (CO)	At the end of this course, learners will be able to:																	
CO-1 :	Understand and explain foundational concepts, architectures, and learning rules of deep neural networks	□	□	-	-	2	85	80	3	2	3	1	2	-	-	1	2	3
CO-2 :	Apply convolutional neural networks and modern architectures to solve image classification and feature extraction tasks	□	□	□	-	3	85	80	3	2	3	2	3	-	-	2	2	2
CO-3 :	Analyze and implement advanced computer vision models for segmentation, detection, and localization problems	□	□	□	□	3	85	80	3	2	3	2	3	-	1	2	2	2
CO-4 :	Develop sequential models using RNNs, LSTMs, GRUs, and apply them to real-world NLP tasks	□	□	□	□	3	85	80	3	2	3	2	3	1	-	2	2	2
CO-5 :	Utilize modern deep learning frameworks and hardware accelerators to build, optimize, and deploy scalable DL applications	□	□	□	□	3	85	80	2	2	2	2	3	-	1	2	2	3

Sessions		CO 1	CO 2	CO 3	CO 4	CO 5
		15	15	15	15	15
S-1	SO-1	Introduction to Deep Learning	Introduction to CNNs	Transfer Learning	Sequential data introduction	CPUs vs GPUs in DL
	SO-2	Biologically inspired computing	Evolution & history of CNNs	Freezing & fine-tuning layers	Sequence modeling applications	GPU computing basics
S2	SO-1	Historical context of neural networks	Convolution operation	Image localization	Recurrent Neural Networks (RNNs)	GPU Architecture – Pascal
	SO-2	Perceptron model	Filters, feature maps, stride, padding	Bounding box concepts	Vanishing and exploding gradients	GPU Architecture – Volta
S3	SO-1	Perceptron Learning Rule	Pooling layers	Image segmentation	LSTM architecture	GPU Architecture – Turing
	SO-2	Limitations of Perceptron	Fully connected layers in CNNs	Masks & annotation concepts	LSTM gates	GPU Architecture – Ampere

S4 – S5	SO-1 SO-2	Lab 1: Perceptron Model for OR/AND Gate	Lab 4: Building a Simple Convolutional Neural Network (CNN)	Lab 7: Semantic Segmentation using UNet	Lab 10: Recurrent Neural Network for Text Generation	Lab 13:GPU vs CPU Execution Time Comparison
S6	SO-1	Introduction to Multilayer Perceptron (MLP)	CNN architecture overview	Segmentation architecture – U-Net	Gated Recurrent Units (GRU)	CUDA cores, Tensor cores
	SO-2	Backpropagation algorithm	Case study – LeNet	V-Net	LSTM vs GRU	GPU kernels – intro
S7	SO-1	Gradient computation (chain rule)	AlexNet	UNet++	Word embeddings (Word2Vec, GloVe)	Vector operations kernel (add/multiply)
	SO-2	Activation functions – Sigmoid, Tanh	VGG family	Medical segmentation case studies	Text preprocessing	Matrix operations kernel (add/multiply)
S8	SO-1	Activation functions – ReLU & Leaky ReLU	GoogLeNet & Inception module	Object detection overview	NLP applications	Tensor Processing Units (TPUs)
	SO-2	Loss functions – MSE, Cross-entropy	InceptionNet variants	Region Proposal Networks (RPNs)	Missing word identification	TPU architecture concepts
S9-10	SO-1 SO-2	Lab 2:. ACTIVATION FUNCTIONS (Sigmoid, Tanh, ReLU)	Lab 5:Image Classification using Pretrained Models (Transfer Learning)	Lab 8:Object Detection using YOLO	Lab 11:LSTM Model for Next Word Prediction	Lab 14:Matrix Multiplication Kernel on GPU
S-11	SO-1	Optimization – Stochastic Gradient Descent	ResNet (skip connections)	RCNN & Fast RCNN	Text summarization	TensorFlow
	SO-2	Parameter updates – Momentum, RMSProp, Adam	EfficientNet basics	Faster RCNN	Sequence-to-sequence models	PyTorch
S-12	SO-1	Weight Initialization techniques	Regularization in CNNs	Mask RCNN	Attention mechanism (basics)	Keras & Theano
	SO-2	Batch Normalization	Data augmentation – zoom, rotate, crop	YOLO family – intro	Encoder–decoder overview	Caffe
S-13	SO-1	Hyperparameter optimization	Data augmentation – blurring, noise addition	CenterNet	Limitations of RNN-based models	Nvidia DGX machines
	SO-2	Regularization – Dropout, Bias–Variance	Self-supervision basics	EfficientDet & BiFPN	Introduction to Transformer (concept only)	Deployment considerations in DL
S14-15	SO-1 SO-2	Lab 3: Multi-Layer Perceptron for Digit Recognition	Lab 6: Applying Data Augmentation Techniques	Lab 9: Region Proposal and RoI Extraction Demo	Lab 12:Text Summarization using Deep Learning	Lab 15:Building and Training a Model using PyTorch or TensorFlow

