MARUDHAR KESARI JAIN COLLEGE FOR WOMEN (AUTONOMOUS)

Vaniyambadi – 635 751

PG Department of Computer Applications

for

Postgraduate Programme

Master of Computer Applications

From the Academic Year 2024-25

CONTENT

LEARNING OUTCOMES BASED CURRICULUM FRAMEWORK FOR POSTGRADUATE EDUCATION

1. Preamble

The Department of Computer Applications was established in 2002, with the objective of imparting quality education in the domain of Computer Applications. With rapidly evolving technology and the continuous need for innovation, the department has always produced quality professionals, holding important positions in Information Technology industries in India and abroad. The Department updates its syllabi frequently to attract young talents from all over the country. The academic activities of the department, during the last four years, were centered on teaching programmes in computer Applications with a view to train postgraduates who can contribute significantly to the requirements of professional organizations in the field.

PROGRAMME OUTCOMES (PO)

Programme	**MCA**
Programme Code	**PS02**
Duration	**2 Years**
Programme Outcomes	**PO1: Disciplinary knowledge:** Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that forma part of an undergraduate Programme of study. **PO2: Communication Skills:** Ability to express thoughts and ideas effectively in writing and orally; Communicate with others using appropriate media; confidently share one's views and express herself / himself; demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups. **PO3:Critical thinking:** Capability to apply analytic thought to a body of knowledge; analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development. **PO4: Problem solving: Capacity** to extra polate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's learning to real life situations. **PO5: Analytical reasoning**: Ability to evaluate there liability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples and addressing opposing view points. **PO6:Research-related skills**: A sense of inquiry and capability for asking relevant/appropriate questions, problem arising, synthesizing and articulating; Ability to recognize cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyse, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation. **PO7:Cooperation/ Teamwork :** Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team. **PO8: Scientific reasoning**: Ability to analyse, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence, and experiences from an open-minded and reasoned perspective.

Programme Specific Outcomes:	**PSO1– Placement:** To prepare the students who will demonstrate respectful engagement with others' ideas, behaviors, beliefs and apply diverse frames of reference to decisions and actions. **PSO2-Entrepreneur:** To create effective entrepreneurs by enhancing their critical thinking, problem solving, decision making and leadership skills that will facilitate startups and high potential organizations. **PSO3 –Research and Development:** Design and implement HR systems and practices grounded in research that comply with employment laws, leading the organization towards Growth and development.

Eligibility for Admission:

- Candidates must have a Bachelor's degree with Mathematics as a subject.
- A minimum of 50% of marks are required in a Bachelor degree.
- Candidates must have completed 10+2 i.e. senior secondary Education with science as a major.

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						
Course Code	Course Title	Hours Distribution				C
		L	T	P	S	
24PCAC11	CC – Data Structure and Algorithm	3	1	2	0	5
24PCAC12	CC – Python Programming	3	1	2	0	5
24PCAC13P	CC – Data Structure using Python Lab	0	0	4	0	3
24PCAE11	EC – Discrete Mathematics	3	1	1	0	3
24PCAE12	EC - RDBMS	3	1	1	0	3
24PCAA11P	AECC – Hands on Training in RDBMS	1	1	0	0	2
24PCHR11	VE - 1 Human Rights	1	1	0	0	2
					30	**23**

Semester - II						
Course Code	Course Title	Hours Distribution				C
		L	T	P	S	
24PCAC21	CC – Data Analytics and Visualization	3	1	2	0	5
24PCAC22	CC – Java Programming	3	1	2	0	5
24PCAC23P	CC – Data Analytics and Visualization Lab	0	0	4	0	3
24PCAC24P	CC – Java Programming Lab	0	0	4	0	3
24PCAE21	EC –Cloud Computing	2	1	1	0	3
24PCAE22	EC – Social Media Networks	2	1	1	0	3
24PCAS21	SEC – 1 Internet and Web Development	1	1	0	0	2
					30	**24**

Semester - III						
	CC – Machine Learning	2	1	2	0	5
	CC – Internet of Things	2	1	2	0	5
	CC – Web Technologies	2	1	1	0	3
	CC – Machine Learning Lab	0	0	4	0	3
	CC – Internet of Things Lab	0	0	4	0	3
	EC – Algorithm of Design and Analysis	2	1	1	0	3
	SEC – Cyber Security	1	1	0	0	2
	Internship	0	0	0	2	2
					30	**26**

Semester - IV						
	CC – Big Data Analytics	3	1	2	0	5
	CC - 14 Project	0	2	4	6	5
	EC – High Performances Computing	4	1	1	0	3
	PEC - 1	1	1	0	0	2
	SLC - 1	0	0	1	3	2
					30	**17**
	Total Credit	**90+2***				

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*.

L- Learning T-Tutorial P-Practical S-Seminar C-Credit

1ST YEAR: FIRST SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24PCAC101	**DATA STRUCTURE AND ALGORITHM**	Core	3	1	2		5	6	25	75	100

Learning Objectives	
LO1	To get a clear understanding of various ADT structures.
LO2	To understand how to implement different ADT structures with real-time scenarios.
LO3	To analyze the various data structures with their different implementations.
LO4	To get an idea of applying the right models based on the problem domain.
LO5	To realize and understand how and where to implement modern data structures with Python language.

Unit	Content	Hours
1	Abstract Data Types: Introduction-Date Abstract Data Type-Bags-Iterators. Arrays: Array Structure-Python List-Two Dimensional Arrays-Matrix Abstract Data Type. Sets, Maps: Sets-Maps- Multi-Dimensional Arrays.	**14**
2	Algorithm Analysis: Experimental Studies-Seven Functions-Asymptotic Analysis. Recursion: Illustrative Examples-Analyzing Recursive Algorithms-Linear Recursion- Binary Recursion-Multiple Recursion.	**14**
3	Stacks, Queues, and De queues: Stacks- Queues- Double-Ended Queues Linked. Lists: Singly Linked Lists-Circularly Linked Lists-Doubly Linked Lists. Trees: General Trees-Binary Trees-Implementing Trees-Tree Traversal Algorithms.	**14**
4	Priority Queues: Priority Queue Abstract Data Type- Implementing a Priority Queue- Heaps-Sorting with a Priority Queue. Maps, Hash Tables, and Skip Lists: Maps and Dictionaries-Hash Tables- Sorted Maps-Skip Lists-Sets, Multi sets, and Multi maps.	**14**
5	Search Trees: Binary Search Trees-Balanced Search Trees-AVL Trees-Splay Trees. Sorting and Selection: Merge sort-Quick sort-Sorting through an Algorithmic Lens- Comparing Sorting Algorithms-Selection. Graph Algorithms: Graphs-Data Structures for Graphs-Graph Traversals-ShortestPaths-Minimum Spanning Trees.	**14**

