Marudhar Kesari Jain College for Women (Autonomous)
Vaniyambadi – 635 751

PG & Research Department of Computer Science for

Postgraduate Programme

Master of Computer Science (M.Sc)

Regulations 2026 - 2027

CONTENT

LEARNING OUTCOMES BASED CURRICULUM FRAMEWORK FOR POSTGRADUATE EDUCATION

1. Preamble

Master of Science (M.Sc.) programme in Computer Science is established in the year 1999 is a 2 year Postgraduate programme spread over four semester. Master of Philosophy established in the year 2012 and Doctor of Philosophy established in the year 2021 is a dynamic and comprehensive academic journey designed to equip students with a strong foundation in the principles and practices of computing. The course is designed to achieve high degree of technical skills in problem solving and application development. The course develops requisite professional skills and problem-solving abilities for pursuing a successful career in software industry and forms the required basics for pursuing higher studies in computer science

PROGRAMME OUTCOMES (PO)

Programme	**M.Sc. Computer Science**
Programme Code	**PSO2**
Duration	**2 years [PG]**
Programme Outcomes	**PO1:** Acquire knowledge in Computer Science to apply the knowledge in their day- to- day life for betterment of self and society. **PO2:** Develop critical, analytical thinking and problem-solving skills. **PO3:** Develop research related skills in defining the problem, formulate and test the hypothesis, analysis, interpret, and draw conclusion from data. **PO4:** Address and develop solutions for societal and environmental needs of local, regionaland national development. **PO5:** Work independently and engage in life long learning and enduring proficient progress. **PO6:** Provoke employability and entrepreneurship among students along with ethics and communication skills. **PO7:** Understand the importance of ethical behavior in business contexts and be able to recognize and address ethical dilemmas they may encounter in their professional careers. **PO8:** Prepared for life long learning and professional development, including the ability to adapt to changes in technology, business practices, and economic conditions throughout their careers.
Programme Specific Outcomes:	**PSO1: Computer Science for Real-World Problem Solving** Demonstrate the ability to apply computer science principles, mathematical modeling, and computational techniques to analyze and solve complex real-world problems. **PSO2: Ethical and Responsible Computing** Exhibit professionalism and ethical responsibility in designing and developing computing solutions while ensuring compliance with cyber regulations, laws, and industry standards. **PSO3: Innovation and Entrepreneurship in Technology** Leverage creativity, innovation, and entrepreneurial skills to develop and implement technology-driven solutions for societal and business challenges.

Eligibility for Admission:

A candidate who has passed the B.Sc. Degree Examination in Computer Science or Computer Science and Technology or B.C.A. or B.Sc. Software Computer Science of this University or an Examination of any other University accepted by the Syndicate as equivalent thereto shall be permitted to appear and qualify for the Master of Science (M.Sc.) in Computer Science Degree Examination of this University after a Course of two academic years in an affiliated Colleges / Department of this University.

Methods of Evaluation and Assessment

Methods of Evaluation		
Internal Evaluation		25 Marks
External Evaluation	End Semester Examination	75 Marks
	Total	**100 Marks**
Methods of Assessment		
Recall (K1)	Simple definitions, MCQ, Recall steps, Concept definitions	
Understand / Comprehend (K2)	MCQ, True/False, Short essays, Concept explanations, short summary or overview	
Application (K3)	Suggest idea/concept with examples, suggest formulae, solve problems, Observe, Explain	
Analyze (K4)	Problem-solving questions, finish a procedure in many steps, Differentiate Between various ideas, Map knowledge	
Evaluate (K5)	Longer essay/Evaluation essay, Critique or justify with pros and cons	
Create (K6)	Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations	

Course Code	Course Category	Title of the Course	Ins. Hrs / Week	Credit	Marks		Total
					CIA	ESE	
Semester – I							
26PCSC11	Core – 1	Principles of Compiler Design	6	5	25	75	100
26PCSC12	Core – 2	Analysis and Design of Algorithms	6	5	25	75	100
26PCSC13P	Core – 3	Analysis and Design of Algorithms Lab	5	3	25	75	100
26PCSE11/ 26PCSE12	DCE – 1	1. Advanced Python Programming 2. Advanced Java Programming	5	3	25	75	100
26PCSE13P/ 26PCSE14P	DCE – 2	1. Advanced Python Programming Lab / 2. Advanced Java Programming Lab	4	3	25	75	100
26PCSA11	AECC -1	Introduction to Robotics	2	2	25	75	100
26PCHR11	HR	Human Rights	2	2	25	75	100
			30	**23**	**175**	**525**	**700**
Semester – II							
26PCSC21	Core – 4	Modern Operating Systems	6	5	25	75	100
26PCSC22	Core – 5	Artificial Intelligence	6	5	25	75	100
26PCSC23P	Core – 6	Modern Operating Systems Lab	5	3	25	75	100
26PCSE21/ 26PCSE22	DCE – 3	1. Data Analytics Using R / 2. Cloud Computing	5	3	25	75	100
26PCSE23P/ 26PCSE24P	DCE – 4	1. Data Analytics Using R Lab 2. Cloud Computing Lab	5	3	25	75	100
26PCSS21P	SEC-1	Data Visualization-Tableau Lab	3	2	25	75	100
			30	**21**	**150**	**450**	**600**
Semester – III							
26PCSC31	Core – 7	Web Technology	6	5	25	75	100
26PCSC32	Core – 8	Advanced Database Management Systems	6	5	25	75	100
26PCSC33P	Core – 9	Advanced Database Management Systems Lab	6	4	25	75	100
26PCSE31/ 26PCSE32	DCE – 5	1. Research Methodology 2. Social Media Analytics	6	3	25	75	100
26PCSS31	SEC – 2	Web Development Lab	3	2	25	75	100
26PCSIK31	IKS*	Machine Learning Ethics & Law	3		25	75	100
26PCSIN31	Internship	Internship		2	25	75	100
			30	**21**	**175**	**525**	**700**
Semester – IV							
26PCSC41	Core – 10	Internet of Things	6	5	25	75	100
26PCSC42	Core – 11	Soft Computing	6	5	25	75	100
26PCSC43P	Core – 12	Internet of Things Lab	4	3	25	75	100
26PCSC44P	Core – 13	Project	6	6	25	75	100
26PCSE41/ 26PCSE42	DCE – 6	1. Block Chain Technology 2. Cyber Security	4	3	25	75	100
26PCSP41	PEC	Computer Vision & Application	2	2	25	75	100
26PCSL41	SLC	Tensor Flow	2	2	25	75	100
	MOOC	**NPTEL (Online)**			25	75	100
			30	**26**	**200**	**600**	**800**
			120	**91**	**700**	**2100**	**2800**

Students must complete at least one online course (MOOC) from platforms like SWAYAM, NPTEL, within the third semester. Additionally, engaging in a specified Self-learning Course is mandatory to qualify for the degree, and successful participation will be acknowledged with an extra credit of 2*.

