

SENGUNTHAR ARTS AND SCIENCE COLLEGE

(Autonomous)

(Affiliated to Periyar University, Salem and Approved by AICTE, New Delhi)
An ISO 9001:2015 Certified Institutions. Recognized under section 2(f)
and 12(B) of the UGC Act, 1956 and Accredited by NAAC with A⁺

TIRUCHENGODE – 637 205, NAMAKKAL DT., TAMILNADU

Website: www.senguarts.edu.in **Email id:** info@senguarts.co.in



SYLLABUS

M.Sc., COMPUTER SCIENCE **(CBCS – LOCF)**

(With effect from the Academic Year 2024-25 onwards)

Chairman

CDC

Principal

Correspondent

INTRODUCTION

The M.Sc. in Computer Science is a two-year postgraduate program designed to develop human resources with core competencies in various key areas of Computer Science. The program covers topics such as software engineering, system development, natural computation, mathematical foundations, and artificial intelligence. Other modules include programming, data analytics, software development, applied communications, network architecture, and database design.

The coursework focuses on preparing students for innovation within Major IT companies or entrepreneurship in startup ventures. Students are given opportunities to develop and hone their core competencies in the field of computer science, encouraging them to make a significant impact in the highly sought-after IT industry. Guest lectures, case studies, and presentations are organized periodically to provide insights into the latest developments and trends in the industry.

AIM

The syllabus of this program is aimed at preparing the students with the latest developments and put them on the right track to fulfill the present requirements.

ELIGIBILITY FOR ADMISSION:

A candidate who has passed in B.Sc. Computer Science / B.C.A / B.Sc. Computer Technology / B.Sc. Information Science / B.Sc. Information Technology / B.Sc. Data Analytics / B.Sc. Data Science / B.Sc. Artificial Intelligence and Data Science / B.Sc. Cyber Security / B.Sc. Internet of Things accepted by the guidance of Periyar university as equivalent there to subject to such conditions as may be prescribed therefore shall be permitted to appear and qualify for the M.Sc. Computer Science degree examination of this University after a course of study of two academic years.

PROGRAMME OUTCOMES

REGULATIONS ON LEARNING OUTCOMES-BASED CURRICULUM FRAME WORK (CBCS) FOR UNDER GRADUATE	
Programme	M.Sc., Computer Science
Programme Code	24PCS
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. PO9: Multicultural competence Possess knowledge of the values and beliefs of multiple cultures and a global perspective. PO10: Moral and ethical awareness/reasoning Ability to embrace moral/ethical values in conducting one's life

Programme Specific Outcomes (PSO)

Programme Specific Outcomes (PSOs)	PSO1 – Placement To prepare the students who will demonstrate respectful engagement with others ideas, behaviors and 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 complies 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.

	POs										PSOs				
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	PS01	PS02	PS03	PS04	PS05
CLO1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CLO2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CLO3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CLO4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CLO5	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

Level of Correlation between POs and PSOs (Suggested by UGC as per Six Sigma Tool – Cause and Effect Matrix); 1 – Low, 2 – Medium, 3 – High, 0 – No Correlation

MASTER OF SCIENCE IN COMPUTER SCIENCE
FIRST YEAR - SEMESTER-I

S. No	Course Category	Course Code	Title of the Course	Credit Distribution			Credits	Hours/ Week	Marks		
				L	T	P			CIA	ESE	Total
1	Core I	24S1PCS01	Core I: Analysis& Design Of Algorithms	3	3	-	5	6	25	75	100
2	Core II	24S1PCS02	Core II: Object Oriented Analysis and Design & C++	3	3	-	5	6	25	75	100
3	Core III	24S1PCS03	Core III: Advance Python Programming	3	3	-	4	6	25	75	100
4	Elective I	24S1PCSE01	Elective I - Cloud Computing	2	2	-	3	4	25	75	100
		24S1PCSE02	Elective I - Multimedia and its applications								
		24S1PCSE03	Elective I - Embedded Systems								
5	Core Practical I	24S1PCSP01	Practical I: Algorithm And Oops Lab	-	-	4	3	4	40	60	100
6	Core Practical II	24S1PCSP02	Practical II: Python Programming Lab	-	-	4	3	4	40	60	100
TOTAL							23	30	180	420	600

MASTER OF SCIENCE IN COMPUTER SCIENCE
SEMESTER-II

S. No	Course Category	Course Code	Title of the Course	Credit Distribution			Credits	Hours/ Week	Marks		
				L	T	P			CIA	ESE	Total
1	Core IV	24S2PCS04	Core IV: Data Mining And Warehousing	3	2	-	4	5	25	75	100
2	Core V	24S2PCS05	Core V: Advanced Operating Systems	3	2	-	4	5	25	75	100
3	Core VI	24S2PCS06	Core VI: Advanced Java Programming	3	2	-	4	5	25	75	100
4	Elective II	24S2PCSE04	Elective II – Artificial Intelligence & Machine Learning	3	2	-	3	5	25	75	100
		24S2PCSE05	Elective II - Internet of Things								
		24S2PCSE06	Elective II - Mobile Computing								
		24S2PCSE07	Elective II - Block Chain Technology								
5	Core Practical III	24S2PCSP03	Practical III: Data Mining Lab Using R	-	-	4	4	4	40	60	100
6	Core Practical IV	24S2PCSP04	Practical IV: Advanced Java programming lab	-	-	4	4	4	40	60	100
7	Common Paper for PG	24S2PHR01	Fundamentals of Human Rights	1	1	-	2	2	25	75	100
TOTAL							25	30	205	495	700

MASTER OF SCIENCE IN COMPUTER SCIENCE
SECOND YEAR - SEMESTER-III

S. No	Course Category	Course Code	Title of the Course	Credit Distribution			Credits	Hours/Week	Marks		
				L	T	P			CIA	ESE	Total
1	Core VII	24S3PCS07	Core VII: Digital Image Processing	3	3	-	5	6	25	75	100
2	Core VIII	24S3PCS08	Core VIII: Cloud Computing	3	2	-	5	5	25	75	100
3	Core IX	24S3PCS09	Core IX: Network Security and Cryptography	3	2	-	5	5	25	75	100
4	Core X	24S3PCS10	Core X: Data Science & Analytics	3	3	-	4	6	25	75	100
5	Core Practical V	24S3PCSP05	Practical V: Digital Image Processing Lab	-	-	4	3	4	40	60	100
6	Core Practical VI	24S3PCSP06	Practical VI: Cloud Computing Lab	-	-	4	2	4	40	60	100
7		24S3PIT01	Internship/ Industrial Activity	-	-	-	2	-	40	60	100
TOTAL							26	30	220	480	700

MASTER OF SCIENCE IN COMPUTER SCIENCE
SEMESTER-IV

S. No	Course Category	Course Code	Title of the Course	Credit Distribution			Credits	Hours/Week	Marks		
				L	T	P			CIA	ESE	Total
1	Core Practical VII	24S4PCSP07	Web Application development and hosting Practical	-	-	5	5	5	25	75	100
2	Elective III	24S4PCSE08	Elective III - Critical thinking, Design thinking and problem solving.	2	2	-	3	4	25	75	100
		24S4PCSE09	Elective III - Web Services								
		24S4PCSE10	Elective III – Robotic process automation for business								
		24S4PCSE11	Elective III - Cyber security								
3	Project	24S4PCSPR01	Project work and Viva-voce	-	-	-	7	-	50	150	200
4	SEC	24S4PCSSP01	Skill Enhancement Course - Data Visualization Lab	-	-	4	2	4	40	60	100
		24S4PCSSP02	Skill Enhancement Course - Soft Skill Development Lab								
5	Core Practical IV	24S4PEX01	Extension Activity	-	-	-	1	-	-	-	-
TOTAL							18	13	140	360	500
Cumulative Total							92				2500

ELECTIVES LIST

Elective Course–I

24S1PCSE01 Cloud Computing

24S1PCSE02 Multimedia and its application

24S1PCSE03 Embedded Systems

Elective Course–II

24S2PCSE04 Artificial Intelligence & Machine Learning

24S2PCSE05 Internet of Things

24S2PCSE06 Mobile Computing

24S2PCSE07 Block Chain Technology

Elective Course–III

24S4PCSE08 Critical thinking, Design thinking and problem solving

24S4PCSE09 Web Services

24S4PCSE10 Robotic process automation for business

24S4PCSE11 Cyber Security

Skill Enhancement Course - Professional Competency Skill list (any one)

24S4PCSSP01 - Data Visualization Lab

24S4PCSSP02 - Soft Skill Development Lab

EDC-EXTRA DISCIPLINARY COURSE LIST SEMESTER-II

S.No.	Paper Code	Title of the Paper
1	24S2PCSN01	Principles of Information Technology
2	24S2PCSN02	Fundamentals of Computers and Communications

SEMESTER-III

S.No.	Paper Code	Title of the Paper
1	24S3PCSN03	E-Commerce

SEMESTER I

FIRST YEAR - SEMESTER I
CORE I – ANALYSIS & DESIGN OF ALGORITHMS

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S1PCS01	Core-I	Theory	Y	Y	-	6	5

Learning Objectives

- ❖ Enable the students to learn the Elementary Data Structures and algorithms.
- ❖ Presents an introduction to the algorithms, their analysis and design
- ❖ Discuss various methods like Basic Traversal and Search Techniques, Divide and Conquer Method, Dynamic programming, backtracking
- ❖ Understood the various design and analysis of the algorithms.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Get knowledge about algorithms and determines their time complexity. Demonstrate specific search and sort algorithms using Divide and conquer technique.	PO1,PO2
CO2	Gain good understanding of Greedy method and its algorithm.	PO2,PO3
CO3	Able to describe about graphs using dynamic programming technique.	PO3,PO4
CO4	Demonstrate the concept of backtracking & branch and bound Technique.	PO5,PO6
CO5	Explore the traversal and searching technique and apply it for trees and graphs.	PO6

CORE I – ANALYSIS & DESIGN OF ALGORITHMS

Unit	Details	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 – Heap sort- Graph.	18
II	TRAVERSAL AND SEARCH TECHNIQUES: Basic Traversal And Search Techniques: Techniques for Binary Trees-Techniques for Graphs - Divide and Conquer: - General Method – Binary Search – Comparative analysis: Merge Sort – Quick Sort.	18
III	GREEDY METHOD: The Greedy Method: - General Method – Knapsack Problem – Minimum Cost Spanning Tree – Single Source Shortest Path.	18
IV	DYNAMIC PROGRAMMING: Dynamic Programming - General Method – Multistage Graphs – All Pair Shortest Path – Optimal Binary Search Trees – Splay trees - 0/1 Knapsacks – Flow Shop Scheduling-Traveling Salesman Problem	18
V	BACKTRACKING: Backtracking: - General Method – 8-Queens Problem –Graph Coloring – Hamiltonian Cycles – Branch And Bound: - The Method – Traveling Salesperson. Model Preparation: Recursive Maze Algorithm NP-HARD AND NP-COMPLETE PROBLEMS: Basic concepts, non-deterministic algorithms, NP-hard and NP-complete classes.	18
	Total	90
Comparative analysis and Model Preparation related to the above topic to be discussed (internal exam only)		

Text books

- ❖ Ellis Horowitz, “Computer Algorithms”, Galgotia Publications, 2022.
- ❖ Alfred V.Aho, John E. Hopcroft ,Jeffrey D.Ullman, "Data Structures and Algorithms", 2022.

