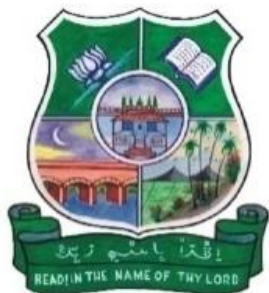# HAJEE KARUTHA ROWTHER HOWDIA COLLEGE

(An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai.)

Re Accredited with A++ Grade by NAAC (3rd Cycle)

Uthamapalayam, Theni District. Pin Code: 625 533.

DEPARTMENT OF INFORMATION TECHNOLOGY

MASTER OF SCIENCE – COMPUTER SCIENCE

SYLLABUS

Choice Based Credit System – CBCS

(As per TANSCHE/MKU Guidelines)

with

Outcome Based Education (OBE)

(with effect from Academic Year 2023 -2024 onwards)

HAJEE KARUTHA ROWTHER HOWDIA COLLEGE

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College Vision and Mission

Vision

Our vision is to provide the best type of higher education to all, especially to students hailing from minority Muslim community, rural agricultural families and other deprived, under privileged sections of the society, inculcating the sense of social responsibility in them. Our college is committed to produce talented, duly-bound citizens to take up the challenges of the changing times.

Mission

Our mission is to impart and inculcate social values, spirit of service and religious tolerance as envisioned by our beloved Founder President Hajee Karutha Rowther.

The Vision beckons........ the Mission continuous forever

DEPARTMENT VISION AND MISSION

Vision

      To transform the students into good citizens and develop them to lead the country as IT professionals

Mission

- ➢ To provide the practical skill in developing the simple applications.

- ➢ To enrich the students knowledge in the recent trends that the industry is seeking for.

- ➢ To impart comprehensive knowledge with equal emphasis on theory and practices.

- ➢ To enhance the employability, the students are to be stimulated to work in a team

TANSCHE REGULATIONS ON LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK FOR POSTGRADUATE EDUCATION	
Programme	**M.Sc., Computer Science**
Programme Code	
Duration	**PG - Two Years**
Programme Outcomes (Pos)	**PO1: Problem Solving Skill** Apply knowledge of Management theories and Human Resource practices to solve business problems through research in Global context. **PO2: Decision Making Skill** Foster analytical and critical thinking abilities for data-based decision-making. **PO3: Ethical Value** Ability to incorporate quality, ethical and legal value-based perspectives to all organizational activities. **PO4: Communication Skill** Ability to develop communication, managerial and interpersonal skills. **PO5: Individual and Team Leadership Skill** Capability to lead themselves and the team to achieve organizational goals. **PO6: Employability Skill** Inculcate contemporary business practices to enhance employability skills in the competitive environment. **PO7: Entrepreneurial Skill** Equip with skills and competencies to become an entrepreneur. **PO8: Contribution to Society** Succeed in career endeavors and contribute significantly to society. **PO 9 Multicultural competence** Possess knowledge of the values and beliefs of multiple cultures and a global perspective. **PO 10: Moral and ethical awareness/reasoning** Ability to embrace moral/ethical values in conducting one's life.
Programme Specific Outcomes	**PSO1 – Placement**

(PSOs)	To prepare the students who will demonstrate respectful engagement with others' ideas, behaviors, beliefs and apply diverse frames of reference to decisions and actions.
	PSO 2 - Entrepreneur
	To create effective entrepreneurs by enhancing their critical thinking, problem solving, decision making and leadership skill 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.
	PSO4 – Contribution to Business World
	To produce employable, ethical and innovative professionals to sustain in the dynamic business world.
	PSO 5 – Contribution to the Society
	To contribute to the development of the society by collaborating with stakeholders for mutual benefit.

METHODS OF EVALUATION		
Internal Evaluation	Continuous Internal Assessment Test	**25 Marks**
	Assignments / Snap Test / Quiz	
	Seminars	
	Attendance and Class Participation	
External Evaluation	End Semester Examination	**75 Marks**
Total		**100 Marks**
METHODS OF ASSESSMENT		
Remembering (K1)	• The lowest level of questions require students to recall information from the course content • Knowledge questions usually require students to identify information in the textbook.	
Understanding (K2)	• Understanding of facts and ideas by comprehending organizing, comparing, translating, interpolating and interpreting in their own words. • The questions go beyond simple recall and require students to combine data together	
Application (K3)	• Students have to solve problems by using/applying a concept learned in the classroom. • Students must use their knowledge to determine a exact response.	
Analyze (K4)	• Analyzing the question is one that asks the students to break down something in to its component parts. • Analyzing requires students to identify reasons causes or motives and reach conclusions or generalizations.	
Evaluate (K5)	• Evaluation requires an individual to make judgment on something. • Questions to be asked to judge the value of an idea, a character, a work of art, or a solution to a problem. • Students are engaged in decision-making and problem–solving. • Evaluation questions do not have single right answers.	
Create (K6)	• The questions of this category challenge students to get engaged in creative and original thinking. • Developing original ideas and problem solving skills	

PROGRAMME OUTCOMES (PO) - PROGRAMME SPECIFIC OUTCOMES (PSO) MAPPING

PROGRAMME SPECIFIC OUTCOMES (PSO)					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**
PSO1	3	3	3	3	3
PSO2	3	3	3	3	3
PSO3	3	3	3	3	3
PSO4	3	3	3	3	3
PSO5	3	3	3	3	3

Level of Correlation between PO's and PSO's
(Suggested by UGC as per Six Sigma Tool – Cause and Effect Matrix)

Assign the value
1 – Low
2 – Medium
3 – High
0 – No Correlation

Programme Scheme

Eligibility

     A candidate who has passed B.Sc., Computer Science/ IT/B.C.A., or any other equivalent degree is eligible for the Master of Science – Computer Science.

Duration of the Course:

M.Sc., Computer Science – Two academic years (Four Semesters)

Medium of instruction:
English.

