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)

From the Academic Year 2024-25

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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	**PS03**
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	

Semester - I

Code	Course Title	Hours Distribution				C
		L	T	P	S	
24PCSC11	CC – 1 Principles of Compiler Design	3	1	2	0	4
24PCSC12	CC – 2 Analysis and Design of Algorithms	3	1	2	0	4
24PCSC13P	CC - 3 Practical Analysis and Design of Algorithms Lab	0	0	4	0	3
24PCSE11	EC - 1 Advanced Python Programming	3	1	1	0	3
24PCSE12P	EC – 2 Machine Learning using Python Lab	0	0	5	0	3
24PCSA11	AECC – 1 Cloud Computing	1	1	0	0	2
24PCHR11	VE - 1 Human Rights	1	1	0	0	2
TOTAL					**30**	**21**

Semester - II

Code	Course Title	Hours Distribution				C
		L	T	P	S	
24PCSC21	CC - 4 Advanced Operating Systems	3	1	2	0	4
24PCSC22	CC - 5 Advanced Java Programming	3	1	2	0	4
24PCSC23P	CC - 6 Practical Advanced Operating Systems Lab (Linux)	0	0	4	0	3
24PCSC24P	CC - 7 Advanced Java Programming Lab	0	0	4	0	3
24PCSE21	EC - 3 1. Artificial Intelligence 2. Advanced Software Engineering	2	1	1	0	3
24PCSE22	EC - 4 Web Services	2	1	1	0	3
24PCSS21	SEC - 1 (NME) Internet concepts and Web Development	1	1	0	0	2
TOTAL					**30**	**22**

Semester - III

Code	Course Title	Hours Distribution				C
		L	T	P	S	
24PCSC31	CC - 8 Data Mining and Warehousing	3	1	2	0	5
24PCSC32	CC - 9 Advanced Database Management Systems	3	1	2	0	5
24PCSC33P	CC - 10 Practical - IV Advanced Database Management Systems Lab	0	0	4	0	3
24PCSC34	CC – 11 Cryptography and Network Security	2	1	1	0	4
24PCSE31 24PCSE32	EC - 5 1. Data Science 2. Social Media Analytics	2	1	1	0	3
24PCSS31P	SEC - 2 Data Mining using R Practical	0	0	4	0	2
24PCSIN31	INTERNSHIP	0	0	2	0	2
TOTAL					**30**	**24**

Semester - IV

Code	Course Title	Hours Distribution				C
		L	T	P	S	
24PCSC41	CC - 12 Internet of Things	3	1	2	0	5
24PCSC42P	CC - 13 Internet of Things Lab	3	1	2	0	5
24PCSC43P	CC - 14 Project	0	0	6	0	5
24PCSE41 24PCSE42	EC - 6 1.Block Chain Technology 2.Mobile Application Development	4	1	1	0	4
24PCSP41	PEC - 1 Data Analytics with Python	1	1	0	0	2
24PCSL41	SLC - 1 Tensor Flow Developer Certificate	0	0	1	3	2
TOTAL					**30**	**23**
Total Credits					**90+2***	

L-LECTURE T- TUTORIAL P-PRACTICAL S- SEMINAR

Students must complete at least one online course (MOOC) from platforms like SWAYAM, NPTEL, or Nanmudalvan within the fifth 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*.

1st YEAR: FIRST SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24PCSC11	CC-1 Principles of Compiler Design	Core	3	1	2	0	4	6	25	75	100

Learning Objectives	
LO1	To introducing Grammar, Finite Automata, Parser, Syntax Tree and Code Generation.
LO2	To enable the students to learn about different phases of Compiler.
LO3	To learn about Conversion of Source Code to Object Code.
LO4	To recognize the underlying formal models such as finite state automata, push-down automata and their connection to language definition through regular expressions and grammars.
LO5	To describe the steps and algorithms used by compilers

Unit	Content	Hours
1	Introduction to Compiling– Compilers–Analysis of the Source Program–Phases of a Compiler. Grouping of Phases–Compiler Construction Tools.	18
2	Lexical Analysis – Role of the Lexical Analyzer – Specification and Recognition of Tokens –Language for specifying Lexical Analyzer – Finite Automata – Regular Expressions to NFA –Design of Lexical Analyzer Generator– Optimization of DFA based pattern matchers.	18
3	Syntax Analysis–Role of Parser–Context Free Grammars–Top Down Parsing– Bottom Up Parsing–Operator Precedence Parsing–LR Parsers.	18
4	Syntax Directed Translation: Syntax Directed Definitions–Construction of Syntax Trees–Bottom Up evaluation of attributed definition – Bottom Up evaluation of inherited attributes – Recursive evaluators.	18
5	Intermediate Code Generation: Intermediate Languages – Declaration – Assignment Statements. Procedure Calls–Runtime Storage Management. Code Generation and Optimization: Basic Blocks and Flow Graphs–DAG Representation.	18

CO	Course Outcomes
CO1	Understand the phases and tools available in Compiler
CO2	Design and implement a Lexical Analyzer
CO3	Compare and analyze different types of Compilers
CO4	Specify appropriate translations to generate Intermediate Code
CO5	Identify sources for Code Optimization
Textbooks:	
1	Compilers–Principles, Techniques and Tools–Alfred Aho, Ravi Sethi, JeffryD. Ullman, Pearson
2	Modern Compiler Design–Dick Grune, Bal, Langendoen, Jacobs, Wiley
3	Compiler Design–K. Muneeswaran, Oxford University Press:
Reference Books:	
1	Modern Compiler Design–David Galles, Pearson EducationAsia:2001
2	Advanced Compiler Design and Implementation–Steven S.Muchnick, Morgan Kaufmann Publishers:2000
3	Craftinga Compiler with C–C.N.Fisher, R.J.LeBlane, Pearson Education:2000
Web resources:	
1	https://www.geeksforgeeks.org/introduction-of-lexical-analysis/
2	https://www.tutorialspoint.com/compiler_design/compiler_design_tutorial.pdf

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	2	3	3	3
CO3	3	3	3	3	3	2	3	2	3	3	3
CO4	3	3	3	3	3	2	3	2	3	3	3
CO5	3	3	3	3	3	2	3	2	3	3	3
Total	15	14	15	14	15	9	14	9	15	15	15
Average	3	2.8	3	2.8	3	1.8	2.8	1.8	3	3	3

3 – Strong, 2- Medium, 1- Low

1st YEAR: FIRST SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24PCSC12	**Analysis and Design of Algorithms**	**Core**	**3**	**1**	**2**		**4**	**6**	**25**	**75**	**100**

Learning Objectives	
LO1	To analyze the asymptotic performance of algorithms
LO2	To write rigorous correctness proofs for algorithms
LO3	To demonstrate a familiarity with major algorithms and data structures
LO4	To discuss various methods like Basic Traversal and Search Techniques, Divide and Conquer method, Dynamic programming, backtracking
LO5	To a properly designed algorithm can notably improve the performance of a program, leading to quicker execution instances and reduced resource utilization

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– Minimum Cost Spanning Tree–Single Source Shortest Path.	18
4	Dynamic Programming-General Method–Multistage Graphs–All Pair Shortest Path–Optimal BinarySearchTrees–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
CO1	Get knowledge about algorithms and determine their time complexity. Demonstrate specific search and sort algorithms using divide and conquer technique
CO2	Gain good understanding of Greedy method and its algorithm
CO3	Able to describe about graphs using dynamic programming technique
CO4	Explore the traversal and searching technique and apply it for trees and graphs
CO5	Demonstrate the concept of backtracking & branch and bound technique
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 3rd 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

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	2	3	3	3
CO3	3	3	3	3	3	2	3	2	3	3	3
CO4	3	3	3	3	3	2	3	2	3	3	3
CO5	3	3	3	3	3	2	3	2	3	3	3
Total	15	14	15	14	15	9	14	9	15	14	15
Average	3	2.8	3	2.8	3	1.8	2.8	1.8	3	2.8	3

3 – Strong, 2- Medium, 1- Low

1st YEAR: FIRST SEMESTER

Course Code	Course Name Core Course	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24PCS13P	**CC-2 Analysis and Design of Algorithm Lab**	**Core**	**0**	**0**	**4**	**0**	**3**	**4**	**25**	**75**	**100**

Learning Objectives	
LO1	To learn and implement fundamental algorithms and data structures like binary search, stack, queue, merge sort, and quick sort.
LO2	To sharpen problem-solving abilities by applying algorithmic techniques to solve real-world problems such as Tower of Hanoi, knapsack problem, and 8-queens problem.
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 greedy algorithms and dynamic programming and understand their application through implementation of algorithms like greedy knapsack.

	List of Programs	**Hours**
	1. Write a program for Binary Search. 2. Write a program to perform the operations on Stack. 3. Write a program to perform the operations on Queue. 4. Write 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. Write a program to traverse binary search tree. 8. Write a program 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. Write a program for Minimum Cost Spanning Tree. 11. Write a program for Single Source Shortest Path. 12. Write a program for Sum of Subsets.	60

CO	Course Outcomes
CO1	Get knowledge about algorithms and determine their time complexity. Demonstrate specific search and sort algorithms using divide and conquer technique
CO2	Gain good understanding of Greedy method and its algorithm
CO3	Able to describe about graphs using dynamic programming technique
CO4	Explore the traversal and searching technique and apply it for trees and graphs
CO5	Demonstrate the concept of backtracking & branch and bound technique
Textbooks:	
1	Ellis Horowitz, “Computer Algorithms” , Galgotia Publications.
2	AlfredV.Aho, JohnE.Hopcroft, Jeffrey D.Ullman,"Data Structures and Algorithms”.
Reference Books:	
1	Good rich, “Data Structures & Algorithms in Java”, Wiley 3rd 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

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	2	3	3	3
CO3	3	3	3	3	3	2	3	2	3	3	3
CO4	3	3	3	3	3	2	3	2	3	3	3
CO5	3	3	3	3	3	2	3	2	3	3	3
Total	15	14	15	14	15	9	14	9	15	14	15
Average	3	2.8	3	2.8	3	1.8	2.8	1.8	3	2.8	3

3 – Strong, 2- Medium, 1- Low

1st YEAR: FIRST SEMESTER

Course Code	Course Name Elective Course	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24PCSE11	**EC-1 Advanced Python Programming**	**EC**	**3**	**1**	**1**	**0**	**3**	**5**	**25**	**75**	**100**