Reference books

- ❖ Goodrich, “Data Structures & Algorithms in Java”, Wiley 3rd edition, 2022
- ❖ Anany Levith,” Introduction to the Design and Analysis of algorithm”, Pearson Education Asia, 2003.
- ❖ Skiena, ”The Algorithm Design Manual”, Second Edition, Springer , 2008
- ❖ Robert Sedgewick, Phillipe Flajolet, ”An Introduction to the Analysis of Algorithms”, Addison-Wesley Publishing Company,1996.

Web Resources

- ❖ <https://nptel.ac.in/courses/106/106/106106131/>
- ❖ https://www.tutorialspoint.com/design_and_analysis_of_algorithms/index.htm
- ❖ https://www.tutorialspoint.com/design_and_analysis_of_algorithms/index.htm

Mapping with Programme Outcomes: 3 Strong, 2 – Medium, 1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	3	2	3	1	2	1	3	2
CO2	3	3	3	3	3	2	3	2	3	2
CO3	3	3	3	3	3	2	3	2	3	2
CO4	3	3	3	3	3	2	3	2	3	2
CO5	3	3	3	3	3	2	3	2	3	2

Mapping with Programme: Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	2	3
CO2	2	2	3	3	3
CO3	3	3	3	3	2
CO4	3	3	2	3	3
CO5	2	3	3	2	3
Weightage	14	14	14	13	14
Weighted percentage of Course Contribution to POs	2.8	2.8	2.8	2.6	2.8

Course Coordinator

BOS Chairman

CORE II– OBJECT ORIENTED ANALYSIS AND DESIGN & C++

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S1PCS02	Core-II	Theory	Y	Y	-	6	5

Learning Objectives

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

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Understand the concept of Object-Oriented development and modeling techniques	PO1, PO2
CO2	Gain knowledge about the various steps performed during object design	PO2,PO3
CO3	Gain knowledge about the various steps performed during object design	PO3
CO4	Link OOAD with C++ language	PO4,PO5
CO5	Apply the basic concept of OOPs and familiarize to write C++ program	PO5,PO6

CORE II– OBJECT ORIENTED ANALYSIS AND DESIGN & C++

Unit	Details	No. of Hours
I	OBJECT MODEL: 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.	18
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.	18
III	OBJECT ORIENTED ANALYSIS: Use case model – Object analysis classification – Approaches for identifying classes – Classes responsibilities and collaborators – Identifying object relationships, attributes and methods.	18
IV	C++ INTRODUCTION: Introduction to C++ - Input and output statements in C++ - Declarations -control structures – Functions in C++. INHERITANCE AND OVERLOADING: Classes and Objects –Constructors and Destructors –operators overloading –Type Conversion- Comparative analysis: Inheritance – Pointers and Arrays.	18
V	POLYMORPHISM AND FILES: Memory Management Operators- Polymorphism – Virtual functions – Files – Exception Handling – String Handling -Templates. Model Preparation: Real world applications of Object-Oriented Analysis and Design (OOAD).	18
	Total	90
Comparative analysis and Model Preparation related to the above topic to be discussed (internal exam only)		

Text books

- ❖ “Object-Oriented Analysis and Design with Applications”, Grady Booch, Third Edition, Addison-Wesley, 2007.
- ❖ “Object-Oriented Programming with ANSI and Turbo C++”, Ashok N. Kamthane, Second Edition, Pearson Education, 2013

Reference books

- ❖ Balagurusamy “Object Oriented Programming with C++”, TMH, Second Edition, 2003.

Web Resources

- ❖ https://onlinecourses.nptel.ac.in/noc19_cs48/preview
- ❖ <https://nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs19/>
- ❖ https://www.tutorialspoint.com/object_oriented_analysis_design/ooad_object_oriented_analysis.htm

Mapping with Programme Outcomes: 3 Strong, 2 – Medium, 1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	2	3	2	3	2	3	2
CO2	3	3	3	2	3	2	3	2	3	2
CO3	3	3	3	2	3	2	3	2	3	2
CO4	3	3	3	2	3	2	3	2	3	2
CO5	3	3	3	2	3	2	3	2	3	2

Mapping with Programme: Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	3	2	3
CO2	3	3	2	3	3
CO3	3	3	3	3	2
CO4	2	3	3	3	3
CO5	2	3	3	2	3
Weightage	13	14	14	13	14
Weighted percentage of Course Contribution to POs	2.6	2.8	2.8	2.6	2.8

Course Coordinator

BOS Chairman

CORE III – ADVANCE PYTHON PROGRAMMING

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S1PCS03	Core III	Theory	Y	Y	-	6	4

Learning Objectives

- ❖ Presents an introduction to Python, creation of web applications, network applications and working in the clouds.
- ❖ Use functions for structuring Python programs.
- ❖ Understand different Data Structures of Python.
- ❖ Represent compound data using Python lists, tuples and dictionaries.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Understand the basic concepts of Python Programming	PO1, PO2
CO2	Understand File operations, Classes and Objects	PO2,PO3
CO3	Acquire Object Oriented Skills in Python	PO3, PO4
CO4	Develop web applications using Python	PO5
CO5	Develop Client Server Networking applications	PO5,PO6

CORE III – ADVANCE PYTHON PROGRAMMING

Unit	Details	No. of Hours
I	INTRODUCTION: Python: Introduction – Numbers – Strings – Variables – Lists – Tuples – Dictionaries – Sets– Comparison. 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 - Dynamic and Meta programming Control Flow	18
II	MODULES, PACKAGES AND CLASSES: Modules, Designing: Packages, and Programs: Standalone Programs – Command-Line Arguments – Modules and the import Statement – The Python Standard Library. Objects and Classes: Define a Class with class – Inheritance – Override a Method – Add a Method – Get Help from Parent with super – In self Defense – Get and Set Attribute Values with Properties – Name Mangling for Privacy – Method Types – Duck Typing – Special Methods –Composition.	18
III	DATA TYPES AND WEB: Data Types: Text Strings – Binary Data. Storing and Retrieving Data: File Input/ Output – Structured Text Files - Structured Binary Files -Relational Databases – No SQL Data Stores. Web: Web Clients – Web Servers – Web Services and Automation. SYSTEMS AND NETWORKS: Systems: Files –Directories – Programs and Processes – Calendars and Clocks. Concurrency: Queues – Processes – Threads – Green Threads 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 Map Reduce – Working in the Clouds. Designing: Power shell scripting.	18
IV	Creating the GUI Form and Adding Widgets: Widgets: Button, Canvas, Check button, Entry, Frame, Label, List box, Menu button, Menu, Message, Radio button, Scale, Scrollbar, text, Top level, Spin box, Paned Window, Label Frame, Message box. Handling Standard attributes and Properties of Widgets.	18
V	Storing Data in Our MySQL Database via Our GUI: Connecting to a MySQL database from Python, Configuring the MySQL connection, Designing the Python GUI database, Using the INSERT command, Using the UPDATE command, Using the DELETE command, Storing and retrieving data from MySQL database.	18
	Total	90
Designing related to the above topic to be discussed (internal exam only)		

Text books

- ❖ “Introducing Python: Modern Computing in Simple Packages” , Bill Lubanovic, Second Edition, O'Reilly Media, 2019
- ❖ “Learning Python”, Mark Lutz, Sixth Edition, O'Reilly Media, 2023
- ❖ “Think Python”, Allen Downey, O'Reilly, Second Edition, 2015
- ❖ “An Introduction to Computer Science using Python 3”, Thomas Erl, Zaigham Mahmood, and Ricardo, SPD, First Edition, 2014.

Reference books

- ❖ David M. Beazley python Essential Reference", Developer's Library, Fourth Edition, 2009.
- ❖ Sheetal Taneja, Naveen Kumar, "Python Programming-A Modular Approach " , Pearson Publications, 2009.

Web Resources

- ❖ <https://www.programiz.com/python-programming/>
- ❖ <https://www.tutorialspoint.com/python/index.htm>
- ❖ https://onlinecourses.swayam2.ac.in/aic20_sp33/preview

Mapping with Programme Outcomes: 3 Strong, 2 – Medium, 1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	2	3	3	3	2	2	3	2
CO2	3	3	3	3	3	3	3	2	3	2
CO3	3	3	3	3	3	3	3	2	3	2
CO4	3	3	3	3	3	3	3	2	3	2
CO5	3	3	3	3	3	3	3	2	3	2

Mapping with Programme: Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	3	2	3
CO2	3	3	2	3	3
CO3	3	3	3	3	2
CO4	2	3	3	3	3
CO5	2	3	3	2	3
Weightage	13	14	14	13	14
Weighted percentage of Course Contribution to POs	2.6	2.8	2.8	2.6	2.8

Course Coordinator

BOS Chairman

PRACTICAL I: ALGORITHM AND OOPS LAB

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S1PCSP01	Core Practical I	Practical	-	-	Y	4	3

Learning Objectives

- ❖ This course covers the basic data structures like Stack, Queue, Tree, and List.
- ❖ This course enables the students to learn the applications of the data structures using various techniques
- ❖ It also enable the students to understand C++ language with respect to OOAD concepts
- ❖ Application of OOPS concepts.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Understand the concepts of object oriented with respect to C++	PO1, PO2
CO2	Able to understand and implement OOPS concepts	PO3,PO4
CO3	Implementation of data structures like Stack, Queue, Tree , List using C++	PO4, PO5
CO4	Application of the data structures for Sorting, Searching using different techniques.	PO5,PO6
CO5	To develop the skills in programming using C++ which forms the basis for advanced Programming.	PO6

PRACTICAL I: ALGORITHM AND OOPS LAB

LIST OF PROGRAMS	Required hours
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 operations 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 to place the 8 queens on an 8X8 matrix so 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.	60
Total	60

Text Books

- ❖ “Data Structures and Algorithms in Java” , Michael T. Goodrich, Roberto Tamassia, Sixth Edition, Wiley, 2014
- ❖ “The Algorithm Design Manual”, Steven S. Skiena, Third Edition, Springer, 2020

Reference books

- ❖ AnanyLevith, "Introduction to the Design and Analysis of algorithm", Pearson Education Asia, 2003.
- ❖ Robert Sedgewick, Phillipe Flajolet, "An Introduction to the Analysis of Algorithms", Addison- Wesley Publishing Company,1996.