Learning Resources	1. Y. Bengio, I. Goodfellow and A. Courville, Deep Learning, 1st ed MIT Press, 2016. 2. Bishop C. M., Pattern Recognition and Machine Learning, 1st ed Springer, 2006. 3. Geoffrey E. Hinton, Neural network architectures for artificial intelligence,1st ed American Association for Artificial Intelligence Menlo Park, 1988, ISBN:0-929280-15-6.	1. Adrian Rosebrock, Deep Learning for Computer Vision with Python, E-Book, 1st ed, September 2017
Assessment		Strategies

Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment (50 % weightage)		Technology		Pedagogy / Andragogy		Sustainable Development	
		CLA – 1 (10 %)		CLA – 2 (10 %)		CLA – 3 (20 %)		CLA – 4 (10%)				Simulations		Clarification/Pauses		Good Health & Well Being	
												Presentation Tools		Group Discussion		Quality Education	
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Learning Management System		Hands-on Practice		Gender Equality	
1	Remember	15	15	15	15	10	10	10	10	15	15			Debate			
2	Understand	15	15	15	15	10	10	10	10	15	15			Interactive Lecture			
3	Apply	20	25	25	20	25	25	25	25	25	25			Brainstorming			
4	Analyze	20	25	25	20	25	25	25	25	25	25						
5	Evaluate	15	10	10	15	15	15	15	15	10	10						
6	Create	15	10	10	15	15	15	15	15	10	10						
Total (%)		100	100	100	100	100	100	100	100	100	100						

***The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments**

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Mr. S. Karthik, IT Analyst, Tata Consultancy Services	1	Dr. Neelanarayanan,, Professor, School of Computer Science and Engineering, VIT Chennai	1	Dr Kumar J, Assistant Professor, Department of Computer Science w/s in Artificial Intelligence and Machine Learning, FSH, SRM IST, RMP, FSH, SRMIST, Ramapuram.

Code	PAI25D33J	Title	Reinforcement Learning	Category	D	Discipline Elective Course	L	T	P	C
							3	0	2	4

Offering Department	Computer Science in Specialization with Artificial Intelligence and Machine Learning	Pre-requisite Courses	NIL	Co-requisite Courses	NIL	Progressive Courses	NIL	Data Book / Codes/Standards	NIL

Rationale (CR)	*The purpose of learning this course is to:*
CR-1	*To understand the concept of algorithms helps approach problems with simple step by step solutions*
CR-2	*To apply creative thinking towards the problem which would help in having a solution-oriented mindset*
CR-3	*To develop the students, have familiarity with them and stays relevant to the future modern world*
CR-4	To develop the abilities creates new opportunities in most business sectors and consumer applications
CR-5	To develop the decision-making knowledge.

Outcomes (CO)	*At the end of this course, learners will be able to:*	Depth				Attainment			Program Outcomes (PO)												
		1 Conceive	2 Design	3 Implement	4 Operate	1 Level of Thinking	2 Expected Proficiency (%)	3 Expected Attainment (%)	1 Disciplinary Knowledge	2 Problem Solving	3 Design & Development	4 Analysis, Design, Research	5 Modern Tool Usage	6 Society & Culture	7 Environment Sustainability	8 Ethical Practices	9 Individual & Team Work	10 Communication	11 Project Management	12 Life Long Learning
CO-1	Learn how to define RL tasks and the core principals behind the RL, including policies, value functions	✓	✓		✓	3	70	65	3	1	1	-	1	-	1	-	3	1	1	L
CO-2	*Implement in code common algorithms following code standards and libraries used in RL*	✓	✓		✓	3	75	65	-	1	3	-	3	-	1	-	3	2	3	2
CO-3	*Understand and work with tabular methods to solve classical control problems*	✓	✓	✓	✓	3	80	70	2	2	3	-	3	-	2	-	2	2	3	2
CO-4	*Explore imitation learning tasks and solutions*	✓	✓	✓	✓	3	70	65	3-	3	2	-	2	-	2	-	3	1	2	1
CO-5	*Recognize current advanced techniques and applications in RL*	✓	✓	✓	✓	3	85	75	-	2	2	-	2	-	2	-	3	2	3	2