CO	Course Outcomes
CO1	Understand various ADT concepts
CO2	Familiar with implementation of ADT models with Python language and understand how to develop ADT for the various real-time problems
CO3	Apply with proper ADT models with problem understanding
CO4	Apply and analyze right models based on the problem domain
CO5	Evaluate modern data structures with Python language

Text books:	
1	Rance D. Necaise, "Data Structures and Algorithms Using Python", John Wiley & Sons, 2011.
2	Michael T. Goodrich, Roberto Tamassia, Michael H. Gold wasser, "Data Structures and Algorithms in Python", John Wiley & Sons, 2013.
3	Data Structures and Algorithmic Thinking with Python by Narasimha Karumanchi
4	Data structures and algorithms in python by Michael T. Goodrich
5	Data Structures and Algorithms with Python by Kent D. Lee and Steve Hubbard.
Reference Books:	
1	Problem Solving with Algorithms and Data Structures Using Python by Bradley N Miller and David L. Ranum.
2	Hands-On Data Structures and Algorithms with Python: Write complex and powerful code using the latest features of Python 3.7, 2nd Edition by Dr. Basant Agarwal, Benjamin Baka.
3	Magnus Lie Hetland, "Python Algorithms: Mastering Basic Algorithms in the Python Language", Apress, 2014.
4	Core Python Programming -Second Edition,R. Nageswara Rao, Dreamtech Press
5	Data Structures and Algorithms in Python. Michael T. Goodrich , Roberto Tamassia , Michael H. Goldwasser, Wiley, 2013.
Web resources:	
1	https://www.programiz.com/python-programming
2	https://www.guru99.com/python-tutorials.html/
3	https://www.w3schools.com/python/python_intro.asp
4	https://www.geeksforgeeks.org/python-programming-language/
5	https://en.wikipedia.org/wiki/Python_(programming_language)

Mapping with Programme Outcomes

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

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
24PCAC102	**PYTHON PROGRAMMING**	Core	3	1	2		5	6	25	75	100

Learning Objectives	
LO1	To acquire programming skills in core Python.
LO2	To learn Strings and function
LO3	To develop object oriented skills in Python
LO4	To comprehend various Python Packages
LO5	To develop web applications using Django

Unit	Content	Hours
1	Introduction : Fundamental ideas of Computer Science - Strings, Assignment and Comments - Numeric Data types and Character sets - Expressions - Loops and Selection Statements: Definite iteration: the for Loop - selection: if and if-else statements - Conditional iteration: the while Loop	**14**
2	Strings and Text Files: Accessing Characters and substrings in strings - Data encryption-Strings and Number systems- String methods - Text - Lists and Dictionaries: Lists - Dictionaries - Design with Functions: A Quick review - Problem Solving with top-Down Design - Design with recursive Functions - Managing a Program's namespace - Higher-Order Functions	**14**
3	Design with Classes: Getting inside Objects and Classes - Data-Modeling Examples - Building a New Data Structure - The Two - Dimensional Grid - Structuring Classes with Inheritance and Polymorphism-Graphical User Interfaces-The Behavior of terminal-Based programs and GUI-Based programs - Coding Simple GUI-Based programs - Windows and Window Components - Command Buttons and responding to events	**14**
4	Working with Python Packages: NumPy Library-Ndarray- Basic Operations - Indexing, Slicing and Iteration - Array manipulation - Pandas - The Series - The Data Frame - The Index Objects - Data Visualization with Matplotlib-	**14**

	The Matplotlib Architecture -Pyplot- The Plotting Window - Adding Elements to the Chart - Line Charts - Bar Charts - Pie charts	
5	Django: Installing Django- Building an Application - Project Creation - Designing the Data Schema - Creating an administration site for models - Working with Query Sets and Managers - Retrieving Objects - Building List and Detail Views	**14**

CO	**Course Outcomes**
CO1	Comprehend the programming skills in python and develop applications using conditional branches and loop
CO2	Create python applications with strings and functions
CO3	Understand and implement the Object Oriented Programming paradigm with the concept of objects and classes, Inheritance and polymorphism
CO4	Evaluate the use of Python packages to perform numerical computations and data visualization
CO5	Design interactive web applications using Django

Text books:	
1	K.A. Lambert, " Fundamentals of Python: first programs", Second Edition, Cengage Learning, 2018 (Unit - I, II and III)
2	Fabio Nelli, "Python Data Analytics: With Pandas, NumPy, and Matplotlib", Second Edition, Kindle Edition, 2018 (Unit - IV)
3	Antonio Mele, "Django 3 By Example", Third Edition, 2020 (Unit - V)
4	Introduction to Python Programming by Udayan Das, et al. Publisher: OpenStax
5	Python Basics: A Practical Introduction to Python 3 Revised and Updated 4th Edition David Amos, Dan Bader, Joanna Jablonski, Fletcher Heisler Copyright © Real Python (realpython.com), 2012–2020
Reference Books:	
1	Paul Gries, Jennifer Campbell, Jason Montojo, Practical Programming: An introduction to Computer Science Using Python, second edition, The Pragmatic Bookshelf, 2013.
2	Allen Downey, Jeffrey Elkner, 2Learning with Python: How to Think Like a Computer Scientist Paperback –2015.
3	Hans Fango hr, Introduction to Python for Computational Science and Engineering (A beginner's guide), 2015.
4	Timothy A. Budd, Exploring Python, McGraw Hill Education, 2009.
5	Mark Lutz, Learning Python, Fourth Edition, O'Reilly publication, 2009.