CC: Core Course
DCE: Discipline Centric Elective
SEC: Skill Enhancement Course
PEC: Professional Enhancement Course
SLC: Self Learning Course
IKS: Indian Knowledge System (Non- Credit Course)
AECC: Ability Enhancement Compulsory Course

FIRST YEAR - FIRST SEMESTER

PG & Research Department of Computer Science		L	T	P	Credits	Hours	Marks		
Regulation 2026-27							CIA	ESE	Total
Course Code	Title of the Course								
26PCSC11	Principles of Compiler Design	4	2	0	5	6	25	75	100
Category	Core Course -1	Theory & Problem							

Learning Objectives

LO1	To introducing about Phases of a compiler and Lexical Analysis
LO2	To enable the students to learn about Role of Parser and different LR Parsers
LO3	To learn about intermediate code generation and Run time environment
LO4	To understand the design and issues of code generator,basic blocks and flow graphs
LO5	To describe the Data-flow Analysis and Loops in Flow Graphs

Unit	Content	Hours
1	**Introduction to Compiling:-** Compilers – Analysis of the source program – Phases of a compiler – Cousins of the Compiler – Grouping of Phases – Compiler construction tools – Lexical Analysis – Role of Lexical Analyzer – Input Buffering – Specification of Tokens.	18
2	**Syntax Analysis:-** Role of the parser – Context-Free Grammars –Writing Grammars – Top Down parsing – Recursive Descent Parsing – Nonrecursive Predictive Parsing – Bottom-up parsing – Shift Reduce Parsing – LR Parsers – SLR Parser – Canonical LR Parser – LALR Parser.	18
3	**Intermediate Code Generation and Run Time Environments:-** Variants of Syntax Trees – Types and Declarations –Translations of Expression –Type Checking – Control Flow – Backpatching – Procedure calls. **Run-time Environments** – Storage Organization – Stack Allocation of Space – Access to non-local Data on the Stack – Heap Management.	18
4	**Code Generation:-** Issues in the design of code generator – The target machine – Runtime Storage management – Basic Blocks and Flow Graphs – Next-use Information – Optimization of basic Blocks – A simple Code generator – Peephole Optimization.	18
5	**Machine-Independent Optimizations:-** The Principal Sources of Optimization – Introduction to Data-flow Analysis– Foundations of Data-Flow Analysis – Partial -Redundancy Elimination– Loops in Flow Graphs – Region Based Analysis – Symbolic Analysis	18

CO	Course Outcomes The students can be able to	Knowledge Level
1	Understand the phases and tools available in Compiler	K1, K2
2	Explain and apply different syntax analysis techniques	K3, K4
3	Compare and analyze the process of intermediate code generation	K1, K2, K3
4	Understand the basic blocks, flow graphs, and code optimization	K1, K2, K3, K4
5	Apply machine-independent optimization techniques	K1, K2,K6

Textbooks:	
1	Alfred V. Aho, Jeffrey D Ullman, "Compilers: Principles, Techniques and Tools", Pearson Education Asia, 2008
2	Jean Paul Tremblay, Paul G Serenson, "The Theory and Practice of Compiler Writing", BS Publications, 2005
3	Dhamdhere, D. M., "Compiler Construction Principles and Practice", 2nd edition, Macmillan dia Ltd., New Delhi, 2008
4	Santanu Chattopadhyay, "Compiler Design", PHI Learning Pvt. Ltd., 2015.
Reference Books:	
1	Allen I. Holub, "Compiler Design in C", Prentice Hall of India, 2003
2	C. N. Fischer and R. J. LeBlanc, "Crafting a compiler with C", Benjamin Cummings, 2003
3	Henk Alblas and Albert Nymeyer, "Practice and Principles of Compiler Building with C", PHI, 2001
4	Kenneth C. Louden, "Compiler Construction: Principles and Practice", Thompson Learning, 2003
Web Resources:	
1	https://www.geeksforgeeks.org/introduction-of-lexical-analysis/
2	https://www.tutorialspoint.com/compiler_design/compiler_design_tutorial.pdf
3	https://onlinecourses.nptel.ac.in/noc21_cs07/preview

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	3	2	3	1	2	1	3	2	3
CO2	3	3	3	3	3	2	3	3	3	3	3
CO3	3	3	3	3	3	3	3	2	3	3	3
CO4	3	3	3	3	3	2	3	2	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3
Total	15	14	15	14	15	11	14	11	15	14	15
Average	3	2.8	3	2.8	3	2.2	2.8	2.2	3	2.8	3

3 – Strong, 2- Medium, 1- Low

FIRST YEAR - FIRST SEMESTER

PG & Research Department of Computer Science		L	T	P	Credits	Hours	Marks		
Regulation 2026-27							CIA	ESE	Total
Course Code	Title of the Course								
26PCSC12	Analysis and Design of Algorithms	3	2	1	5	6	25	75	100
Category	Core Course -2	Theory & Problem							

Learning Objectives

LO1	To analyze the asymptotic performance of algorithms
LO2	To discuss various methods like Basic Traversal,Search Techniques, Divide and Conquer method
LO3	To demonstrate about the knapsack problem and shortest path
LO4	Explore and analyze the Traveling salesman Problem
LO5	Understand and apply Backtracking and Branch and Bound techniques

Unit	Content	Hours
1	**Introduction: -** Algorithm Definition and Specification – Space complexity Time Complexity-Asymptotic Notations - Elementary Data Structure: Stacks and Queues – Binary Tree – Binary Search Tree-Graph.	18
2	**Basic Traversal and Search Techniques:-** Techniques for Binary Trees Techniques for Graphs -Divide and Conquer:-General Method–Binary Search–Merge Sort–Quick Sort.	18
3	**The Greedy Method: -** General Method – Knapsack Problem - Job sequencing with deadlines– Optimal merge patter- Minimum Cost Spanning Tree – Single Source Shortest Path.	18
4	**Dynamic Programming:**-General Method–Multistage Graphs–All Pair Shortest Path–Optimal Binary Search Trees–0/1 Knapsacks–Traveling Salesman Problem.	18
5	**Backtracking:-** General Method–8-Queens Problem–Sum Of Subsets – Graph Coloring–Hamiltonian Cycles – Branch And Bound:-The Method –Traveling Salesperson	18

CO	Course Outcomes The students will be able to	Knowledge Level
CO1	Get knowledge about algorithms and determine their time complexity.	K1, K2
CO2	Able to describe about Techniques in graphs and divide and conquer method	K1, K2
CO3	Gain good understanding of Greedy method and its algorithm	K1, K2
CO4	Explore the searching technique and apply it for trees and graphs	K1, K2, K3, K4,K6
CO5	Demonstrate the concept of backtracking & branch and bound technique	K1, K2,K3

Textbooks:	
1	Ellis Horowitz, "Computer Algorithms" , Galgotia Publications.
2	Alfred V.Aho, John E.Hopcroft, Jeffrey D.Ullman,"Data Structures and Algorithms".
Reference Books:	
1	Good rich, "Data Structures & Algorithms in Java", Wiley 3 rd edition.
2	Skiena, "The Algorithm Design Manual", Second Edition, Springer, 2008.
3	Anany Levith,"Introduction to the Design and Analysis of algorithm", Pearson Education Asia, 2003.
4	Robert Sedge wick, Phillipe Flajolet, "An Introduction to the Analysis of Algorithms".
5	Addison - Wesley Publishing Company, 1996
Web Resources:	
1	https://www.tutorialspoint.com/design_and_analysis_of_algorithms/index.htm
2	https://www.javatpoint.com/daa-tutorial
3	https://onlinecourses.nptel.ac.in/noc19_cs47/preview

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	3	2	3	2	2	2	3	2	3
CO2	3	3	3	3	3	3	3	2	3	3	3
CO3	3	3	3	3	3	2	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	2	3	2	3	3	3
Total	15	14	15	14	15	12	14	12	15	14	15
Average	3	2.8	3	2.8	3	2.4	2.8	2.4	3	2.8	3

3 – Strong, 2- Medium, 1- Low

FIRST YEAR - FIRST SEMESTER

PG & Research Department of Computer Science		L	T	P	Credits	Hours	Marks		
Regulation 2026-27							CIA	ESE	Total
Course Code	Title of the Course								
26PCSC13P	Analysis and Design of Algorithms Lab	0	0	5	3	5	25	75	100
Category	Core Practical	Practical							

Learning Objectives	
LO1	To implement fundamental algorithms and data structures like binary search, stack, queue
LO2	To sharpen problem-solving abilities by applying algorithmic techniques to solve various sorting techniques
LO3	To master recursion principles and techniques by implementing recursive solutions to problems like Tower of Hanoi.
LO4	To explore graph theory and algorithms covering traversing binary search trees, minimum cost spanning tree and single-source shortest path
LO5	To gain insight into algorithmic paradigms such as Minimum Cost Spanning Tree,Single Source Shortest Path and Sum of Subsets

S.no	Content	Hours
1	Develop a program for Binary Search.	75
2	Write a program to perform the operations on Stack.	
3	Implement a program to perform the operations on Queue.	
4	Design a program to sort a given array of elements using Merge Sort.	
5	Write a program to sort a given array of elements using Quick Sort.	
6	Write a program to solve the tower of Hanoi using recursion.	
7	Build a program to traverse binary search tree.	
8	Implement to solve the knapsack problem using a greedy method.	
9	Write a program to place the 8 queens on an 8 X 8 matrix so that no two queens Attack.	
10	Implement a program for Minimum Cost Spanning Tree.	
11	Write a program for Single Source Shortest Path.	
12	Construct a program for Sum of Subsets.	