Title & Session Outcomes	CO-1	CO-2	CO-3	CO-4	CO-5
Duration (60 minutes)	15	15	15	15	15
SO-1	Reinforcement learning basics,*Use and applications of RL*	*RL formalisms and relations,Rewards in RL*	*Open AI Gym,The Random Cartpole agent D*	*Deep Q-Networks,Deep Learning Architecture*	*Learning All possible policies with Entropy Methods,Maximum Entropy RL*
SO-2	*Reinforcement learning as MDF, A Learnable Functions in Reinforcement learning*	*Agents in Reinforcement learning,The environnent*	*The extra Gym Functionality , Wrapper and monitors,Deep Learning with PyTorch*	*Deep Q-Learning,Rainbow DQN*	*Soft Actor-Critic,Extension to maximum Entropy Methods*
SO-3	*Reinforcement learning and machine learning* Taxonomy of RL Approaches	*Actions* ,Observations	*Tensors*,Gradients	*Example: Rainbow DQN on Atari Games*,Other DQN Improvements	*Performance Comparison: SAC Versus PPO*,Industrial Example: Learning to drive with a remote

					control car
SO-4-5	Lab 1: Introduction to Reinforcement Learning & OpenAI Gym	Lab 4 Design Your Own Custom RL Environment	*Lab 7:* Understanding Environment Spaces & Wrappers	***Lab 10:*** Deep Q-Network (DQN) on CartPole	Lab 13: Soft Actor-Critic
SO-6	*Reinforcement learning flow,Deep Reinforcement learning Algorithms*	*Markov décisions process N,Inventory Control and control simulation*	*NN building blocks,Custom layers*	*Policy Gradient Method,* *Benefits of Learning a Policy Directly*	*Rethinking the MDP,Hierarchical RL*
SO-7	*On-Policy and Off - Policy Algorithm ,The First RL*	*Markov reward process,Markov decision process*	*Final glue - loss functions and optimizers,Monitoring with Tensor Board*	*Policy Gradient Theorem,Algorithm n-Step Actor-Critic and Advantage Actor-Critic (A2C)*	*Multi- Agent RL,Expert Guidance*
SO-8	*Compare and contrast RL and ML,State change and transition process*	*Rewards Engineering,Policy Evaluation: The Vale Function*	*GAN on Atari,The Cross-Entropy Method*	*Industrial Example: Automatically purchasing products for customers,Beyond Policy Gradients*	*Other Paradigms,The RL Project Life sysle*
SO-9-10	Lab 2 Implement the RL Loop: Agent–Environment Interaction	Lab 5: Implementing a Markov Decision Process (MDP)	Lab 8:. RL on Atari with CNN Preprocessing	***Lab 11:*** Actor–Critic (A2C)	Lab 14: Multi-Agent RL using PettingZoo
SO-11	*RL as a Discipline,Deep Learning for Reinforcement learning*	*Policy Improvement: Choosing the Best Action,Improving the e-greedy Algorithm*	*Taxonomy of RL methods,Cross entropy on cartpole and Frozem Lake*	*Off-Policy Algorithms,Deterministic policy Gradients*	*Problem definition in RL,RL Engineering and refinement*
SO-12	*Reinforcement learning and Supervised Learning,Lack of an Oracle*	*Policies and Value Functions,* *Discounted Rewards*	*Theoretical background of the cross-entropy method,Tabulate Learning and the Bellman equation*	*Trust Region Methods,Using Servos for a Real-Life Reacher*	*Mapping policies and Action spaces,Operational RL Implementation and Deploymen*
SO-13	Sparsity of Feedback,*Data Generation*	*Monte Carlo Policy Generation,Value Iteration with Dynamic Programming*	*Value, state and optimality,Q-Learning for FrozenLake*	*Other policy Gradient Algorithms,Extensions to policy Gradient Algorithms*	*Conclusion and the future Tips and Trick,The future of RL*
SO 14-15	Lab 3: Train a Supervised Model and an RL Agent – Compare Learning	Lab 6: **Value Iteration**	*Lab 9:* SARSA and Q-Learning on FrozenLake	***Lab 12:*** Double DQN	*Lab 15:* Full RL Project (Inventory, Robotics, Pricing, etc.)

Evaluation

Level of Thinking	***Continuous Learning Assessment (CLA)*** *(50 % weightage)*								***Final Exam*** *(50% Weightage)*	
	CLA – 1 (10%)		*CLA– 2 (10%)*		*CLA – 3 (20%)*		*CLA – 4 (10%)*			
	Theory	*Practice*	*Theory*	*Practice*	*Theory*	*Practice*	*Theory*	*Practice*	*Theory*	*Practice*
Remember										
Understand	*20%*	*20%*	*15%*	*15%*	*15%*	*15%*	*20%*	*20%*	*20%*	*20%*
Apply										
Analyze	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
Evaluate										
Create	*10%*	*10%*	*15%*	*15%*	*15%*	*15%*	*10%*	*10%*	*10%*	*10%*
Total	*100%*		*100%*		*100%*		*100%*		*100%*	

Strategies

Technology		***Pedagogy / Andragogy***		***Sustainable Development***	
Simulations	✓	*Case Studies*		*No Poverty*	
Emulations		*Group Discussion*		*Zero Hunger*	
Prototypes		*Hands-on Practice*	✓	*Good Health & Well Being*	
Hands-on Practice Tools	✓	*Inquiry Learning*	✓	*Quality Education*	✓
Mathematical Computing Tools	✓	*Interactive Lecture*	✓	*Gender Equality*	
Field Visit		*Leading Question*	✓	*Clean Water & Sanitation*	
		Mind Map	✓	*Affordable & Clean Energy*	
		Minute Paper			
		Peer Review			
		Problem Based Learning	✓		