Web resources:	
1	https://www.programiz.com/python-programming
2	https://www.guru99.com/python-tutorials.html
3	https://www.w3schools.com/python/python_intro.asp
4	https://www.geeksforgeeks.org/python-programming-language/
5	https://en.wikipedia.org/wiki/Python_(programming_language)

Mapping with Programme Outcomes and Programme Specific Outcomes

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

3 – Strong, 2- Medium, 1- Low

1. DISCRETE MATHEMATICS

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
24PCAE101	3	1	0	0	3	4	25	75	100

Learning Objectives	
LO1	To know the concepts of relations
LO2	To know the concepts of functions
LO3	To know and solve matrices, rank of matrix
LO4	To gain knowledge on mathematical logics
LO5	To study the graphs and its types

Unit	Contents	No. of Hours
I	**Relations:** Relation Introduction- Cartesian Product of Two Sets- Relation Definition with Examples- Domain and Range of a Relation- Representation of Relation- Matrix of a Relation- Digraph of a Relation- Operations on Relations- Compositions of Relation- Equivalence Relations	10
II	**Functions:** Functions and Operators- Range of a Function- One to One & Onto Functions- Special Types of Functions- Many to One Mapping- The Identity Function- Invertible Functions- Composition of Functions	10
III	**Matrices:** Matrix Algebra- Equality of Matrix- Matrix Operations- Transpose of a Matrix- The Inverse of a Square Matrix- Elementary Operations and Rank of a Matrix- Simultaneous Linear Equations	10
IV	**Mathematical logics:** Proposition- TF Statement- Connectives- Conjunction & Disjunction - Negation - Conditional & Bi conditional Statement- The Truth Table of a Formula- Tautalogy- Tautological Implications and Equivalence of Formulae	10
V	**Graph Theory:** Basic Concepts- Incidence and Degree- Subgraph- Graph Isomorphism- Some Special Classes of Graphs- Path, Cycles and Connectedness Definitions only- Matrix Representation of Graph- The Adjacency of and Undirected Graph.	10
	Total	50

COURSE OUTCOMES	
CO1	To understand the concepts ofrelations distinguish among normal forms
CO2	To understand the concepts of functions distinguish among normal forms
CO3	To solve and know various types of matrices
CO4	To distinguish the various logic operators
CO5	To evaluate and solve various types of graphs

TEXT BOOKS	
1	Discrete Mathematics – Dr. M. K. Venkataraman, Dr. N. Sridharan, N. Chandrasekaran-The National Publishing Company
2	N.Chandrasekaran and M.Umaparvathi, Discrete mathematics, PHI Learning Private Limited, New Delhi, 2010.
3	Rudolf Lidl and Gunter Pilz, Applied Abstract Algebra, 2nd Indian Reprint, Springer Verlag, NewYork, 2006.
4	Discrete Mathematics- Susanna. S.Epp -Metric Version
5	Discrete Mathematics-Schaum's Outlines-Seymour Lipschutz, Marc Lars Lipson 3rd Edition

REFERENCE BOOKS	
1	Kimmo Eriksson &Hillevi Gavel, Discrete Mathematics & Discrete Models, Student litteratur AB, 2015.
2	Kenneth H. Rosen Discrete Mathematics and applications, Mc Graw Hill,2012
3	A.Gill, Applied Algebra for Computer Science, Prentice Hall Inc., New Jersey.
4	J.L.Gersting, Mathematical Structures for Computer Science, 3 rdEdn., ComputerScience Press, New York.
5	S.Wiitala,Discrete Mathematics - AUnified Approach, McGraw Hill Book Co.

Web Resources
https://nptel.ac.in/courses/106106094 https://nptel.ac.in/courses/111107058

Mapping with Programme Outcomes and Programme Specific Outcomes

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

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
24PCAP103	**DATA STRUCTURE USING PYTHON LAB**	**Practical**	**0**	**0**	**4**	**0**	**3**	**4**	**25**	**75**	**100**

Learning Objectives	
LO1	Understand basic data structures in python like Lists, Tuples, Dictionaries, Sets and Maps.
LO2	Design and analyze simple linear data structures
LO3	Identify and apply the suitable data structure for the given real world problem
LO4	Design and analyze non linear data structures
LO5	Gain knowledge in practical applications of data structures

Unit	Content	Hours
1	Program using elementary data items, lists, dictionaries and tuples	5
2	Program using conditional branches, loop	5
3	Program for creating dynamic and interactive web pages using forms	5
4	Write a Python program to illustrate the following comprehensions: a) List Comprehensions b) Dictionary Comprehensions c) Set Comprehensions d) Generator Comprehensions	5
5	Write a Python program to generate the combinations of n distinct objects taken from the elements of a given list. Example: Original list: [1, 2, 3, 4, 5, 6, 7, 8, 9] Combinations of 2 distinct objects: [1, 2] [1, 3] [1, 4] [1, 5] .... [7, 8] [7, 9] [8, 9].	5
6	Write a program for Linear Search and Binary search.	5
7	Write a program to implement Bubble Sort and Selection Sort.	5
8	Write a program to implement Merge sort and Quick sort.	5

9	Write a program to implement Stacks and Queues.	5
10	Write a program to implement Singly Linked List.	5
11	Write a program to implement Doubly Linked list.	5
12	Write a program to implement Binary Search Tree.	5

CO	Course Outcomes
CO1	Understand various data representation techniques in the real world
CO2	Implement linear and non-linear data structures.
CO3	Analyze various algorithms based on their time and space complexity.
CO4	Develop real-time applications using suitable data structure
CO5	Identify suitable data structure to solve various computing problems

Text books:	
1	Data Structures and Algorithmic Thinking with Python by Narasimha Karumanchi
2	Data structures and algorithms in python by Michael T. Goodrich
3	K.A. Lambert, " Fundamentals of Python: first programs", Second Edition, Cengage Learning, 2018
4	Fabio Nelli, "Python Data Analytics: With Pandas, NumPy, and Matplotlib", Second Edition, Kindle Edition, 2018
5	Antonio Mele, "Django 3 By Example", Third Edition, 2020
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1	Problem Solving with Algorithms and Data Structures Using Python by Bradley N Miller and David L. Ranum.
2	Hands-On Data Structures and Algorithms with Python: Write complex and powerful code using the latest features of Python 3.7, 2nd Edition by Dr. Basant Agarwal, Benjamin Baka.
3	Magnus Lie Hetland, "Python Algorithms: Mastering Basic Algorithms in the Python Language", Apress, 2014.
4	Core Python Programming -Second Edition,R. Nageswara Rao, Dream tech Press
5	Data Structures and Algorithms in Python. Michael T. Goodrich , Roberto Tamassia , Michael H. Goldwasser, Wiley, 2013.