CO	Course Outcomes The students will be able to	Knowledge Level
CO1	Implement the Binary Search tree and operation of Stack and Queue	K1, K2,K3
CO2	Design and solve the problem of sorting algorithm	K3, K4,K6
CO3	Describe and solve the tower of Hanoi using recursion and knapsack problem	K1, K2
CO4	Develop a program on Minimum cost spanning tree	K1, K2, K3, K4,K6
CO5	Demonstrate the single source shortest path and sum of subsets	K1, K2,K3

Textbooks:	
1	Ellis Horowitz, “Computer Algorithms” , Galgotia Publications.
2	Alfred V.Aho, John E.Hopcroft, Jeffrey D.Ullman,"Data Structures and Algorithms”.
Reference Books:	
1	Good rich, “Data Structures & Algorithms in Java”, Wiley 3 rd edition.
2	Skiena, ”The Algorithm Design Manual”, Second Edition, Springer, 2008.
3	Anany Levith,”Introduction to the Design and Analysis of algorithm”, Pearson Education
4	Robert Sedge wick, Phillipe Flajolet, ”An Introduction to the Analysis of Algorithms”.
5	Addison - Wesley Publishing Company, 1996
Web Resources:	
1	https://www.tutorialspoint.com/design_and_analysis_of_algorithms/index.htm
2	https://www.javatpoint.com/daa-tutorial
3	https://onlinecourses.nptel.ac.in/noc19_cs47/preview

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	3	2	3	1	2	2	3	2	3
CO2	3	3	3	3	3	2	3	2	3	3	3
CO3	3	3	3	3	3	2	3	2	3	3	3
CO4	3	3	3	3	3	3	3	2	3	3	3
CO5	3	3	3	3	3	2	3	2	3	3	3
Total	15	14	15	14	15	10	14	10	15	14	15
Average	3	2.8	3	2.8	3	2	2.8	2	3	2.8	3

3 – Strong, 2- Medium, 1- Low

FIRST YEAR - FIRST SEMESTER

PG & Research Department of Computer Science		L	T	P	Credits	Hours	Marks		
Regulation 2026-27							CIA	ESE	Total
Course Code	Title of the Course								
26PCSE11	Advanced Python Programming	3	2	0	3	5	25	75	100
Category	DCE-1	Theory & Problem							

Learning Objectives

LO1	To build basic programs using fundamental programming constructs like variables, conditional logic, looping, and functions
LO2	To learning about conditional statements and Functions
LO3	To understand File operations, Classes and Objects
LO4	To learn about different packages and modules in python
LO5	To understanding the concepts Machine Learning

Unit	Content	Hours
1	**Python:** Introduction – Numbers – Strings – Variables – Lists – Tuples – Dictionaries – Sets – Comparison.	13
2	**Code Structures:** if, else if, and else–Repeat with while– Iterate with for–Comprehensions–Functions–Generators–Decorators–Namespaces and Scope–Handle Errors with try and except–User Exceptions.	15
3	**Design with Classes:** Getting inside Objects and Classes – Data-Modeling Examples – Building a New Data Structure – The Two – Dimensional Grid - Structuring Classes with Inheritance and Polymorphism - Graphical User Interfaces - The Behavior of terminal-Based programs and GUI-Based programs - Coding Simple GUI-Based programs - Windows and Window Components - Command Buttons and responding to events.	17
4	**Working with Python Packages:** NumPy Library- Ndarray – Basic Operations – Indexing, Slicing and Iteration – Array manipulation - Pandas – The Series – The DataFrame - The Index Objects – Data Vizualization with Matplotlib – The Matplotlib Architecture – pyplot – The Plotting Window – Adding Elements to the Chart – Line Charts – Bar Charts – Pie charts	15
5	**Machine Learning:** Types of Machine Learning - Supervised Learning - Unsupervised Learning – reinforcement- The Curse of dimensionality -Over fitting and linear regression- Bias and Variance - Learning Curve-Classification-Error and noise-Parametric vs. non-parametric models-Linear models	15

CO	Course Outcomes The students will be able to	Knowledge Level
CO1	Understand the basic concepts of Python Programming	K1, K2
CO2	Explain about the code structures	K1, K2, K3, K4
CO3	Acquire knowledge on Design with classes and GUI Programs	K1, K2, K3
CO4	Design the program on various Concepts using Numpy packages and libraries	K1, K2, K3, K4,K6
CO5	Analyze the supervised and unsupervised Learning	K1, K2,K6

Textbooks:	
1	BillLubanovic, "Introducing Python",O'Reilly,First Edition-Second Release.
2	K.A. Lambert, " Fundamentals of Python: first programs", Second Edition, Cengage Learning, 2018 (unit-3)
3	MarkLutz, "Learning Python", O'Reilly, Fifth Edition.
4	Fabio Nelli, "Python Data Analytics: With Pandas, NumPy, and Matplotlib", Second Edition, Kindle Edition, 2018 (Unit - IV)
5	Jeeva Jose and P. SojanLal, —Introduction to Computing and Problem Solving with Python, Khanna Book Publising Co. (P) Ltd., 2016.
6	Machine Learning : A Practitioner's Approach Chandra S.S., Vinod Hareendran S., Anand 2021
Reference Books:	
1	David M.Beazley, "Python Essential Reference",Developer's Library,Fourth Edition,2009
2	Sheetal Taneja, Naveen Kumar, "Python Programming-A Modular Approach", Pearson Publications.
3	Python Programming using problem solving approach reema Thareja 2023, second edition
4	Python Machine Learning, Third Edition is a comprehensive guide to machine learning and deep learning with Python,7 Sebastian Raschka (Author), Vahid Mirjalili , December 2019
5	Introduction to Machine Learning with Python, by Andreas C. Muller, Sarah Guido September 2016
Web Resources:	
1	https://nptel.ac.in/courses/106106145
2	https://www.programiz.com/python-programming/
3	https://www.geeksforgeeks.org/machine-learning/

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	3	3	3	3	3
CO2	2	3	3	3	3	2	3	3	3	3	2
CO3	3	3	2	3	2	3	3	3	2	3	3
CO4	3	3	3	3	3	2	1	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3
Total	14	15	14	15	14	13	13	15	14	15	14
Average	2.8	3	2.8	3	2.8	2.6	2.6	3	2.8	3	2.8

3 – Strong, 2- Medium, 1- Low

FIRST YEAR - FIRST SEMESTER

PG & Research Department of Computer Science		L	T	P	Credits	Hours	Marks		
Regulation 2026-27							CIA	ESE	Total
Course Code	Title of the Course								
26PCSE12	Advanced Java Programming	3	2	0	3	5	25	75	100
Category	DCE - 1	Theory & Problem							

Learning Objectives

LO1	To learn the basic concepts of Advanced java programming and AWT Controls.
LO2	To learn about the swing components and how to apply in web applications.
LO3	To explore the concepts in JDBC and Event Listeners
LO4	To understand about the Life Cycle of servlet and Http Request and Response
LO5	To learn JDBC and ODBC Architecture and Driver Managers