Web Resources

- ❖ https://onlinecourses.nptel.ac.in/noc19_cs48/preview
- ❖ <https://nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs19/>
- ❖ https://www.tutorialspoint.com/object_oriented_analysis_design/ooad_object_oriented_analysis.htm

Mapping with Programme Outcomes: 3 Strong, 2 – Medium, 1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	2	3	3	3	2	2	3	3
CO2	3	3	3	3	3	3	3	2	3	3
CO3	3	3	3	3	3	3	3	2	3	3
CO4	3	3	3	3	3	3	3	2	3	3
CO5	3	3	3	3	3	3	3	2	3	3

Mapping with Programme: Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	3	3	3
CO2	3	3	2	3	3
CO3	3	3	3	3	2
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	14	14	15	14
Weighted percentage of Course Contribution to POs	3.0	2.8	2.8	3.0	2.8

Course Coordinator

BOS Chairman

PRACTICAL II: PYTHON PROGRAMMING LAB

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S1PCSP02	Core Practical II	Practical	-	-	Y	4	3

Learning Objectives

- ❖ This course presents an overview of elementary data items, lists, dictionaries, sets and tuples
- ❖ To understand and write simple Python programs
- ❖ To Understand the OOPS concepts of Python
- ❖ To develop web applications using Python

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Able to write programs in Python using OOPS concepts	PO1, PO2
CO2	To understand the concepts of File operations and Modules in Python	PO2,PO3
CO3	Implementation of lists, dictionaries, sets and tuples as programs	PO3, PO4
CO4	Express proficiency in the handling of strings and functions.	PO5,PO6
CO5	To develop web applications using Python	PO6

PRACTICAL II: PYTHON PROGRAMMING LAB

LIST OF PROGRAMS	Required hours
Implement the following in Python: 1. Programs using elementary data items, lists, dictionaries and tuples. 2. Programs using conditional branches. 3. Programs using loops. 4. Programs using functions 5. Programs using exception handling 6. Programs using inheritance 7. Programs using polymorphism 8. Programs to implement file operations. 9. Programs using modules. 10. Programs for creating dynamic and interactive web pages forms.	60
Total	60

Text Books

- ❖ “Introducing Python: Modern Computing in Simple Packages”, Bill Lubanovic, Third Edition, O'Reilly Media, 2024
- ❖ “Learning Python”, Mark Lutz, Seventh Edition, O'Reilly Media, 2024

Reference Books

- ❖ David M. Beazley python Essential Reference", Developer's Library, Fourth Edition, 2009.
- ❖ Sheetal Taneja, Naveen Kumar, "Python Programming-A Modular Approach", Pearson Publications, 2017.

Web Resources

- ❖ <https://www.programiz.com/python-programming>
- ❖ <https://www.tutorialspoint.com/python/index.htm>
- ❖ https://onlinecourses.swayam2.ac.in/aic20_sp33/preview

Mapping with Programme Outcomes: 3 Strong, 2 – Medium, 1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	2	3	3	3	2	2	3	3
CO2	3	3	3	3	3	3	3	2	3	2
CO3	3	3	3	3	3	3	3	2	3	3
CO4	3	3	3	3	3	3	3	2	3	3
CO5	3	3	3	3	3	3	3	2	3	3

Mapping with Programme: Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	2	3	3	3	3
CO3	3	3	3	3	2
CO4	2	3	3	3	3
CO5	3	3	3	3	3
Weightage	13	15	15	15	14
Weighted percentage of Course Contribution to POs	2.6	3.0	3.0	3.0	2.8

Course Coordinator

BOS Chairman

ELECTIVE COURSES

ELECTIVE I

SEMESTER I

ELECTIVE COURSE

ELECTIVE I – CLOUD COMPUTING

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S1PCSE01	Elective I	Theory	Y	Y	-	4	3

Learning Objectives

- ❖ To provide students with the fundamentals and essentials of Cloud Computing.
- ❖ To provide students a sound foundation of the Cloud computing so that they are able to start using and adopting Cloud Computing services and tools in their real-life scenarios.
- ❖ To enable students exploring some important cloud computing driven commercial systems and applications.
- ❖ To expose the students to frontier areas of Cloud Computing and information systems, while providing sufficient foundations to enable further study and research.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Understand the basic terminologies, characteristics and platforms of Cloud Computing	PO1, PO2
CO2	Understand the basic principles of virtualization	PO2,PO3
CO3	Provide basics of cloud files systems	PO3, PO4
CO4	Understand basic issues concerning cloud security	PO4,PO5
CO5	Understand how to implement disaster recovery plans and ensure high availability of cloud applications and services.	PO5.PO6

ELECTIVE I – CLOUD COMPUTING

Unit	Details	No. of Hours
I	COMPUTING BASICS: Cloud computing definition- Characteristics- Benefit-Challenges- Distributed Virtualization-Service-oriented computing- Utility-oriented computing- Building Cloud Computing environments- computing platforms & technologies - Cloud Models – Cloud Service Examples - Cloud Based Services & Applications - Cloud concepts and Technologies.	12
II	VIRTUALIZATION, CLOUD SERVICES AND PLATFORMS : Virtualization: Virtualization- Characteristics-taxonomy-types- Pros and Cons- Examples Architecture: Reference model- types of clouds- Compute Service - Storage Services - Cloud Database Services - Application Services - Content Delivery Services - Analytics Services - Deployment And Management Service - Identity And Access Management Services - Open Source Private Cloud Software.	12
III	CLOUD APPLICATION DESIGN AND DEVELOPMENT : Design consideration- Reference Architecture for Cloud Application - Cloud Application Design Methodologies - Data Storage Approaches- Development in Python: Design Approaches – Application: Image Processing - Document Storage – Map Reduce - Social Media Analytics.	12
IV	PYTHON FOR CLOUD : Introduction- Installing Python-Data types & Data Structures- Control Flow- Functions- Modules- Packages- File Handling- Date/Time Operations – Classes- Python for Cloud: Amazon Web Services –Google Cloud Platform - Windows Azure –Map Reduced – Packages of Interest–Designing a REST full Web API.	12
V	BIG DATA ANALYTICS, MULTIMEDIA CLOUD & CLOUD SECURITY: Big Data Analytics: Clustering big data - Classification of Big Data – Recommendation systems. Multimedia Cloud: Case Study: Live Video Stream App - Streaming Protocols – Case Study: Video Transcoding App-Cloud Security: CSA Cloud Security Architecture – Authentication - Authorization - Identity and Access management - Data Security - Key Management- Auditing- Cloud for Industry, Healthcare & Education.	12
	Total	60

Text Books

- ❖ Buyya, Vecciola and Selvi, Mastering Cloud Computing: Foundations and Applications Programming, Tata McGraw Hill, 2013.
- ❖ ArshdeepBahga, Vijay Madiseti, “Cloud Computing: A Hands – On Approach” Universities press (India) Pvt. limited2016.

Reference books

- ❖ Rittinghouse and Ransome, Cloud Computing: Implementation, Management, and Security, CRC Press, 2016.
- ❖ Michael Miller “Cloud Computing Web based application that change the way you work and collaborate online”. Pearson edition, 2008.
- ❖ Kris Jamsa, Cloud Computing: SaaS, PaaS, IaaS, Virtualization, Business Models, Mobile, Security and More, Jones & Bartlett Learning, 2012.

Mapping with Programme Outcomes: 3 Strong, 2 – Medium, 1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	2	3	3	3	2	2	2	2
CO2	3	3	3	3	3	3	3	2	3	3
CO3	3	3	3	3	3	3	3	2	3	3
CO4	3	3	3	3	3	3	3	2	3	3
CO5	3	3	3	3	3	3	3	2	3	3

Mapping with Programme: Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	2	3	3	3	3
CO5	3	3	2	3	3
Weightage	14	15	13	15	15
Weighted percentage of Course Contribution to POs	2.8	3.0	2.6	3.0	3.0

Course Coordinator

BOS Chairman

ELECTIVE I– MULTIMEDIA AND ITS APPLICATIONS

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S1PCSE02	Elective I	Theory	Y	-	-	4	3

Learning Objectives

- ❖ To introduce the students the concepts of Multimedia, Images & Animation.
- ❖ To introduce Multimedia authoring tools
- ❖ To understand the role of Multimedia in Internet
- ❖ To know about High Definition Television and Desktop Computing – Knowledge based Multimedia systems.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Understand the basic concepts of Multimedia	PO1, PO2
CO2	Demonstrate Multimedia authoring tools	PO2,PO3
CO3	Analyze the concepts of Sound, Images, Video & Animation	PO4
CO4	Apply and Analyze the role of Multimedia in Internet and real time applications	PO4,PO5
CO5	Analyze multimedia applications using HDTV	PO5.PO6

ELECTIVE I– MULTIMEDIA AND ITS APPLICATIONS

Unit	Details	No. of Hours
I	INTRODUCTION: What is Multimedia? – Introduction to making Multimedia – Macintosh and Windows Production Platforms – Basic Software tools.	12
II	MULTIMEDIA TOOLS: Making Instant Multimedia – Multimedia authoring tools – Multimedia building blocks – Text – Sound.	12
III	ANIMATION: Images – Animation – Video.	12
IV	INTERNET: Multimedia and the Internet – The Internet and how it works – Tools for World Wide Web – Designing for the World Wide Web.	12
V	MULTIMEDIA SYSTEMS: High Definition Television and Desktop Computing – Knowledge based Multimedia systems. Self Study: 5G	12
	Total	60

Text Books

- ❖ “Multimedia: Making It Work”, Tay Vaughan, Eighth Edition, McGraw-Hill Education, 2018
- ❖ “Multimedia Systems”, John F. Koegel Buford, Second Edition, Pearson, 2014

Reference Books

- ❖ Judith Jeffloat, “Multimedia in Practice (Technology and Applications)”, PHI, 2003.