Web resources:	
1	https://www.programiz.com/python-programming
2	https://www.guru99.com/python-tutorials.html
3	https://www.w3schools.com/python/python_intro.asp
4	https://www.geeksforgeeks.org/python-programming-language/
5	https://en.wikipedia.org/wiki/Python_(programming_language)

Mapping with Programme Outcomes and Programme Specific Outcomes

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

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
24PCAE102	**RELATIONAL DATABASE MANAGEMENT SYSTEM**	**Core**	**3**	**1**	**1**	**0**	**3**	**5**	**25**	**75**	**100**

Learning Objectives	
LO1	Master the basics of SQL and construct queries using SQL.
LO2	Understand the relational database design principles.
LO3	Familiar with the basic issues of transaction processing and concurrency control.
LO4	Familiar with database storage structures and access techniques.
LO5	Understand the relational database design principles.

Unit	Content	Hours
1	Database & Database Users. Characteristics of the Database Approach advantages of using DBMS. Data Models, Schemas & Instances. DBMS Architecture & Data Independence. System Architecture for DBMS and Data Dictionary, Database Users Data Base languages & Interfaces. Data Modeling using the Entity-Relationship Model -Entity types, Entity Sets, Attributes and Keys, Relationship, Relationship Types, Week Entity Types, Structural Constraints, Enhanced ER Model- Specialization Generalization, Constraints on Specialization Generalization.	**12**
2	Relational Data Model Concepts and Constraints. Relational Algebra - select, project, set theoretic, join operations. Overview of Relational Calculus. SQL - A Relational Database Language. Data Definition commands, View and Queries , transaction commands, Specifying Constraints & Indexes in SQL.	**12**
3	Function Dependencies & Normalization for Relational Databases. Informal design guidelines for relation schemas, Functional Dependencies. Normal forms based on primary keys (INF, 2NF, 3NF& BCNF). Lossless join & Dependency preserving decomposition. Multivalued dependencies, join dependencies (4NF & 5NF), Denormalization.	**12**

4	Basic concept; ACID properties; transaction state; implementation of atomicity and durability; concurrent executions; basic idea of serializability; view and conflict serializabllity Recovery Techniques Failure Classification , Storage Structure, Recovery and Atomicity Log Based Recovery, Shadow Paging ,stable storage implementation, data access; recovery and atomicity - log based recovery, deferred database modification, immediate database modification, checkpoints.	**12**
5	Distributed databases; Basic idea; distributed data storage; data replication; data fragmentation horizontal, vertical and mixed fragmentation. Concepts of Multimedia databases, Object oriented data base management systems. Data Warehousing & mining.	**12**

CO	Course Outcomes
CO_1	Describe the fundamental elements of relational database management systems
CO2	Explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL.
CO3	Design ER-models to represent simple database application scenarios
CO4	Convert the ER-model to relational tables, populate relational database and formulate SQL queries on data.
CO5	Improve the database design by normalization.

Text books:	
1	Data base System Concepts, Silberschatz, Korth, McGraw hill, Sixth Edition.(All UNITS except III th)
2	Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, TATA McGraw Hill 3rd Edition.
3	Henry F.Korth, and Abraham Silberschatz , Sudarshan "Database Concepts", McGraw Hill, 4th Edition, 2002 system
4	Singh. S. K., "Database Systems – Concepts, Design and Applications", Pearson Education Publications, New Delhi, 2006.
5	Pipin C. Desai, "An Introduction to data base systems", Galgotia Publications Private Limited, 1991.
Reference Books:	
1	Fundamentals of Database Systems, Elmasri Navathe Pearson Education
2	An Introduction to Database systems, C.J. Date, A.Kannan, S.Swami Nadhan, Pearson, Eight Edition for UNIT III.
3	Ramez Elamassri and Shankant B-Navathe, "Fundamentals of Database Systems", Sixth Edition, Pearson Education Delhi, 2010.
4	Raghu Ramakrishnan, Johannes Gehrke , "Database management systems" McGraw Hill, 2003.
5	C.J. Date, "An Introduction to Database Systems", 3rd Edition, Addison Wesley 1983.

Web resources:	
1	http://www.cs.helsinki.fi/u/laine/tikape/k03/material03.html
2	http://infolab.stanford.edu/~ullman/dscb.html
3	http://cs.nyu.edu/courses/spring06/G22.2433-001/
4	https://www.w3schools.com/mysql/mysql_rdbms.asp
5	https://www.w3resource.com/sql/tutorials.php

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

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
24PCAP101	**HANDS ON TRAINING IN RDBMS**	**Core**	**0**	**0**	**2**	**0**	**2**	**2**	**25**	**75**	**100**

Learning Objectives	
LO1	To understand the data definition and data manipulation commands
LO2	To learn the use of nested and join queries
LO3	To understand function, procedures and procedural extension of database
LO4	To be familiar with the use of a front end tool
LO5	To understand design and implementation of typical database applications

Unit	Content	Hours
1	Use of DDL for creating objects (Table, Database).	3
2	Use of DML for performing retrieval operations.	3
3	Use of DCL for specifying constraints and authorities on table.	3
4	Use of Aggregate functions.	3
5	Use of String functions.	3
6	Creating and Performing various operations on Views	3
7	Performing queries for Union, Intersection, Difference, Cartesian Product and Division.	3
8	Performing queries on varies joins and nested queries	3
9	Writing Programs in PL/SQL	3
10	Understanding and Creating Cursors	3

CO	Course Outcomes
CO1	Use typical data definition and manipulation commands
CO2	Design applications to test Nested and Join Queries
CO3	Implementing simple applications that use Views
CO4	Implementing applications that required a Front-end tool
CO5	Critically analyses the use of Tables, Views, Functions and Procedures.