Resources	
2	Deep Reinforcement Learning Hands-On - Second Edition, Maxim Lapan, January 2020
2	Foundations of Deep Reinforcement Learning: Theory and Practice in Python, By Laura Graesser and Wah Loon Keng, December 2019

Designers					
Professional Experts		**Higher Institution Experts**		**Internal Experts**	
1	Mr. K V Srivallaban, Principal Consultant, Infosys Limited	1	Dr. D I George Amalarthinam, Principal, Associate Professor and Head, Jamal Mohamed College, Tiruchirappalli, Tamil Nadu	1	Mr. D. Siva, Asst. Prof, Department of Computer Science w/s in Artificial Intelligence and Machine Learning, FSH, SRM IST, RMP

Course Code	PSC25G34J	Course Title	Internet of Things	Category	G	Generic Elective	L	T	P	C
							1	0	2	2

Course Offering Department	Computer Science in Specialization with Cyber Security	Pre-requisite Courses	NIL	Co-requisite Courses	NIL	Progressive Courses	NIL	Data Book / Codes/Standards	NIL

[

CR	The purpose of learning this course is to:	Depth				Attainment			Program Outcomes (PO)									
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
		Conceive	Design	Implement	Operate	Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving	Critical Thinking	Creativity	Communication Skills	Analytical Reasoning	Research Skills	Collaborating & Leadership	Lifelong Learning	Learning to Learn	Digital Technology
CR-1	Learners understand the design principles, communication models, and enabling technologies of Internet of Things (IoT) systems.																	
CR-2	Learners able to examine the IoT system management approaches and application domains across diverse real-world scenarios.																	
CR-3	Learners classify and compare IoT communication protocols used in application development.																	
CR-4	Learners analyze the use of IoT communication protocols in sensor–actuator systems implemented on embedded platforms.																	
CR-5	Learners effectively deploy IoT applications and integrate them with cloud platforms.																	
CO	At the end of this course, learners will be able to:																	
CO-1	Explain the fundamentals, architecture, and enabling technologies of IoT	✓	✓	-	-	2	85	75	3	2	1	1	1	3	1	2	2	1
CO-2	Analyze IoT communication models and protocols for different application scenarios.	✓	✓	✓	-	3	85	75	3	2	1	2	2	3	-	1	2	2
CO-3	Demonstrate the use of IoT protocols with sensors, actuators, and embedded platforms.	✓	✓	✓	✓	3	85	75	3	1	2	1	3	3	-	1	1	2
CO-4	Implement IoT-based applications to address practical, real-world problems effectively.	✓	✓	✓	✓	3	85	75	2	3	2	3	3	3	2	2	3	3
CO-5	Deploy IoT applications and integrate them with cloud services for data management.	✓	✓	✓	✓	3	85	75	2	3	2	3	3	3	2	3	3	3

Title & Session	CO-1	CO-2	CO-3	CO-4	CO-5
Duration (60	9	9	9	9	9
SO-1	Introduction Definition& Characteristics of IoT	Introduction Application of IoT	Introduction about Iot protocols Infrastructure	IoT Platforms Design Methodology, Purpose & Requirements, process model specification,	Introduction about RESTful API, Designing a RESTful Web API
SO-2	Physical design of IoT Things in IoT	Home Automation Discuss Home automation problems	6LowPAN Architecture of 6LowPAN	Information model specifications, service specifications, Iot level specifications Functional view specifications, operational	Amazon Web Services Amazon Web Services for IoT
SO-3	Logical Design of IoT IoT Functional Blocks	Cities Discuss cities problem	Ipv6 Architecture of Ipv6	Device & component Integration, Application development, IoT System for Weather	Creating a ID in Amazon EC2
SO 4-5	Practice 1: Develop a simple application based on sensors	Practice 3: Demonstrate the REST APIs to send/read IoT data	Practice 5: To develop an application that measures the moisture of soil and post the sensed data over Google Firebase cloud	Practice 7: Weather Reporting Systems	Practice 9: IoT application: Smart agriculture prototype
SO-6	IoT Communication APIs	M2M Architecture of M2M	MQTT Examples of MQTT	Introduction to Cloud Storage Models	Implementation of S3 RDS
SO-7	IoT Levels and Deployment Templates Level 0,1	NFV for IOT Architecture of NFV	CoAP Request and Response methods	Introduction to Cloud Storage Communication APIs	Implementation of RDS DynamoDB
SO 8-9	Practice 2 - Digital/Analog Sensor interfacing	Practice 4: IoT Application Development Using sensors and actuators (temperature	Practice 6: MQTT Publish/Subscribe with local broker and Secure MQTT using	Practice 8: Home Automation System	Practice 10: Air Pollution Monitoring System