Learning Objectives

LO1	To build basic programs using fundamental programming constructs like variables, conditional logic, looping, and functions
LO2	To learning about conditional statements, checking for certain items in lists, and combining strings using the addition assignment operator.
LO3	To understand File operations, Classes, and Objects
LO4	To understanding the concepts Machine Learning
LO5	To understand a range of the key algorithms and approaches to machine learning

Unit	Content	Hours
1	Python:Introduction–Numbers–Strings–Variables–Lists–Tuples–Dictionaries–Sets–Comparison.	15
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	Modules, Packages, and Programs: Standalone Programs–Command-Line Arguments–Modules and the import Statement – The Python Standard Library. Objects and Classes: Define a Class with class–Inheritance–Override a Method–Add a Method–Get Help from Parent with super In self Defense–Get and Set Attribute Values with Properties –Name Mangling for Privacy –Method Types–Duck Typing.	15
4	Machine learning: What and why?-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
5	Measuring (dis)similarity - Evaluating the output of clustering method-Spectral clustering - Graph Laplacian - Normalized graph Laplacian- Hierarchical clustering -Agglomerative clustering - Divisive clustering - Choosing the number of clusters- Bayesian hierarchical clustering- Clustering data points and features- Bi-clustering- Multi-view clustering- K-Means clustering	15

CO	Course Outcomes
CO1	Understand the basic concepts of Python Programming
CO2	Understand File operations, Classes, and Objects
CO3	Acquire Object Oriented Skills in Python
CO4	Understanding the Concepts of Machine Learning
CO5	Understanding the key algorithm of machine learning
Textbooks:	
1	BillLubanovic, “Introducing Python”,O’Reilly,First Edition-Second Release.
2	MarkLutz, “Learning Python”, O’Reilly, Fifth Edition.
3	Jeeva Jose and P. SojanLal, ―Introduction to Computing and Problem Solving with Python, Khanna Book Publising Co. (P) Ltd., 2016.
4	Machine Learning : A Practitioner's Approach Chandra S.S., Vinod Hareendran S., Anand 2021
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.
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://www.geeksforgeeks.org/introduction-machine-learning/
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	1	3	3	3	3	3	3	3	3
Total	14	15	12	15	14	13	13	15	14	15	14
Average	2.8	3	2.4	3	2.8	2.6	2.6	3	2.8	3	2.8

3 – Strong, 2- Medium, 1- Low

1st YEAR: FIRST SEMESTER

Course Code	Course Name Elective Course	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24PCSE12P	**EC-2 Machine Learning using Python Lab**	**EC**	**3**	**1**	**1**	**0**	**3**	**5**	**25**	**75**	**100**

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

Unit	**Content**	**Hours**
	1. Write Programs using elementary data items, lists, dictionaries, and tuples. 2. Write a Programs using conditional branches, 3. Write Programs using loops. 4. Write Programs using functions. 5. Write a Programs using exception handling. 6. Write a Programs 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	75

CO	Course Outcomes
CO1	Able to write programs in Python using OOPS concepts
CO2	To understand the concepts of File operations and Modules in Python
CO3	Implementation of lists, dictionaries, sets and tuples as programs
CO4	Effectively use the various machine learning tools
CO5	Design Python programs for various machine learning algorithms
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://www.geeksforgeeks.org/python-programming-language/
2	https://www.geeksforgeeks.org/machine-learning/
3	https://www.w3schools.com/

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	1	3	3	3	3	3	3	3	3
Total	14	15	12	15	14	13	13	15	14	15	14
Average	2.8	3	2.4	3	2.8	2.6	2.6	3	2.8	3	2.8

3 – Strong, 2- Medium, 1- Low

1st YEAR: FIRST SEMESTER

Course Code	Course Name AECC	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24PCSA11	AECC -1 Cloud Computing	AECC	1	1	0	0	2	2	25	75	100

Learning Objectives	
LO1	To provide students with the fundamentals and essentials of Cloud Computing.
LO2	To provide students are able to start using and adopting Cloud Computing services and tools in their real life scenarios.
LO3	To Gain knowledge on cloud computing, cloud services, architectures, and applications
LO4	To how to store and share, in and from cloud
LO5	To the concepts of virtualization and use of cloud service models

Unit	Content	Hours
1	Introduction: Cloud Computing Introduction, From, Collaboration to cloud, Working of cloud computing, pros and cons, benefits, developing cloud computing services, Cloud service development, discovering cloud services	6
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.	6
3	Using 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.	6
4	Outside The Cloud: valuating web mails services, Evaluating instant messaging, Evaluating web conference tools, creating groups on social networks, Evaluating online groupware.	6
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.	6

CO	Course Outcomes
CO1	To understand the principles and paradigm of Cloud Computing
CO2	Ability to design and deploy Cloud Infrastructure
CO3	Understand cloud security issues and solutions
CO4	Ability to understand role of Virtualization Technologies
CO5	Design & develop backup strategies for cloud data based on features
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://www.tutorialspoint.com/cloud_computing/index.htm
2	https://www.javatpoint.com/cloud-computing-tutorial

Mapping with Programme Outcomes and Programme Specific Outcomes

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

3 – Strong, 2- Medium, 1- Low

1st YEAR: SECOND SEMESTER

Course Code	Course Name Core Course	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24PCSC21	**Advanced Operating Systems**	**Core**	**3**	**1**	**2**	**0**	**4**	**6**	**25**	**75**	**100**

Learning Objectives	
LO1	To enable the students to learn the different types of operating systems and their functioning.
LO2	To gain knowledge on Distributed Operating Systems
LO3	To gain insight into the components and management aspects of real time and mobile operating systems
LO4	To learn case studies in Linux Operating Systems
LO5	To learn about File Systems and Storage

Unit	**Content**	**Hour**
1	Basics of 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	Distributed Operating Systems: Issues – Communication Primitives – Lampert's Logical Clocks –Deadlock handling strategies – Issues in deadlock detection and resolution-distributed file systems– design issues – Case studies – The Sun Network File System-Coda.	18
3	Realtime Operating Systems : Introduction – Applications of Real Time Systems – Basic Model of Real Time System – Characteristics – Safety and Reliability - Real Time Task Scheduling	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
CO1	Understand the design issues associated with operating systems.
CO2	Master various process management concepts including scheduling, deadlocks, and distributed file systems
CO3	Prepare Real Time Task Scheduling
CO4	Analyze Operating Systems for Handheld Systems
CO5	Analyze Operating Systems like LINUX and IOS
Textbooks:	
1	Abraham Silberschatz; Peter Baer Galvin; Greg Gagne, "Operating System Concepts", Seventh Edition, John Wiley & Sons, 2004.
2	Mukesh Singhal and Niranjan G. Shivaratri, "Advanced Concepts in Operating Systems – Distributed, Database, and Multiprocessor Operating Systems", Tata McGraw-Hill, 2001.
Reference Books:	
1	Rajib Mall, "Real-Time Systems : Theory and Practice", Pearson EducationIndia,2006
2	Pramod Chandra P. Bhatt, An introduction to operating systems, concept and practice, PHI, Third edition, 2010.
3	Daniel. P. Bovet & Marco Cesati, "Understanding the Linux kernel",3rd edition, O"Reilly,2005
4	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/

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

1st YEAR: SECOND SEMESTER

Course Code	Course Name Core Course 2	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24PCSC22	CC-2 Practical-Advanced Operating Systems Lab(LINUX)	Core Practical	0	0	4	0	3	4	25	75	100

Learning Objectives	
LO1	To understand the design issues associated with operating systems.
LO2	To master various process management concepts including scheduling, deadlocks, and distributed file systems
LO3	To prepare Real Time Task Scheduling
LO4	To analyze Operating Systems for Handheld Systems
LO5	To analyze Operating Systems like LINUX and Ios

List of Programs

1. Basic Linux Commands 1. Shell Scripting 2. 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. 3. File handling utilities ,Process utilities, Disk utilities Networking commands, Filters, Text processing Utilities Backup utilities 4. Write a C program to implement kill(), raise() and sleep()functions. 5. Write a C program that illustrates two processes communicating using Shared memory. 6. Simulate the following CPU scheduling algorithms. a)FCFS b) SJF c) Round Robin d) Priority. 7. Write a C program to simulate disk scheduling algorithms. a) FCFS b) SCAN c) C-SCAN 9. Simulate Bankers Algorithm for Dead Lock 10. Simulate all page replacement algorithms a) FIFO b) LRU c) OPTIMAL	60

CO	Course Outcomes
CO1	Understand the design issues associated with operating systems.
CO2	Master various process management concepts including scheduling, deadlocks, and distributed file systems
CO3	Prepare Real Time Task Scheduling
CO4	Analyze Operating Systems for Handheld Systems
CO5	Analyze Operating Systems like LINUX and IOS
Textbooks:	
1	Abraham Silberschatz; Peter Baer Galvin; Greg Gagne, "Operating System Concepts", Seventh Edition, John Wiley & Sons, 2004.
2	Mukesh Singhal and Niranjan G. Shivaratri, "Advanced Concepts in Operating Systems – Distributed, Database, and Multiprocessor Operating Systems", Tata McGraw-Hill, 2001.
Reference Books:	
1	Rajib Mall, "Real-Time Systems : Theory and Practice", Pearson EducationIndia,2006
2	Pramod Chandra P. Bhatt, An introduction to operating systems, concept and practice, PHI, Third edition, 2010.
3	Daniel. P. Bovet & Marco Cesati, "Understanding the Linux kernel",3rd edition, O"Reilly,2005
4	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

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

1st YEAR: SECOND SEMESTER

Course Code	Course Name Core Course	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24PCSC23P	**Advanced Java Programming**	**Core**	**3**	**1**	**2**	**0**	**4**	**6**	**25**	**75**	**100**

Learning Objectives	
LO1	To enable the students to learn the basic functions, principles and concepts of advanced java programming.
LO2	To learn why Java is useful for the design of desktop and web applications.
LO3	To learn how to design a graphical user interface (GUI) with Java Swing
LO4	To understand how to design applications with threads in Java
LO5	To learn JDBC, Servlet packages, JQuery, Java Server Pages

Unit	Content	Hour
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	18
2	Introduction to 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	18
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 .	18
4	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.	18
5	Introduction to JDBC , ODBC JDBC Architecture: - Types of JDBC Drivers- Drivers Interfaces and Driver Manager class – Advanced Java Techniques	18