For Programme Completion

A Candidate shall complete:

- Part III - Core papers in semesters I, II, III and IV respectively
- Part III - Elective papers in semesters I, II, III and IV respectively
- Part IV - Non- Major Elective papers in semester II and III respectively
- Part IV - Skill Enhancement Course papers in semester II, III and IV respectively
- Part V – Extension activity in semester IV respectively

Scheme of Examinations under Choice Based Credit System

Term End Examinations (TEE)	- 75 Marks
Continuous Internal Assessment Examinations (CIAE)	- 25 Marks
Total	- 100 Marks

Pattern of Continuous Internal Assessment Examinations (CIAE)

Average of Two Internal Tests (each 20 marks)	- 20 Marks
Seminar / Quiz	- 05 Marks
Total	- 25 Marks

Practical Examination

Internal	– 40 marks
External	– 60 marks
Total	- 100 Marks

Pattern of Term End Examinations

(Max. Marks: 75 / Time: 3 Hours)

External Examinations Question Paper Pattern

Section – A (10 X 1 = 10 Marks)

Answer ALL the questions.

- Questions 1 - 10
- Two questions from each UNIT

- Multiple choice questions and each question carries Four choices

Section – B (5 X 7 = 35 Marks)

Answer ALL the questions, choosing either a or b.

- Questions 11 - 15
- Two questions from each UNIT (either…. or…. type)
- Descriptive Type

Section – C (3 X 10 = 30 Marks)

- Answer ALL the questions, choosing either a or b.
- Questions 16 – 18
- Descriptive Type

Passing Marks

A Candidate passes the M.Sc., Computer Science degree by scoring a minimum of 50% of Marks (internal + external) in each course of the Programme. No minimum marks for internal assessment.

- Minimum 34 Marks (45%) for External Examination in Theory Courses. Minimum 27 Marks (45%) for External Examination in Practical

M.Sc., Computer Science

Course Category	Course Code	Title of the Course	Credits	Hours		Maximum Marks		
				Theory	Practical	CIA	ESE	Total
FIRSTSEMESTER								
Core - I	23PCSCC11	Paper I : Analysis& Design of Algorithms	5	6		25	75	100
Core – II	23PCSCC12	Paper II : Object Oriented Analysis and Design & C++	5	6		25	75	100
Core – III	23PCSCC13	Paper III: Python Programming	4	6		25	75	100
Elective - I	23PCSDE11	Paper IV: Advanced Software Engineering	3	6		25	75	100
Elective – II	23PCSGE1P	Practical I: Algorithm And OOPS Lab	3		6	40	60	100
		Total	20	24	6			
SECONDSEMESTER								
Core - IV	23PCSCC21	Paper V: Data Mining And Warehousing	5	5		25	75	100
Core – V	23PCSCC22	Paper VI Advanced Operating Systems	5	5		25	75	100
Core - VI	23PCSCC23	Paper VII Advanced Java Programming	4	4		25	75	100
Elective – III	23PCSDE21	Paper VIII : Artificial Intelligence & Machine Learning	3	4		25	75	100
Elective –IV	23PCSGE2P	Elective –IV Advanced Java Lab	3		4	40	60	100
NME – I	23PCSSE2P	Practical III : Data Mining Lab using R	2		4	40	60	100
Elective - V	23PCSDE22	Mobile Computing	3	4		25	75	100
		Total	25	22	8			

Course Code	Course Title	Category	Credits	Inst. Hours	Marks		
					CIAE	External	Total
23PCSCC11	**ANALYSIS & DESIGN OF ALGORITHMS**	**Core**	5	6	25	75	100

Learning Objectives	
L1	Enable the students to learn the Elementary Data Structures and algorithms.
L2	Presents an introduction to the algorithms, their analysis and design
L3	Discuss various methods like Basic Traversal And Search Techniques, divide and conquer method, Dynamic programming, backtracking
L4	Understood the various design and analysis of the algorithms.
L5	

UNIT	Contents	No. of Hours
I	**INTRODUCTION** Introduction: - Algorithm Definition and Specification – Space complexity-Time Complexity- Asymptotic Notations - Elementary Data Structure: Stacks and Queues – Binary Tree - Binary Search Tree - Heap – Heapsort- Graph.	15
II	**TRAVERSAL AND SEARCH TECHNIQUES** Basic Traversal And Search Techniques: Techniques for Binary Trees-Techniques for Graphs -Divide and Conquer: - General Method – Binary Search – Merge Sort – Quick Sort.	15
III	**GREEDY METHOD** The Greedy Method:-General Method–Knapsack Problem–Minimum Cost Spanning Tree– Single Source Shortest Path.	15
IV	**DYNAMIC PROGRAMMING** Dynamic Programming-General Method–Multistage Graphs–All Pair Shortest Path–Optimal Binary Search Trees – 0/1 Knapsacks – Traveling Salesman Problem – Flow Shop Scheduling.	15
V	**BACK TRACKING** Back tracking:-General Method–8-Queens Problem–Sum Of Subsets–Graph Coloring– Hamiltonian Cycles – Branch And Bound: - The Method – Traveling Salesperson.	13
VI	**CONTEMPORARY ISSUES** Expert lectures, online seminars– webinars	2
	Total	**75**

CO	Course Outcomes On completion of this course, students will	Knowledge Level
1	Get knowledge about algorithms and determines their time complexity. Demonstrate specific search and sort algorithms using divide and conquer technique.	K1,K2,K3,K4,K5
2	Gain good understanding of Greedy method and its algorithm.	K1,K2,K3,K4,K5
3	Able to describe about graphs using dynamic programming technique.	K1,K2,K3,K4,K5,K6

4	Demonstrate the concept of backtracking & branch and bound technique.	K1,K2,K3,K4,K5,K6
5	Explore the traversal and searching technique and apply it for trees and graphs.	K1,K2,K3,K4,K5,K6

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.	Goodrich, "Data Structures & Algorithms in Java",Wiley 3rd edition.
2.	Skiena,"The Algorithm Design Manual",SecondEdition,Springer,2008
3.	Anany Levith,"Introduction to the Design and Analysis of algorithm",Pearson Education Asia, 2003.
4.	Robert Sedgewick, Phillipe Flajolet,"An Introduction to the Analysis of Algorithms", Addison-Wesley Publishing Company,1996.