Assessment									
Level of Thinking		**Continuous Learning Assessment (CLA)** (100 % weightage)							
		CLA – 1 (20%)		CLA – 2 (20%)		CLA – 3 (40%)		CLA – 4 (20%)	
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
	Remember								
	Understand	20%	20%	20%	15%	20%	15%	20%	15%
	Apply								
	Analyze	20%	20%	20%	20%	20%	20%	20%	15%
	Evaluate								
	Create	10%	10%	10%	15%	10%	15%	10%	20%
Total		100%		100%		100 %		100%	

Strategies					
Technology		**Pedagogy / Andragogy**		**Sustainable Development**	
Simulations	✓	Case Studies		No Poverty	
Emulations		Group Discussion	✓	Zero Hunger	
Prototypes		Hands-on Practice	✓	Good Health & Well Being	
Hands-on Practice Tools	✓	Inquiry Learning	✓	Quality Education	✓
Mathematical Computing Tools	✓	Interactive Lecture	✓	Gender Equality	
Field Visit		Leading Question	✓	Clean Water & Sanitation	
		Mind Map		Affordable & Clean Energy	
		Minute Paper			
		Peer Review			
		Problem Based Learning	✓		

Learning Resources	1. ArshdeepBahga and Vijay Madisetti, (2015), "Internet of Things - A Hands-on Approach", Universities Press 2. Dieter Uckelmann et.al, (2011), "Architecting the Internet of Things", Springer 3. CunoPfister, (2011), "Getting Started with the Internet of Things", O'Reilly, 2011. 4. Adrian McEwen, Hakim Cassimally, (2014), "Designing the Internet of Things", Wiley 5. HonboZhou, (2012), "The Internet of Things in the Cloud: A Middleware Perspective ", CRC Press 6. Olivier Hersent, David Boswarthick, Omar Elloumi, (2012), "The Internet of Things – Key applications and Protocols", Wiley

*The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		**Higher Institution Experts**		**Internal Experts**	
1	Mr. K V Srivallaban, Principal Consultant, Infosys Limited	1	Dr. D I George Amalarthinam,Principal,Associate Professor and Head, Jamal Mohamed College, Trichirappalli, Tamil Nadu	1	Dr S Uma Shankari Associate Professore FSH SRM IST Ramapuram Chennai Mr. U. Udaya Kumar, AP FSH SRM IST Ramapuram Chennai

Code	PCS25G35J	Title	Responsible AI	Category	G	Generic Elective	L	T	P	C
							1	0	2	2

Offering Department	Computer Science	Pre-requisite Courses	Artificial Intelligence	Co-requisite Courses	NIL	Progressive Courses	NIL	Data Book / Codes/Standards	

Course Rationale (CR):	The purpose of learning this course is to:	Depth				Attainment			Program Outcomes (PO)												
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12
		Conceive	Design	Implement	Operate	Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity	Communication Skills	Analytical Reasoning, Learning to Learn	Professionalism,	Digital Technology Skills	Value Incurcation,	Environmental Action, Multicultural Inclusivity	Community Engagement	Ethical Practices	Entrepreneurial Risk Taking	PSO - 1	Project Management	Life Long Learning
CR-1	Learn ethical theories and how they apply to AI technologies.																				
CR-2	Understand responsible AI development and deployment.																				
CR-3	Identify and address ethical dilemmas in AI applications.																				
CR-4	Explore legal and societal impacts of AI.																				
CR-5	Gain insights into regulatory frameworks and AI governance.																				
Course Outcomes (CO)	At the end of this course, learners will be able to:																				
CO-1	Learn fundamental ethical theories, issues and its challenges	✓	✓			3	80	75	3	3	3	3	3	2	1	3	3	2	3	2	
CO-2	Understand the ethical harms and ethical initiatives in AI	✓	✓			3	75	65	3	3	3	3	3	2	1	3	3	2	3	3	
CO-3	Evaluate the ethical implications of AI in decision-making, privacy, and surveillance	✓	✓			3	80	70	3	3	3	3	3	2	1	3	3	2	3	3	
CO-4	Identify legal and societal challenges in AI adoption and governance.	✓	✓	✓		3	75	75	3	3	3	3	3	2	1	3	3	2	3	3	
CO-5	Demonstrate responsible AI development by integrating ethical frameworks into AI design.	✓	✓	✓	✓	3	85	75	3	3	3	3	3	2	1	3	3	2	3	3	