CO	Course Outcomes
CO1	Develop GUI programs using AWT components for the given problem
CO2	Develop a program using menu and Dialog Boxes for the given problem
CO3	Use relevant type of JDBC Driver for the specified environment
CO4	Develop program for Client/Server Communication through TCP/IP Server sockets for the given problem
CO5	Use delegation event model to develop event driven program for the given problem
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://www.javatpoint.com/servlet-tutorial
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	2.8	2.6	2.8	2.4	2.8	2.8	2.8	2.4

3 – Strong, 2- Medium, 1- Low

1st YEAR: SECOND SEMESTER

Course Code	Course Name Core Course 2	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24PCSC24P	CC-2 Practical- Advanced Java Programming Lab	Core	0	0	4	0	3	4	25	75	100

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

List of Programs

1. Multi threading Using Priorities 2. File & String Manipulations 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. Program to implement Client/Server technology. 8. Write a Java program to create an Employee pay bill calculation using various swing controls. 9. Write 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	60

CO	Course Outcomes
CO1	Develop GUI programs using AWT components for the given problem
CO2	Develop a program using menu and Dialog Boxes for the given problem
CO3	Use relevant type of JDBC Driver for the specified environment
CO4	Develop program for Client/Server Communication through TCP/IP Server sockets for the given problem
CO5	Use delegation event model to develop event driven program for the given problem
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://www.javatpoint.com/servlet-tutorial
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	2.8	2.6	2.8	2.4	2.8	2.8	2.8	2.4

3 – Strong, 2- Medium, 1- Low

1st YEAR: SECOND SEMESTER

Course Code	Course Name Core Course	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24PCSE21	**Artificial Intelligence**	**Elective**	**2**	**1**	**1**	**0**	**3**	**4**	**25**	**75**	**100**

Learning Objectives	
LO1	To understand the need for ensuring ethics in AI
LO2	To understand ethical issues with the development of AI agents
LO3	To apply the ethical considerations in different AI applications
LO4	To evaluate the relation of ethics with nature
LO5	To overcome the risk for Human rights and other fundamental values.

Unit	**Content**	**Hour**
1	Role of Artificial Intelligence in Human Life, Understanding Ethics, Why Ethics in AI? Ethical Considerations of AI, Current Initiatives in AI and Ethics, Ethical Issues with our relationship with artificial Entities	12
2	AI Governance by Human-right centered design, Normative models, Role of professional norms, Teaching Machines to be Moral.	12
3	Accountability in Computer Systems, Transparency, Responsibility and AI. Race and Gender, AI as a moral right-holder.	12
4	Perspectives on Ethics of AI, Integrating ethical values and economic Value, Automating origination AI a Binary approach, Machine learning values, Artificial Moral Agents	12
5	Ethics of Artificial Intelligence in Transport, Ethical AI in Military, Biomedical research, Patient Care, Public Health, Robot Teaching, Pedagogy, Policy, Smart City Ethics.	12

CO	Course Outcomes
CO1	Understand the ethical issues in the development of AI Agents
CO2	Learn the ethical considerations of AI with perspectives on ethical values.
CO3	Apply the ethical policies in AI based applications and Robot development.
CO4	To implement the AI concepts to societal problems by adapting the legal concepts by securing fundamental rights
CO5	Overcome the evil genesis in the concepts of AI
Textbooks:	
1	Paula Boddington, ―Towards a Code of Ethics for Artificial Intelligence‖, Springer, 2017
2	Markus D. Dubber, Frank Pasquale, Sunit Das, ―The Oxford Handbook of Ethics of AI, Oxford University Press Edited book, 2020
3	S. Matthew Liao, ―Ethics of Artificial Intelligence‖, Oxford University Press Edited Book, 2020
4	Markus D. Dubber, Frank Pasquale, Sunit Das, ―The Oxford Handbook of Ethics of AI, Oxford University Press Edited book, 2020
Reference Books:	
1	N. Bostrom and E. Yudkowsky. ―The ethics of artificial intelligence‖. In W. M. Ramsey and K. Frankish, editors, The Cambridge Handbook of Artificial Intelligence, pages 316–334. Cambridge University Press, Cambridge, 2014.
2	Wallach, W., & Allen, C, ―Moral machines: coaching robots right from wrong‖, Oxford University Press, 2008.
Web resources:	
1	https://skillsbuild.org/students/course-catalog/artificial-intelligence
2	https://www.coursera.org/courses?queryartificial%20intelligence

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

1st YEAR: SECOND SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24PCSE22	**Web Services**	**Elective**	**2**	**1**	**1**	**0**	**3**	**4**	**25**	**75**	**100**

Learning Objectives	
LO1	To understand the foundational concepts of distributed computing and web services, including industry standards and supporting technologies
LO2	To explore the role of XML and related communication technologies, such as SOAP and WSDL, in facilitating information exchange in distributed environments
LO3	To examine security issues, transaction management, and QoS considerations in the design and implementation of web services
LO4	To develop practical skills in building and deploying enterprise web applications
LO5	To gain proficiency in deploying web services on Tomcat and Axis SOAP server

Unit	Content	Hour
1	Overview of Distributed Computing. Introduction to web services, Industry standards Technologies and concepts underlying web services, their support to web services. Applications that consume web services.	12
2	XML with its choice for web services, network protocols to backend databases, technologies, SOAP, WSDL exchange of information between applications in distributed environment, locating remote web services, its access and usage. UDDI specification an introduction.	12
3	A brief outline of web services conversation static and interactive aspects of system interface and its implementation, workflow orchestration and refinement, transactions, security issues the common attacks security attacks facilitated within web services quality of services Architecting of systems to meet users requirement with respect to latency, performance, reliability, QOS metrics.	12
4	Building real world enterprise applications using web services sample source codes to develop web services steps necessary to build and deploy web services and client applications to meet customer's requirement Easier development, customization, maintenance, transactional requirements, seamless porting to multiple devices and platforms.	12
5	Deployment of Web services and applications onto Tomcat application server and axis SOAP server Web services platform as a set of enabling technologies for XML based distributed computing.	12

CO	Course Outcomes
CO1	Describe the key concepts industry standards, and technologies supporting distributed computing and web services
CO2	Apply XML, SOAP, WSDL, and UDDI for effective information exchange and service location in distributed environments
CO3	Assess security vulnerabilities and QoS metrics in web services to identify areas for improvement
CO4	Create and deploy enterprise applications using web services to meet specific customer and operational needs
CO5	Deploy web services on platforms like Tomcat and Axis SOAP server, utilizing XML-based distributed computing technologies
Textbooks:	
1	Sandeep Chatterjee, James Webber, "Developing Enterprise Web Services: Architects Guide, Prentice Hall, Nov2003.
Reference Books:	
1	Kirk Zurell- "C Programming for Embedded Systems" R&D, Books- 2000
2	David. E, Simon,"Anembedded software primer", Pearson Education Asia-Addison Wesley Longman (Singapore), Low Priced Edition, 2001,ISBN- 81- 7808- 045- 1
3	Michael Barr, "Programming Embedded Systems in C and C++", Shroff Publishers & Distributors Pvt. Ltd., Calcutta. March 2001, ISBN- 81- 7366 - 076 – X
4	Andreas Witting, Michael Wittig, "Amazon Web services in Action", Paperback, 2015
Web resources:	
1	https://www.altexsoft.com/blog/web-service/
2	https://docs.redhat.com/en/documentation/red_hat_jboss_fuse/6.0/html/developing_restful web_services/restintro#RESTIntro

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

1st YEAR: SECOND SEMESTER

Course Code	Course Name NME	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24PCSS21	NME : Internet Concepts and Web Development	SEC	1	1	0	0	2	2	25	75	100

Learning Objectives	
LO1	To understand the basic concepts of web and internet.
LO2	To learn designing webpage using HTML & CSS
LO3	To learn the use of scripting languages and appreciate their limitations.
LO4	To understand the concept of Database and Server-side scripting language
LO5	To understand the need of AJAX and developing applications using AJAX controls

Unit	Content	Hours
1	Introduction To Internet: Internet Overview-Networks-Web Protocols—Web Organization and Addressing - Web Browsers and Web Servers - Security and Vulnerability-Web System Architecture – URL - Domain Name – Client-side and server-side scripting	6
2	Web Designing:Introduction to HTML, HTML5 - Structure of HTML, HTML elements – Form elements and its controls, Input types and Media elements - CSS, CSS3 - Selectors, Box Model, Backgrounds and Borders, Text Effects, Animations, Multiple Column Layout, User Interface Markup tags for inserting URL, Images, Tables, Frames - Dynamic HTML.	6
3	Client-Side Processing and Scripting JavaScript Introduction – Data Types – Variables – Operators - Control Statements – Functions – Arrays – DOM, Built-in Objects, Regular Expression, Exceptions, Event handling - Windows and Frames - Forms and Validation. - AJAX – Jquery.	6
4	Server-Side Processing and Scripting PHP Introduction to PHP, Features, Data types– Variable –Declaring and Using Constants – Operators – Control Structures– Functions – Arrays- Date and Time Functions – String functions - File Handling - Accessing MySQL Database from the Web with PHP. Introduction to MY SQL - The Show Databases and Table - The USE command – Create Database and Tables - Describe Table - Select, Insert, Update, and Delete statement – Some Administrative detail -Loading and Dumping a Database.	6
5	PHP with AJAX: Introducing Ajax-Ajax Basics-PHP and Ajax-Database Driven Ajax. PHP with SEO: Basic SEO-Provocative SE Friendly URLs-Duplicate Content-CMS: Word press creating an SE-Friendly Blog.	6

CO	Course Outcomes
CO1	Gain a comprehensive understanding of how the internet works.
CO2	Develop and design websites using HTML, CSS, and JavaScript
CO3	Implement client-side script using JavaScript.
CO4	Implement server-side script using PHP
CO5	Develop application using JavaScript with recent advancement like JSON, AJAX and JQuery.
Textbooks:	
1	Paul Deitel, Harvey Deitel, Abbey Deitel, Internet & World Wide Web - How to Program, 5 the dition, Pearson Education, 2012.
2	Kogent Learning Solutions Inc, Web Technologies Black Book, Dream Tech press, 2013.
3	Brad Dayley, Brendan Dayley, and Caleb Dayley, Node.js, MongoDB and Angular Web Development: The definitive guide to using the MEAN stack to build web applications, 2nd Edition, Pearson Education, 2018
Reference Books:	
1	Lindsay Bassett, Introduction to JavaScript Object Notation, 1st Edition, O'Reilly Media, 2015
2	Fritz Schneider, Thomas Powell, JavaScript – The Complete Reference, 3rd Edition, Mc-Graw Hill, 2017
3	Steven Holzener, PHP – The Complete Reference, 1st Edition, Mc-Graw Hill, 2017 4. Sandeep Kumar Patel, Developing Responsive Web Applications with AJAX and JQuery,Packet Publications, 2014
Web resources:	
1	https://www.geeksforgeeks.org/web-development//

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	2	3	3
CO2	3	2	3	3	3	3	3	3	3	3	2
CO3	3	3	2	2	3	3	3	3	3	2	3
CO4	3	3	3	3	2	3	2	2	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3
Total	15	14	14	14	14	15	14	14	14	14	14
Average	3	2.8	2.8	2.8	2.8	3	2.8	2.8	2.8	2.8	2.8

3 – Strong, 2- Medium, 1- Low

1st YEAR: SECOND SEMESTER

Course Code	Course Name EC	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
	EC: Advanced Software Engineering	**EC**	**2**	**1**	**1**	**0**	**3**	**4**	**25**	**75**	**100**

Learning Objectives

LO1	Introduction to Software Engineering, Design, Testing and Maintenance.
LO2	Enable the students to learn the concepts of Software Engineering.
LO3	Learn about Software Project Management, Software Design & Testing
LO4	Software engineering is a computer science field that involves designing, developing, testing, and maintaining software applications.
LO5	It uses engineering principles and programming languages to create software that meets user needs.