Unit	Content	Hours
1	**Advanced Java Framework :** component, container, window, frame, panel- AWT controls and Layout Managers - AWT Controls : Labels, buttons, checkbox, scroll bars, text field, text area. Use of Layout Managers- Media Techniques	15
2	**Swing :** Swing features, Difference between AWT and Swing. Swing Components: JApplet, Icons and Labels, Text Fields, Combo Boxes -Buttons- Advanced Swing Components: Tabbed Panes, Scroll Panes, Trees, Tables, Progress bar, tool tips- Remote Method Invocation - Creating Stubs and skeletons-Remote object Activation – Java Spaces	15
3	**Java in Databases**- JDBC principles–database access-Interacting- database search– The delegation Event Model: Event sources, Event listeners - Event classes - Event Listner interfaces – Mouse Listener Interface -Creating multimedia databases – Database support in web applications - Threading concepts – Networking features .	15
4	**Servlet:** The life cycle of a Servlet – Creating simple Servlet – Handling HTTP Request and Response-sending data to a client and writing the http response header-Cookies and Session Tracking – Introduction to JSP. The Networking classes and interfaces. Inet Address: Factory Methods, Instance Methods. TCP/IP Client Sockets: Who is URL: Formate, The URL Class.	15
5	Introduction to JDBC , ODBC JDBC Architecture: - Types of JDBC Drivers- Drivers Interfaces and Driver Manager class – Advanced Java Techniques	15

CO	Course Outcomes The Students can be able to	Knowledge Level
CO1	Develop GUI programs using AWT components for the given problem	K4,K5,K6
CO2	Develop a program using menu and Dialog Boxes for the given problem	K4,K5,K6
CO3	Use delegation event model to develop event driven program for the given problem	K1, K2, K3
CO4	Develop program for Client/Server Communication through TCP/IP Server sockets for the given problem	K3, K4,K5,K6
CO5	Use relevant type of JDBC Driver for the specified environment	K1, K2,K6

Textbooks:	
1	Herbert Schildt and Danny Coward - Java : The Complete Reference - Tata McGraw Hill Publishing Company Limited Edition 13, 2024.
2	Holzner, Steven et al-Java 2 Programming Black Book –Deramtech Press, New Delhi .ISBN 10 : 817722655X / ISBN 13 : 9788177226553
3	Phil Hanna - JSP 2.0: The Complete Reference -Tata McGraw Hill Publishing Company Limited, Edition 2, 2003
Reference Books:	
1	P. Naoughton and H. Schildt - Java2: The Complete Reference - Tata McGraw Hill Publishing Company Limited, Edition 3, 1999.
2	K. Arnold and J. Gosling - The Java Programming Language - Edition 2, Publication, 2000
3	Deitel & Deitel,"Java How to program", 8th ed., PHI.
Web Resources:	
1	https://nptel.ac.in/courses/106105191
2	https://www.javatpoint.com/free-java-projects

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	3	2	2	2	2	3
CO2	3	3	2	3	2	3	2	3	3	3	2
CO3	2	3	2	3	3	2	2	3	3	3	2
CO4	3	2	2	3	3	3	3	3	3	3	3
CO5	3	3	2	3	3	3	3	3	3	3	2
Total	14	14	10	15	13	14	12	14	14	14	12
Average	2.8	2.8	2	3	2.6	2.8	2.4	2.8	2.8	2.8	2.4

3 – Strong, 2- Medium, 1- Low

FIRST YEAR - FIRST SEMESTER

PG & Research Department of Computer Science		L	T	P	Credits	Hours	Marks		
Regulation 2026-27							CIA	ESE	Total
Course Code	Title of the Course								
24PCSE13P	Advanced Python Programming Lab	0	0	4	3	4	25	75	100
Category	DCE - 2	Practical							

Learning Objectives

LO1	To introduce students to the basic knowledge of programming fundamentals of Python
LO2	Understand and implement the program use basic flow control, including for loops and conditionals
LO3	Understand and implement the handing of exception
LO4	Understand and implement the procedures for machine learning algorithms
LO5	Apply appropriate datasets to the Machine Learning algorithms

S.NO	Content	Hours
1	Write a Python program to manage a small bookstore by storing book names and prices in a dictionary, maintaining a list of purchased books, using a tuple for store details (name and location), and calculating the total bill for selected books.	60
2	Write a program that takes student marks as input and prints the grade using conditional statements.	
3	Write a Python program to calculate the total and average marks of a class by taking input for n students using a loop and displaying the result.	
4	Write a Python program to swap two numbers and find the area of different shapes (circle, rectangle, triangle) using functions	
5	Write a Python program to divide two user-entered numbers by handling division by zero and invalid (non-numeric) inputs using exception handling, and display appropriate error messages.	
6	Write a program to display student details using inheritance.	
7	Write a program to train dataset to find mean median mode using numpy.	
8	Write a program to draw the line of Linear Regression.	
9	Extract the data from database using python	
10	Implement k-nearest neighbors classification using python	

CO	Course Outcomes The students can be able to	Knowledge Level
CO1	Able to write programs in Python using OOPS concepts	K1, K2,K3
CO2	To understand the concepts of File operations and Modules in Python	K1, K2
CO3	Implementation of lists, dictionaries, sets and tuples as programs	K3,K4,K5
CO4	Effectively use the various machine learning tools	K1, K2, K3, K4
CO5	Design Python programs for various machine learning algorithms	K3, K5,K6

Textbooks:	
1	Bill Lubanovic, "Introducing Python" , O'Reilly, First Edition-Second Release,2014.
2	MarkLutz, "Learning Python" ,O'Reilly, Fifth Edition, 2013.
Reference Books:	
1	David M.Beazley, "Python EssentialReference",Developer's Library, Fourth Edition,2009.
2	Sheetal Taneja, Naveen Kumar, "Python Programming- A Modular Approach", Pearson Publications.
Web Resources:	
1	https://nptel.ac.in/courses/106106145
2	https://www.geeksforgeeks.org/machine-learning/

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	3	3	3	3	3
CO2	2	3	3	3	3	2	3	3	3	3	2
CO3	3	3	2	3	2	3	3	3	2	3	3
CO4	3	3	3	3	3	2	2	3	3	3	3
CO5	3	3	2	3	3	3	3	3	3	3	3
Total	14	15	13	15	14	13	14	15	14	15	14
Average	2.8	3	2.6	3	2.8	2.6	2.8	3	2.8	3	2.8

3 – Strong, 2- Medium, 1- Low

FIRST YEAR - FIRST SEMESTER

PG & Research Department of Computer Science		L	T	P	Credits	Hours	Marks		
Regulation 2026-27									
Course Code	Title of the Course						CIA	ESE	Total
26PCSE14P	Advanced Java Programming Lab	0	0	4	3	4	25	75	100
Category	DCE-2	Practical							

Learning Objectives	
LO1	To explore advanced topic of Java programming for solving problems and Multi threading and file concepts
LO2	To perform Font Animation using Java Applets
LO3	To create a student database using JDBC concepts
LO4	To implement client server and employee details using Java
LO5	To create dynamic web pages, using Servlets and JSP

S.No	Content	Hours
1	Write a program to implement multi threading with thread priorities	60
2	Write a program to perform file handling and string manipulation operations such as reading from a file, writing to a file, and processing text data.	
3	Write an Applet Program to use various Controls and perform Font Animation.	
4	Create a menu with sub menu, popup menu, short cut keys, check box items and separator.	
5	Implement calculator using Java AWT controls.	
6	Create a Student mark statement using JDBC control and display the information using Table.	
7	Construct a Program to implement Client/Server technology.	
8	Write a Java program to create an Employee pay bill calculation using various swing controls.	
9	Demonstrate a servlet to display the user name and password accepted from the client	
10	Write a servlet for demonstrating the concept of session and cookies	

CO	Course Outcomes The students can be able to	Knowledge Level
CO1	Develop GUI programs using AWT components for the given problem	K3, K4,K5
CO2	Develop a program using menu and Dialog Boxes for the given problem	K3, K4,K5,K6
CO3	Use relevant type of JDBC Driver for the specified environment	K1, K2, K3
CO4	Develop program for Client/Server Communication through TCP/IP Server sockets for the given problem	K3, K4,K5,K6
CO5	Use delegation event model to develop event driven program for the given problem	K1, K2,K3