Title & Session Outcomes	CO-1	CO-2	CO-3	CO-4	CO-5
Duration (60 minutes)	9	9	9	9	9
SO-1	Understanding Ethics in AI	Ethical Initiatives in AI	Model process for Addressing ethical concern in AI system design	Robo ethic and Morality	Ethics in Science and Technology
SO-2	Definition of morality	Fairness and Bias mitigation	Transparency and explainability in Autonomous systems	Regulatory compliance and governance in AI systems	AI and Ethics opportunities
SO-3	Evolution of AI Ethics	AI's Role in workforce Automation	Autonomous AI and Ethical Decision-making	Algorithmic Bias and Fairness in AI	Ethics and professional responsibility
SO 4-5	Practice 1: Ethical Dilemmas in AI	Practice 2: Implement fairness and bias mitigation in AI models	Practice 3:Data privacy in AI-powered health systems	Practice 4:case study on ontology where ethics is at stake	Practice 5:Identification on optimization in AI affecting ethics SDG Mini Project
SO-6	Ethical challenges in AI Decision- making	Ethical harms and concerns	Data privacy and protection in AI systems	Moral Theories	Ethical issues in artificial intelligence
SO-7	AI's Role in workforce Automation	Sustainability and AI for social Good	Regulatory compliance and governance in AI systems	Ethics and professional responsibility	AI and Creativity

SO 8-9	Practice 2:Analyze where AI made an unethical decision	Practice 4: Healthcare robots, Autonomous Vehicles, warfare and weaponization	Practice 6:Algorithmic bias in facial recognition systems	Practice 8:Analyze the role of moral theories in Roboethics	Practice 10:SDG Mini Project

Assessment									
Level of Thinking		Continuous Learning Assessment (CLA) (100 % weightage)							
		CLA– 1 (20%)		CLA– 2 (20%)		CLA– 3 (40%)		CLA – 4 (20%)	
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
	Remember	20%	20%	20%	15%	20%	15%	20%	15%
	Understand								
	Apply	20%	20%	20%	20%	20%	20%	20%	15%
	Analyze								
	Evaluate	10%	10%	10%	15%	10%	15%	10%	20%
	Create								
Total		100%		100%		100 %		100%	

Strategies					
Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations	✓	Case Studies		No Poverty	
Emulations		Group Discussion	✓	Zero Hunger	
Prototypes		Hands-on Practice	✓	Good Health & Well Being	
Hands-on Practice Tools	✓	Inquiry Learning	✓	Quality Education	
Mathematical Computing Tools	✓	Interactive Lecture	✓	Gender Equality	
Field Visit		Leading Question	✓	Clean Water & Sanitation	
		Mind Map		Affordable & Clean Energy	
		Minute Paper			
		Peer Review			
		Problem Based Learning	✓		

Resources	
2	y. Eleanor Bird, Jasmin Fox-Skelly, Nicola Jenner, Ruth Larbey, Emma Weitkamp and Alan Winfield ,"The ethics of artificial intelligence: Issues and initiatives", EPRS | European Parliamentary Research Service Scientific Foresight Unit (STOA) PE 634.452 – March 2020
2	Patrick Lin, Keith Abney, George A Bekey," Robot Ethics: The Ethical and Social Implications of Robotics", The MIT Press- January 2014
3	https://www.weforum.org/agenda/2016/10/top-10-ethical-issues-in-artificial-intelligence/

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Mr. K V Srivallaban, Principal Consultant, Infosys Limited	1	Dr. D I George Amalarthinam,Principal,Associate Professor and Head, Jamal Mohamed College, Trichirappalli, Tamil Nadu	1	Dr.S.KanchanaAssistant Professor, Department of Computer Science, SRM Institute of Science and Technology, Kattankulathur.

Code	PCS25G36J	Title	Security and Privacy in Cloud	Category	G	Generic Elective	L	T	P	C
							1	0	2	2

Offering Department	Computer Science	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

Course Rationale (CR):	The purpose of learning this course is to:
CR-1	To Introduce Cloud Computing terminology, definition& concepts
CR-2	To understand the security design and architectural considerations for Cloud
CR-3	To understand the Identity, Access control in Cloud
CR-4	To follow best practices for Cloud security using various design patterns
CR-5	To be able to monitor and audit cloud applications for security

Course Outcomes (CO)	At the end of this course, learners will be able to:	Depth				Attainment			Program Outcomes (PO)												
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12
		Conceive	Design	Implement	Operate	Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity	Communication Skills	Analytical Reasoning,	Learning to Learn	Professionalism,	Digital Technology Skills	Value incucation,	Multicultural Inclusivity	Environmental Activity,	Community Engagement	Ethical Practices	Entrepreneurial Risk Taking	PSO - 1	Project Management	Life Long Learning
CO-1	Understand the cloud concepts and fundamentals.	✓	✓			3	80	75	3	3	3	3	3	2	1	3	3	2	3	2	
CO-2	Explain the security challenges in the cloud.	✓	✓			3	75	65	3	3	3	3	3	2	1	3	3	2	3	3	
CO-3	Define cloud policy and Identity and Access Management.	✓	✓	✓	✓	3	80	70	3	3	3	3	3	2	1	3	3	2	3	3	
CO-4	Understand various risks and audit and monitoring mechanisms in the cloud.	✓	✓	✓	✓	3	75	75	3	3	3	3	3	2	1	3	3	2	3	3	
CO-5	Define the various architectural and design considerations for security in the cloud.	✓	✓	✓	✓	3	85	75	3	3	3	3	3	2	1	3	3	2	3	3	