Unit	Content	Hours
1	Introduction: The Problem Domain – Software Engineering Challenges - Software Engineering Approach – Software Processes: Software Process – Characteristics of a Software Process – Software Development Process Models – Other software processes.	12
2	Software Requirements Analysis and Specification : Requirement engineering – Type of Requirements – Feasibility Studies – Requirements Elicitation – Requirement Analysis – Requirement Documentation – Requirement Validation – Requirement Management – SRS - Formal System Specification – Axiomatic Specification – Algebraic Specification - Case study: Student Result management system. Software Quality Management –Software Quality, Software Quality Management System, ISO 9000, SEI CMM.	12
3	Software Project Management: Responsibilities of a software project manager – Project planning – Metrics for Project size estimation – Project Estimation Techniques – Empirical Estimation Techniques – COCOMO – Halstead‟s software science – Staffing level estimation – Scheduling– Organization and Team Structures – Staffing – Risk management – Software Configuration Management – Miscellaneous Plan.	12
4	Software Design: Outcome of a Design process – Characteristics of a good software design – Cohesion and coupling - Strategy of Design – Function Oriented Design – Object Oriented Design - Detailed Design - IEEE Recommended Practice for Software Design Descriptions.	12
5	Software Testing: A Strategic approach to software testing – Terminologies – Functional testing– Structural testing – Levels of testing – Validation testing - Regression testing – Art of Debugging– Testing tools-Metrics-Reliability Estimation. Software Maintenance -Maintenance Process - Reverse Engineering – Software Re-engineering - Configuration Management Activities.	12

CO	Course Outcomes
CO1	Understand about Software Engineering process
CO2	Understand about Software project management skills, design and quality management
CO3	Analyze on Software Requirements and Specification
CO4	Analyze on Software Testing, Maintenance and Software, Re-Engineering
CO5	Design and conduct various types and levels of software quality for a software project.
Textbooks:	
1	An Integrated Approach to Software Engineering–Pankaj Jalote, Narosa Publishing House, Delhi, 3rd Edition.
2	Fundamentals of Software Engineering –Rajib Mall, PHI Publication,3rdEdition.
Reference Books:	
1	Software Engineering–K.K.Aggarwal and Yogesh Singh, New Age International Publishers, 3rd edition.
2	A Practitioners Approach – Software Engineering, R.S.Pressman, McGraw Hill.
3	Fundamentals of Software Engineering - Carlo Ghezzi, M. Jarayeri, D. Manodrioli, PHI Publication.
Web resources:	
1	https://www.javatpoint.com/software-engineering-tutorial

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	2	3	3
CO2	3	2	3	3	3	3	3	3	3	3	2
CO3	3	3	2	2	3	3	3	3	3	2	3
CO4	3	3	3	3	2	3	2	2	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3
Total	15	14	14	14	14	15	14	14	14	14	14
Average	3	2.8	2.8	2.8	2.8	3	2.8	2.8	2.8	2.8	2.8

3 – Strong, 2- Medium, 1- Low

2nd YEAR: THIRD SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24PCSC31	Data Mining and Warehousing	CC-8	3	1	2	0	5	6	25	75	100

Learning Objectives

LO1	To understand various Data Mining Techniques and their applicability to different data mining tasks and challenges
LO2	To understand the strengths and weaknesses of various classification algorithms
LO3	To understand and utilize various clustering and association rule techniques
LO4	To Understand about the concepts of OLTP and OLAP
LO5	To Learn about the Data warehouse architecture and its applications

Unit	Content	Hours
1	Basic data mining tasks – data mining versus knowledge discovery in databases – data mining issues – data mining metrics – social implications of data mining – data mining from a database perspective. Data mining techniques: Introduction – a statistical perspective on data mining – similarity measures – decision trees – neural networks – genetic algorithms.	18
2	Classification: Introduction – Statistical – based algorithms – distance – based algorithms – decision tree – based algorithms – neural network – based algorithms – rule – based algorithms –combining techniques.	18
3	Clustering: Introduction – Similarity and Distance Measures – Outliers – Hierarchical Algorithms – Partitional Algorithms. Association rules: Introduction – large item sets – basic algorithms – parallel & distributed algorithms – comparing approaches – incremental rules – advanced association rules techniques – measuring the quality of rules.	18
4	Data warehousing: Introduction – characteristics of a data warehouse data marts – other aspects of data mart. Online analytical processing: introduction – OLTP & OLAP systems .Data modeling –star schema for multi dimensional view –data modeling – multi facts schema or snowflake schema – OLAP TOOLS – State of the market – OLAP TOOLS and the internet.	18
5	Developing a data warehouse: why and how to build a data warehouse – data warehouse architectural strategies and organization issues – design consideration – data content – meta data distribution of data – tools for data warehousing – performance considerations – crucial decisions in designing a data warehouse. Applications of data warehousing and data mining in government: Introduction – national data warehouses – other areas for data warehousing and data mining.	18

CO	Course Outcomes Students can able to
CO1	Design and implement a data mining solution that addresses a real-world problem
CO2	Design, implement, and evaluate a classification model using multiple classification algorithms
CO3	Design and implement Clustering techniques
CO4	Design and implement a data warehouse solution using appropriate data modeling techniques and OLAP tools to enable multidimensional analysis and support business reporting
CO5	Design a comprehensive data warehouse architecture, addressing crucial design decisions, performance considerations, and tool selection, to effectively support organizational data analysis and reporting requirements
Textbooks:	
1	Margaret H.Dunham, "Data Mining: Introductory and Advanced Topics", Pearson education,2003.
2	C.S.R.Prabhu,"Data Warehousing Concepts, Techniques, Products and Applications", PHI, Second Edition.
Reference Books:	
1	ArunK.Pujari,"DataMiningTechniques",UniversitiesPress(India)Pvt.Ltd.,2003.
2	AlexBerson, StephenJ.Smith,"Data Warehousing,Data Mining and OLAP",TMCH, 2001.
3	Jiawei Han & Micheline Kamber, "Data Mining Concepts &Techniques",2001, Academic press.
Web resources:	
1	https://www.techtarget.com/searchdatamanagement/resources/Data-warehousing
2	https://www.btechguru.com/training--it--database-management-systems--file-structures--introduction-to-data-warehousing-and-olap-2-video-lecture--12054--26--151.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	3	3	3	3	3	2	3
CO2	3	3	3	3	3	3	3	3	3	2	3
CO3	3	3	3	3	3	3	3	3	3	2	3
CO4	3	3	3	3	3	3	3	3	3	2	3
CO5	3	3	3	3	3	3	3	3	3	2	3
Total	15	15	15	15	15	15	15	15	15	10	15
Average	3	3	3	3	3	3	3	3	3	2	3

3 – Strong, 2- Medium, 1- Low

2nd YEAR: THIRD SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24PCSC32	Advanced Database Management Systems	CC-9	3	1	2	0	5	6	25	75	100

Learning Objectives

LO1	To understand the basic concepts and terminology related to DBMS and Relational Database Design
LO2	To have a high-level understanding of major DBMS components and relational data
LO3	To understand various normalization techniques in Databases.
LO4	To be able to write SQL commands to create tables and indexes, insert/update/delete data, and query data in a relational DBMS
LO5	To be able to program a data-intensive application using PL/SQL.

Unit	Content	Hours
1	INTRODUCTION TO DATABASE CONCEPTS Introduction : Database System – Architecture – Database Management System as Implemented in Modern Database Packages – System Databases. The Entity - Relationship Model : Introduction – Entities – Entity Sets – Relationships – Mapping Constraints – Keys – Roles in E-R Diagrams –Non Binary Relationships – Combining Two E-R Diagrams – Representation of Strong and Weak Entity Sets –Breaking Higher Cardinalities into Lower Cardinalities – Generalization - Aggregation.	18
2	STORAGE AND RELATIONAL DATA Storage Structure : File Organization and Addressing Schemes – Sequential and Indexed Sequential Organizations – Direct Organization of File – Interface Indexing – Hashing Scheme of File Organization – Dynamic Hashing Technique – Insertion Scheme in Dynamic Hashing – B-Trees – Indexing Methods - Clustering. Relational Data Structure: Introduction - Relations - Domains.	18
3	NORMALIZATION Introduction – Purpose of Normalization - Normalization - Definition of Functional Dependence (FD) - Normal Forms: 1NF, 2NF, 3NF and BCNF. Decomposition and synthesis approaches - Basics of query processing - external sorting - file scans.	18
4	STRUCTURED QUERY LANGUAGE (SQL) Overview– Basic Structure - Set Operations, Aggregate Functions – GROUPBY – HAVING, Nested Sub queries. Creating, Dropping and Altering Tables – Inserting Rows – Querying the Database – Simple select Statement Sub – Number and Date Functions – SET Operations – Views – create view – drop view – Modifying the Database.	18
5	PROCEDURAL LANGUAGE – SQL (PL/SQL) Data Types and Variables – Program Control Statements – null Statement – Assignment Statement – Conditional Statements – Loops – Program Structure – Anonymous Blocks – Procedures and Functions – Stored Procedures and Functions – Packages– Database Access using Cursors.	18