Text books:	
1	Data base System Concepts, Silberschatz, Korth, McGraw hill, Sixth Edition.(All UNITS except III th)
2	Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, TATAMcGraw Hill 3rd Edition.
3	Henry F.Korth, and Abraham Silberschatz , Sudarshan "Database Concepts", McGraw Hill, 4th Edition, 2002 system
4	Singh. S. K., "Database Systems – Concepts, Design and Applications", Pearson Education Publications, New Delhi, 2006.
5	Pipin C. Desai, "An Introduction to data base systems", Galgotia Publications Private Limited, 1991.
Reference Books:	
1	Fundamentals of Database Systems, Elmasri Navathe Pearson Education
2	An Introduction to Database systems, C.J. Date, A.Kannan, S.SwamiNadhan, Pearson, Eight Edition for UNIT III.
3	Ramez Elamassri and Shankant B-Navathe, "Fundamentals of Database Systems", Sixth Edition, Pearson Education Delhi, 2010.
4	Raghu Ramakrishnan, Johannes Gehrke , "Database management systems" McGraw Hill, 2003.
5	C.J. Date, "An Introduction to Database Systems", 3rd Edition, Addison Wesley 1983.
Web resources:	
1	http://www.cs.helsinki.fi/u/laine/tikape/k03/material03.html
2	http://infolab.stanford.edu/~ullman/dscb.html
3	http://cs.nyu.edu/courses/spring06/G22.2433-001/
4	https://www.w3schools.com/mysql/mysql_rdbms.asp
5	https://www.w3resource.com/sql/tutorials.php

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	3	3	3	3	3
CO4	3	3	3	3	3	3	2	3	3	3	3
CO5	3	3	3	3	3	2	3	2	3	3	2
Total	15	15	15	15	15	14	14	14	15	15	14
Average	3	3	3	5	5	2	2	2	3	3	2

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
24PCAC21	DATA ANALYTICS AND VISUALIZATION	Core	3	2	0	1	5	6	25	75	100

Learning Objectives

LO1	To understand the basics in R programming in terms of constructs, control statements, string functions
LO2	To learn about the getting data In and Out of R
LO3	To learn the principles and methods of statistical analysis
LO4	To learn the Data Mining concepts using R
LO5	To understand the basic concepts of data visualization using R.

Unit	Content	Hours
1	**Introduction To R** : Overview -Evolution Of R -Features Of R -Identifiers– Data Types-Data Structure: Vectors -Lists -Matrices –Arrays Factors -Data Frames - Variables -Operators– Functions- Decision Making - Loops. **Chapter 4: Section -4.1, 4.2, 4.3** **Chapter 5: Section -5.1, 5.2, 5.3, 5.4** **Chapter 9: Section- 9.1,9.2,9.3** **Chapter 10: Section – 10.1,10.2,10.3**	14
2	**R Programming** Reading and getting data into R (External Data): Using CSV files, XML files, Web Data, JSON files, Databases, Excel files. Working with R Charts and Graphs: Histograms, Boxplots, Bar Charts, Line Graphs, Scatterplots, Pie Charts. **Chapter 6:Section - 6.1, 6.2, 6.3, 6.4, 6.7,6.8** **Chapter 7: Section - 7.1, 7.2,**	14
3	**Data Analytics**: Introduction to Analytics, Introduction to Tools and Environment, Application of Modelling in Business, Databases & Types of Data and variables, Data Modelling Techniques, Missing Imputation set. Need for Business Modelling. **Chapter 3 : Section 3.1,3.2** **Chapter 4 : Section 4.2,4.3,4.4**	14
4	**Data Mining :** Association -Classification & Prediction: -Classification by Decision Tree Induction - Bayes' Theorem Naïve Bayesian Classification – Bayesian Belief Networks The k-Nearest Neighbour Algorithm-Decision Trees - k-Means Clustering- Hierarchical Clustering. **Chapter 5 :Section5.3** **Chapter 6.3 : Section 6.3.1, 6.3.2, 6.3.3,6.4.1,6.4.2, 6.4.3** **Chapter 6.9 : Section 6.9.1**	14

5	**Data visualization with R** : Introduction to ggplot2 - A worked example, Placing the data and mapping options, Graphs as objects, Univariate Graphs: Categorical, Quantitative. Bivariate Graphs- Categorical vs. Categorical, Quantitative vs Quantitative, Categorical vs. Quantitative, Multivariate Graphs : Grouping, Faceting **Chapter 3 : Section 3.1, 3.2, 3.3** **Chapter 4 : Section 4.1, 4.2** **Chapter 5: Section 5.1, 5.2, 5.3** **Chapter 6: 6.1, 6.2**	14

CO	**Course Outcomes**
CO1	Gain the knowledge about basic R programming.
CO2	To understand the getting data In and Out of R
CO3	To understand the principles and methods of statistical analysis
CO4	To understand the Data Mining concepts using R
CO5	To Gain the knowledge about the basics of data visualization.
Textbooks:	
1	R for Everyone: Advanced Analytics and Graphics By Jared P. Lander
2	Student's Handbook for Associate Analytics – III.
3	Data Mining : Concepts and Techniques : Concepts and Techniques (3rd Edition) Jiawei Han, Micheline Kambar, Jian Pie
4	Hands-On Programming with R- Garrett Grolemund Foreword by Hadley Wickham -Oreilly
5	https://rkabacoff.github.io/datavis/Univariate.html#categorical
Reference Books:	
1	Beginning Data Science in R-Data Analysis, Visualization, and Modelling for the Data Scientist - Thomas Mailund –Apress -2017.
2	Introduction to Data Mining, Tan, Steinbach and Kumar, Addision Wisley, 2006
3	Data Warehousing Fundament's, Pualraj Ponnaiah, Wiley Student Edition.
4	Practical Data Science with R, Nina Zumel & John Mount, Manning Publications NY, 2014.
5	R Programming for Data Science -Roger D. Peng, 2015 , Lean Publishing.
Web resources:	
1	https://sves.org.in/ecap/Resources/_53.pdf
2	https://www.cs.upc.edu/~robert/teaching/estadistica/rprogramming.pdf

Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	2	2	2	3	3	2
CO2	2	1	2	1	3	2	2	3	3	3	3
CO3	3	2	2	2	2	3	1	3	2	3	3
CO4	2	2	2	2	2	2	2	2	3	3	2
CO5	3	1	2	2	3	3	3	2	3	2	3
Total	13	8	10	9	12	12	10	12	14	14	13
Average	2	1	2	1	2	2	2	2	3	3	2

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
24PCAC22	**JAVA PROGRAMMING**	**Core**	**3**	**1**	**2**	**0**	**5**	**6**	**25**	**75**	**100**

Learning Objectives	
LO1	To understand the basics of Object Oriented Programming concepts, Character Set, tokens, variables, data types, operators and control structure.
LO2	To understand the fundamental concept of Java like class and object, array, methods, constructors and inheritance.
LO3	To understand the concept of package, Exception Handling and Threading.
LO4	To understand the concepts of Applets and AWT.
LO5	To understand the concepts of JDBC connectivity.