Web Resources

1.	https://nptel.ac.in/courses/106/106/106106131/
2.	https://www.tutorialspoint.com/design_and_analysis_of_algorithms/index.htm
3.	https://www.javatpoint.com/daa-tutorial

Mapping with Programme Outcomes:

CO /PO	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	3	3	3	3	2
CO 2	2	3	3	3	3
CO 3	3	3	2	2	1
CO 4	2	2	3	1	3
CO 5	2	3	2	3	2

Strong-3   Medium-2   Low-1

Level of Correlation between PSO's and CO's

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	2
CO2	2	3	3	3	3
CO3	3	3	2	2	1
CO4	2	2	3	1	3
CO5	2	3	2	3	2

Strong-3   Medium-2   Low-1

Course Code	Course Title	Category	Credits	Inst. Hours	Marks		
					CIAE	External	Total
23PCSCC12	**OBJECT ORIENTED ANALYSIS AND DESIGN & C++**	Core	5	6	25	75	100

	Learning Objectives
L1	Present the object model, classes and objects, object orientation, machine view and model management view.
L2	Enables the students to learn the basic functions, principles and concepts of object oriented analysis and design.
L3	Enable the students to understand C++ language with respect to OOAD

UNIT	Contents	No. of Hours
I	**INTRODUCTION** The Object Model: The Evolution of the Object Model – Elements of the Object Model – Applying the Object Model. Classes and Objects: The Nature of an Object – Relationship among Objects.	15
II	**CLASSES AND OBJECTS** Classes and Object: Nature of Class – Relationship Among classes – The Interplay of classes and Objects. Classification: The importance of Proper Classification –identifying classes and objects –Key Abstractions and Mechanism..	15
III	**C++ INTRODUCTION** Introduction to C++-Input and output statements in C++-Declarations-control structures– Functions in C++.	15
IV	**INHERITANCE AND OVERLOADING** Classes and Objects–Constructors and Destructors–operators overloading–Type Conversion- Inheritance – Pointers and Arrays.	15
V	**POLYMORPHISM AND FILES** MemoryManagementOperators-Polymorphism–Virtualfunctions–Files–Exception Handling – String Handling -Templates.	13
VI	**CONTEMPORARY ISSUES** Expert lectures, online seminars– webinars	2
	Total	**75**

	Course Outcomes	Knowledge Level
CO	**On completion of this course, students will**	
1	Understand the concept of Object-Oriented development and modeling techniques	K1,K2,K3,K4,K5
2	Gain knowledge about the various steps performed during object design	K1,K2,K3,K4,K5
3	Abstract object-based views for generic software systems	K1,K2,K3,K4,K5,K6
4	Link OOAD with C++ language	K1,K2,K3,K4,K5,K6
5	Apply the basic concept of OOPs and familiarize to write C++ program	K1,K2,K3,K4,K5,K6

	Textbooks
1	"Object Oriented Analysis and Design with Applications", Grady Booch, Second Edition, Pearson Education.
2	"Object-Oriented Programming with ANSI & TurboC++", Ashok N. Kamthane, First Indian Print -2003, Pearson Education.
	Reference Books
1.	Balagurusamy "Object Oriented Programming with C++",TMH,SecondEdition,2003.
	Web Resources
1.	https://onlinecourses.nptel.ac.in/noc19_cs48/preview
2.	https://nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs19/
3.	https://www.tutorialspoint.com/object_oriented_analysis_design/ooad_object_oriented_analysis.htm

Mapping with Programme Outcomes:

CO /PO	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	3	3	3	2	2
CO 2	3	2	2	3	1
CO 3	2	3	2	3	3
CO 4	1	2	3	3	2
CO 5	3	2	2	1	2

Strong-3   Medium-2   Low-1

Level of Correlation between PSO's and CO's

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	2	2
CO2	3	2	2	3	1
CO3	2	3	2	3	3
CO4	1	2	3	3	2
CO5	3	2	2	1	2

Strong-3   Medium-2   Low-1

Course Code	Course Title	Category	Credits	Inst. Hours	Marks		
					CIAE	External	Total
23PCSCC13	PYTHON PROGRAMMING	Core	4	6	25	75	100

Learning Objectives	
L1	Presents an introduction to Python, creation of web applications, network applications and working in the clouds
L2	Use functions for structuring Python programs
L3	Understand different Data Structures of Python
L4	Represent compound data using Python lists, tuples and dictionaries

UNIT	Contents	No. of Hours
I	**INTRODUCTION** Python: Introduction–Numbers–Strings–Variables–Lists–Tuples–Dictionaries–Sets– Comparison.	15
II	**CODE STRUCTURES** **Code Structures:** if, elseif, and else – Repeat with while – Iterate with for – Comprehensions – Functions – Generators – Decorators – Namespaces and Scope – Handle Errors with try and except – User Exceptions.	15
III	**MODULES, PACKAGES AND CLASSES** **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– Inself Defense –Get and Set Attribute Values with Properties –Name Mangling for Privacy – Method Types – Duck Typing – Special Methods –Composition.	15
IV	**DATA TYPES AND WEB** **DataTypes:**TextStrings–BinaryData.**StoringandRetrievingData:**FileInput/Output–Structured Text Files – Structured Binary Files - Relational Databases – NoSQL Data Stores. **Web:** Web Clients –Web Servers–Web Services and Automation	15
V	**SYSTEMS AND NETWORKS** **Systems:** Files–Directories–Programs and Processes–Calendars and Clocks. **Concurrency:** Queues– Processes–Threads–GreenThreads and event–twisted–Redis. **Networks:** Patterns – The Publish-Subscribe Model – TCP/IP – Sockets – Zero MQ –Internet Services – Web Services and APIs – Remote Processing – Big Fat Data and MapReduce – Working in the Clouds.	13