CO	Course Outcomes Students can able to
CO1	Understand the database concepts and database management system software
CO2	Learn the High-level understanding of major DBMS components and their function
CO3	Learn about the various normalization techniques.
CO4	Write SQL commands to create tables and indexes, insert/update/delete data, and query data in a relational DBMS.
CO5	Understand about the PL/SQL and Stored Procedures
Textbooks:	
1	Abraham Silberschatz, Henry F. Korth and S. Sudarshan- "Database System Concepts", seventh Edition,McGraw-Hill. March 2019
Reference Books:	
1	Raghu Ramakrishnan and Johannes Gehrke, "Database Management Systems", Tata McGraw-Hill Publishing Company, 2003
2	Ramez Elmasri and Shamkant B. Navathe, "Fundamental Database Systems", Third Edition, Pearson Education, 2003
3	Hector Garcia–Molina, Jeffrey D.Ullman and Jennifer Widom- "Database System Implementation"- Pearson Education- 2000
4	Narang,"Database Management Systems", 2nd ed., PHI
Web resources:	
1	https://www.tutorialspoint.com/sql/sql-rdbms-concepts.htm
2	http://www.rjspm.com/PDF/BCA-428%20Oracle.pdf
3	https://www.teachmint.com/tfile/studymaterial/class-12th/informaticspractices/sqlqueries3pptx/a2a19ffa-3889-4e42-bc6d-a98be1dfead6

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	2
CO2	3	3	2	3	2	3	2	3	2	2	2
CO3	2	3	2	3	3	2	2	2	1	1	1
CO4	3	2	2	3	3	3	3	3	2	2	3
CO5	3	3	2	3	3	3	2	2	2	2	2
Total	14	14	10	15	13	14	11	12	9	9	10
Average	2.8	2.8	2	3	2.6	2.8	2.2	2.4	1.8	1.8	2

3 – Strong, 2- Medium, 1- Low

2nd YEAR: THIRD SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24PCSC33P	Advanced Database Management Systems Lab	CC-10	0	0	4	0	3	4	25	75	100

Learning Objectives

LO1	To understand the basic concepts and terminology related to DBMS and Relational Database Design
LO2	To have a high-level understanding of major DBMS components and their function
LO3	To the design and implement Distributed Databases.
LO4	To be able to write SQL commands to create tables and indexes, insert/update/delete data, and query data in a relational DBMS.
LO5	To be able to program a data-intensive application using PL/SQL

List of Programs

	1. Creating database tables and using data types. • Create table • Modify table • Drop table 2. Data Manipulation. • Adding data with Insert • Modify data with Update • Deleting records with Delete 3. Implementing the Constraints. • NULL and NOT NULL • Primary Key and Foreign Key Constraint • Unique, Check and Default Constraint 4. Data Retrieval • Simple select clause • Accessing specific data with Where, Ordered By, Distinct and Group By 5. Aggregate Functions. • AVG • COUNT • MAX • MIN • SUM • CUBE 6. String functions. 7. Date and Time Functions, Union, intersection and set difference. 8. Nested Queries & JOIN operation. 9. Practical Based on performing different operations on a view in sql. 10. Practical Based on implementing use of triggers, cursors & procedures.	60

CO	Course Outcomes The students can able to
CO1	Create the database table and manipulate the data
CO2	Implement the Primary Key and Foreign Key Constraints
CO3	Create a Program using string functions.
CO4	Write SQL commands to create tables and indexes, insert/update/delete data, and query data in a relational DBMS.
CO5	Understand about the packages and Database Access using Cursors.
Textbooks:	
1	Abraham Silberschatz, Henry F. Korth and S. Sudarshan- "Database System Concepts", seventh Edition,McGraw-Hill. March 2019
Reference Books:	
1	Raghu Ramakrishnan and Johannes Gehrke, "Database Management Systems", Tata McGraw-Hill Publishing Company, 2003
2	Ramez Elmasri and Shamkant B. Navathe, "Fundamental Database Systems", Third Edition, Pearson Education, 2003
3	Hector Garcia–Molina, Jeffrey D.Ullman and Jennifer Widom- "Database System Implementation"- Pearson Education- 2000
4	Narang,"Database Management Systems", 2nd ed., PHI
Web resources:	
1	https://www.tutorialspoint.com/sql/sql-rdbms-concepts.htm
2	http://www.rjspm.com/PDF/BCA-428%20Oracle.pdf
3	https://www.teachmint.com/tfile/studymaterial/class-12th/informaticspractices/sqlqueries3pptx/a2a19ffa-3889-4e42-bc6d-a98be1dfead6

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	2
CO2	3	3	2	3	2	3	2	3	2	2	2
CO3	2	3	2	3	3	2	2	2	1	1	1
CO4	3	2	2	3	3	3	3	3	2	2	3
CO5	3	3	2	3	3	3	2	2	2	2	2
Total	14	14	10	15	13	14	11	12	9	9	10
Average	2.8	2.8	2	3	2.6	2.8	2.2	2.4	1.8	1.8	2

3 – Strong, 2- Medium, 1- Low

2nd YEAR: THIRD SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24PCSC34	**Cryptography and Network Security**	**CC-11**	**2**	**1**	**1**	**0**	**3**	**4**	**25**	**75**	**100**

Learning Objectives	
LO1	To understand the fundamental concepts of cryptography, security threats, and classical cryptography techniques.
LO2	To study the design principles and working of symmetric key cryptographic algorithms such as DES, 3DES, and AES.
LO3	To explore the principles of public-key cryptography and understand key exchange algorithms like RSA and Diffie-Hellman.
LO4	To understand authentication mechanisms, hash functions, and digital signatures for ensuring message integrity and security.
LO5	To study network security threats, security controls, firewalls, intrusion detection systems, and email security mechanisms.

Unit	Content	Hours
1	Introduction to Cryptography, Security Threats, Vulnerability, Active and Passive attacks, Security services and mechanism, Conventional Encryption Model, CIA model, Modular Arithmatic, Euclidean and Extended Euclidean algorithm, Prime numbers, Fermat and Euler's Theorem, Classical Cryptographic Techniques.	12
2	Feistal Cipher Structure, Simplifies DES, DES, Double and Triple DES, Block Cipher design Principles, AES, Modes of Operations.	12
3	Principles Of Public-Key Cryptography, RSA Algorithm, Key Management, Diffie- Hellman Key Exchange, Elgamal Algorithm, Elliptic Curve Cryptography	12
4	Authentication Requirement, Functions, Message Authentication Code, Hash Functions, Security Of Hash Functions And Macs, MD5 Message Digest Algorithm, Secure Hash Algorithm, Digital Signatures, Key Distribution Techniques, Kerberos.	12
5	Threats in networks, Network Security Controls – Architecture, Encryption, Content Integrity, Strong Authentication, Access Controls, Wireless Security, Honeypots, Traffic flow security, Firewalls – Design and Types of Firewalls, Personal Firewalls, IDS, Email Security – PGP, S/MIME.	12

CO	Course Outcomes Students can able to
CO1	Explain different types of security threats, vulnerabilities, and cryptographic models used for data security.
CO2	Compare and evaluate symmetric encryption techniques and their modes of operation for secure data transmission.
CO3	Apply public-key cryptographic techniques for secure key distribution and encryption.
CO4	Implement authentication techniques using hash functions, message authentication codes, and digital signatures.
CO5	Design and implement network security solutions using firewalls, IDS, and secure email protocols like PGP and S/MIME.
Textbooks:	
1	Cryptography And Network Security, Principles And Practice, 4th Edition, WilliamStallings, Pearson Education
2	Modern Cryptography, Theory and Practice, Wenbo Mao, Prentice Hall
3	Network Security Essentials, Applications and Standards, William Stallings, Prentice Hall
Reference Books:	
1	Bruce Schneier, Applied Cryptography: Protocols, Algorithms, and Source Code in C, 2nd Edition, Wiley.
2	Behrouz A. Forouzan, Cryptography and Network Security, McGraw-Hill.
3	Douglas R. Stinson, Cryptography: Theory and Practice, CRC Press.
Web resources:	
1	https://csrc.nist.gov/
2	https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-857-network-and- computer-security-fall-2014/

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	2
CO2	3	3	2	3	2	3	2	3	2	2	2
CO3	2	3	2	3	3	2	2	2	1	1	1
CO4	3	2	2	3	3	3	3	3	2	2	3
CO5	3	3	2	3	3	3	2	2	2	2	2
Total	14	14	10	15	13	14	11	12	9	9	10
Average	2.8	2.8	2	3	2.6	2.8	2.2	2.4	1.8	1.8	2

3 – Strong, 2- Medium, 1- Low

2nd YEAR: THIRD SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24PCSE31	**Data Science**	**EC-5**	2	1	1	0	3	4	25	75	100

Learning Objectives

LO1	To introduce the students to data science, big data & its ecosystem.
LO2	To learn data analytics &its life cycle.
LO3	To explore the programming language R, with respect to the data mining algorithms.
LO4	To relate the relationship between artificial intelligence, machine learning and data science.
LO5	To understand AI concepts, developing skills in AI techniques, and applying AI to solve real-world problems.

Unit	Content	Hours
1	Introduction of Data Science: data science and big data–facets of data-data science process -Ecosystem- The Data Science process – six steps- Machine Learning.	12
2	Data Analytics life cycle-review of data analytics-Advanced data Analytics-technology and tools.	12
3	Basic Data Analytics 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.	12
4	Overview of 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.	12
5	Artificial intelligence: Machine Learning and deep learning in data science-Clustering, association rules. Linear regression-logistic regression-Additional regression methods.	12

CO	Course Outcomes Students can able to
CO1	Understand the concept of data science and its techniques
CO2	Review data science concepts
CO3	Apply and determine appropriate Data Mining techniques using R to real time applications
CO4	Analyze on clustering algorithms
CO5	Analyze on regression methods in AI
Textbooks:	
1	Introducing Data Science: Big Data, Machine Learning, and More, Using Python Tools Davy Cielen, Arno D.B. Meysman, Mohamed Ali, ISBN: 9789351199373
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://www.tutorialspoint.com/python_data_science/index.htm
2	https://www.tpointtech.com/data-science

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	2	2	2
CO2	3	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3
Total	15	15	15	15	15	15	15	15	14	14	14
Average	3	3	3	3	3	3	3	3	2.8	2.8	2.8

3 – Strong, 2- Medium, 1- Low

2nd YEAR: THIRD SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24PCSE32	**Social Media Analytics**	**EC-5**	**2**	**1**	**1**	**0**	**3**	**4**	**25**	**75**	**100**

Learning Objectives

LO1	Familiarize the learners with the concept of social media.
LO2	Familiarize the learners with the concept of social media analytics and understand its significance
LO3	Enable the learners to develop skills required for analyzing the effectiveness of Social media.
LO4	Familiarize the learners with different tools of social media analytics.
LO5	Familiarize the learner with different visualization techniques for Social media analytics.