Unit	Content	Hours
1	**OOP** and Java Objects and Classes, Encapsulation, Inheritance, Polymorphism, Java Language, The Primaries– Character Set, Tokens, Constants, Variables, Operators and Expressions, Library Methods, Strings, I/O Streams, Formatting the Output values, Control Statements–If, Switch, While, Do-While-for.	14
2	**Arrays**: One, Two dimensional Arrays, Methods – General form, invoking, method overloading, recursion, Classes and objects – General form, creation, constructors, constructor overloading, copy constructor, this ‘ keyword, Static members, finalize method, Inner class and anonymous classes, Inheritance– inheriting, abstract classes and final classes, Interfaces – structure, implementation, interface inheritance.	14
3	**Packages–** Package Hierarchy, Import Statement, Hiding the Classes, Access Control Modifiers, Exception Handling – Default Exception – User Defined Exception Handling, Exception and Error Classes, Throw and Throws. Threading– Life Cycle, Creating and Running, Methods in Thread Class, Priority Thread, Synchronization, Dead Lock, Inter Thread Communication.	14
4	**Applets**–Life Cycle, Applet Class, Syntax of Applet Tag, Methods in Graphics Class, Events, Listeners, Event Handling Methods, Inheritance of Control Classes, Labels, Button Control, Check Box Control, Radio Button, Choice Control, List Control, Scroll Bars, Layouts and Panel, Windows and Frames, Menus and Dialogs, Mouse Events and Listeners, Adapter Class and Inner Class.	14
5	**JDBC**– Establishing Connection, Creating Tables, Enter Data, Table Updating Obtaining Metadata, Using Transactions.	14

CO	Course Outcomes
CO1	The student will be able to understand the basics of Object Oriented Programming concepts, Character Set, tokens, variables, datatypes, operators and control structure
CO2	The student will be able to understand the fundamental concept of Java like class and object, array, methods, constructors and inheritance
CO3	The student will be able to understand the concept of package, Exception Handling and Threading
CO4	The student will be able to understand the concepts of Applets and AWT
CO5	The student will be able to understand the concepts of JDBC connectivity
Textbooks:	
1	Muthu C,—Programming in Java ǁ, 2nd Edition, Tata Mcgraw Hill Education Private Limited, 2009. Unit–I : Ch.1,2,3 Unit-II : Ch.4,5,6 Unit-III : Ch.7,12,13 Unit–IV : Ch.8,9,10 Unit–V : Ch.18
2	Core Java for beginners, RASHMI Kanta Das, Vikas pub.
3	Java Server Programming Java EE 7 (J2EE 1.7) - Black Book, Kogent, Dreamtech PressSenn, LA., "Analysis and Design of Information Systems". Tata McGraw Hill Book Company, 1986.
4	Java Programming – A Practical Approach – C Xavier, Tata McGraw-Hill Edition
5	K. Arnold and J. Gosling, “The JAVA programming language”, Third edition, Pearson Education, 2000
Reference Books:	
1	Herbert Schildt,—The Complete Reference–Java2 ǁ, 4th Edition,Tata Mc Graw Hill, 2001
2	Balaguruswamy,— ProgrammingwithJAVAǁ,2ndEdition,Tata Mc Graw Hill,1999.
3	Java Programming by Hari Mohan Pandey, Pearson Education, 2012.
4	Java 6 Programming, Black Book, KoGenT, Dreamtech Press, 2012.
5	Java 2 Essentials, Cay Hortsmann, second edition, Wiley
Web resources:	
1	http://www.tutorialspoint.com/java/
2	http://javabeginnerstutorial.com/core-java/

Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	3	1	3	2	3	2
CO2	3	3	3	2	2	3	1	3	2	3	2
CO3	3	3	3	2	2	3	1	3	2	3	2
CO4	3	3	3	2	2	3	1	3	2	3	2
CO5	3	3	3	2	2	3	1	3	2	3	2
Total	15	15	15	10	10	15	5	15	10	15	10
Average	3	3	3	2	2	3	1	3	2	3	2

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
24PCAC23P	**DATA ANALYTICS AND VISUALIZATION LAB**	Practical	0	0	4	0	3	4	25	75	100

Learning Objectives	
LO1	To Learn the basic concepts of R
LO2	To learn the usage of different R Data Structures.
LO3	Develop programming logic using R Packages. C
LO4	Analyze the datasets using R programming capabilities
LO5	Apply R programming for reading, cleaning, visualizing and analyzing data

Unit	Content	Hours
1	Download and install R-Programming environment and install basic packages using install. Packages () command in R.	4
2	Learn all the basics of R-Programming (Data types ,Variables , Operators ,Control statements	4
3	Write a R program to create a two-dimensional 5x3 array of sequence of even integers greater than 50.	4
4	a)Create a Scatter plot from CSV in R b) Create a Json Files	4
5	Implement data frames in R. Write a program to join columns and rows in a data frame using c bind () and r bind () in R.	4
6	a)Write a R program to find factorial of a number using recursion b)Write a R program to mean, variance, standard deviation for the given probability distribution	4
7	Implement A priori algorithm to extract association rule of data mining.	4
8	Implement k-means clustering technique.	4
9	Implement Classification algorithm.	4
10	Create pie charts and bar charts using R.	4
	Total	40

CO	Course Outcomes
CO1	Utilize and R Data types for developing programs.
CO2	Make use of different R Data Structures.
CO3	Develop programming logic using R Packages. C
CO4	Analyze the datasets using R programming capabilities
CO5	Apply R programming for reading, cleaning, visualizing and analyzing data
Text Books:	
1	R for Everyone: Advanced Analytics and Graphics By Jared P. Lander
2	Student's Handbook for Associate Analytics – III.
3	Data Mining : Concepts and Techniques : Concepts and Techniques (3rd Edition) Jiawei Han, Micheline Kambar, Jian Pie
4	Hands-On Programming with R- Garrett Grolemund Foreword by Hadley Wickham -Oreilly
5	https://rkabacoff.github.io/datavis/Univariate.html#categorical
Reference Books:	
1	Beginning Data Science in R-Data Analysis, Visualization, and Modelling for the Data Scientist - Thomas Mailund –Apress -2017.
2	Introduction to Data Mining, Tan, Steinbach and Kumar, Addision Wisley, 2006
3	Data Warehousing Fundament's, Pualraj Ponnaiah, Wiley Student Edition.
4	Practical Data Science with R, Nina Zumel & John Mount , Manning Publications NY, 2014.
5	R Programming for Data Science -Roger D. Peng, 2015 , Lean Publishing.
Web resources:	
1	https://sves.org.in/ecap/Resources/_53.pdf
2	https://www.cs.upc.edu/~robert/teaching/estadistica/rprogramming.pdf

Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	2	2	2	3	3	2
CO2	2	1	2	1	3	2	2	3	3	3	3
CO3	3	2	2	2	2	3	1	3	2	3	3
CO4	2	2	2	2	2	2	2	2	3	3	2
CO5	3	1	2	2	3	3	3	2	3	2	3
Total	13	8	10	9	12	12	10	12	14	14	13
Average	2	1	2	1	2	2	2	2	3	3	2

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
24PCAC24P	**JAVA PROGRAMMING LAB**	Practical	0	0	4	0	3	4	25	75	100

Learning Objectives	
LO1	To understand the basics of Object Oriented Programming concepts, Character Set, tokens, variables, data types, operators and control structure.
LO2	To understand the fundamental concept of Java like class and object, array, methods, constructors and inheritance.
LO3	To understand the concept of package, Exception Handling and Threading.
LO4	To understand the concepts of Applets and AWT.
LO5	To understand the concepts of JDBC connectivity.

Unit	Content	Hours
1	Class and Objects	4
2	String and String Buffer Class	4
3	Inheritance and Interface	4
4	Packages	4
5	Exception Handling	4
6	Threads	4
7	Applet	4
8	Shapes	4
9	AWT	4
10	JDBC	4
	Total	40

CO	Course Outcomes
CO1	The student will be able to understand the basics of Object Oriented Programming concepts, Character Set, tokens, variables, data types, operators and control structure
CO2	The student will be able to understand the fundamental concept of Java like class and object, array, methods, constructors and inheritance
CO3	The student will be able to understand the concept of package, Exception Handling and Threading
CO4	The student will be able to understand the concepts of Applets and AWT
CO5	The student will be able to understand the concepts of JDBC connectivity
Textbooks:	
1	Muthu C,—Programming in Java ǁ, 2nd Edition, Tata Mcgraw Hill Education Private Limited, 2009. Unit–I : Ch.1,2,3 Unit-II : Ch.4,5,6 Unit-III : Ch.7,12,13 Unit–IV : Ch.8,9,10 Unit–V : Ch.18
2	Core Java for beginners, RASHMI Kanta Das, Vikas pub.
3	Java Server Programming Java EE 7 (J2EE 1.7) - Black Book, Kogent, Dreamtech PressSenn, LA., "Analysis and Design of Information Systems". Tata McGraw Hill Book Company, 1986.
4	Java Programming – A Practical Approach – C Xavier, Tata McGraw-Hill Edition
5	K. Arnold and J. Gosling, “The JAVA programming language”, Third edition, Pearson Education, 2000
Reference Books:	
1	Herbert Schildt,—The Complete Reference–Java2 ǁ, 4th Edition,Tata Mc Graw Hill, 2001
2	Balaguruswamy,— ProgrammingwithJAVAǁ,2ndEdition,Tata Mc Graw Hill,1999.
3	Java Programming by Hari Mohan Pandey, Pearson Education, 2012.
4	Java 6 Programming, Black Book, KoGenT, Dreamtech Press, 2012.
5	Java 2 Essentials, Cay Hortsmann, second edition, Wiley
Web resources:	
1	http://www.tutorialspoint.com/java/
2	http://javabeginnerstutorial.com/core-java/

Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	3	1	3	2	3	2
CO2	3	3	3	2	2	3	1	3	2	3	2
CO3	3	3	3	2	2	3	1	3	2	3	2
CO4	3	3	3	2	2	3	1	3	2	3	2
CO5	3	3	3	2	2	3	1	3	2	3	2
Total	15	15	15	10	10	15	5	15	10	15	10
Average	3	3	3	2	2	3	1	3	2	3	2

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
24PCAE21	**CLOUD COMPUTING**	**Elective**	**2**	**1**	**1**	**0**	**3**	**4**	**25**	**75**	**100**

Learning Objectives	
LO1	Understand the basic ideas and motivation for cloud computing
LO2	Elaborate the deployments models based on properties
LO3	To identify the various of cloud computing paradigm
LO4	Know about different companies that support cloud computing
LO5	Understand the features supported by tools

Unit	Content	Hours
1	**CLOUD COMPUTING FUNDAMENTALS** Motivation for Cloud Computing- Defining Cloud computing – Principles Cloud Computing - Cloud Ecosystem - Requirements for Cloud Services - Cloud Application and Benefits and Drawbacks - Introduction Cloud Computing Architecture and Management -Cloud Architecture – Anatomy of the cloud - Network Connectivity in Cloud Computing - Applications on the Cloud and Managing the Cloud - Migrating Application to Cloud.	12
2	**CLOUD DEPLOYMENT MODELS** Introduction - Private Cloud – Public Cloud-Community Clod-Hybrid Cloud-Public vs Private Cloud - Introduction to Cloud Service Models -Software as a Service- Platform as a Service – Infrastructure as a Services — Other Cloud Service Models.	12
3	**TECHNOLOGICAL DRIVERS FOR CLOUD COMPUTING** Introduction- Virtualization- Multi Core Technology- Memory and Storage Technologies- Networking Technologies- Programming Models- Pervasive Computing-Operating System- Application Environment.	12
4	**CLOUD SERVICE PROVIDERS** Introduction - EMC: EMC IT- Captiva cloud toolkit-Google: Cloud Platform and Cloud storage- Google cloud content and Google cloud print- Google App Engine- Amazon Web Services- Amazon Elastic Compute Cloud- Amazon Simple Storage Service- Microsoft: Windows Azure- Microsoft Assessment- Microsoft Planning Toolkit- IBM: Cloud Models- IBM Smart Cloud	12

5	**OPEN SOURCE SUPPORT FOR CLOUD** Introduction - Open Source Tools for IaaS- Open Nebula – Eucalyptus- Open Stack and Apache Cloud Stack-Open Source Tools for PaaS: Paasmaker- Red Hat Open Shift Origin- Open Source Tools for SaaS: Apache VCL- Google Drive - Google Docs – Drop box- Open Source Tools for Research: CloudSim- Sim MapReduce, Cloud Analyst and Green Cloud- Distributed Computing Tools for Management of Distributed Systems: Cassandra- Hadoop and MongoDB- NGrid and Ganglia.	12