Title & Session Outcomes	CO-1	CO-2	CO-3	CO-4	CO-5
Duration (60 minutes)	9	9	9	9	9
SO-1	Overview of cloud security	Security design principles for Cloud Computing	Access control requirements for Cloud infrastructure	Introduction to Design Patterns	Proactive activity monitoring
SO-2	Security Services	Comprehensive data protection	User Identification	Cloud bursting	Incident Response
SO-3	Confidentiality, Integrity	End-to-end access control	Authentication and Authorization	Geo-tagging	Monitoring for unauthorized access
SO 4-5	Practice 1: Simulate a Cloud scenario using cloud Sim	Practice 3: Simulate a secure file sharing using a cloud Sim	Practice 5: Implementanyencryptionalgorithmtoprotecttheimages	Practice 7: Implement an attribute-based access control mechanism	Practice 9: Develop a log monitoring system with incident management in the cloud
SO-6	Basic of cryptography	Common attack vectors and threats	Roles-based Access Control	Secure Cloud Interfaces	malicious traffic, abuse of system privileges

SO-7	Conventional and public-key cryptography	Network and Storage	Multi-factor authentication	Cloud Resource Access Control	Events and alerts ,Auditing
SO 8-9	Practice 2: Simulate resource management using Cloud Sim	Practice 4: simulate log forensics using cloud sim	Practice 6: Implement a role-based access control mechanism in a specific scenario	Practice 8: Implement data anonymization techniques over the simple dataset	Practice 10: SDG Mini Project

Assessment									
Level of Thinking		**Continuous Learning Assessment (CLA)** (100 % weightage)							
		CLA– 1 (20%)		CLA– 2 (20%)		CLA– 3 (40%)		CLA – 4 (20%)	
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
	Remember	20%	20%	20%	15%	20%	15%	20%	15%
	Understand								
	Apply	20%	20%	20%	20%	20%	20%	20%	15%
	Analyze								
	Evaluate	10%	10%	10%	15%	10%	15%	10%	20%
	Create								
Total		100%		100%		100 %		100%	

Strategies					
Technology		**Pedagogy / Andragogy**		**Sustainable Development**	
Simulations	✓	Case Studies		No Poverty	
Emulations		Group Discussion	✓	Zero Hunger	
Prototypes		Hands-on Practice	✓	Good Health & Well Being	
Hands-on Practice Tools	✓	Inquiry Learning	✓	Quality Education	✓
Mathematical Computing Tools	✓	Interactive Lecture	✓	Gender Equality	
Field Visit		Leading Question	✓	Clean Water & Sanitation	
		Mind Map		Affordable & Clean Energy	
		Minute Paper			
		Peer Review			
		Problem Based Learning	✓		

Resources	
1	RajKumarBuyya,JamesBroberg,andrzejGoscinski,“CloudComputing:”,Wiley2013
2	Daveshackleford,“VirtualizationSecurity”,SYBEXawileyBrand2013.
3	Mather,KumaraswamyandLatif,“CloudSecurityandPrivacy”,OREILLY2011

Designers					
Professional Experts		**Higher Institution Experts**		**Internal Experts**	
1	Mr. K V Srivallaban, Principal Consultant, Infosys Limited	1	Dr. D I George Amalarthinam,Principal,Associate Professor and Head, Jamal Mohamed College, Trichirappalli, Tamil Nadu	1	Dr.T.Nathiya Assistant Professor, Department of Computer Science, SRMIST

Code	PAI25P31L	Title	Internship	Category	P	Project Work, Internship in Industry/Higher Technical Institutions	L	T	P	C
							0	0	0	2

Offering Department	Computer Science w/s in Artificial Intelligence and Machine Learning	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

Course Rationale (CR):	The purpose of learning this course is to:
CR-1	Apply theoretical concepts to real-world industry challenges and professional practices.
CR-2	Enhance technical skills, problem-solving abilities, and workplace competencies relevant to the field.
CR-3	Demonstrate clear and professional communication through reports, presentations, and teamwork.
CR-4	Understand workplace ethics, professional responsibilities, and industry standards.
CR-5	Critically reflect on the internship experience to identify key learnings and areas for professional growth.