Unit	Content	Hours
1	**Social Media Analytics :An Overview** Core Characteristics of Social Media, Types of Social Media, Social media landscape, Need for Social Media Analytics (SMA), SMA in small & large organizations. Purpose of Social Media Analytics, Social Media vs. Traditional Business Analytics, Seven Layers of Social Media Analytics, Types of Social Media Analytics, Social Media Analytics Cycle, Challenges to Social Media Analytics, Social Media Analytics Tools	12
2	**Social Network Structure, Measures & Visualization** Basics of Social Network Structure - Nodes, Edges & Tie Describing the Networks Measures –Degree Distribution, Density, Connectivity, Centralization, Tie Strength & Trust Network Visualization-Graph Layout, Visualizing Network features, Scale Issues. Social Media Network Analytics - Common Network Terms, Common Social Media Network Types, Types of Networks, Common Network Terminologies, Network Analytics Tools.	12
3	**Social Media Text, Action & Hyperlink Analytics** Social Media Text Analytics- Types of Social Media Text, Purpose of Text Analytics, Steps in Text Analytics, Social Media Text Analysis Tools, Social Media Action Analytics What Is Actions Analytics? Common Social Media Actions, Actions Analytics Tools Social Media Hyperlink Analytics- Types of Hyperlinks, Types of Hyperlink Analytics, Hyperlink Analytics Tools	12

4	**Social Media Location & Search Engine Analytics** Location Analytics - Sources of Location Data, Categories of Location Analytics, Location Analytics and Privacy Concerns, Location Analytics Tools, Search Engine Analytics- Types of Search Engines, Search Engine Analytics, Search Engine Analytics Tools	12
5	**Social Information Filtering - Social Sharing and filtering** Automated Recommendation systems, Traditional Vs social Recommendation Systems, Understanding Social Media and Business Alignment, Social Media KPI, Formulating a Social Media Strategy, Managing Social Media Risks.	12

CO	**Course Outcomes** **Students can able to**
CO1	Understand the concept of Social media
CO2	Understand the concept of social media Analytics and its significance.
CO3	Learners will be able to analyze the effectiveness of social media.
CO4	Learners will be able to use different Social media analytics tools effectively and efficiently.
CO5	Learners will be able to use different effective Visualization technique store present Social media analytics
Textbooks:	
1	Reza Zafarani Mohammad Ali Abbasi Huan Liu, Social Media Mining, Cambridge University Press, ISBN: 10: 1107018854.
2	Charu C. Aggarwal, Social Network Data Analytics, Springer, ISBN: 978-1-4419-8461-6.
Reference Books:	
1	Marshall Sponder, Social Media Analytics: Effective Tools for Building, Interpreting, and Using Metrics, McGraw Hill Education, 978-0-07-176829-0.
2	Matthew A. Russell, Mining the Social Web, O'Reilly, 2nd Edition, ISBN:10: 1449367615.
3	Jiawei Han University of Illinois at Urbana-Champaign Micheline Kamber, Data Mining: Concepts and Techniques, Morgan Kaufmann, 2nd Edition, ISBN: 13: 978-1-55860-901-3 ISBN: 10: 1-55860-901-6.
4	Bing Liu, Web Data Mining : Exploring Hyperlinks, Contents and Usage Data, Springer, 2 nd Edition, ISBN: 978-3-642-19459-7.
Web resources:	
1	www.geeksforgeeks.com
2	https://www.udemy.com/course/introduction-to-social-analytics/?srsltid=AfmBOoqZa-tfFDAuEJciahdnihDXA8HEwgRtt2pV1FRHYd7KvkIaf-4N

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	2	2	2
CO2	3	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3
Total	15	15	15	15	15	15	15	15	14	14	14
Average	3	3	3	3	3	3	3	3	2.8	2.8	2.8

3 – Strong, 2- Medium, 1- Low

2nd YEAR: THIRD SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24PCSS31P	Data Mining using R Lab Practical	SEC-2	0	0	4	0	2	4	25	75	100

Learning Objectives	
LO1	To Implement and apply various clustering algorithms (k-means, hierarchical) to group data based on similarity.
LO2	To Develop and evaluate classification models (decision trees, Naive Bayes, KNN) to predict categorical outcomes.
LO3	Extract and interpret association rules using the Apriori algorithm to discover relationships between items in a dataset.
LO4	Build and assess regression models (linear regression, decision tree regression) to predict continuous values.
LO5	To Create and interpret various data visualizations (scatter plots, histograms, boxplots) to effectively communicate patterns and insights in data.

Unit	Content	Hours
	1. Implement k-means clustering Technique. 2. Implement Decision Tree Classification. 3. Implement Naive Bayes Classification. 4. Implement K-Nearest Neighbors (KNN) Classification. 5. Implement anyone Hierarchal Clustering. 6. Implement Apriori algorithm to extract association rule of datamining. 7. Implement Decision Tree. 8. Linear Regression. **9.** Data Visualization.	60

CO	Course Outcomes Students can able to
CO1	Demonstrate proficiency in applying core data mining techniques (clustering, classification, association rule mining, regression) to solve real-world problems.
CO2	Evaluate the performance of data mining models using appropriate metrics and techniques.
CO3	Utilize R programming to implement data mining algorithms and perform data analysis tasks.
CO4	Effectively visualize and present data analysis results to stakeholders using appropriate graphical representations.
CO5	Apply different data mining algorithms to solve real world applications
Textbooks:	
1	Margaret H. Dunham, "Data Mining : Introductory and Advanced Topics", Pearson education,1st edition 2020
2	C.S.R. Prabhu, "Data Warehousing Concepts, Techniques, Products and Applications", PHI, Second Edition
Reference Books:	
1	Arun K. Pujari, "Data Mining Techniques", Universities Press (India)Pvt. Ltd.,2003.
2	Alex Berson, Stephen J. Smith, "Data Warehousing, Data Mining and OLAP",TMCH, 2001.
Web resources:	
1	https://www.javatpoint.com/data-warehouse

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	2	2	2
CO2	3	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3
Total	15	15	15	15	15	15	15	15	14	14	14
Average	3	3	3	3	3	3	3	3	2.8	2.8	2.8

3 – Strong, 2- Medium, 1- Low

SEMESTER – III

ABILITY ENHANCEMENT COURSE-I

INTERNSHIP INDUSTRIAL ACTIVITY

SUBJECT CODE: 24PCSIN31

L	T	P	C
0	0	0	2

Total Hours: 30

OBJECTIVES:

1. Introduce the Working Ambience, Attitude, Adaptability, Problem Solving Ability, Ability to work with Supervisor, Ability to take Directions, etc.,
2. Expose on the different phases of Developing a Computer Solution with Team Spirit.
3. Learn about Problem Solving Skills, Soft Skills and other related Skills required for the industry.
4. To develop skill competencies specific to an occupation or profession.
5. To acquire additional interpersonal communication and interaction skills.

REGULATIONS:

1. The Candidates have to undergo a Minimum of 40 Hours of Internship Programme in the Industry during the holidays of the Second Semester of the Course of Study.
2. The Candidates need to get a Project, Analyze, learn the various stages of Developing a solution, Test, Validate and carryout the other related requirements.
3. During the course of Third Semester, the Candidates need to refine the work carried out during the Internship at the Industry, progress towards developing a better Solution as per the standards of the industry and by carrying out the constructive comments received from the industry and / or Institution during the Reviews.
4. Then the Candidates have to prepare and submit the manuscript of the Internship experience as a Report as per the requirements of the Institution / Department for Evaluation.
5. The submission of the Internship Report will be done at the end of the Third Semester for Presentation and Viva– Voce during the Practical Examinations of the Semester.
6. The Passing Minimum for Internship is 50%.
7. If the Candidate fails to score 50% in the Internship, the Candidate has to improve it during the next attempt.
8. A Faculty Member from the Department will act as a Guide to Supervise and Monitor the progress of the Candidates during the course of Internship.
9. The Faculty Member will act as the Internal Examiner during the course of Internship as well as at the time of conducting the Viva– Voce Examination.
10. The Internal Marks for the Internship will be awarded by the concerned Guide / Internal Examiner.
11. The Internal and External Examiners shall both evaluate the Internship Report, Presentation and conduct the Viva– Voce Examination.

2nd YEAR: 4th SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24PCSC41	Internet of Things	CC-12	5	1	0	0	6	6	25	75	100

Learning Objectives	
LO1	Introduce the fundamental concepts, architecture, protocols, and emerging trends in IoT, including edge computing and 5G integration.
LO2	Familiarize students with the basics of electronics, microcontrollers, and hardware platforms, emphasizing low-power design and advanced boards like ESP32.
LO3	Develop programming skills for IoT applications using Arduino IDE and Micro Python to control devices and process data.
LO4	Provide practical knowledge of various sensors, actuators, and industrial-grade sensor integration, including basics of sensor fusion.
LO5	Enable students to transmit, store, and visualize IoT sensor data using cloud platforms like Thing Speak, AWS IoT Core, and Azure IoT Hub.