Textbooks:	
1	Herbert Schildt - The Complete Reference Java - Tata McGraw Hill Publishing Company Limited Edition 7, 2007.
2	Holzner, Steven et al-Java 2 Programming Black Book –Deramtech Press, New Delhi .ISBN 10 : 817722655X / ISBN 13 : 9788177226553
3	Phil Hanna - JSP 2.0: The Complete Reference -Tata McGraw Hill Publishing Company Limited, Edition 2, 2003
Reference Books:	
1	P. Naoughton and H. Schildt - Java2: The Complete Reference - Tata McGraw Hill Publishing Company Limited, Edition 3, 1999.
2	K. Arnold and J. Gosling - The Java Programming Language - Edition 2, Publication, 2000
3	Deitel & Deitel,"Java How to program", 8th ed., PHI.
Web Resources:	
1	https://www.tutorialspoint.com/java
2	https://nptel.ac.in/courses/106105191
3	https://www.javatpoint.com/free-java-projects

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	3	2	2	2	2	3
CO2	3	3	2	3	2	3	2	3	3	3	2
CO3	2	3	2	3	3	2	2	3	3	3	2
CO4	3	2	2	3	3	3	3	3	3	3	3
CO5	3	3	2	3	3	3	3	3	3	3	2
Total	14	14	10	15	13	14	12	14	14	14	12
Average	2.8	2.8	2	3	2.6	2.8	2.4	2.8	2.8	2.8	2.4

3 – Strong, 2- Medium, 1- Low

FIRST YEAR - FIRST SEMESTER

PG & Research Department of Computer Science		L	T	P	Credits	Hours	Marks		
Regulation 2026-27									
Course Code	Title of the Course						CIA	ESE	Total
26PCSA11	Introduction to Robotics	1	1	0	2	2	25	75	100
Category	AECC-1	Theory & Problem							

Learning Objectives	
LO1	To Learn about the concepts of Robotics automation and its strategies
LO 2	To Learn the introduction and history of Robotics
LO 3	To Explore knowledge in sensors and Machine Vision
LO 4	To analyze the robotics programming Techniques
LO 5	To analyze the various applications of robotics

Unit	Content	Hours
1	**Automation** - Definition of Automation - Mechanization Vs Automation- Advantages - Goals - Social Issues-Types - Current Emphasis in Automation - Issues in automation in Factory Operations - Strategies of Automation	6
2	**Industrial Robots**- Definition - Laws of Robotics - Characteristics- Components - Comparison of the Human and the Robot Manipulator - Robot Wrist and End of Arm Tools - Robot Terminology-Robotic Joints - Classification - Robotics Accident - Robotic Safety and Maintenance	6
3	**Robotic Sensors:** Types of Sensors in Robots, Exteroceptors Sensors -Tactile Sensors -Proximity Sensors-Range Sensors - Machine Vision Sensors- Velocity Sensors - Proprioceptors - Robots with sensors	6
4	**Robot Programming Techniques**: Online programming- Lead-through Programming-Offline Programming-Task Level Programming-Motion Programming-Robot Programming Languages - Types of Robot languages	6
5	**Applications of Robots**: Robot Capabilities - Application of Robots - Manufacturing Applications-Material handling applications - **Robots using Real time - Embedded system** - Robotic Arm.	6

CO	Course Outcomes The students will be able to	Knowledge Level
CO1	Understand the concepts of Robotics automation and its strategies	K1, K2
CO 2	Explain the history, laws, characteristics, components, joints, and classification of industrial robots.	K1, K2, K3, K4
CO 3	Describe different types of sensors, machine vision systems.	K1, K2, K3
CO 4	Apply various robot programming methods, including online, offline	K3, K4
CO 5	Analyze the capabilities and applications of robots in manufacturing	K4, K5,K6

Textbooks:	
1	Gupta.A.K, Arora. S. K., Industrial Automation and Robotics, Mercury Learning and Information, 2017 (Unit I,II ,III,IV,V)
Reference Books:	
1	Mikell P Groover, "Industrial Robotics", Mc GrawHill, 2012.
2	D.J.Todd, "Fundamentals of Robot Technology", An Introduction to Industrial Robots, Teleoperators and Robot Vehicles, Wiley,1986
Web Resources:	
1	https://onlinecourses.nptel.ac.in/noc20_de11/preview
2	https://www.theengineeringprojects.com/2024/04/what-is-robotics.html

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	3	2	2	2	2	3
CO2	3	3	3	3	2	3	2	3	3	3	2
CO3	2	3	2	3	3	2	2	3	3	3	2
CO4	3	2	3	3	3	3	3	3	3	3	3
CO5	3	3	2	3	3	3	3	3	3	3	2
Total	14	14	13	15	13	14	12	14	14	14	12
Average	2.8	2.8	2.6	3	2.6	2.8	2.4	2.8	2.8	2.8	2.4

3 – Strong, 2- Medium, 1- Low

FIRST YEAR - SECOND SEMESTER

PG & Research Department of Computer Science		L	T	P	Credits	Hours	Marks		
Regulation 2026-27							CIA	ESE	Total
Course Code	Title of the Course								
26PCSC21	Modern Operating Systems	3	2	1	5	6	25	75	100
Category	Core Course - 4	Theory & Problem							

Learning Objectives	
1	To enable the students to learn the different types of operating systems and their functioning.
2	To gain knowledge on Memory Management and File systems
3	To gain insight into the components and management aspects of real time and mobile operating
4	To learn about the how to handled operating system
5	To learn case studies in Linux Operating Systems

Unit	Content	Hours
1	**Operating Systems:** What is an Operating System - Main frame Systems – Desktop Systems – Multiprocessor Systems – Distributed Systems – Clustered Systems – Real-Time Systems – Handheld Systems – Feature Migration – Computing Environments – Process Scheduling – Cooperating Processes – Inter Process Communication - Deadlocks – Prevention –Avoidance – Detection – Recovery.	18
2	**Memory Management and File Systems and I/O :** Memory Management - Paging - Segmentation - Virtual Memory- Demand paging - Replacement Algorithms – Design Issues – Implementation Issues – Research on Memory Management – **File systems** - Design issues - User interface to file– File System Implementation – File System Management and Optimization. Principle of I/O Hardware & Software - Systems I/O device management - Disk Scheduling approaches	18
3	**Mobile and Real Time Operating Systems:** Basic Model of Real Time Systems – Characteristics – Applications of Real Time Systems – Real Time Task Scheduling – Handling Resource Sharing. Mobile Operating Systems – Architecture – Layers – Micro kernel Design – Kernel Extensions – Processes and Threads – Memory Management – File system – Android – iOS.	18
4	**Operating Systems for Handheld Systems :** Requirements–Technology Overview–Handheld Operating Systems–Palm OS-Symbian Operating System-Android–Architecture of android– Securing handheld systems	18
5	**Case Studies :** Linux System: Introduction – Memory Management – Process Scheduling –Scheduling Policy - Managing I/O devices – Accessing Files- iOS : Architecture and SDK Framework - Media Layer - Services Layer - Core OS Layer - File System.	18

CO	Course Outcomes The students can be able to	Knowledge Level
1	Understand the design issues associated with operating systems.	K1, K2
2	Explore about the memory manangement and file system	K1, K2, K3, K4
3	Prepare Real Time Task Scheduling and modern operating systems	K1, K2, K3
4	Analyze Operating Systems for Handheld Systems	K3, K4
5	Analyze Operating Systems like LINUX and IOS	K3, K4,K6

Textbooks:	
1	Andrew S. Tanenbaum and Herbert Bos, Modern Operating Systems, Prentice Hall, Fourth Edition, 2014.
2	Abraham Silberschatz; Peter Baer Galvin; Greg Gagne, "Operating System Concepts", Seventh Edition, John Wiley & Sons, 2004.
3	Rajib Mall, "Real-Time Systems : Theory and Practice", Pearson EducationIndia,2006
4	Mukesh Singhal and Niranjan G. Shivaratri, "Advanced Concepts in Operating Systems – Distributed, Database, and Multiprocessor Operating Systems", Tata McGraw-Hill, 2001.
Reference Books:	
1	Pramod Chandra P. Bhatt, An introduction to operating systems, concept and practice, PHI, Third edition, 2010.
2	Daniel. P. Bovet & Marco Cesati, "Understanding the Linux kernel",3rd edition, O"Reilly,2005
3	Neil Smyth, "iPhonei OS4 Development Essentials–Xcode", Fourth Edition, Payload media, 2011.
Web Resources:	
1	https://www.geeksforgeeks.org/introduction-of-operating-system-set-1/
2	https://onlinecourses.nptel.ac.in/noc24_cs108/preview