VI	**CONTEMPORARY ISSUES** Expert lectures, online seminars– webinars	2
	Total	**75**

	Course Outcomes	Knowledge Level
CO	**On completion of this course, students will**	
1	Understand the basic concepts of Python Programming	K1,K2,K3,K4,K5
2	Understand File operations, Classes and Objects	K1,K2,K3,K4,K5
3	Acquire Object Oriented Skills in Python	K1,K2,K3,K4,K5,K6
4	Develop web applications using Python	K1,K2,K3,K4,K5,K6
5	Develop Client Server Networking applications	K1,K2,K3,K4,K5,K6

Textbooks	
1	Bill Luba novic, "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 Essential Reference", Developer's Library, Fourth Edition,2009.
2.	Sheetal Taneja, Naveen Kumar, "Python Programming-A Modular Approach", Pearson Publications.

Web Resources	
1.	https://www.programiz.com/python-programming/
2.	https://www.tutorialspoint.com/python/index.htm
3.	https://onlinecourses.swayam2.ac.in/aic20_sp33/preview

Mapping with Programme Outcomes:

CO /PO	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	3	3	2	3	3
CO 2	3	3	3	3	3
CO 3	3	3	1	3	2
CO 4	3	3	3	2	1
CO 5	3	2	3	2	1

Strong-3   Medium-2   Low-1

Level of Correlation between PSO's and CO's

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	3	1
CO2	2	3	3	1	3
CO3	2	3	3	3	1
CO4	2	2	3	3	3
CO5	3	2	3	2	3

Strong-3   Medium-2   Low-1

Course Code	Course Title	Category	Credits	Inst. Hours	Marks		
					CIAE	External	Total
23PCSDE11	ADVANCED SOFTWARE ENGINEERING	Elective	3	6	25	75	100

Learning Objectives	
L1	Introduce to Software Engineering, Design, Testing and Maintenance.
L2	Enable the students to learn the concepts of Software Engineering.
L3	Learn about Software Project Management, Software Design &Testing.

UNIT	Contents	No. of Hours
I	**INTRODUCTION** 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.	15
II	**SOFTWARE REQUIREMENTS** 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.	15
III	**PROJECT MANAGEMENT** 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.	15
IV	**SOFTWARE DESIGN** 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.	15
V	**SOFTWARE TESTING** Software Testing: A Strategic approach to software testing – Terminologies – Functional testing– Structural testing – Levels of testing – Validation testing - Regression testing – Art of Debugging–Testingtools-Metrics-Reliability Estimation.	13

	Software Maintenance -Maintenance Process - Reverse Engineering – Software Re-engineering - Configuration Management Activities.	
VI	**CONTEMPORARY ISSUES** Expert lectures, online seminars– webinars	2
	Total	**75**

	Course Outcomes	Knowledge Level
CO	**On completion of this course, students will**	
1	Understand about Software Engineering process	K1,K2,K3,K4,K5
2	Understand about Software project management skills, design and quality management	K1,K2,K3,K4,K5
3	Analyze on Software Requirements and Specification	K1,K2,K3,K4,K5,K6
4	Analyze on Software Testing, Maintenance and Software Re-Engineering	K1,K2,K3,K4,K5,K6
5	Design and conduct various types and levels of software quality for a software project	K1,K2,K3,K4,K5,K6
Textbooks		
1	AnIntegratedApproachtoSoftwareEngineering– PankajJalote,NarosaPublishingHouse, Delhi, 3rd Edition.	
2	Fundamentals of Software Engineering – RajibMall,PHIPublication,3rdEdition.	
Reference Books		
1.	SoftwareEngineering–K.K.AggarwalandYogeshSingh,NewAgeInternational Publishers, 3 rd edition.	
2.	A Practitioners Approach- Software Engineering,-R.S.Pressman, McGraw Hill.	
3.	Fundamentals of Software Engineering - Carlo Ghezzi, M. Jarayeri, D. Manodri oli, PHI Publication.	
Web Resources		
1.	https://www.javatpoint.com/software-engineering-tutorial	
2.	https://onlinecourses.swayam2.ac.in/cec20_cs07/preview	
3.	https://onlinecourses.nptel.ac.in/noc19_cs69/preview	

Mapping with Programme Outcomes:

CO /PO	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	3	3	2	3	3
CO 2	3	3	3	3	3
CO 3	3	3	3	3	3
CO 4	3	3	3	3	3
CO 5	3	3	3	3	3

Strong-3   Medium-2   Low-1

Level of Correlation between PSO's and CO's

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3

Strong-3   Medium-2   Low-1

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3

Course Code	Course Title	Category	Credits	Inst. Hours	Marks		
					CIAE	External	Total
23PCSGE1P	PRACTICALI: ALGORITHM AND OOPS LAB	Elective	3	6	40	60	100

Learning Objectives	
L1	This course covers the basic data structures like Stack, Queue, Tree, List.
L2	Thiscourseenablesthestudentstolearntheapplicationsofthedatastructures using various techniques
L3	It also enable the students to understand C++language with respect to OOAD concepts
L4	Application of OOPS concepts.