Course Outcomes (CO)	At the end of this course, learners will be able to:	Depth				Attainment			Program Outcomes (PO)											
		Conceive	Design	Implement	Operate	Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity	Communication Skills	Analytical reasoning,	Learning to Learn, Professionalism,	Digital Technology Skills	Multicultural Inclusivity, value incucaron,	Environmental Action,	Ethical Practices & Social Commitment,	Entrepreneurial risk Taking	PSO - 1	PSO - 2	Life Long Learning
CO-1	Demonstrate the ability to apply theoretical concepts to practical industry scenarios.	✓	✓	✓	✓	3	85	75	3	3	3	3	3	3	3	3	3	3	3	3
CO-2	Develop problem-solving and analytical skills by assessing industry challenges and proposing evidence-based solutions.	✓	✓	✓	✓	3	85	75	3	3	3	3	3	3	3	3	3	3	3	3
CO-3	Exhibit proficiency in academic and professional communication through structured reports, documentation, and presentations.	✓	✓	✓	✓	3	85	75	3	3	3	3	3	3	3	3	3	3	3	3
CO-4	Understand and adhere to professional ethics, workplace discipline, and academic integrity in a real-world environment.	✓	✓	✓	✓	3	85	75	3	3	3	3	3	3	3	3	3	3	3	3
CO-5	Evaluate personal and professional growth through reflective analysis of the internship experience, identifying strengths, weaknesses, and areas for continuous learning.	✓	✓	✓	✓	3	85	75	3	3	3	3	3	3	3	3	3	3	3	3

*** Internship Training Selection: List of Industries/Research Centre's for Internship Training for students would be finalized by the Department Internship/Industrial Training Committee

LearningAssessment				
	Continuous Learning Assessment (50%weightage)		Final Evaluation (50%weightage)	
	Review–1	Review–2	Internship Report	Viva-Voce
ProjectWork/Internship	20%	30%	30%	20%

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Mr. K V Srivallaban Principal Consultant Infosys Limited	1	Dr. D I George Amalarthinam ,Principal Associate Professor and Head of the Department of Computer Science, Jamal Mohamed College, Trichirappalli, Tamil Nadu, India	1	Dr.S.Kanchana Assistant Professor, Department of Computer Science, FSH, SRMIST

Semester – IV

Code	PAI25P41L	Title	Project Work	Category	P	. Project Work, Internship in Industry/Higher Technical Institutions	L	T	P	C
							0	0	20	10

Offering Department	Computer Science w/s in Artificial Intelligence and Machine Learning	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

Course Rationale (CR):	The purpose of learning this course is to:
CR-1	Enables students to apply academic knowledge to solve real-world industrial problems.
CR-2	Encourages analytical thinking and innovation in addressing industry challenges.
CR-3	Strengthens students' technical expertise, project management, and teamwork capabilities.
CR-4	Provides exposure to industry practices, tools, and professional work culture.
CR-5	Equips students with critical thinking, adaptability, and employability skills for future career growth.

Course Outcomes (CO)	At the end of this course, learners will be able to:	Depth				Attainment			Program Outcomes (PO)												
		1 Conceive	2 Design	3 Implement	4 Operate	1 Level of Thinking	2 Expected Proficiency (%)	3 Expected Attainment (%)	1 Problem Solving, Critical Thinking, Creativity	2 Communication Skills	3 Analytical reasoning, Learning to Learn	4 Professionalism, Autonomy	5 Digital Technology Skills	6 value incucaron, Multicultural Inclusivity	7 Environmental Action, Community Engagement	8 Ethical Practices & Social Responsibility,	9 Entrepreneurial risk Taking	10 PSO - 1	11 Project Management &Finance	12 Life Long Learning
CO-1	Apply software engineering principles to design, develop, test, and deploy efficient and scalable software solutions.	3	3	3	3	3	85	80	3	3	3	3	3	3	3	3	3	3	3	3	3
CO-2	Analyze complex problems and implement optimized algorithms and data structures to enhance system performance.	3	3	3	3	3	85	80	3	3	3	3	3	3	3	3	3	3	3	3	3
CO-3	Utilize modern software tools, programming languages, and industry best practices to develop high-quality applications.	3	3	3	3	3	85	80	3	3	3	3	3	3	3	3	3	3	3	3	3
CO-4	Work effectively in teams, follow agile methodologies, and adhere to ethical and professional standards in software development.	3	3	3	3	3	85	80	3	3	3	3	3	3	3	3	3	3	3	3	3
CO-5	Stay updated with emerging technologies, frameworks, and trends to enhance career growth and innovation in the software industry.	3	3	3	3	3	85	80	3	3	3	3	3	3	3	3	3	3	3	3	3

***** Project Work Selection: Project Work Titles for students would be finalized by the Department Project Work Evaluation Committee.**

LearningAssessment				
	Continuous Learning Assessment (50%weightage)		Final Evaluation (50%weightage)	
	Review–1	Review–2	Project Report	Viva-Voce
ProjectWork/Internship	20%	30%	30%	20%

Designers					
Professional Experts		**Higher Institution Experts**		**Internal Experts**	
1	Mr. K V Srivallaban Principal Consultant Infosys Limited	1	Dr. D I George Amalarthinam,Principal Associate Professor and Head of the Department of Computer Science, Jamal Mohamed College, Trichirappalli, Tamil Nadu, India	1	Dr.P. Muthulakshmi Professor, Department of Computer Science, FSH, SRMIST