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	3	2	2	2	2	3
CO2	3	3	2	3	2	3	2	3	3	3	2
CO3	2	3	2	3	3	2	3	3	3	3	2
CO4	3	2	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	2	3	3	3	2
Total	14	14	13	15	13	14	12	14	14	14	12
Average	2.8	2.8	2.6	3	2.6	2.8	2.4	2.8	2.8	2.8	2.4

3 – Strong, 2- Medium, 1- Low

FIRST YEAR - SECOND SEMESTER

PG & Research Department of Computer Science		L	T	P	Credits	Hours	Marks		
Regulation 2026-27							CIA	ESE	Total
Course Code	Title of the Course								
26PCSC22	Artificial Intelligence	3	2	1	5	6	25	75	100
Category	Core Course - 5	Theory & Problem							

Learning Objectives	
1	To Learn about the Intelligent Agents and strategies
2	To understand about the search Algorithms and Apache Spark
3	To explore knowledge Acquisition techniques
4	To gain knowledge on the concepts in Natural Language Processing
5	To define ethics in Artificial Intelligence of various Applications

Unit	Content	Hours
1	**Introduction and Problem solving** AI – Foundations of AI, Intelligent Agents – Agents and Environments – Good Behavior – Nature of Environments – Structure of Agents – Problem Solving Agents – Searching for solutions- Uninformed Search Strategies – Informed Search Strategies, heuristic functions - **Agentic AI**: Types,Building AI Agents, AI Agent Framework - Multi-Agent System -Agent to Agent Communication	18
2	**Search Algorithms and Languages and Tools** Local search algorithms and optimization problems – Searching with nondeterministic Actions, Constraint satisfaction problems – Working with LISP, Prolog – Apache Spark.	18
3	**Expert systems -** Expert systems – Introduction – Difference between expert system and conventional programs – Expert system organization – Architecture of Expert system – Knowledge representation techniques- Knowledge acquisition techniques - Inference Engine- Explanation systems.	18
4	**Learning and Communication :** Learning from example - Learning Decision Tree - evaluating best hypothesis -ANN-SVM - Knowledge in Learning - Reinforcement Learning - Natural Language Processing - Natural Language Processing for communication	18
5	**Ethics of Artificial Intelligence -** Ethics of Artificial Intelligence in Transport, Ethical AI in Military, Biomedical research, Patient Care, Public Health, Robot Teaching, Pedagogy, Policy, Smart City Ethics.	18

CO	Course Outcomes The students will be able to	Knowledge Level
CO 1	Understand the concepts of Intelligence agents and strategies	K1, K2
CO 2	Demonstrate the use of AI programming languages and tools	K1, K2, K3, K4
CO 3	Explain the concept, structure, and functioning of Expert Systems	K1, K2, K3
CO 4	Apply machine learning techniques such as decision trees, Artificial Neural Networks and Support Vector Machines	K3, K4,K5
CO 5	Analyze the ethical issues of Artificial Intelligence	K4,K5,K6

Textbooks:	
1	Stuart J Russell and Peter Norvig, Artificial Intelligence – A Modern Approach, PHI Learning, Third Edition,
2	Patterson W D, Introduction to Artificial Intelligence and Expert Systems, PHI Learning, First Edition, 1995.
3	Paula Boddington, —Towards a Code of Ethics for Artificial Intelligence‖, Springer, 2017
Reference Books:	
1	Elaine Rich and Kelvin Knight, Artificial Intelligence, TMH, Third Edition, 2009.
Web Resources:	
1	https://nptel.ac.in/domains/discipline/106?course=106_0

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	3	2	2	2	2	3
CO2	3	3	2	3	2	3	2	3	3	3	2
CO3	2	3	3	3	3	2	2	3	3	3	2
CO4	3	2	3	3	3	3	3	3	3	3	3
CO5	3	3	2	3	3	3	2	3	3	3	2
Total	14	14	12	15	13	14	11	14	14	14	12
Average	2.8	2.8	2.4	3	2.6	2.8	2.2	2.8	2.8	2.8	2.4

3 – Strong, 2- Medium, 1- Low

FIRST YEAR - SECOND SEMESTER

PG & Research Department of Computer Science		L	T	P	Credits	Hours	Marks		
Regulation 2026-27							CIA	ESE	Total
Course Code	Title of the Course								
26PCSC23P	Mordern Operating Systems Lab	0	0	5	3	5	25	75	100
Category	Core Course - 6	Practical							

Learning Objectives	
1	To understand the design issues associated with operating systems.
2	To gain knowledge on File handling and Networking commands
3	To master various concepts including scheduling, deadlocks and distributed file systems
4	To analyze disk scheduling algorithm
5	To analyze Page replacement algorithms

S.No	Content	Hours
1	Implement a program to demonstrate the use of basic Linux commands for file handling, directory management, and system operations.	75
2	Write a program to create and execute a shell script that performs tasks such as user input processing, conditional statements, and looping.	
3	Write a shell script that receives any number of file names as arguments checks if every argument supplied is a file or directory and reports accordingly. Whenever the argument is a file it reports no of lines present in it.	
4	Develop File handling utilities ,Process utilities, Disk utilities Networking commands, Filters, Text processing Utilities Backup utilities	
5	Write a C program to implement kill(), raise() and sleep()functions.	
6	Write a C program that illustrates two processes communicating using Shared memory.	
7	Simulate the following CPU scheduling algorithms. FCFS b) SJF c) Round Robin d) Priority.	
8	Implement a C program to simulate disk scheduling algorithms. FCFS b) SCAN c) C-SCAN	
9	Simulate the Bankers Algorithm for Dead Lock	
10	Simulate all page replacement algorithms a) FIFO b) LRU c) OPTIMAL	

CO	Course Outcomes The Students can be able to	Knowledge Level
CO 1	Understand the design issues associated with operating systems.	K1, K2
CO 2	Explore knowledge on File handling and Networking commands	K1, K2, K3, K4
CO 3	Describe various concepts including scheduling, deadlocks and distributed file systems	K1, K2, K3
CO 4	Analyze and implement disk scheduling algorithm	K3, K4,K5
CO 5	Analyze and Implement Page replacement algorithms	K4,K5,K6

Textbooks:	
1	Andrew S. Tanenbaum and Herbert Bos, Modern Operating Systems, Prentice Hall, Fourth Edition, 2014.
2	Abraham Silberschatz; Peter Baer Galvin; Greg Gagne, "Operating System Concepts",
3	Rajib Mall, "Real-Time Systems : Theory and Practice", Pearson EducationIndia,2006
4	Mukesh Singhal and Niranjan G. Shivaratri, "Advanced Concepts in Operating Systems –
Reference Books:	
1	Pramod Chandra P. Bhatt, An introduction to operating systems, concept and practice, PHI, Third edition, 2010.
2	Daniel. P. Bovet & Marco Cesati, "Understanding the Linux kernel",3rd edition, O"Reilly,2005
3	Neil Smyth, "iPhonei OS4 Development Essentials–Xcode", Fourth Edition, Payload media, 2011.
Web Resources:	
1	https://nptel.ac.in/courses/106106144

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	3	2	2	2	2	3
CO2	3	3	2	3	2	3	2	3	3	3	2
CO3	2	3	3	3	3	2	2	3	3	3	2
CO4	3	2	2	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	2	3	3	3	2
Total	14	14	12	15	13	14	11	14	14	14	12
Average	2.8	2.8	2.4	3	2.6	2.8	2.2	2.8	2.8	2.8	2.4

3 – Strong, 2- Medium, 1- Low

FIRST YEAR - SECOND SEMESTER

PG & Research Department of Computer Science		L	T	P	Credits	Hours	Marks		
Regulation 2026-27							CIA	ESE	Total
Course Code	Title of the Course								
26PCSE21	Data Analytics Using R	1	4	0	3	5	25	75	100
Category	DCE-3	Theory & Problem							

Learning Objectives	
1	Introduce the concepts in data science, bigdata & its ecosystem
2	To Learn data analytics &its life cycle.
3	To explore the programming language R, with respect to the data mining algorithms
4	To Learn about the Clustering and Decision Tree Algorithm
5	Relate the relationship between artificial intelligence, machine learning and data science.