UNIT	Contents	No. of Hours
I	1) Write a program to solve the tower of Hanoi using recursion. 2) Write a program to traverse through binary search tree using traversals. 3) Write a program to perform various operations on stack using linked list. 4) Write a program to perform various operation in circular queue. 5) Write a program to sort an array of an elements using quick sort. 6) Write a program to solve number of elements in ascending order using heap sort. 7) Write a program to solve the knapsack problem using greedy method 8) Write a program to search for an element in a tree using divide& conquer strategy. 9) Write a program toplacethe8 queens on an8X8matrixso that no two queens Attack. 10) Write a C++program to perform Virtual Function 11) Write a C++ program to perform Parameterized constructor 12) Write a C++ program to perform Friend Function 13) Write a C++ program to perform Function Overloading 14) Write a C++program to perform Single Inheritance 15) Write a C++program to perform Employee Details using files.	75
	Total	**75**

Course Outcomes		Knowledge Level
CO	On completion of this course, students will	
1	Understand the concepts of object oriented with respect to C++	K1,K2,K3,K4,K5
2	Able to understand and implement OOPS concepts	K1,K2,K3,K4,K5
3	Implementation of data structures like Stack, Queue, Tree, List using C++	K1,K2,K3,K4,K5,K6
4	Application of the data structures for Sorting, Searching using different techniques.	K1,K2,K3,K4,K5,K6
5	Explore the traversal and searching technique and apply it for trees and graphs	K1,K2,K3,K4,K5,K6
Textbooks		
1	Goodrich, "Data Structures & Algorithms in Java", Wiley 3rd edition.	
2	S kiena,"The Algorithm Design Manual",SecondEdition,Springer,2008	
Reference Books		
1.	Anany Levith, "Introduction to the Design and Analysis of algorithm", Pearson Education Asia, 2003.	
2.	Robert Sedgewick, Phillipe Flajolet,"An Introduction to the Analysis of Algorithms", Addison-Wesley Publishing Company,1996.	
Web Resources		
1.	https://onlinecourses.nptel.ac.in/noc19_cs48/preview	
2.	https://nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs19/	
3.	https://www.tutorialspoint.com/object_oriented_analysis_design/ooad_object_oriented_analysis.htm	

Mapping with Programme Outcomes:

CO /PO	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	3	3	2	3	3
CO 2	3	3	3	3	3
CO 3	3	3	3	3	3
CO 4	3	3	3	3	3
CO 5	3	3	3	3	3

Strong-3   Medium-2   Low-1

Level of Correlation between PSO's and CO's

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3

Strong-3   Medium-2   Low-1

Course Code	Course Title	Category	Credits	Inst. Hours	Marks		
					CIAE	External	Total
23PCSCC21	**DATA MINING AND WAREHOUSING**	**Core**	5	5	25	75	100

	Learning Objectives	
L1	Enable the students to learn the concepts of Mining tasks, classification, clustering and Data Warehousing.
L2	Develop skills of using recent datamining software for solving practical problems.
L3	Develop and apply critical thinking, problem-solving, and decision-making skills.

UNIT	Contents	No. of Hours
I	**BASICS AND TECHNIQUES** 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.	15
II	**ALGORITHMS** Classification: Introduction –Statistical –based algorithms - distance–based algorithms-decision tree-basedalgorithms- neuralnetwork–basedalgorithms–rule-basedalgorithms– combining techniques.	15
III	**CLUSTERING AND ASSOCIATION** 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.	15
IV	**DATAWAREHOUSING AND MODELING** Dataware housing: 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 multidimensional view –data modeling – multifact star schema or snow flake schema – OLAP TOOLS – State of the market – OLAP TOOLS and the internet.	15
V	**APPLICATIONS OF DATA WAREHOUSE** Developing a data WAREHOUSE: why and how to build a data warehouse – data warehouse architectural strategies and organization issues - design consideration – data content – metadata distribution of data – tools for data warehousing –	13

	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.	
VI	**CONTEMPORARY ISSUES** Expert lectures, online seminars– webinars	2
	Total	**75**

	Course Outcomes	**Knowledge Level**
CO	**On completion of this course, students will**	
1	Understand the basic datamining techniques and algorithms	K1,K2,K3,K4,K5
2	Understand the Association rules, Clustering techniques and Data ware housing contents	K1,K2,K3,K4,K5
3	Compare and evaluate different datamining techniques like classification, prediction, Clustering and association rule mining	K1,K2,K3,K4,K5,K6
4	Design data warehouse with dimensional modeling and apply OLAP operations	K1,K2,K3,K4,K5,K6
5	Identify appropriate datamining algorithms to solve real world problems	K1,K2,K3,K4,K5,K6

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.	Arun K.Pujari, "Data Mining Techniques", Universities Press(India)Pvt. Ltd.,2003.
2.	AlexBerson,StephenJ.Smith,"DataWarehousing,DataMiningandOLAP",TMCH, 2001.
3.	Jiawei Han & Micheline Kamber, "Data Mining Concepts &Techniques", 2001, Academic press.

Web Resources	
1.	https://www.javatpoint.com/data-warehouse
2.	https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs12/
3.	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:

CO /PO	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	3	2	3	2	3
CO 2	3	3	2	3	3
CO 3	2	2	3	3	2
CO 4	3	1	3	2	2
CO 5	1	3	2	3	3

Strong-3   Medium-2   Low-1

Level of Correlation between PSO's and CO's

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	3	2	3
CO2	3	3	2	3	3
CO3	2	2	3	3	2
CO4	3	2	3	2	2
CO5	2	3	2	3	3

Strong-3   Medium-2   Low-1

Course Code	Course Title	Category	Credits	Inst. Hours	Marks		
					CIAE	External	Total
23PCSCC22	**ADVANCED OPERATING SYSTEMS**	**Core**	5	5	25	75	100

	Learning Objectives	
L1	Enable the students to learn the different types of operating systems and their functioning.	
L2	Gain knowledge on Distributed Operating Systems	
L3	Gain insight into the components and management aspects of realtime and mobile operating systems.	
L4	Learn case studies in Linux Operating Systems	
UNIT	**Contents**	**No. of Hours**
I	**BASICS OF OPERATING SYSTEMS** 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.	15
II	**DISTRIBUTED OPERATING SYSTEMS** Distributed Operating Systems: Issues – Communication Primitives – Lamport'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.	15
III	**REAL TIME OPERATING SYSTEM** Realtime Operating Systems : Introduction – Applications of Real Time Systems – Basic Model of Real Time System – Characteristics – Safety and Reliability - Real Time Task Scheduling	15
IV	**HANDHELD SYSTEM** Operating Systems for Handheld Systems: Requirements– Technology Overview–Handheld OperatingSystems– PalmOS-SymbianOperatingSystem-Android– Architectureofandroid– Securing hand held systems	15
V	**CASE STUDIES** 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.	13
VI	**CONTEMPORARY ISSUES** Expert lectures, online seminars– webinars	2
	Total	**75**