Web Resources

- ❖ <https://www.tutorialspoint.com/multimedia/index.htm>
- ❖ https://www.tutorialspoint.com/basics_of_computer_science/basics_of_computer_science_m ultimedia.htm
- ❖ <https://nptel.ac.in/courses/117/105/117105083/>

Mapping with Programme Outcomes: 3 Strong, 2 – Medium, 1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	2	3	2	2	2	3
CO2	3	3	3	3	2	3	2	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3

Mapping with Programme: Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	2	3	3	3	3
CO5	3	3	2	3	3
Weightage	14	15	13	15	15
Weighted percentage of Course Contribution to POs	2.8	3.0	2.6	3.0	3.0

Course Coordinator

BOS Chairman

ELECTIVE I– EMBEDDED SYSTEMS

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S1PCSE03	Elective I	Theory	Y	Y	-	4	3

Learning Objectives

- ❖ Present the introduction to 8051 Microcontroller Instruction Set, concepts on RTOS & Software tools.
- ❖ Gain the knowledge about the embedded software development.
- ❖ Learn about Microcontroller and software tools in the embedded systems.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Understand the concept of 8051 microcontroller	PO1, PO2
CO2	Understand the Instruction Set and Programming	PO2,PO3
CO3	Analyze the concepts of RTOS	PO3,PO4
CO4	Analyze and design various real time embedded systems using RTOS	PO5
CO5	Debug the malfunctioning system using various debugging techniques	PO5,PO6

ELECTIVE I– EMBEDDED SYSTEMS

Unit	Details	No. of Hours
I	8051 MICROCONTROLLER: 8051 Microcontroller: Introduction - 8051 Architecture-Input/ Output Pins, Ports and Circuits - External Memory - Counters / Timers - Serial Data Input / Output –Interrupts	12
II	PROGRAMMING BASICS: Instruction Set and Programming Moving Data-Addressing Modes-Logical operations Arithmetic Operation-Jump and Call Instructions-Simple Program. Applications: Keyboard Interface- Display Interface-Pulse Measurements-DIA and AID Conversions-Multiple Interrupts	12
III	CONCEPTS ON RTOS: CONCEPTS ON RTOS: Introduction to RTOS-Selecting an RTOS-Task and Task states - Tasks and data-Semaphores and shared data. MORE operating systems services: Interrupt Process communication - Message Queues, Mailboxes and pipes- Timer Functions-Events - Memory Management-Interrupt Routines in an RTOS Environment	12
IV	DESIGN USING RTOS: Basic Design Using A RTOS: Principles - Encapsulating Semaphores And Queues- Hard Real Time Scheduling Considerations -Saving Memory Space And Power- Introductions To RTL &QNX.	12
V	SOFTWARE TOOLS: SOFTWARE TOOLS: Embedded software Development Tools: Hosts and Target Machines- 56 Linker/Locators for Embedded software-getting Embedded software into the Target systems. Debugging Techniques: Testing on your Host machine -Instruction set simulators- The assert macro- using laboratory tools. Self Study: Embedded Linux	12
	Total	60

Text Books

- ❖ “Embedded Software: An Introduction to Real-Time Systems”, David E. Simon, Second Edition, Pearson, 2018
- ❖ “The 8051 Microcontroller and Embedded Systems: Using Assembly and C for ATMEL”, Muhammad Ali Mazidi, Janice Gillispie Mazidi, and Rolin D. McKinlay, Fourth Edition, Pearson, 2021

Reference books

- ❖ Raj Kamal, “Embedded Systems – Architecture, programming and design”, Tata McGraw – Hill, 2003.

Web Resources

- ❖ https://onlinecourses.nptel.ac.in/noc20_cs14/preview
- ❖ <https://www.javatpoint.com/embedded-system-tutorial>
- ❖ https://www.tutorialspoint.com/embedded_systems/index.htm

Mapping with Programme Outcomes: 3 Strong, 2 – Medium, 1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	1	1	3	2	3	3	2	2	3
CO2	2	2	3	3	2	3	2	3	3	3
CO3	2	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3

Mapping with Programme: Specific Outcomes:

CO/PO	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	2	3	3
Weightage	15	15	13	15	15
Weighted percentage of Course Contribution to POs	3.0	3.0	2.6	3.0	3.0

Course Coordinator

BOS Chairman

SEMESTER II

FIRST YEAR - SEMESTER II
CORE IV– DATA MINING AND WAREHOUSING

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S2PCS04	Core IV	Theory	Y	Y	-	5	4

Learning Objectives

- ❖ Enable the students to learn the concepts of Mining tasks, classification, clustering and Data Warehousing.
- ❖ Develop skills of using recent data mining software for solving practical problems.
- ❖ Develop and apply critical thinking, problem-solving, and decision-making skills.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Understand the basic data mining techniques and algorithms	PO1, PO2
CO2	Understand the Association rules, Clustering techniques and Data warehousing contents	PO2,PO3
CO3	Compare and evaluate different data mining techniques like classification, prediction, Clustering and association rule mining	PO4, PO5
CO4	Design data warehouse with dimensional modeling and apply OLAP operations	PO5,PO6
CO5	Identify appropriate data mining algorithms to solve real world problems	PO6

CORE IV– DATA MINING AND WAREHOUSING

Unit	Details	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 – Comparative analysis: Statistical based algorithms – distance based algorithms- decision tree based algorithms - neural network based algorithms –rule based algorithms – combining techniques.	15
III	CLUSTERING AND ASSOCIATION: Clustering: Introduction – Similarity and Distance Measures – Outliers – Hierarchical Algorithms - Partitional Algorithms - Spectral Clustering. 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	DATA WAREHOUSING AND MODELING: Data warehousing: introduction - characteristics of a data warehouse – data marts – other aspects of data mart. Online analytical processing: introduction - OLTP & OLAP systems Data modeling –star schema for multidimensional view –data modeling – multi fact star schema or snow flake schema – OLAP TOOLS- State of the market – OLAP TOOLS and the internet	15
V	WEB MINING: Introduction: Web Content Mining - Web Structure Mining Web Usage Mining - Text Mining - Text Clustering, Temporal Mining Spatial Mining. Model Preparation: Amazon's Product Recommendation System.	15
	Total	75
Comparative analysis and Model Preparation related to the above topic to be discussed (internal exam only)		

Text Books

- ❖ “Data Mining: Introductory and Advanced Topics”, Margaret H. Dunham, Second Edition, Pearson Education, 2015
- ❖ “Data Warehousing: Concepts”, Techniques, Products and Applications, C.S.R. Prabhu, Fourth Edition, PHI Learning, 2021

Reference books

- ❖ Arun K. Pujari, “Data Mining Techniques”, Universities Press (India) Pvt. Ltd., 2003.
- ❖ Alex Berson, Stephen J. Smith, “Data Warehousing, Data Mining and OLAP”, TMCH, 2001.
- ❖ Jiawei Han & Micheline Kamber, “Data Mining Concepts & Techniques”, 2001, Academic press

Web Resources

- ❖ <https://www.javatpoint.com/data-warehouse>
- ❖ <https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs12/>
- ❖ <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: 3 Strong, 2 – Medium, 1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	3	3	3	3	2	2	2	2
CO2	3	3	3	3	3	3	3	2	3	3
CO3	3	3	3	3	3	3	3	2	3	3
CO4	3	3	3	3	3	3	3	2	3	3
CO5	3	3	3	3	3	3	3	2	3	3

Mapping with Programme: Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	2	3	2
CO3	3	3	3	3	3
CO4	3	3	3	3	2
CO5	3	2	3	3	3
Weightage	15	14	14	15	13
Weighted percentage of Course Contribution to POs	3.0	2.8	2.8	3.0	2.6

Course Coordinator

BOS Chairman

CORE V– ADVANCED OPERATING SYSTEMS

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S2PCS05	Core V	Theory	Y	Y	-	5	4

Learning Objectives

- ❖ Enable the students to learn the different types of operating systems and their functioning.
- ❖ Gain knowledge on Distributed Operating Systems
- ❖ Gain insight into the components and management aspects of real time and mobile operating systems.
- ❖ Learn case studies in Linux Operating Systems

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Understand the design issues associated with operating systems	PO1, PO2
CO2	Master various process management concepts including scheduling, deadlocks and distributed file systems	PO3,PO4
CO3	Prepare Real Time Task Scheduling	PO4, PO5
CO4	Analyze Operating Systems for Handheld Systems	PO5
CO5	Analyze Operating Systems like LINUX and iOS	PO5, PO6

CORE V– ADVANCED OPERATING SYSTEMS

Unit	Details	No. of Hours
I	BASICS OF OPERATING SYSTEMS: Basics of Operating Systems: What is an Operating System? – Comparative analysis: 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: Real time Operating Systems : Introduction – Applications of Real Time Systems – Model Preparation: Real Time System – Characteristics – Safety and Reliability - Real Time Task Scheduling- Task Synchronization	15
IV	HANDHELD SYSTEM: Operating Systems for Handheld Systems: Requirements – Technology Overview –Handheld Operating Systems – Palm OS - Symbian Operating System - Android –Architecture of android – Securing handheld systems.	15
V	Database Operating systems: Introduction- requirements of a database operating system Concurrency control: theoretical aspects – introduction, database systems – a concurrency control model of database systems- the problem of concurrency control – serializability theory- distributed database systems, concurrency control algorithms – introduction, basic synchronization primitives; lock based algorithms-timestamp based algorithms.	15
	Total	75
Comparative analysis and Model Preparation related to the above topic to be discussed (internal exam only)		

Text Books

- ❖ “Operating System Concepts”, Abraham Silberschatz, Henry Korth, and S. Sudarshan, Eleventh Edition, Wiley, 2020
- ❖ Mukesh Singhal and Niranjana G. Shivaratri, “Advanced Concepts in Operating Systems –Distributed, Database, and Multiprocessor Operating Systems”, Tata McGraw-Hill, 2001.
- ❖ Andrew S.Tanenbaum, "Distributed operating system", Pearson education, 2017.

Reference books

- ❖ Rajib Mall, “Real-Time Systems: Theory and Practice”, Pearson Education India, 2006.
- ❖ Pramod Chandra P.Bhatt, An introduction to operating systems, concept and practice, PHI,
- ❖ Third edition, 2010.
- ❖ Daniel.P.Bovet & Marco Cesati, “Understanding the Linux kernel”,3rd edition,O’Reilly, 2005
- ❖ Neil Smyth, “iPhone iOS 4 Development Essentials – X code”, Fourth Edition, Payload media, 2011.