Unit	Content	Hours
1	**Data Science in a big data World :** Data science and big data–facets of data-data science process - Ecosystem - The Data Science process –Six Steps - Machine Learning , The modeling process,Types of machine learning.	15
2	**Data Analytics life cycle** - Discovery,Data Preparation,Model Planning,Model Building,Communicate Results,Operationalize, Case Studies - Review of data analytics-R,Exploratory Data Analysis,Statistical Methods for Evaluation, - **Advanced Analytics - technology and tools:** Analytics for Unstructured Data,The Hadoop Ecosystem.	15
3	**Data Analytics Methos using R :** R Graphical User Interfaces – Data Import and Export – Attribute and Data Types –Descriptive Statistics – Exploratory Data Analysis – Visualization Before Analysis – Dirty Data – Visualizing a Single Variable – Examining Multiple Variables – Data Exploration Versus Presentation.	15
4	**Clustering :** K-means – Use Cases – Overview of the Method – Perform a K-means Analysis using R –Classification – Decision Trees – Overview of a Decision Tree – Decision Tree Algorithms – Evaluating a Decision Tree – Decision Tree in R – Bayes' Theorem – Naïve Bayes Classifier – Smoothing – Naïve Bayes in R	15
5	**Artificial intelligence :** Machine Learning and deep learning in data science-Clustering, association rules. Linear regression - logistic regression - Additional regression methods.	15

CO	Course Outcomes The student will be able to	Knowledge Level
1	Understand the concept of data science and its techniques	K1, K2
2	Explore and Review the data analytics concepts	K1, K2, K3, K4
3	Apply and determine appropriate Data Mining techniques using R to real time applications	K1, K2, K3
4	Analyze on clustering algorithms and Decision Tree Algorithm	K1, K2, K3, K4
5	Analyze on regression methods in AI	K1, K2,K6

Textbooks:	
1	Data science in big data analytics-Wiley 2015 John Wiley & Sons
2	Introducing-Data-Science-Big-Data-Machine-Learning-and-more-using-Python-tools-2016
Reference Books:	
1	A simple introduction to Data Science-Lars Nielson 2015
2	Introducing Data Science Davy Cielen, Arno D.B.Meysman, Mohamed Ali 2016 Manning Publication
3	R Programming for Data Science-Roger D. Peng 2015 Lean Publication
4	Data Science & Big Data Analytics : Discovering, Analyzing, Visualizing and Presenting Data
Web Resources:	
1	https://nptel.ac.in/courses/106/106/106106179/

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	3	2	2	2	2	3
CO2	3	3	3	3	2	3	2	3	3	3	2
CO3	2	3	2	3	3	2	2	3	3	3	2
CO4	3	2	3	3	3	3	3	3	3	3	3
CO5	3	3	2	3	3	3	2	3	3	3	2
Total	14	14	12	15	13	14	11	14	14	14	12
Average	2.8	2.8	2.4	3	2.6	2.8	2.2	2.8	2.8	2.8	2.4

3 – Strong, 2- Medium, 1- Low

FIRST YEAR - SECOND SEMESTER

PG & Research Department of Computer Science		L	T	P	Credits	Hours	Marks		
Regulation 2026-27							CIA	ESE	Total
Course Code	Title of the Course								
26PCSE22	Cloud Computing	2	3	0	3	5	25	75	100
Category	DCE-3	Theory & Problem							

Learning Objectives	
1	To provide students with the fundamentals and essentials of Cloud Computing.
2	To provide students are able to start using and adopting Cloud Computing services and tools
3	To Gain knowledge on cloud computing, cloud services, architectures, and applications
4	To how to store and share, in and from cloud
5	To the concepts of virtualization and use of cloud service models

Unit	Content	Hours
1	**Cloud Computing:** Collaboration to cloud, Working of cloud computing, pros and cons, benefits, developing cloud computing services, Cloud service development,discovering cloud services	15
2	**Cloud Computing For Everyone:** Centralizing email communications, cloud computing for community, collaborating on schedules, collaborating on group projects and events, cloud computing for corporation, mapping and schedules.	15
3	**Cloud Services:** Collaborating on calendars, Schedules and task management, exploring online scheduling and planning, collaborating on event management, collaborating on contact management, collaborating on project management.	15
4	**Outside The Cloud:** valuating web mails services, Evaluating instant messaging, Evaluating web conference tools, creating groups on social networks, Evaluating online groupware.	15
5	**Storing And Sharing:** Understanding cloud storage, evaluating online file storage, exploring on line book marking services, exploring on line photo editing applications, exploring photo sharing communities, controlling it with web based desktops.	15

CO	Course Outcomes The students can be able to	Knowledge Level
1	To understand the principles and paradigm of Cloud Computing	K1, K2
2	Ability to design and deploy Cloud Infrastructure	K3, K4.K5.K6
3	Understand cloud security issues and solutions	K1, K2,
4	Ability to understand role of Virtualization Technologies	K1, K2, K3,
5	Design & develop backup strategies for cloud data based on features	K4, K5,K6

Textbooks:	
1	Michael Miller, "Cloud Computing", Pearson Education, New Delhi.
2	Nikos Antonopoulos, Lee Gillam: "Cloud Computing: Principles, Systems and Applications", Springer, 2012
3	Douglas Comer, The Cloud Computing Book: The Future of Computing Explained, Edition 1,Publisher ,Chapman and Hall/CRC, 2021
4	Lizhe Wang, Rajiv Ranjan, Jinjun Chen, Boualem Benatallah: O'Reilly "Cloud Computing Methodology, System and Applications",2017
Reference Books:	
1	To by Velte, Anthony Velte, Robert Elsenpeter, Cloud Computing, A Practical Approach, McGraw Hill, 2010
2	Judith Hurwitz, Robin Bloor, Marcia Kaufman, Fern Helper, Cloud Computing for Dummies, Wiley, 2010.
Web Resources:	
1	https://onlinecourses.nptel.ac.in/noc26_cs55/preview

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	3	3	3	3	3
CO2	3	2	3	3	2	3	2	2	2	3	3
CO3	3	3	3	3	3	2	3	2	3	3	3
CO4	3	2	3	2	2	3	2	3	2	3	3
CO5	3	3	3	2	3	2	3	2	2	3	3
Total	15	13	15	13	13	13	13	12	12	15	15
Average	3	2.6	3	2.6	2.6	2.6	2.6	2.4	2.4	3	3

3 – Strong, 2- Medium, 1- Low

FIRST YEAR - SECOND SEMESTER

PG & Research Department of Computer Science		L	T	P	Credits	Hours	Marks		
Regulation 2026-27							CIA	ESE	Total
Course Code	Title of the Course								
26PCSE23P	Data Analytics Using R Lab	0	0	5	3	5	25	75	100
Category	DCE-4	Practical							

Learning Objectives	
1	Know Basic Data Analytics using R and Graphical User Interfaces
2	Use functions for structuring R programs and different statistics techniques
3	Understand different Data Structures and Pandas of R
4	Have an idea on Exploratory Data Analysis and clustering algorithms
5	Work on different clustering and classification algorithms

S.No	Content	Hours
1	Write an R Script to perform the data Import and export operations.	75
2	Write an R Script to perform the Data Pre-processing techniques.	
3	Implement an R Script to perform the descriptive statistics concepts.	
4	Visualizing the data in different graphics using R Scripts.	
5	Write an R Script to implement the Time series data analysis and forecasting.	
6	Develop an R Script to implement the Cross-Validation.	
7	Write an R Script to implement the Ordinary Least Squares (OLS).	
8	Implement an R Script to implement the Linear regression algorithm.	
9	Construct an R Script to implement the K-Means clustering algorithm.	
10	Write an R Script to implement the Naïve Bayes.	