	Course Outcomes	Knowledge Level
CO	**On completion of this course, students will**	
1	Understand the design issues associated with operating systems	K1,K2,K3,K4,K5
2	Master various process management concepts including scheduling, deadlocks and distributed file systems	K1,K2,K3,K4,K5
3	Prepare Real Time Task Scheduling	K1,K2,K3,K4,K5,K6
4	Analyze Operating Systems for Handheld Systems	K1,K2,K3,K4,K5,K6
5	Analyze Operating Systems like LINUX and iOS	K1,K2,K3,K4,K5,K6
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 Education India,2006.	
2.	Pramod Chandra P.Bhatt, An introduction to operating systems, concept and practice, PHI, Third edition, 2010.	
3.	Daniel.P.Bovet&MarcoCesati,"UnderstandingtheLinuxkernel",3rdedition,O"Reilly,2005	
4.	NeilSmyth,"iPhoneiOS4DevelopmentEssentials–Xcode",FourthEdition,Payload media, 2011.	
Web Resources		
1.	https://onlinecourses.nptel.ac.in/noc20_cs04/preview	
2.	https://www.udacity.com/course/advanced-operating-systems--ud189	
3.	https://minnie.tuhs.org/CompArch/Resources/os-notes.pdf	

Mapping with Programme Outcomes:

CO /PO	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	2	3	3	2	1
CO 2	3	2	2	3	1
CO 3	1	2	1	2	3
CO 4	3	2	2	3	3
CO 5	2	3	3	2	2

Strong-3   Medium-2   Low-1

Level of Correlation between PSO's and CO's

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	3	2	1
CO2	3	2	2	3	1
CO3	1	2	1	2	3
CO4	3	2	2	3	3
CO5	2	3	3	2	2

Strong-3   Medium-2   Low-1

Course Code	Course Title	Category	Credits	Inst. Hours	Marks		
					CIAE	External	Total
23PCSCC23	**ADVANCED JAVA PROGRAMMING**	**Core**	4	4	25	75	100

Learning Objectives	
L1	Enable the students to learn the basic functions, principles and concepts of advanced java programming.
L2	Provide knowledge on concepts needed for distributed Application Architecture.
L3	Learn JDBC, Servlet packages, JQuery, Java Server Pages and JAR file format

UNIT	Contents	No. of Hours
I	**BASICS OF JAVA** Java Basics Review: Components and event handling–Threading concepts–Networking features – Media techniques.	12
II	**REMOTE METHOD INVOCATION** Remote Method Invocation-Distributed Application Architecture- Creating stubs and skeletons- Defining Remote objects- Remote Object Activation-Object Serialization-Java Spaces.	12
III	**DATABASE** Java in Databases-JDBC principles–database access-Interacting-database search–Creating multimedia databases – Database support in web applications.	10
IV	**SERVLETS** Java Servlets: Java Servlet and CGI programming- A simple java Servlet-Anatomy of a java Servlet-Reading data from a client-Reading http request header-sending data to a client and writing the http response header-working with cookies Java Server Pages: JSP Overview-Installation-JSP tags-Components of a JSP page-Expressions- Scriptlets-Directives-Declarations-A complete example.	12
V	**ADVANCED TECHNIQUES** JAR file format creation – Internationalization – Swing Programming–Advanced java techniques.	12
VI	**CONTEMPORARY ISSUES** Expert lectures, online seminars– webinars.	2
	Total	**60**

CO	Course Outcomes	Knowledge Level
	On completion of this course, students will	
1	Understand the advanced concepts of Java Programming	K1,K2,K3,K4,K5
2	Understand JDBC and RMI concepts	K1,K2,K3,K4,K5

3	Apply and analyze Java in Database	K1,K2,K3,K4,K5,K6
4	Handle different event in java using the delegation event model, event listener and class	K1,K2,K3,K4,K5,K6
5	Design interactive applications using Java Servlet, JSP and JDBC	K1,K2,K3,K4,K5,K6

Textbooks

1	JamieJaworski,"JavaUnleashed",SAMSTechmediaPublications,1999.
2	Campione, Walrath and Huml,"TheJavaTutorial",AddisonWesley,1999.

Reference Books

1.	Jim Keogh, "The Complete ReferenceJ2EE",TataMcGrawHillPublishingCompanyLtd,2010.
2.	David Sawyer McFarland, "Java Script And JQuery -The Missing Manual", Oreilly Publications, 3rd Edition,2011.
3.	Deitel and Deitel, "Java How to Program", Third Edition, PHI/Pearson Education Asia.

Web Resources

1.	https://www.javatpoint.com/servlet-tutorial
2.	https://www.tutorialspoint.com/java/index.htm
3.	https://onlinecourses.nptel.ac.in/noc19_cs84/preview

Mapping with Programme Outcomes:

CO /PO	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	3	3	2	3	3
CO 2	2	3	3	2	3
CO 3	3	3	3	3	3
CO 4	2	3	3	2	3
CO 5	2	3	2	2	3

Strong-3   Medium-2   Low-1

Level of Correlation between PSO's and CO's

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	3	2	3
CO2	3	3	2	3	3
CO3	3	3	3	3	3
CO4	3	2	2	2	3
CO5	2	2	3	3	3

Strong-3   Medium-2   Low-1

Course Code	Course Title	Category	Credits	Inst. Hours	Marks		
					CIAE	External	Total
23PCSDE21	ARTIFICIAL INTELLIGENCE & MACHINE LEARNING	Elective	3	4	25	75	100

Learning Objectives	
L1	Enable the students to learn the basic functions of AI, Heuristic Search Techniques.
L2	Provide knowledge on concepts of Representations and Mappings and Predicate Logic.
L3	Introduce Machine Learning with respect Data Mining, Big Data and Cloud.
L4	Study about Applications & Impact of ML.