Unit	Content	Hours
1	**INTRODUCTION** Evolution of IoT – Definition & Characteristics of IoT – Architecture of IoT – Technologies for IoT – Developing IoT Applications – Applications of IoT – Industrial IoT – IoT Standards and Protocols – Introduction to Edge Computing and 5G for IoT – Security in IoT.	18
2	**BASIC ELECTRONICS FOR IoT** Electric Charge, Resistance, Current and Voltage – Binary Calculations – Logic Chips – Microcontrollers – Multipurpose Computers – Electronic Signals – A/D and D/A Conversion – Pulse Width Modulation – Low-power Design Techniques for IoT Devices – Overview of ESP32 Microcontroller.	18
3	**PROGRAMMING USING ARDUINO** Installing and Setting up the Arduino IDE – Basic Syntax – Data Types / Variables / Constants – Operators – Conditional Statements and Loops – Using Arduino C Library Functions for Serial, delay and other invoking Functions – Strings and Mathematics Library Functions – Introduction to Micro Python for IoT Boards.	18
4	**SENSORS AND ACTUATORS** Analog and Digital Sensors – Interfacing Temperature Sensor, Ultrasound Sensor and Infrared (IR) Sensor with Arduino – Interfacing LED and Buzzer with Arduino – Basics of Sensor Fusion – Introduction to Industrial-grade Sensors.	18
5	**SENSOR DATA IN INTERNET** Introduction to ESP8266 NODEMCU WiFi Module – Programming NODEMCU using Arduino IDE – Using WiFi and NODEMCU to transmit data from temperature sensor to Open Source IoT cloud platform (Thing Speak) – Basics of AWS IoT Core / Azure IoT Hub for Projects.	18

CO	Course Outcomes Students can able to
CO1	Explain IoT architecture, protocols, and applications, and describe advanced IoT trends like edge computing and 5G.
CO2	Identify and apply basic electronics principles, microcontroller features, and low-power techniques for IoT devices.
CO3	Write and debug IoT programs in Arduino IDE and Micro Python for device control and data handling.
CO4	Analyze and integrate multiple sensors and actuators, and apply basic sensor fusion concepts in IoT applications.
CO5	Design IoT solutions that send sensor data to cloud platforms, visualize the results, and demonstrate secure data communication.
Textbooks:	
1	Arshdeep Bahga and Vijay Madisetti, “Internet of Things: A Hands-on Approach”, 1st Edition, Universities Press, 2015, ISBN: 978-8173719547.
2	Boris Adryan, Dominik Obermaier, Paul Fremantle, “The Technical Foundations of IoT”, Artech Houser Publishers, 2017.
3	Peter Waher, Mastering Internet of Things: Design and Create Your Own IoT Applications Using Raspberry Pi, ESP32, and Python, Packt Publishing, 2018.
Reference Books:	
1	Michael Margolis, Arduino Cookbook, O’Reilly, 2011
2	Marco Schwartz, Internet of Things with ESP8266, Packt Publishing, 2016
3	Dhivya Bala, ESP8266: Step-by-Step Tutorial for ESP8266 IoT, Arduino NODEMCU Dev. Kit, 2018
4	Pethuru Raj, Anupama Raman, The Internet of Things: Enabling Technologies, Platforms, and Use Cases, CRC Press, 2017
Web resources:	
1	https://geekflare.com/internet-of-things-iot-learning-resources/
2	https://www.javatpoint.com/iot-internet-of-things

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	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	2	3	3	3	3
CO4	3	3	3	3	2	3	3	3	2	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3
Total	15	15	15	15	14	15	14	15	14	15	15
Average	3	3	3	3	2.8	3	2.8	3	2.8	3	3

3 – Strong, 2- Medium, 1- Low

2nd YEAR: 4th SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24PCSC42P	**Internet of Things Lab**	**CC-13**	**0**	**0**	**6**	**0**	**4**	**6**	**25**	**75**	**100**

Learning Objectives	
LO1	To create IoT program to turn ON/OFF LED.
LO2	To implement IoT program for object detection.
LO3	To develop IoT programs for agricultural purposes.
LO4	To create web server program for local hosting.
LO5	To design IoT application for health monitoring.

	Content	**Hours**
	1. To develop an IoT program to turn ON/OFF LED light (3.3V) 2. To develop an IoT program using IR sensor (Smart Garbage Monitoring, Detecting Parking Availability, etc.) 3. To develop an IoT program using Humidity and Temperature Monitoring (Forest fire Detection, Weather Monitoring) 4. To develop an IoT web server program for local hosting 5. To develop an IoT dashboard using Thing Speak or Blynk to visualize real-time sensor data 6. To implement secure MQTT communication between IoT devices with authentication 7. To develop an IoT program using Soil Moisture Sensor 8. To implement edge processing on ESP32 (e.g., noise filtering before cloud upload) **9.** To develop an IoT program for Gas Leakage detection (Home, Industry, etc.) **10.** To design and implement a IoT mini-project integrating multiple sensors, wireless communication, and a cloud dashboard	90

CO	Course Outcomes Students can able to
CO1	Implement IoT programs to turn ON/OFF LED.
CO2	Develop IoT programs for object detection.
CO3	Create IoT programs for agricultural purpose.
CO4	Implement web server program for local hosting.
CO5	Design various IoT applications.
Textbooks:	
1	Adrian McEwen and Hakim Cassimally, Designing the Internet of Things, Wiley, 2014.
2	Donald Norris, The Internet of Things: Do-It-Yourself at Home Projects for Arduino, Raspberry Pi and Beagle Bone Black, McGraw Hill, 2015.
3	Peter Waher, Learning Internet of Things, Packt Publishing, 2015.
Reference Books:	
1	Ovidiu Vermesan and Peter Friess, Internet of Things – From Research and Innovation to Market Deployment, River Publishers, 2014.
2	Anand Tamboli, Build Your Own IoT Platform, Apress, 2019.
Web resources:	
1	https://www.techtarget.com/iotagenda/definition/Internet-of-Things-IoT
2	https://www.shiksha.com/online-courses/industrial-internet-of-things-iiot-course-cour1405
3	https://ibm.com/topics/internet-of-things

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	3	3	3	3	3	3	3	3	2	3
CO3	3	3	3	3	3	3	3	3	3	3	2
CO4	3	3	3	3	2	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	2	3	3
Total	15	15	15	15	14	15	15	15	14	14	14
Average	3	3	3	3	2.8	3	3	3	2.8	2.8	2.8

3 – Strong, 2- Medium, 1- Low

2nd YEAR: 4th SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24PCSC43P	Project	CC-14	0	0	6	0	5	6	25	75	100

Learning Objectives	
LO1	Expose to the various phases of Software Development Life Cycle.
LO2	Learn to apply the Skills and Knowledge in Design, Coding and Testing with appropriate Technological Tools and Procedures.
LO3	Learn to Develop Applications with Personal, Societal and Professional Ethical Standards.
LO4	Learn to prepare a manuscript and documentation of the Project
LO5	Explore knowledge in Organizing the Application concepts

	Regulations	Hours
	1. The Candidates have to undergo a Minimum of 150 Hours of Project Work during the Course of Study either in an IT Industry / Public or Private Sector Organization / Research Institutes / Institution itself. 2. The Candidates need to identify and analyze real world problems on the selected project domain. 3. During the course of study, the Candidates need to Develop, Design, Test, etc., the Applications as per the directions by the Guide. 4. Then the Candidates have to prepare and submit the manuscript of the Project Work as a Report as per the requirements of the Institution / Department for Evaluation. 5. The submission of the Project Report will be done at the end of the Semester for Presentation and Viva-Voce during the Practical Examinations of the Semester. The Passing Minimum for Project Work is 50%. 7. If the Candidate fails to score 50% in the Project Work, the Candidate has to improve it during the next attempt. 8. A Faculty Member from the Department will act as a Guide to Supervise and Monitor the progress of the Candidates during the course of Project Work. 9. The Faculty Member will act as the Internal Examiner during the course of Project Work as well as at the time of conducting the Viva-Voce Examination. 10. The Internal Marks for the Project Work will be awarded by the concerned Guide / Internal Examiner. 11. The Internal and External Examiners shall both evaluate the Project Report, Presentation and conduct the Viva-Voce Examination.	**90**

	INTERNAL MARKS AWARDED FOR THE PROJECT WORK **25 Marks**	
	1. Plan of the Project – 5 Marks 2. Execution of the Plan – 5 Marks 3. Review 1 – 5 Marks 4. Review 2 – 5 Marks 5. Review 3 – 5 Marks	
	EXTERNAL MARKS AWARDED FOR THE PROJECT WORK **75 Marks**	
	1. Evaluation of the Project Report – 25 Marks 2. Presentation – 25 Marks 3. Viva-Voce Examination – 25 Marks	

CO	**Course Outcomes**
CO1	Show Leadership Skills and Learn Time Management
CO2	Identify various Tools to be applied to a specific Problem
CO3	Evaluate the Reports
CO4	Involve in the Team and Manage it to deliver the excellent Outcomes
CO5	Assess and Develop the Individual Skills to Present and Organize the Projects

2nd YEAR: 4th SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24PCSE41	Block Chain Technology	EC-6	4	1	1	0	4	6	25	75	100

Learning Objectives	
LO1	Understand the fundamentals of block chain and cryptocurrency.
LO2	Understand the influence and role of Block Chain in various other fields.
LO3	Learn security features and its significance.
LO4	Learn about the Stakeholders and Bitcoin
LO5	To understand the challenges and applications of blockchain in various industries.

Unit	Content	Hours
1	**INTRODUCTION:** Introduction to Blockchain - The big picture of the industry – size, growth, structure, players. Bitcoin versus Cryptocurrencies versus Blockchain - Distributed Ledger Technology (DLT). Strategic analysis of the space – Blockchain platforms, regulators, application providers. The major application: currency, identity, chain of custody.	18
2	**NETWORK AND SECURITY** Advantage over conventional distributed database, Blockchain Network, Mining Mechanism, Distributed Consensus, Blockchain 1.0, 2.0 and 3.0 – transition, advancements and features. Privacy, Security issues in Blockchain.	18
3	**CRYPTOCURRENCY** Cryptocurrency - History, Distributed Ledger, Bitcoin protocols -Symmetric-key cryptography - Public-key cryptography - Digital Signatures -High and Low trust societies - Types of Trust model: Peer-to-Peer, Leviathan, and Intermediary. Application of Cryptography to Blockchain	18
4	**Crypto currency Regulation** Crypto currency Regulation-Stakeholders, Roots of Bitcoin, Legal views-exchange of cryptocurrency - Black Market - Global Economy. Cyrpto economics–assets, supply and demand, inflation, and deflation – Regulation.	18
5	**CHALLENGES IN BLOCKCHAIN:** Opportunities and challenges in Blockchain – Application of Blockchain: Industry 4.0 – Machine-to-Machine Communication – Data Management in Industry 4.0 – Future Prospects – Blockchain in Health 4.0 – Blockchain Properties – Healthcare Costs – Healthcare Quality – Healthcare Value – Blockchain Applications in Supply Chain Management, Logistics, Smart Cities, Finance and Banking, Insurance, etc. – Case Study.	18