Web Resources

- ❖ https://onlinecourses.nptel.ac.in/noc20_cs04/preview
- ❖ <https://www.udacity.com/course/advanced-operating-systems--ud189>
- ❖ <https://minnie.tuhs.org/CompArch/Resources/os-notes.pdf>

Mapping with Programme Outcomes: 3 Strong, 2 – Medium, 1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	3	3	3	3	2	2	2	2
CO2	3	2	3	3	3	3	3	2	3	2
CO3	3	2	3	3	3	3	3	2	3	2
CO4	3	2	3	3	3	3	3	2	3	2
CO5	3	2	3	3	3	3	3	2	3	2

Mapping with Programme: Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	2	3	2	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	2
Weightage	14	15	14	15	14
Weighted percentage of Course Contribution to POs	2.8	3.0	2.8	3.0	2.8

Course Coordinator

BOS Chairman

CORE VI– ADVANCED JAVA PROGRAMMING

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S2PCS06	Core VI	Theory	Y	Y	-	5	4

Learning Objectives

- ❖ Enable the students to learn the basic functions, principles and concepts of advanced java programming.
- ❖ Provide knowledge on concepts needed for distributed Application Architecture.
- ❖ Learn JDBC, Servlet packages, J Query, Java Server Pages and JAR file format

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Understand the advanced concepts of Java Programming	PO1, PO2
CO2	Understand JDBC and RMI concepts	PO2,PO3
CO3	Apply and analyze Java in Database	PO3, PO4
CO4	Handle different event in java using the delegation event model, event listener and class	PO5
CO5	Design interactive applications using Java Servlet, JSP and JDBC	PO5.PO6

CORE VI– ADVANCED JAVA PROGRAMMING

Unit	Details	No. of Hours
I	BASICS OF JAVA: Java Basics Review: Components and event handling – Threading concepts – Networking features – Media techniques.	15
II	REMOTE METHOD INVOCATION: Remote Method Invocation-Distributed Application Architecture- Creating stubs and skeletons- Defining Remote objects- Remote Object Activation-Object Serialization-Java Spaces	15
III	DATABASE: Java in Databases- JDBC principles – database access- Interacting- database search – Designing: Creating multimedia databases – Database support in web applications- Java Persistence API.	15
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.	15
V	ADVANCED TECHNIQUES: JAR file format creation – Internationalization – Model Preparation: Swing Programming – Advanced java- Techniques. Hibernate: Introduction to Hibernate, Exploring Architecture of Hibernate, Object Relation Mapping (ORM) with Hibernate, Hibernate Annotation.	15
	Total	75
Designing and Model Preparation related to the above topic to be discussed (internal exam only)		

Text Books

- ❖ Jamie Jaworski, “Java Unleashed”, SAMS Techmedia Publications,1999.
- ❖ “The Java™ Tutorial: A Short Course on the Basics”, Sharon J. Campione, Kathy Walrath, and Sarah Huml, Addison-Wesley, Fifth Edition, 2022
- ❖ “Java Server Faces in Action”, Kito D. Mann, Manning Publications, Second Edition, 2020
- ❖ "Java EE 8 Application Development" by David R. Heffelfinger, 2018.

Reference books

- ❖ Jim Keogh,” The Complete Reference J2EE”, Tata McGraw Hill Publishing Company Ltd,2010.
- ❖ David Sawyer McFarland, “JavaScript And JQuery- The Missing Manual”, O’reilly Publications, 3rd Edition, 2011.
- ❖ Deitel and Deitel, “Java How to Program”, Third Edition, PHI/Pearson Education Asia, 2017.
- ❖ Neil Smyth, “iPhone iOS 4 Development Essentials – Xcode”, Fourth Edition, Payload media, 2011.

Web Resources

- ❖ <https://www.javatpoint.com/servlet-tutorial>
- ❖ <https://www.tutorialspoint.com/java/index.htm>
- ❖ https://onlinecourses.nptel.ac.in/noc19_cs84/preview

Mapping with Programme Outcomes: 3 Strong, 2 – Medium, 1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	2	2	2	3
CO2	3	3	3	3	3	3	3	2	3	3
CO3	3	3	3	3	3	3	3	2	3	3
CO4	3	3	3	3	3	3	3	2	3	3
CO5	3	3	3	3	3	3	3	2	3	3

Mapping with Programme: Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	2	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	14	15	15
Weighted percentage of Course Contribution to POs	3.0	3.0	2.8	3.0	3.0

Course Coordinator

BOS Chairman

PRACTICAL III: DATA MINING LAB USING R

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S2PCSP03	Core Practical III	Practical		-	Y	4	4

Learning Objectives

- ❖ To enable the students to learn the concepts of Data Mining algorithms namely
Classification, clustering, regression
- ❖ To understand & write programs using the DM algorithms
- ❖ To apply statistical interpretations for the solutions
- ❖ Able to use visualizations techniques for interpretations

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Able to write programs using R for Association rules, Clustering techniques	PO1, PO2
CO2	To implement data mining techniques like classification, prediction	PO2,PO3
CO3	Able to use different visualizations techniques using R	PO4, PO5
CO4	To apply different data mining algorithms to solve real world applications	PO5,PO6
CO5	Analyze data and generate reports based on the data	PO6

PRACTICAL III: DATA MINING LAB USING R

LIST OF PROGRAMS	Required hours
1. Implement Apriori algorithm to extract association rule of data mining. 2. Implement k-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

Text Books

- ❖ “Data Mining: Introductory and Advanced Topics”, Margaret H. Dunham, Third Edition, Pearson, 2015
- ❖ “Data Warehousing: Concepts, Techniques, Products and Applications”, C.S.R. Prabhu, Third Edition, PHI Learning, 2019

Reference books

- ❖ ArunK.Pujari, “Data Mining Techniques”, Universities Press (India) Pvt. Ltd. ,2003.
- ❖ Alex Berson, Stephen J. Smith, “Data Warehousing, Data Mining and OLAP”, TMCH, 2001

Web Resources

- ❖ <https://www.javatpoint.com/data-warehouse>
- ❖ <https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs12/>
- ❖ <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: 3 Strong, 2 – Medium, 1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	2	2	2	3
CO2	3	3	3	3	3	3	3	2	3	3
CO3	3	3	3	3	3	3	3	2	3	3
CO4	3	3	3	3	3	3	3	2	3	3
CO5	3	3	3	3	3	3	3	2	3	3

Mapping with Programme: Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	2	2	3	2
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	14	14	15	14
Weighted percentage of Course Contribution to POs	3.0	2.8	2.8	3.0	2.8

Course Coordinator

BOS Chairman

PRACTICAL IV: ADVANCED JAVA PROGRAMING LAB

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S2PCSP04	Core Practical IV	Practical		-	Y	4	4

Learning Objectives

- ❖ To enable the students to implement the simple programs using JSP, JAR
- ❖ To provide knowledge on using Servlets, Applets
- ❖ To introduce JDBC and navigation of records
- ❖ To understand RMI & its implementation
- ❖ To introduce to Socket programming

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Understand to the implement concepts of Java using HTML forms, JSP & JAR	PO1, PO2
CO2	Must be capable of implementing JDBC and RMI concepts	PO2,PO3
CO3	Able to write Applets with Event handling mechanism	PO4, PO5
CO4	To Create interactive web based applications using servlets and JSP	PO5,PO6
CO5	Able to solving real world problems using java collection frame work.	PO6

PRACTICAL IV: ADVANCED JAVA PROGRAMING LAB

LIST OF PROGRAMS	Required hours
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

Text Books

- ❖ Jamie Jaworski, “Java Unleashed”, SAMS Tech media Publications, 1999
- ❖ “The Java Tutorial: A Short Course on the Basics”, Sharon J. Campione, Kathy Walrath, and Sarah Huml, Addison-Wesley, Sixth Edition, 2024

Reference Books

- ❖ Jim Keogh,” The Complete Reference J2EE”, Tata McGraw Hill Publishing Company Ltd, 2010.
- ❖ David Sawyer McFarland, “JavaScript And JQuery- The Missing Manual”, O'Reilly Publications, 3rd Edition, 2011.

Web Resources

- ❖ <https://www.javatpoint.com/servlet-tutorial>
- ❖ <https://www.tutorialspoint.com/java/index.htm>
- ❖ https://onlinecourses.nptel.ac.in/noc19_cs84/preview

Mapping with Programme Outcomes: 3 Strong, 2 – Medium, 1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	2	2	2	3
CO2	3	3	3	3	3	3	3	2	3	3
CO3	3	3	3	3	3	3	3	2	3	3
CO4	3	3	3	3	3	3	3	2	3	3
CO5	3	3	3	3	3	3	3	2	3	3

Mapping with Programme: Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	2	3	3	3	3
CO5	3	3	3	3	3
Weightage	14	15	15	15	15
Weighted percentage of Course Contribution to POs	2.8	3.0	3.0	3.0	3.0

Course Coordinator

BOS Chairman

24S2PHR01 - FUNDAMENTALS OF HUMAN RIGHTS

Unit	Details	No. of Hours
I	Introduction: Meaning and Definitions of Human Rights – Characteristics and Importance of Human Rights – Evolution of Human Rights – Formation, Structure and Functions of the UNO - Universal Declaration of Human Rights – International Covenants – Violations of Human Rights in the Contemporary Era.	6
II	Human Rights in India: Development of Human Rights in India – Constituent Assembly and Indian Constitution – Fundamental Rights and its Classification – Directive Principles of State Policy – Fundamental Duties.	6
III	Rights of Marginalized and other Disadvantaged People: Rights of Women – Rights of Children – Rights of Differently Abled – Rights of Elderly - Rights of Scheduled Castes – Rights of Scheduled Tribes – Rights of Minorities – – Rights of Prisoners – Rights of Persons Living with HIVAIDS – Rights of LGBT.	6
IV	Redressal Mechanisms: Protection of Human Rights Act, 1993 (Amendment 2019) – Structure and Functions of National and State Human Rights Commissions - National Commission for SCs – National Commission for STs – National Commission for Minorities – Characteristics and Objectives of Human Rights Education.	6
V	ADVANCED TECHNIQUES: JAR file format creation – Internationalization – Swing Programming – Advanced java-Techniques. Self Study: National Commission for Women	6
	Total	30

Reference books

- ❖ Sudarshanam Gankidi, Human Rights in India: Prospective and Retrospective, Rawat Publications, Jaipur, 2019.
- ❖ SatvinderJuss, Human Rights in India, Routledge, New Delhi, 2020.
- ❖ Namita Gupta, Social Justice and Human Rights in India, Rawat Publications, Jaipur, 2021.

- ❖ Mark Frezo, The Sociology of Human Rights, John Willy & Sons, U.K. 2014. 36
- ❖ Chiranjivi J. Nirmal, Human Rights in India: Historical, Social and Political Perspectives, Oxford University Press, New York, 2000.
- ❖ Dr. S. Mehartaj Begum, Human Rights in India: Issues and perspectives, APH Publishing Corporation, New Delhi, 2010.
- ❖ Asha Kiran, The History of Human Rights, Mangalam Publications, Delhi, 2011.
- ❖ Bani Borgohain, Human Rights, Kanishka Publishers & Distributors, New Delhi-2, 2007.
- ❖ Jayant Chudhary, A Textbook of Human Rights, Wisdom Press, New Delhi, 2011.

Course Coordinator

BOS Chairman

ELECTIVE COURSES

ELECTIVE II

SEMESTER II

ELECTIVE II – ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S2PCSE04	Elective II	Theory	Y	Y	-	5	3

Learning Objectives

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

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Demonstrate AI problems and techniques	PO1, PO2
CO2	Understand machine Learning concepts	PO2,PO3
CO3	Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning	PO3,PO4
CO4	Analyze the impact of machine learning on applications	PO4,PO5
CO5	Analyze and design a real world problem for implementation and understand the dynamic behavior of a system	PO5, PO6

ELECTIVE II – ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

Unit	Details	No. of Hours
I	INTRODUCTION: Introduction: AI Problems - AI techniques - Criteria for success. Problems, Problem Spaces, Search: State space search - Production Systems - Problem Characteristics - Issues in design of Search.	15
II	SEARCHTECHNIQUES: 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.	15
III	PREDICATELOGIC: 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.	15
IV	MACHINELEARNING: 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.	15
V	APPLICATIONSOFMACHINELEARNING: Looking Inside Machine Learning: The Impact of Machine Learning on Applications-Data Preparation-The Machine Learning Cycle. Self Study: Real-Time Analytics System	15
	Total	75

Text Books

- ❖ “Artificial Intelligence”, Elaine Rich and Kevin Knight, Fourth Edition, McGraw-Hill Education, 2021
- ❖ “Artificial Intelligence: A Modern Approach”, Stuart Russell and Peter Norvig ,Fourth Edition, Pearson, 2023.