UNIT	Contents	No. of Hours
I	**INTRODUCTION** Introduction: AI Problems - Al techniques - Criteria for success. Problems, Problem Spaces, Search: State space search - Production Systems - Problem Characteristics - Issues in design of Search.	12
II	**SEARCH TECHNIQUES** Heuristic Search techniques: Generate and Test - Hill Climbing- Best-First, Problem Reduction, Constraint Satisfaction, Means-end analysis. Knowledge representation issues: Representations and mappings -Approaches to Knowledge representations -Issues in Knowledge representations - Frame Problem.	12
III	**PREDICATE LOGIC** Using Predicate logic: Representing simple facts in logic - Representing Instance and Isa relationships - Computable functions and predicates - Resolution - Natural deduction. Representing knowledge using rules: Procedural Vs Declarative knowledge- Logic programming -Forward Vs Backward reasoning -Matching-Control knowledge.	12
IV	**MACHINE LEARNING** Understanding Machine Learning: What Is Machine Learning?-Defining Big Data-Big Data in Context with Machine Learning-The Importance of the Hybrid Cloud-Leveraging the Power of Machine Learning-The Roles of Statistics and Data Mining with Machine Learning-Putting Machine Learning in Context-Approaches to Machine Learning.	12
V	**APPLICATIONS OF MACHINE LEARNING** Looking Inside Machine Learning: The Impact of Machine Learning on Applications-Data Preparation-The Machine Learning Cycle.	10

VI	**CONTEMPORARY ISSUES** Expert lectures, online seminars– webinars.	2
	Total	**60**

	Course Outcomes	**Knowledge Level**
CO	**On completion of this course, students will**	
1	Demonstrate AI problems and techniques	K1,K2,K3,K4,K5
2	Understand machine learning concepts	K1,K2,K3,K4,K5
3	Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning	K1,K2,K3,K4,K5,K6
4	Analyze the impact of machine learning on applications	K1,K2,K3,K4,K5,K6
5	Analyze and design a real world problem for implementation and understand the dynamic behavior of a system	K1,K2,K3,K4,K5,K6
	Textbooks	
1	Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw Hill Publishers company Pvt Ltd, Second Edition, 1991.	
2	GeorgeFLuger,"ArtificialIntelligence",4thEdition, Pearson Education Publ,2002.	
	Reference Books	
1.	Machine Learning For Dummies®, IBM Limited Edition by Judith Hurwitz, Daniel Kirsch.	
	Web Resources	
1.	https://www.ibm.com/downloads/cas/GB8ZMQZ3	
2.	https://www.javatpoint.com/artificial-intelligence-tutorial	
3.	https://nptel.ac.in/courses/106/105/106105077/	

Mapping with Programme Outcomes:

CO /PO	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	3	3	3	3	3
CO 2	3	3	3	2	3
CO 3	3	3	2	3	2
CO 4	3	3	3	3	3
CO 5	3	3	2	3	2

Strong-3   Medium-2   Low-1

Level of Correlation between PSO's and CO's

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	2	3
CO3	3	3	2	2	1
CO4	3	2	3	3	2
CO5	3	3	2	3	2

Strong-3   Medium-2   Low-1

Course Code	Course Title	Category	Credits	Inst. Hours	Marks		
					CIAE	External	Total
23PCSGE2P	PRACTICAL IV: ADVANCED JAVA LAB	Elective	3	4	40	60	100

	Learning Objectives
L1	To enable the students to implement the simple programs using JSP, JAR
L2	To provide knowledge on using Servlets, Applets
L3	To introduce JDBC and navigation of records
L4	To understand RMI& its implementation
L5	To introduce to Socket programming

UNIT	LISTOF PROGRAMS	No. of Hours
I	1. Display a welcome message using Servlet. 2. Design a Purchase Order form using Html form and Servlet. 3. Develop a program for calculating the percentage of marks of a student using JSP. 4. Design a Purchase Order form using Html form and JSP. 5. Prepare a Employee pay slip using JSP. 6. Write a program using JDBC for creating a table, Inserting, Deleting records and list out the records. 7. Write a program using Java servlet to handle form data. 8. Write a simple Servlet program to create a table of all the headers it receives along with their associated values. 9. Write a program in JSP by using session object. 10. Write a program to build a simple Client Server application using RMI. 11. Create an applet for a calculator application. 12. Program to send a text message to another system and receive the text message from the system (use socket programming).	60
	Total	**60**

	Course Outcomes	Knowledge Level
CO	On completion of this course, students will	
1	Understand to the implement concepts of Java using HTML forms, JSP &JAR	K1,K2,K3,K4,K5
2	Must be capable of implementing JDBC and RMI concepts	K1,K2,K3,K4,K5
3	Able to write Applets with Event handling mechanism	K1,K2,K3,K4,K5,K6
4	To Create interactive web based applications	K1,K2,K3,K4,K5,K6

	using servlets and jsp	
5	Design interactive applications using Java Servlet, JSP and JDBC	K1,K2,K3,K4,K5,K6

<div align="center">Textbooks</div>

1	Jamie Jaworski, "Java Unleashed", SAMS Tech media Publications,1999.
2	Campione, Walrath and Huml,"TheJavaTutorial",AddisonWesley,1999.

<div align="center">Reference Books</div>

1.	Jim Keogh,"The Complete Reference J 2EE", Tata Mc Graw Hill Publishing Company Ltd,2010.
2.	David Sawyer McFarland, "Java Script And JQuery -The Missing Manual", Oreilly Publications, 3rd Edition,2011.