CO	Course Outcomes Students can able to
CO1	Demonstrate blockchain technology and crypto currency.
CO2	Understand the mining mechanism in blockchain.
CO3	Apply and identify security measures, and various types of services that allow people to trade and transact with bitcoins.
CO4	Understand about the Crypto Currency regualtion and Roots of Bitcoin
CO5	Analyze security, privacy, and efficiency of a given Blockchain system
Textbooks:	
1	Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, "Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction", Princeton University Press (July 19, 2016).
2	Antonopoulos, "Mastering Bitcoin : Unlocking Digital Cryptocurrencies"
Reference Books:	
1	Satoshi Nakamoto, "Bitcoin : A Peer-to-Peer Electronic Cash System"
2	Rodrigoda Rosa Righi, Antonio Marcos Alberti, Madhusudan Singh, "Blockchain Technology for Industry 4.0" Springer 2020.
Web resources:	
1	https://www.javatpoint.com/blockchain-tutorial
2	https://www.tutorialspoint.com/blockchain/index.htm

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	2	3
CO2	3	3	3	3	3	3	3	3	3	2	3
CO3	3	3	3	3	3	3	3	3	2	2	3
CO4	3	3	2	3	3	3	3	3	3	2	3
CO5	3	3	3	3	3	3	2	3	3	2	3
Total	15	15	14	15	15	15	14	15	14	10	15
Average	3	3	2.8	3	3	3	2.8	3	2.8	2	3

3 – Strong, 2- Medium, 1- Low

2nd YEAR: 4th SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24PCSE42	Mobile Application Development	EC-6	4	1	1	0	4	6	25	75	100

Learning Objectives	
LO1	To learn the characteristics of mobile applications.
LO2	Understand the intricacies of UI required by mobile applications.
LO3	To study about the design aspects of mobile application.
LO4	To learn development and programming of mobile application.
LO5	To learn the latest tools used to develop mobile app.

Unit	Content	Hours
1	**INTRODUCTION :** Mobile Applications – Characteristics and Benefits – Application Model – Infrastructure and Managing Resources – Mobile Software Engineering – Frameworks and Tools – Mobile devices Profiles.	18
2	**USER INTERFACE :** Generic UI Development – VUIs and Mobile Applications – Text to Speech techniques – Designing the right UI – Multimodal and Multichannel UI – Gesture based UIs – Screen Elements and Layouts – Voice XML – Java API.	18
3	**APPLICATION DESIGN :** Memory Management – Design patterns for limited memory – Work flow for Application Development – Techniques for composing Applications – Dynamic Linking – Plug ins and rules of thumb for using DLLs – Concurrency and Resource Management – Look and feel.	18
4	**APPLICATION DEVELOPMENT :** Intents and Services – Storing and Retrieving data – Communication via the Web – Notification and Alarms – Graphics and Multimedia – Telephony – Location based services – Packaging and Deployment – Security and Hacking.	18
5	**TOOLS:** Google Android Platform – Eclipse Simulator – Android Application Architecture – Event based programming – Apple iPhone Platform – UI tool kit interfaces – Event handling and Graphics services – Layer Animation.	18

CO	Course Outcomes Students can able to
CO1	To design and implement the user interfaces of mobile applications.
CO2	To design the mobile applications that is aware of the resource constraints of the mobile devices.
CO3	To develop advanced mobile applications that accesses the databases and the web.
CO4	To develop useful mobile applications in the current scenario using Google Android and Eclipse simulator
CO5	To apply mobile development frameworks and APIs to build interactive and scalable apps for real-world use cases.
Textbooks:	
1	"Professional Android" by Reto Meier and Ian Lake, Wiley India.
2	"Beginning iPhone Development with Swift" by Molly Maskrey, Kim Topley, and David Mark, Apress.
Reference Books:	
1	Zigurd Mednieks, Laird Dornin, G,Blake Meike and Masumi Nakamura —Programming Android, O'Reilly, 2011.
2	2. Reto Meier, —Professional Android 2 Application Development, Wrox Wiley, 2010.
3	Alasdair Allan, —iPhone Programming, O'Reilly, 2010.
4	Wei-Meng Lee, —Beginning iPhone SDK Progrmming with Objective-C, Wrox Wiley, 2010.
5	Poslad, —Ubiquitous Computing: Smart Devices, Environments and Interactions, Wiley, 2009.
Web resources:	
1	https://geekflare.com/internet-of-things-iot-learning-resources/
2	https://www.javatpoint.com/iot-internet-of-things

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	3	3	3	3	3	3	2	3	3	3
CO3	3	3	3	3	3	2	3	3	3	2	3
CO4	3	3	3	2	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	2	3	3	3
Total	15	15	15	14	15	14	15	13	15	14	15
Average	3	3	3	2.8	3	2.8	3	2.6	3	2.8	3

3 – Strong, 2- Medium, 1- Low

2nd YEAR: 4th SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24PCSP41	Data Analytics with Python	PEC-1	1	1	0	0	2	2	25	75	100

Learning Objectives	
LO1	To introduce the concepts and techniques of Data Analytics.
LO2	To enable students to work with Python libraries for data handling and analysis.
LO3	To provide practical skills in data preprocessing, visualization, and interpretation.
LO4	To encourage critical thinking in applying analytics for decision-making.
LO5	To equip students with the ability to apply Python-based data analysis techniques to derive insights from diverse real-world datasets.

Unit	Content	Hours
1	Introduction to Data Analytics – Practical Importance and Applications – Python Setup for Data Analytics – Hands-on with NumPy and Pandas.	6
2	Data Collection and Preprocessing – Loading and Cleaning Datasets – Handling Missing Values – Data Transformation, Feature Scaling, and Integration using Python.	6
3	Exploratory Data Analysis – Descriptive Statistics – Data Visualization using Matplotlib and Seaborn – Practical Exercises on Line, Bar, Histogram, Scatter, and Box Plots.	6
4	Statistical and Predictive Analysis – Hypothesis Testing, Correlation, and Regression using Python – Building Basic Predictive Models.	6
5	End-to-End Data Analytics Project – Real-world Case Studies in Python – Best Practices and Ethical Considerations in Data Analytics.	6

CO	Course Outcomes Students can able to
CO1	Understand the fundamental concepts of data analytics.
CO2	Perform data cleaning, transformation, and exploration using Python.
CO3	Apply statistical and visualization techniques to datasets.
CO4	Interpret analytical results to support decision-making.
CO5	Develop Python scripts for analyzing real-world datasets.
Textbooks:	
1	Wes McKinney, 'Python for Data Analysis', O'Reilly Media, 2nd Edition, 2017.
2	Jake VanderPlas, 'Python Data Science Handbook', O'Reilly Media, 2016.
Reference Books:	
1	Joel Grus, 'Data Science from Scratch', O'Reilly Media, 2nd Edition, 2019.
2	Foster Provost and Tom Fawcett, 'Data Science for Business', O'Reilly Media, 2013.

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	3	3	3	3	3	3	3	3	3	2
CO3	3	3	3	3	2	3	3	1	3	2	3
CO4	3	2	3	2	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	2	3	3	2
Total	15	14	15	14	14	15	15	12	15	14	13
Average	3	2.8	3	2.8	2.8	3	3	2.4	3	2.8	2.6

3 – Strong, 2- Medium, 1- Low

2nd YEAR: 4th SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24PCSL41	Tensor Flow Developer Certificate	SLC-1	0	0	1	3	2	4	25	75	100

Learning Objectives	
LO1	Understand the fundamentals of TensorFlow and its ecosystem for deep learning.
LO2	Develop the ability to build, train, and evaluate neural network models using TensorFlow.
LO3	Apply TensorFlow for computer vision, natural language processing, and time-series data.
LO4	Gain proficiency in data preprocessing, model optimization, and deployment.
LO5	Prepare for and successfully attempt the official TensorFlow Developer Certificate examination.

Unit	Content	Hours
1	Introduction to TensorFlow - TensorFlow Basics - TensorFlow Installation and Setup - TensorFlow Tensors and Operations - Data Types and Shape Manipulation - Eager Execution - TensorFlow Graphs and Sessions.	12
2	Machine Learning Fundamentals with TensorFlow - Supervised and Unsupervised Learning Concepts - Linear and Logistic Regression - Loss Functions and Optimizers - Model Evaluation and Metrics - Data Preprocessing with TensorFlow.	12
3	Neural Networks with TensorFlow - Introduction to Neural Networks - Activation Functions - Building Sequential Models - Training and Evaluating Models - Saving and Loading Models - Overfitting and Regularization.	12
4	Convolutional Neural Networks (CNNs) - Convolution and Pooling Layers - CNN Architectures - Image Data Augmentation - Transfer Learning with Pretrained Models - Fine-tuning CNN Models - CNN Applications in Image Classification.	12
5	Natural Language Processing and Deployment - Word Embeddings and Tokenization - Recurrent Neural Networks (RNNs) and LSTMs - Text Classification - TensorFlow Serving - Model Deployment to Web and Mobile - TensorFlow Lite and TensorFlow.js.	12

CO	Course Outcomes Students can able to
CO1	Implement TensorFlow workflows for supervised and unsupervised machine learning tasks.
CO2	Design, train, and evaluate deep learning models for real-world datasets.
CO3	Apply TensorFlow APIs for image classification, text classification, and sequence modeling.
CO4	Optimize model performance using callbacks, regularization, and transfer learning.
CO5	Demonstrate readiness for the TensorFlow Developer Certificate exam through a capstone project.
Textbooks:	
1	Laurence Moroney, AI and Machine Learning for Coders: A Programmer's Guide to Artificial Intelligence, O'Reilly Media, 2020.
Reference Books:	
1	Aurélien Géron, *Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow*, 3rd Edition, O'Reilly Media, 2022.
2	François Chollet, *Deep Learning with Python*, 2nd Edition, Manning Publications, 2021.
Web Resources:	
1	Official TensorFlow Developer Certificate website: https://www.tensorflow.org/certificate
2	TensorFlow Tutorials: https://www.tensorflow.org/tutorials

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	3	3	3	3	3	3	3	3	3	3
CO3	3	2	3	3	3	3	2	3	2	3	3
CO4	3	3	3	2	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	2	3	3	2	3
Total	15	14	15	14	15	15	13	15	14	14	15
Average	3	2.8	3	2.8	3	3	2.6	3	2.8	2.8	3

3 – Strong, 2- Medium, 1- Low