Reference books

- ❖ Machine Learning For Dummies ,IBM Limited Edition by Judith Hurwitz,Daniel Kirsch, 2018

Web Resources

- ❖ <https://www.ibm.com/downloads/cas/GB8ZMQZ3>
- ❖ <https://www.javatpoint.com/artificial-intelligence-tutorial>
- ❖ <https://nptel.ac.in/courses/106/105/106105077/>

Mapping with Programme Outcomes: 3 Strong, 2 – Medium, 1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	3	2	2	3
CO2	3	3	3	3	3	3	3	2	3	3
CO3	3	3	3	3	3	3	3	2	3	3
CO4	3	3	3	3	3	3	3	2	3	3
CO5	3	3	3	3	3	3	3	2	3	3

Mapping with Programme: Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	2
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	2	3	3
Weightage	15	15	13	15	14
Weighted percentage of Course Contribution to POs	3.0	3.0	2.6	3.0	2.8

Course Coordinator

BOS Chairman

ELECTIVE II – INTERNET OF THINGS

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S2PCSE05	Elective II	Theory	Y	Y	-	5	3

Learning Objectives

- ❖ About Internet of Things where various communicating entities are controlled and managed for decision making in the application domain.
- ❖ Enable students to learn the Architecture of IOT and IOT Technologies
- ❖ Developing IOT applications and Security in IOT, Basic Electronics for IOT, Arduino IDE, Sensors and Actuators Programming NODEMCU using Arduino IDE.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Understand about IOT, its Architecture and its Applications	PO1, PO2
CO2	Understand basic electronics used in IoT & its role	PO2,PO3
CO3	Develop applications with C using Arduino IDE	PO4
CO4	Analyze about sensors and actuators	PO5, PO6
CO5	Design IoT in real time applications using today's internet & wireless technologies	PO6

ELECTIVE II – INTERNET OF THINGS

Unit	Details	No. of Hours
I	INTRODUCTION : Introduction to IOT: Evolution of IOT – Definition & Characteristics of IOT - Architecture of IOT– Technologies for IOT – Developing IOT Applications – Applications of IOT – Industrial IOT – Security in IOT.	15
II	BASIC ELECTRONICS FOR IOT: Basic Electronics for IOT: Electric Charge, Resistance, Current and Voltage – Binary Calculations – Logic Chips – Microcontrollers – Multipurpose Computers – Electronic Signals – A/D and D/A Conversion – Pulse Width Modulation.	15
III	PROGRAMMING USING ARDUINO : Programming Fundamentals with C using Arduino IDE: Installing and Setting up the Arduino IDE – Basic Syntax – Data Types/ Variables/ Constant – Operators – Conditional Statements and Loops – Using Arduino C Library Functions for Serial, delay and other invoking Functions – Strings and Mathematics Library Functions.	15
IV	SENSORS AND ACTUATORS: Sensors and Actuators: Analog and Digital Sensors–Interfacing temperature sensor, ultrasound, sensor and infrared(IR) sensor with Arduino. -Interfacing LED and Buzzer with Arduino.	15
V	SENSOR DATA IN INTERNET: Sending Sensor Data Over Internet: Introduction to ESP8266 NODEMCU WiFi Module – Programming NODEMCU using Arduino IDE – Using WiFi and NODEMCU to transmit data from temperature sensor to Open Source IoT cloud platform (Thing Speak). Self Study: AWS IoT	15
	Total	75

Text Books

- ❖ Arshdeep Bahga, Vijay Madiseti, “Internet of Things: A Hands-On Approach”, 2014.
- ❖ Boris Adryan, Dominik Obermaier, Paul Fremantle, “The Technical Foundations of IoT”, Artech Houser Publishers, 2017.

Reference books

- ❖ Michael Margolis, “Arduino Cook book”, O’Reilly, 2011

- ❖ Marco Schwartz, “Internet of Things with ESP8266”, Packt Publishing, 2016.
- ❖ Dhivya Bala, “ESP8266: Step by Step Tutorial for ESP8266 IoT, Arduino NODEMCU Dev. Kit”, 2018.

Web Resources

- ❖ https://onlinecourses.nptel.ac.in/noc20_cs66/preview
- ❖ <https://www.javatpoint.com/iot-internet-of-things>
- ❖ https://www.tutorialspoint.com/internet_of_things/index.htm

Mapping with Programme Outcomes: 3 Strong, 2 – Medium, 1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	2	3	2	3	2	2	3	2
CO2	2	3	2	3	2	3	2	3	3	3
CO3	3	3	3	3	2	3	2	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3

Mapping with Programme: Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	2
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	2	3	3
Weightage	15	15	13	15	14
Weighted percentage of Course Contribution to POs	3.0	3.0	2.6	3.0	2.8

ELECTIVE II– MOBILE COMPUTING

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S2PCSE06	Elective II	Theory	Y	Y	-	5	3

Learning Objectives

- ❖ Present the overview of Mobile computing, Applications and Architectures.
- ❖ Describe the futuristic computing challenges.
- ❖ Enable the students to learn the concept of mobile computing.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Understand the need and requirements of mobile communication.	PO1, PO2
CO2	Focus on mobile computing applications and techniques	PO2,PO3
CO3	Demonstrate satellite communication in mobile computing	PO4
CO4	Analyze about wireless local loop architecture	PO5, PO6
CO5	Analyze various mobile communication technologies	PO6

ELECTIVE II– MOBILE COMPUTING

Unit	Details	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.	15
II	MOBILE COMMUNICATION: Introduction to Cellular Mobile Communication –Mobile Communication Standards–Mobility Management – Frequency Management – Cordless Mobile Communication Systems.	15
III	MOBILE COMPUTING: 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.	15
IV	MOBILE COMMUNICATION SYSTEM: 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.	15
V	COMMUNICATION TECHNOLOGY: WCDMA Technology and Fiber Optic Microcellular Mobile Communication – Ad hoc Network and Bluetooth technology – Intelligent Mobile Communication system – Fourth Generation Mobile Communication systems. Self Study: Spread Spectrum in Mobile Computing	15
	Total	75

Text Books

- ❖ “Wireless and Mobile Communication”, T.G. Palanivelu and R. Nakkeeran, Second Edition, PHI Learning, 2016.
- ❖ “Mobile Communications”, Jochen Schiller, Third Edition, Pearson, 2010

Reference books

- ❖ AsokeK Talukder, Hasan Ahmed, Roopa Yavagal, “Mobile Computing”, TMH, 2010.

Web Resources

- ❖ https://www.tutorialspoint.com/mobile_computing/index.htm
- ❖ <https://www.javatpoint.com/mobile-computing>
- ❖ <https://nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs13/>

Mapping with Programme Outcomes: 3 Strong, 2 – Medium, 1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	2	1	1	2	3	2	2	2	2
CO2	3	3	3	2	2	3	2	3	3	3
CO3	3	3	3	3	2	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3

Mapping with Programme: Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	3	2
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	2	3	3
Weightage	15	14	13	15	14
Weighted percentage of Course Contribution to POs	3.0	2.8	2.6	3.0	2.8

Course Coordinator

BOS Chairman

ELECTIVE II– BLOCK CHAIN TECHNOLOGY

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S2PCSE07	Elective II	Theory	Y	Y	-	5	3

Learning Objectives

- ❖ Understand the fundamentals of block chain and crypto currency.
- ❖ Understand the influence and role of block chain in various other fields.
- ❖ Learn security features and its significance.
- ❖ Identify problems & challenges posed by Block Chain the students to learn the concept of mobile computing.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Demonstrate block chain technology and crypto currency	PO1, PO2
CO2	Understand the mining mechanism in block chain	PO2
CO3	Apply and identify security measures, and various types of services that allow people to trade and transact with bit coins	PO3,PO4
CO4	Apply and analyze Block chain in health care industry	PO4, PO5
CO5	Analyze security, privacy, and efficiency of a given Block chain system	PO5,PO6

ELECTIVE II– BLOCK CHAIN TECHNOLOGY

Unit	Details	No. of Hours
I	INTRODUCTION: Introduction to Block chain - The big picture of the industry – size, growth, structure, players. Bit coin versus Crypto currencies versus Block chain - Distributed Ledger Technology (DLT). Strategic analysis of the space – Block chain platforms, regulators, application providers. The major application: Currency, identity, chain of custody.	15
II	NETWORK AND SECURITY: Advantage over conventional distributed database, Block chain Network, Mining Mechanism, Distributed Consensus, Block chain 1.0, 2.0 and 3.0 – transition, Advancements and features. Privacy, Security issues in Block chain	15
III	CRYPTO CURRENCY: Crypto currency - History, Distributed Ledger, Bit coin protocols -Symmetric-key cryptography - Public-key cryptography - Digital Signatures -High and Low trust societies - Types of Trust model: Peer-to-Peer, Leviathan, and Intermediary. Application of Cryptography to Block chain	15
IV	CRYPTO CURRENCY REGULATION: Crypto currency Regulation-Stakeholders, Roots of Bit coin, Legal views –exchange of crypto currency - Black Market -Global Economy. Crypto economics–assets, supply and demand, inflation and deflation–Regulation.	15
V	CHALLENGES IN BLOCKCHAIN: Opportunities and challenges in Block Chain – Application of block chain: Industry 4.0 –machine to machine communication–Data management inindustry4.0–future prospects. Block chain in Health 4.0 – Block chain properties - Healthcare Costs - Healthcare Quality - Healthcare Value - Challenges for using block chain for healthcare data. Self Study: Wireless Cellular Block chain Networks	15
	Total	75

Text Books

- ❖ Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, “Bit coin and Crypto currency Technologies: A Comprehensive Introduction”, Princeton University Press (July 19, 2016).
- ❖ Antonopoulos, “Mastering Bitcoin: Unlocking Digital Crypto currencies”, 2014.

Reference books

- ❖ Satoshi Nakamoto, “Bit coin: A Peer-to-Peer Electronic Cash System”, 2009
- ❖ Rodrigoda Rosa Righi, Antonio Marcos Alberti, Madhusudan Singh, “Block chain Technology for Industry 4.0” Springer 2020.