CO	Course Outcomes
CO1	Understand the concepts of cloud computing and their models
CO2	Apply cloud computing techniques for various cloud architecture and its services
CO3	Analyze the best technologies for cloud computing in terms of network, storage and other services
CO4	Evaluate the various virtualization and cloud deployment models in cloud computing.
CO5	Develop real time applications by using various cloud service providers and open source tools.
Textbooks:	
1	K. Chandrasekaran (2015), Essentials of Cloud Computing , CRC Press Taylor & Francis Group, LLC (Unit I to V).
2	"Cloud Computing: Concepts, Technology & Architecture" Authors: Thomas Erl, Ricardo Puttini, and Zaigham Mahmood
3	"Mastering Cloud Computing: Foundations and Applications Programming" Authors: Rajkumar Buyya, Christian Vecchiola, and S. Thamarai Selvi
4	"Cloud Native Patterns: Designing Change-Tolerant Software" Author: Cornelia Davis
5	"Cloud Native Java: Designing Resilient Systems with Spring Boot, Spring Cloud, and Cloud Foundry" Authors: Josh Long and Kenny Bastani
Reference Books:	
1	Rishabh Sharma (2014), Cloud Computing: Fundamentals, Industry Approach and Trends, WileyIndia Edition.
2	Dr. Kumar Saurabh (2011), Cloud Computing : Insights into New Era Infrastructure, Wiley India
3	Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi (2013), Mastering Cloud Computing
4	Foundations and Applications Programming, Morgan Kaufmann is an imprint of Elsevier.
5	A.Srinivasan, J.Suresh,(2014), Cloud Computing A Practical Approach for Learning and Implementation, Pearson Education.

Web resources:	
1	https://aws.amazon.com/Free/CloudComputing
2	https://www.w3schools.com/aws/aws_cloudessentials_cloudcomputing.php

Mapping with Programme 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	2	3	3	3	2	3	3	3	3
CO3	3	3	3	2	3	3	3	3	3	3	3
CO4	2	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	2	3	3	2
Total	14	15	14	14	15	15	14	14	15	15	14
Average	2.8	3	2.8	2.8	3	3	2.8	2.8	3	3	2.8

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
24PCAE22	**SOCIAL MEDIA ANALYTICS**	Elective	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. Seven Layers of Social Media Analytics, Types of Social Media Analytics, Social Media Analytics Cycle, 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, Graph Layout, 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, Steps in Text Analytics, Social Media Text Analysis Tools, Social Media Action Analytics-What Is Actions Analytics? 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 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
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
3	"Social Media Analytics: Effective Tools for Building, Interpreting, and Using Metrics" Author: Matthew Ganis and Avinash Kohirkar
4	"Social Media Data Mining and Analytics" Authors: Gabor Szabo and G. L. Ciampaglia
5	"Social Media Metrics: How to Measure and Optimize Your Marketing Investment" Author: Jim Sterne
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.
5	"Social Media Mining: An Introduction" Authors: Reza Zafarani, Mohammad Ali Abbasi, and Huan Liu
Web resources:	
1	https://www.bing.com/videos/riverview/relatedvideo?q=social+Media+analytics+web+resources+link&mid=05D562A78D17FE262CCA05D562A78D17FE262CCA&FORM=VIRE

Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	1	2	1	3	3	3
CO2	3	3	3	2	2	1	2	1	3	3	3
CO3	3	2	2	2	2	1	3	2	3	2	2
CO4	3	3	2	3	3	3	2	2	3	2	2
CO5	3	3	3	2	1	2	1	3	2	2	1
Total	15	14	13	11	10	8	10	9	14	12	11
Average	3	2.8	2.6	2.2	2	1.6	2	3	2.8	2.4	2.2

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
24PCAS11	**INTERNET AND WEB DEVELOPMENT**	NME	1	1	0	0	2	2	25	75	100

Learning Objectives

LO1	To understand the basic concepts of web and internet.
LO2	To learn about Client-Side Processing and Scripting
LO3	To Learn and implement the concepts of Web Designing.
LO4	To Learn and implement the concepts of CSS in the Program.
LO5	To understand the need of My SQL and its usage in web development.

Unit	Content	Hours
1	**Introduction To Internet** Concept of Internet-Evolution of internet-Basic concepts-Communication on the Internet-Internet Domains-Internet Server Identities-Establishing Connectivity on Internet-Client IP Address-TCP/IP and its Services-Web Server-Web Client-Domain Registration	6
2	**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.	6
3	**Web Designing** Introduction to HTML- HTML tags-Commonly used HTML commands - Title and footers - Text formatting - Text Style - Lists - Forms - Adding Graphics to HTML documents -Tables - Linking Documents - Frames	6
4	**Introduction to Cascading Style Sheet** 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
5	**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

CO	Course Outcomes
CO1	Gain a comprehensive understanding of how the internet works.
CO2	Implement client-side Processing and Script.
CO3	Implement the concepts of HTML in Web Design.
CO4	Implement the concepts of CSS in Web Design.
CO5	Develop application using My SQL as a backend Connectivity in web Design.
Text books:	
1	"Internet & World Wide Web" 5th Edition, Paul Deitel, Harvey Dietel, Abbey Dietel.
2	The Internet Book : Everything You Need to Know About Computer Networking and How the Internet Works, Douglas E Comer Fifth Edition
3	Achyut S Godbole and Atul Kahate, "Web Technologies", 2nd Edition, Tata McGraw Hill, 2012.
4	Thomas A Powell, Fritz Schneider, "JavaScript: The Complete Reference", 3rd Edition, Tata McGraw Hill, 2013.
5	Mike Mcgrath, "PHP & MySQL in easy Steps", Tata McGraw Hill, 2012.
Reference Books:	
1	Web Development with JavaServer Pagesby Duane K. Fields and Mark A. Kolb (Manning Publications, 2000)
2	Internet Working with TCP/IP Volume 2, Douglas E Comer, Second Edition.
3	https://stucor.in
4	https://www.techtarget.com/searchnetworking/definition/TCP-IP
5	Harvey & Paul Deitel & Associates, Harvey Deitel and Abbey Deitel, "Internet and World Wide Web - How to Program", 5th Edition, Pearson Education, 2011.

Mapping with Programme Outcomes

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

3 – Strong, 2- Medium, 1- Low