<div align="center">Web Resources</div>

1.	https://www.javatpoint.com/servlet-tutorial
2.	https://www.tutorialspoint.com/java/index.htm
3.	https://onlinecourses.nptel.ac.in/noc19_cs84/preview

Mapping with Programme Outcomes:

CO /PO	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	3	3	3	3	2
CO 2	3	2	3	3	3
CO 3	2	2	3	3	3
CO 4	3	3	2	3	3
CO 5	2	2	3	3	2

Strong-3   Medium-2   Low-1

Level of Correlation between PSO's and CO's

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	3	3	2
CO2	3	3	3	2	3
CO3	3	2	3	2	3
CO4	3	3	3	3	2
CO5	3	2	2	2	3

Strong-3   Medium-2   Low-1

Course Code	Course Title	Category	Credits	Inst. Hours	Marks		
					CIAE	External	Total
23PCSSE2P	**PRACTICALIII: DATAMINING LAB USING R**	**SEC**	2	4	40	60	100

	Learning Objectives	
L1	To enable the students to learn the concepts of Data Mining algorithms namely classification, clustering, regression….	
L2	To understand & write programs using the DM algorithms	
L3	To apply statistic linter pretations for the solutions	
L4	Able to use visualization stechniques for interpretations	
UNIT	**LISTOF PROGRAMS**	**No. of Hours**
I	1. Implement Apriori algorithm to extract association rule of datamining. 2. Implement – means clustering technique. 3. Implement any one Hierarchal Clustering. 4. Implement Classification algorithm. 5. Implement Decision Tree. 6. Linear Regression. 7. Data Visualization.	60
	Total	**60**
	Course Outcomes	**Knowledge Level**
CO	**On completion of this course, students will**	
1	Able to write programs using R for Association rules, Clustering techniques	K1,K2,K3,K4,K5
2	To implement data mining techniques like classification, prediction	K1,K2,K3,K4,K5
3	Able to use different visualizations techniques using R	K1,K2,K3,K4,K5,K6
4	To apply different datamining algorithms to solve real world applications	K1,K2,K3,K4,K5,K6
5	Able to apply statistic linter pretations for the solutions	K1,K2,K3,K4,K5,K6
	Textbooks	
1	MargaretH.Dunham,"DataMining:IntroductoryandAdvancedTopics",Pearson education,2003.	
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
2.	https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs12/
3.	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:

CO /PO	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	3	3	3	3	3
CO 2	3	3	3	2	3
CO 3	3	3	2	3	2
CO 4	3	3	3	3	3
CO 5	3	3	2	3	2

Strong-3   Medium-2   Low-1

Level of Correlation between PSO's and CO's

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	2	3
CO3	3	3	2	2	1
CO4	3	2	3	2	2
CO5	3	3	2	3	1

Strong-3   Medium-2   Low-1

Course Code	Course Title	Category	Credits	Inst. Hours	Marks		
					CIAE	External	Total
23PCSDE22	MOBILE COMPUTING	Elective	3	4	25	75	100

Learning Objectives	
L1	Present the overview of Mobile computing, Applications and Architectures.
L2	Describe the futuristic computing challenges.
L3	Enable the students to learn the concept of mobile computing.

UNIT	Contents	No. of Hours
I	**INTRODUCTION** Introduction: Advantages of Digital Information - Introduction to Telephone Systems –Mobile communication: Need for Mobile Communication – Requirements of Mobile Communication – History of Mobile Communication.	12
II	**MOBILECOMMUNICATION** Introduction to Cellular Mobile Communication – Mobile Communication Standards –Mobility Management – Frequency Management – Cordless Mobile Communication Systems.	12
III	**MOBILECOMPUTING** Mobile Computing: History of data networks – Classification of Mobile data networks - CDPD System – Satellites in Mobile Communication: Satellite classification – Global Satellite Communication – Changeover from one satellite to other – Global Mobile Communication – Interferences in Cellular Mobile Communication.	12
IV	**MOBILECOMMUNICATIONSYSTEM** Important Parameters of Mobile Communication System – Mobile Internet: Working of Mobile IP – Wireless Network Security – Wireless Local Loop Architecture: Components in WLL – Problems in WLL – Modern Wireless Local Loop – Local Multipoint Distribution Service – Wireless Application Protocol.	11
V	**COMMUNICATIONTECHNOLOGY** WCDMA Technology and Fiber Optic Microcellular Mobile Communication – Ad hoc Network and Bluetooth technology – Intelligent Mobile Communication system – Fourth Generation Mobile Communication systems.	11
VI	**CONTEMPORARY ISSUES** Expert lectures, online seminars– webinars.	2
	Total	**60**

CO	Course Outcomes On completion of this course, students will	Knowledge Level
1	Understand the need and requirements of mobile communication	K1,K2,K3,K4,K5

2	Focus on mobile computing applications and techniques	K1,K2,K3,K4,K5
3	Demonstrate satellite communication in mobile computing	K1,K2,K3,K4,K5,K6
4	Analyze about wireless local loop architecture	K1,K2,K3,K4,K5,K6
5	Analyze various mobile communication technologies	K1,K2,K3,K4,K5,K6

Textbooks

1	T.G.Palanivelu, R.Nakkeeran, "Wireless and Mobile Communication" ,PHI Limited, 2009.
2	Jochen Schiller, "Mobile Communications", Second Edition, Pearson Education, 2007.

Reference Books

1.	Asoke K Talukder, Hasan Ahmed, Roopa Yavagal, "Mobile Computing", TMH,2010.

Web Resources

1.	https://www.tutorialspoint.com/mobile_computing/index.htm
2.	https://www.javatpoint.com/mobile-computing
3.	https://nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs13/

Mapping with Programme Outcomes:

CO /PO	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	3	2	2	2	2
CO 2	3	2	3	3	3
CO 3	3	3	3	3	3
CO 4	3	3	3	3	3
CO 5	3	3	3	3	3

Strong-3   Medium-2   Low-1

Level of Correlation between PSO's and CO's

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	2	1	1	2
CO2	3	3	3	2	2
CO3	3	3	3	3	2
CO4	3	3	3	3	3
CO5	3	3	3	3	3

Strong-3   Medium-2   Low-1