Web Resources

- ❖ <https://www.javatpoint.com/blockchain-tutorial>
- ❖ <https://www.tutorialspoint.com/blockchain/index.htm>
- ❖ <https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs01/>

Mapping with Programme Outcomes: 3 Strong, 2 – Medium, 1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	3	2	3	2
CO2	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3

Mapping with Programme: Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	2	3	3	3
CO3	3	3	3	3	3
CO4	3	2	3	2	3
CO5	3	3	3	3	3
Weightage	15	13	15	14	15
Weighted percentage of Course Contribution to POs	3.0	2.6	3.0	2.8	3.0

Course Coordinator

BOS Chairman

SEMESTER III

SECOND YEAR - SEMESTER III

CORE VII – DIGITAL IMAGE PROCESSING

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S3PCS07	Core-VII	Theory	Y	Y	-	6	5

Learning Objectives

- ❖ Learn basic image processing techniques for solving real problems.
- ❖ Gain knowledge in image transformation and Image enhancement techniques
- ❖ . Learn Image compression and Segmentation procedures.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Understand the fundamentals of Digital Image Processing	PO1,PO2
CO2	Understand the mathematical foundations for digital image representation, image acquisition, image transformation, and image enhancement	PO2,PO3
CO3	Apply, Design and Implement and get solutions for digital image processing problems	PO3,PO4
CO4	Apply the concepts of filtering and segmentation for digital image retrieval	PO4,PO5
CO5	Explore the concepts of Multi-resolution process and recognize the objects in an efficient manner	PO5,PO6

CORE VII – DIGITAL IMAGE PROCESSING

Unit	Details	No. of Hours
I	INTRODUCTION: Introduction: What is Digital image processing – the origin of DIP – Examples of fields that use DIP – Fundamentals steps in DIP – Components of an image processing system. Digital Image Fundamentals: Elements of Visual perception – Light and the electromagnetic spectrum – Image sensing and acquisition – Image sampling and Quantization – Some Basic relationship between Pixels – Linear & Nonlinear operations.	18
II	IMAGE ENHANCEMENT: Image Enhancement in the spatial domain:- Background – some basic Gray level Transformations – Histogram Processing – Enhancement using Arithmetic / Logic operations – Basics of spatial filtering – Smoothing spatial filters – Sharpening spatial filters – Combining spatial enhancement methods.	18
III	IMAGE RESTORATION : Image Restoration: A model of the Image Degradation / Restoration Process – Noise models – Restoration is the process of noise only – Spatial Filtering – Periodic Noise reduction by frequency domain filtering – Linear, Portion – Invariant Degradations – Estimating the degradation function – Inverse filtering – Minimum mean square Error Filtering – Constrained least squares filtering – Geometric mean filter – Geometric Transformations.	18
IV	IMAGE COMPRESSION: Image Compression: Fundamentals – Need of image compression - Image compression models – Elements of Information Theory – Error Free compression – Lossy compression – Image compression standards. Object Recognition: Patterns and patterns classes, matching, classifiers.	18
V	IMAGE SEGMENTATION: Image Segmentation: Detection and Discontinuities – Edge Linking and Boundary deduction – Thresholding -Hough Transform Line Detection and Linking – Region-Based segmentation – Segmentation by Morphological watersheds – The use of motion in segmentation	18
	Total	90
Comparative analysis and Model Preparation related to the above topic to be discussed (internal exam only)		

Text books

- ❖ Rafael C. Gonzalez, Richard E. Woods, “Digital Image Processing”, Second Edition, PHI/Pearson Education.
- ❖ B. Chanda, D. Dutta Majumder, “Digital Image Processing and Analysis”, PHI, 2003.

Reference books

- ❖ Nick Efford, “Digital Image Processing a practical introducing using Java”, Pearson Education, 2004.

Web Resources

- ❖ <https://nptel.ac.in/courses/117/105/117105135/>
- ❖ <https://www.tutorialspoint.com/dip/index.htm>
- ❖ <https://www.javatpoint.com/digital-image-processing-tutorial>

Mapping with Programme Outcomes: 3 Strong, 2 – Medium, 1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	3	2	3	2	3	2	2	3
CO2	3	3	3	3	3	2	3	2	3	3
CO3	3	3	3	3	3	3	3	2	3	3
CO4	3	3	3	3	3	3	3	2	3	3
CO5	3	3	3	3	3	3	3	2	3	3

Mapping with Programme: Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	2	3
CO2	2	2	3	3	3
CO3	3	3	3	3	2
CO4	3	3	2	3	3
CO5	2	3	3	2	3
Weightage	14	14	14	13	14
Weighted percentage of Course Contribution to POs	2.8	2.8	2.8	2.6	2.8

Course Coordinator

BOS Chairman

CORE VIII – CLOUD COMPUTING

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S3PCS08	Core-VIII	Theory	Y	Y	-	5	5

Learning Objectives

- ❖ Gain knowledge on cloud computing, cloud services, architectures and applications.
- ❖ Enable the students to learn the basics of cloud computing with real time usage.
- ❖ How to store and share, in and from cloud?

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Understand the concepts of Cloud and its services	PO1,PO2
CO2	Collaborate Cloud for Event & Project Management	PO3,PO4
CO3	Analyze on cloud in – Word Processing, Spread Sheets, Mail, Calendar, Database	PO4,PO5
CO4	Analyze cloud in social networks	PO5,PO6
CO5	Explore cloud storage and sharing	PO6

CORE VIII CLOUD COMPUTING

Unit	Details	No. of Hours
I	INTRODUCTION: INTRODUCTION Cloud Computing Introduction, From, Collaboration to cloud, Working of cloud computing, pros and cons, benefits, developing cloud computing services, Cloud service development, discovering cloud services.	15
II	CLOUD COMPUTING: CLOUD COMPUTING FOR EVERYONE Centralizing email communications, cloud computing for community, collaborating on schedules, collaborating on group projects and events, cloud computing for corporation, mapping, schedules, managing projects, presenting on road.	15
III	CLOUD SERVICES: USING CLOUD SERVICES Collaborating on calendars, Schedules and task management, exploring on line scheduling and planning, collaborating on event management, collaborating on contact management, collaborating on project management, collaborating on word processing, spreadsheets, and databases.	15
IV	CLOUD SECURITY: Top concern for cloud users, Risks, Privacy Impact Assessment, Cloud Data Encryption, Security of Database Services, OS security, VM Security, Security Risks Posed by Shared Images and Management OS, XOAR, A Trusted Hypervisor, Mobile Devices and Cloud Security	15
V	STORING AND SHARING: STORING AND SHARING Understanding cloud storage, evaluating on line file storage, exploring on-line book-marking services, exploring on line photo editing applications, exploring photo sharing communities, controlling it with web based desktops.	15
	Total	75
Comparative analysis and Model Preparation related to the above topic to be discussed (internal exam only)		

Text books

- ❖ Michael Miller, “Cloud Computing”, Pearson Education, New Delhi, 2009.
- ❖ Dan C. Marinescu, Cloud Computing Theory and Practice, Morgan Kaufmann, 2nd Edition, Elsevier 2018

Reference books

- ❖ Anthony T. Velte, “Cloud Computing: A Practical Approach”, 1st Edition, Tata McGraw Hill Education Private Limited, 2009.

Web Resources

- ❖ <https://nptel.ac.in/courses/106/105/106105167/>
- ❖ https://www.tutorialspoint.com/cloud_computing/index.htm
- ❖ <https://www.javatpoint.com/cloud-computing-tutorial>

Mapping with Programme Outcomes: 3 Strong, 2 – Medium, 1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	3	2	3	2	3	2	2	2	3
CO2	2	3	2	3	3	3	2	2	2	3
CO3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3
CO5	2	3	3	3	3	3	3	3	3	3

Mapping with Programme: Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	2	3
CO2	2	2	3	3	3
CO3	3	3	3	3	2
CO4	3	3	2	3	3
CO5	2	3	3	2	3
Weightage	14	14	14	13	14
Weighted percentage of Course Contribution to Pos	2.8	2.8	2.8	2.6	2.8

Course Coordinator

BOS Chairman

CORE XI – NETWORK SECURITY AND CRYPTOGRAPHY

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S3PCS09	Core-XI	Theory	Y	Y	-	5	5

Learning Objectives

- ❖ Enable students to learn the Introduction to Cryptography, Web Security and Case studies in Cryptography.
- ❖ To gain knowledge on classical encryption techniques and concepts of modular arithmetic and number theory.
- ❖ Enable the students to learn the basics of cloud computing with real time usage.
- ❖ To explore the design issues and working principles of various authentication Applications and various secure communication standards including Kerberos, IPsec, and SSL/TLS and email.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Understand the process of the cryptographic algorithms	PO1,PO2
CO2	Compare and apply different encryption and decryption techniques to solve problems related to confidentiality and authentication	PO2,PO3
CO3	Apply and analyze appropriate security techniques to solve network security problem	PO3,PO4
CO4	Exploresuitable cryptographic algorithms	PO4,PO5
CO5	Analyze different digital signature algorithms to achieve authentication and design secure applications	PO5,PO6

CORE XI – NETWORK SECURITY AND CRYPTOGRAPHY

Unit	Details	No. of Hours
I	INTRODUCTION: Introduction to Cryptography – Security Attacks – Security Services – Security Algorithm- Stream cipher and Block cipher - Symmetric and Asymmetric-key Cryptosystem Symmetric Key Algorithms: Introduction – DES – Triple DES – AES – IDEA – Blowfish – RC5.	15
II	CRYPTO SYSTEM: Public-key Cryptosystem: Introduction to Number Theory - RSA Algorithm – Key Management - Diffie-Hellman Key exchange – Elliptic Curve Cryptography Message Authentication and Hash functions – Hash and Mac Algorithm – Digital Signatures and Authentication Protocol.	15
III	NETWORK SECURITY: Network Security Practice: Authentication Applications -Biometrics, Passwords, Challenge Response protocols- Kerberos – X.509 Authentication services and Encryption Techniques. E-mail Security – PGP – S / MIME – IP Security.	15
IV	WEB SECURITY: Web Security - Secure Socket Layer - Secure Shell (SSH) – Secure Electronic Transaction. System Security - Intruders and Viruses – Firewalls–Design and Types of Firewalls, Personal Firewalls- Password Security.	15
V	CASE STUDY: Implementation of Cryptographic Algorithms – RSA – DSA – ECC (C / JAVA Programming). Network Forensic – Security Audit - Other Security Mechanism: Introduction to: Stenography – Quantum Cryptography – Water Marking - DNA Cryptography	15
	Total	75
Comparative analysis and Model Preparation related to the above topic to be discussed (internal exam only)		

Text books

- ❖ William Stallings, “Cryptography and Network Security”, PHI/Pearson Education.
- ❖ Bruce Schneir, “Applied Cryptography”, CRC Press.

Reference books

- ❖ A.Menezes, P Van Oorschot and S.Vanstone, “Hand Book of Applied Cryptography”, CRC Press, 1997
- ❖ AnkitFadia,”Network Security”,MacMillan.