CO	Course Outcomes The students can be able to	Knowledge Level
1	Apply R programming to import, export, and processors datasets effectively.	K1, K2
2	Analyze data using descriptive statistics and visualize insights through various graphical techniques in R.	K2, K3
3	Implement statistical models such as OLS and linear regression for data analysis.	K3,K4
4	Develop machine learning models including K-Means clustering and Naïve Bayes using R.	K5
5	Perform time series analysis, forecasting, and model validation techniques like cross-validation.	K5,K6

Textbooks:	
1	Introducing-Data-Science-Big-Data-Machine-Learning-and-more-using-Python-tools-2016. Pdf
2	Data science in big data analytics-Wiley 2015 John Wiley & Sons.
Reference Books:	
1	A simple introduction to Data Science – Lars Nielson 2015
2	Introducing Data Science Davy Cielen, Arno D.B. Meysman, Mohamed Ali 2016 Manning Publication
3	R Programming for Data Science-Roger D. Peng 2015 Lean Publication
4	Data Science & Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data
Web Resources:	
1	https://nptel.ac.in/courses/106/106/106106179/

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	3	2	2	2	3
CO2	3	3	3	3	3	3	3	2	3	3	2
CO3	3	3	3	3	3	3	3	2	3	3	2
CO4	3	3	3	3	3	3	3	2	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	2
Total	15	15	15	15	15	15	15	11	14	14	12
Average	3	3	3	3	3	3	3	2.2	2.8	2.8	2.4

3 – Strong, 2- Medium, 1- Low

FIRST YEAR - SECOND SEMESTER

PG & Research Department of Computer Science		L	T	P	Credits	Hours	Marks		
Regulation 2026-27							CIA	ESE	Total
Course Code	Title of the Course								
26PCSE24P	Cloud Computing Lab	0	0	5	3	5	25	75	100
Category	DCE-4	Practical							

Learning Objectives	
1	To Deploy applications over commercial cloud computing infrastructures.
2	To Experiment the google Cloud and Virtualization Experience.
3	To Deploy Website Using Google App Engine
4	To Implement the Cloud Environments with the available resources.
5	To Understand the Cloud Storage and Security.

S.No	Content	Hours
1	Working to create, edit, and share spreadsheets and notes using Google Drive.	75
2	Create and run a Linux Virtual Machine using virtualization software.	
3	Implement to host a simple static website using a Linux Virtual Machine.	
4	Exploring Google cloud for the following a). Storage b). Sharing of data c). Manage your calendar, to-do lists, d). a document editing tool.	
5	Deploy a Static Website using Google App Engine	
6	A student is required to host a simple static website on the cloud using Microsoft Azure. Design and deploy the solution.	
7	To Connect Amazon Redshift with S3bucket.	
8	To Create and Query a NoSQL Table.	
9	Create an account in any cloud storage platform (e.g., Google Drive or Dropbox) and perform the following: 1.Upload different file types (document, image, video) ,2.Create folders and organize files,3.Share a file with another user using a link,4.Set permissions (view/edit)	
10	Compare at least two cloud storage services (e.g., Google Drive and OneDrive) based on: 1.Storage capacity , 2.Upload/download speed ,3.Security features ,4.User interface, Prepare a comparison report.	

CO	Course Outcomes The students can be able to	Knowledge Level
1	Articulate the main concepts, key technologies, strengths, and limitations of Cloud Computing and deploy applications over commercial cloud computing infrastructures.	K1, K2
2	Gain knowledge about cloud and virtualization along with it, how one can migrate over it.	K3, K4
3	Develop the ability to manage the cloud environment and understand the concepts of cloud storage, security	K4,K5
4	Choose the appropriate technologies, algorithms and approaches for implementation of cloud environment using Openstack and AWS	K5,K6
5	Implement and Analyze the Microsoft Azure / Google App Engine, etc.	K5,K6

Textbooks:	
1	Michael Miller, "Cloud Computing", Pearson Education, New Delhi, 2009.
Reference Books:	
1	Anthony T. Velte, "Cloud Computing: A Practical Approach", 1st Edition, Tata McGraw Hill Education Private Limited, 2009.
Web Resources:	
1	https://nptel.ac.in/courses/106/105/106105167/

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	3	2	2	2	2	3
CO2	3	3	2	3	2	3	2	3	3	3	2
CO3	2	3	2	3	3	2	2	3	3	3	2
CO4	3	2	2	3	3	3	3	3	3	3	3
CO5	3	3	2	3	3	3	2	3	3	3	2
Total	14	14	10	15	13	14	11	14	14	14	12
Average	2.8	2.8	2	3	2.6	2.8	2.2	2.8	2.8	2.8	2.4

3 – Strong, 2- Medium, 1- Low

FIRST YEAR - SECOND SEMESTER

PG & Research Department of Computer Science		L	T	P	Credits	Hours	Marks		
Regulation 2026-27							CIA	ESE	Total
Course Code	Title of the Course								
26PCSS21P	Data Visualization -Tableau Lab	0	0	3	2	3	25	75	100
Category	SEC - 1	Practical							

Learning Objectives	
1	To Understand the importance of data visualization for business intelligence and decision making.
2	To Know approaches to understand visual perception
3	To Learn about categories of visualization and application areas
4	To Familiarize with the data visualization tools
5	To Gain knowledge of effective data visuals to solve workplace problems

S.No	Content	Hours
1	Create Pie chart for Sales and Sales % by Country (sorted in descending order). using excel	45
2	Create Bar chart for Sales by Country by Year (rounded to nearest thousand and sorted by Grand Total). using excel	
3	Basic Visualization Line plots,Area plots,Histograms,Bar charts,Pie charts, Box plots, Scatter plots in Python	
4	Basic Visualization like Scatter plots,Line plots,Box plots,Histograms,Bar charts using R	
5	Connecting to Data and preparing data for visualization in Tableau	
6	Data Aggregation and Statistical functions in Tableau	
7	Create a Basic Dashboards in Tableau for category of sales across months in a year, region is the field added.	
8	Design a symbol map to represent population or sales distribution across different cities.	
9	Creating Interactive Visualizations in Tableau for Sales by Ship Mode by Country (rounded to the nearest dollar and sorted by First Class).	
10	A college wants to share student performance dashboards with faculty members. Deploy and share the dashboard using Tableau.	

CO	Course Outcomes The students can be able to	Knowledge Level
1	Use Python, R and Tableau for data visualization	K1, K2
2	Apply data visuals to convey trends in data over time using tableau	K1, K2, K3, K4
3	Construct effective data visuals to solve workplace problems	K4, K5, K6
4	Explore and work with different plotting libraries	K3,K4,K5, K6
5	Learn and create effective visualizations dashboard	K1, K2,K6

Textbooks:	
1	Data visualization with python: create an impact with meaningful data insights using interactive and engaging visuals, Mario Dobler, Tim Grobmann, Packt Publications, 2019
2	Practical Tableau: 100 Tips, Tutorials, and Strategies from a Tableau Zen Master, Ryan Sleeper, Oreilly Publications, 2018
Reference Books:	
1	Data Visualization with R: 111 Examples by Thomas Rahlf, Springer, 2020
Web Resources:	
1	https://elearn.nptel.ac.in/shop/completed-courses/short-term-programs-completed/data-visualization-with-r/?v=13b5bfe96f3e
2	https://mrcet.com/downloads/digital_notes/CSIT/CSIT_R22_DATA%20VISUALIZATION.pdf

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	3	2	2	2	2	3
CO2	3	3	3	3	2	3	2	3	3	3	2
CO3	2	3	3	3	3	2	2	3	3	3	2
CO4	3	2	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	2	3	3	3	2
Total	14	14	15	15	13	14	11	14	14	14	12
Average	2.8	2.8	3	3	2.6	2.8	2.2	2.8	2.8	2.8	2.4

3 – Strong, 2- Medium, 1- Low