Web Resources

- ❖ <https://nptel.ac.in/courses/106/105/106105031/>
- ❖ <http://www.nptelvideos.in/2012/11/cryptography-and-network-security.html>
- ❖ <https://www.tutorialspoint.com/cryptography/index.html>

Mapping with Programme Outcomes: 3 Strong, 2 – Medium, 1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	3	2	1	3	2	3	2	3
CO2	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3

Mapping with Programme: Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	2	3
CO2	2	2	3	3	3
CO3	3	3	3	3	2
CO4	3	3	2	3	3
CO5	2	3	3	2	3
Weightage	14	14	14	13	14
Weighted percentage of Course Contribution to Pos	2.8	2.8	2.8	2.6	2.8

Course Coordinator

BOS Chairman

CORE X – DATA SCIENCE & ANALYTICS

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S3PCS10	Core-X	Theory	Y	Y	-	6	4

Learning Objectives

- ❖ Introduce the students to data science, big data & its eco system.
- ❖ Learn data analytics & its life cycle.
- ❖ To explore the programming language R, with respect to the data mining algorithms.
- ❖ Relate the relationship between artificial intelligence, machine learning and data science

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Understand the concept of data science and its techniques	PO1,PO2
CO2	Review data analytics	PO2,PO3
CO3	Apply and determine appropriate Data Mining techniques using R to real time applications	PO3,PO4
CO4	Analyze on clustering algorithms	PO4,PO5
CO5	Analyze on regression methods in AI	PO6

CORE X – DATA SCIENCE & ANALYTICS

Unit	Details	No. of Hours
I	INTRODUCTION: Introduction of Data Science: data science and big data – facets of data- Understanding data: Introduction – Types of Data: Numeric – Categorical – Graphical – High Dimensional Data – Classification of digital Data: Structured, Semi-Structured and Unstructured - Example Applications -data science process-Ecosystem- The Data Science process – six steps- Machine Learning.	18
II	BASICS OF DATA ANALYTICS: Data Analytics life cycle - review of data analytics - Advanced data Analytics-technology and tools. Types of Data Analytics - Descriptive Analytics - Diagnostic Analytics - Predictive Analytics - Prescriptive Analytics - Benefits of Data Analytics	18
III	DATA ANALYTICS USING R: Basic Data Analytics using R : R Graphical User Interfaces – Data Import and Export – Attribute and Data Types –Descriptive Statistics – Exploratory Data Analysis – Visualization Before Analysis – Dirty Data – Visualizing a Single Variable – Examining Multiple Variables – Data Exploration Versus Presentation.	18
IV	CLUSTERING: Overview of Clustering : K-means – Use Cases – Overview of the Method – Perform a K-means Analysis using R – Classification – Decision Trees – Overview of a Decision Tree – Decision Tree Algorithms – Evaluating a Decision Tree – Decision Tree in R – Bayes’ Theorem – Naïve Bayes Classifier – Smoothing – Naïve Bayes in R.	18
V	ARTIFICIAL INTELLIGENCE: Artificial intelligence: Machine Learning and deep learning in data science - Clustering, association rules. Linear regression-logistic regression-Additional regression methods.	18
	Total	90
Comparative analysis and Model Preparation related to the above topic to be discussed (internal exam only)		

Text books

- ❖ Introducing-Data-Science-Big-Data-Machine-Learning-and-more-using-Python-tools-2016. Pdf
- ❖ Data science in big data analytics-Wiley 2015 John Wiley & Sons.

Reference books

- ❖ A simple introduction to Data Science - Lars Nielson 2015
- ❖ Introducing Data Science Davy Cielen, Arno D.B.Meysman, Mohamed Ali 2016 Manning Publication
- ❖ R Programming for Data Science - Roger D.Peng 2015 Lean Publication
- ❖ Data Science & Big Data Analytics: Discovering, Analyzing , Visualizing and Presenting Data

Web Resources

- ❖ https://www.tutorialspoint.com/python_data_science/index.htm
- ❖ <https://www.javatpoint.com/data-science>
- ❖ <https://nptel.ac.in/courses/106/106/106106179/>

Mapping with Programme Outcomes: 3 Strong, 2 – Medium, 1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	3	2	2	3
CO2	3	3	3	3	3	3	3	2	3	3
CO3	3	3	3	3	3	3	3	2	3	3
CO4	3	3	3	3	3	3	3	2	3	3
CO5	3	3	3	3	3	3	3	2	3	3

Mapping with Programme: Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	2	3
CO2	2	2	3	3	3
CO3	3	3	3	3	2
CO4	3	3	2	3	3
CO5	2	3	3	2	3
Weightage	14	14	14	13	14
Weighted percentage of Course Contribution to POs	2.8	2.8	2.8	2.6	2.8

Course Coordinator

BOS Chairman

PRACTICAL V: DIGITAL IMAGE PROCESSING LAB

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S3PCSP05	Core Practical -V	Practical	-	-	Y	4	3

Learning Objectives

- ❖ To understand the basics of Digital Image Processing fundamentals, image enhancement and image restoration techniques
- ❖ To enable the students to learn the fundamentals of image compression and segmentation
- ❖ To understand Image Restoration & Filtering Techniques
- ❖ Implementation of the above using MATLAB

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	To write programs in MATLAB for image processing using the techniques	PO1,PO2
CO2	To able to implement Image Enhancements & Restoration techniques	PO2,PO3
CO3	Capable of using Compression techniques in an Image	PO3,PO4
CO4	Must be able to manipulate the image and Segment it	PO5,PO6
CO5	Enable students to demonstrate proficiency in applying image processing techniques using MATLAB.	PO6

PRACTICAL V: DIGITAL IMAGE PROCESSING LAB

LIST OF PROGRAMS	Required hours
1. Implement Image enhancement Technique. 2. Histogram Equalization 3. Image Restoration. 4. Implement Image Filtering. 5. Edge detection using Operators (Roberts, Prewitts and Sobels operators) 6. Implement image compression. 7. Image Subtraction 8. Boundary Extraction using morphology. 9. Image Segmentation 10. Image sampling and quantization	60
Total	60

Text books

- ❖ Rafael C. Gonzalez, Richard E. Woods, “Digital Image Processing”, Second Edition, PHI/Pearson Education.
- ❖ B. Chanda, D. Dutta Majumder, “Digital Image Processing and Analysis”, PHI, 2003.

Reference books

- ❖ Nick Efford, “Digital Image Processing a practical introducing using Java”, Pearson Education, 2004.

Web Resources

- ❖ <https://nptel.ac.in/courses/117/105/117105135/>
- ❖ <https://www.tutorialspoint.com/dip/index.htm>
- ❖ <https://www.javatpoint.com/digital-image-processing-tutorial>

Mapping with Programme Outcomes: 3 Strong, 2 – Medium, 1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	2	3	3	3	2	2	3	3
CO2	3	3	3	3	3	3	3	2	3	3
CO3	3	3	3	3	3	3	3	2	3	3
CO4	3	3	3	3	3	3	3	2	3	3
CO5	3	3	3	3	3	3	3	2	3	3

Mapping with Programme: Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	2	3
CO2	2	2	3	3	3
CO3	3	3	3	3	2
CO4	3	3	2	3	3
CO5	2	3	3	2	3
Weightage	14	14	14	13	14
Weighted percentage of Course Contribution to Pos	2.8	2.8	2.8	2.6	2.8

Course Coordinator

BOS Chairman

PRACTICAL VI: CLOUD COMPUTING LAB

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S3PCSP06	Core Practical - VI	Practical	-	-	Y	4	2

Learning Objectives

- ❖ This course covers the basic data structures like Stack, Queue, Tree , List.
- ❖ This course enables the students to learn the applications of the data structures using various techniques
- ❖ It also enable the students to understand C++ language with respect to OOAD concepts
- ❖ Application of OOPS concepts

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Understand the concepts of object oriented with respect to C++	PO1,PO2
CO2	Able to understand and implement OOPS concepts	PO3,PO4
CO3	Implementation of data structures like Stack, Queue, Tree , List using C++	PO4,PO5
CO4	Application of the data structures for Sorting, Searching using different techniques.	PO5,PO6
CO5	Able to deploy simple applications to cloud platforms using C++.	PO6

PRACTICAL VI : CLOUD COMPUTING LAB

LIST OF PROGRAMS	Required hours
1. Working with Google Drive to make spreadsheet and notes. 2. Launch a Linux Virtual Machine. 3. To host a static website 4. Exploring Google cloud for the following a) Storage b) Sharing of data c) manage your calendar, to-do lists, d) a document editing tool 5. Working and installation of Google App Engine 6. Working and installation of Microsoft Azure 7. To Connect Amazon Redshift with S3 bucket 8. To Create and Query a NoSQL Table 9. Find a procedure to transfer the files from one virtual machine to another virtual machine. 10. Find procedure to set up the one node HADOOP cluster	60
Total	60

Text books

- ❖ Michael Miller, “Cloud Computing”, Pearson Education, New Delhi, 2009.

Reference books

- ❖ Anthony T. Velte, “Cloud Computing: A Practical Approach”, 1st Edition, Tata McGraw Hill Education Private Limited, 2009.

Web Resources

- ❖ <https://nptel.ac.in/courses/106/105/106105167/>
- ❖ https://www.tutorialspoint.com/cloud_computing/index.htm
- ❖ <https://www.javatpoint.com/cloud-computing-tutorial>

Mapping with Programme Outcomes: 3 Strong, 2 – Medium, 1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	2	3	3	3	2	2	3	3
CO2	3	3	3	3	3	3	3	2	3	3
CO3	3	3	3	3	3	3	3	2	3	3
CO4	3	3	3	3	3	3	3	2	3	3
CO5	3	3	3	3	3	3	3	2	3	3

Mapping with Programme: Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	2	3
CO2	2	2	3	3	3
CO3	3	3	3	3	2
CO4	3	3	2	3	3
CO5	2	3	3	2	3
Weightage	14	14	14	13	14
Weighted percentage of Course Contribution to POs	2.8	2.8	2.8	2.6	2.8

Course Coordinator

BOS Chairman

SEMESTER IV

SECOND YEAR - SEMESTER IV

PRACTICAL VII: WEB APPLICATION DEVELOPMENT AND HOSTING PRACTICAL

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S4PCSP07	Core Practical - VII	Practical	-	-	Y	5	5

Learning Objectives

- ❖ Able to design a web page using HTML tags.
- ❖ To enable the students to use Framesets, hyperlinks and different formatting features of HTML tags
- ❖ Enable the students to use Forms & other controls in a web page
- ❖ To create interactive applications using PHP

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Understand & implement the basic HTML tags to create static web pages	PO1,PO2
CO2	Capable of using hyperlinks, frames , images, tables,.....in a web page	PO2,PO3
CO3	Able to write dynamic web applications using HTML forms	PO4,PO5
CO4	Must be able to write dynamic web applications in PHP & HTML tags using XAMPP.	PO5,PO6
CO5	Deploying applications using server-side technologies	PO6

PRACTICAL VII: WEB APPLICATION DEVELOPMENT AND HOSTING PRACTICAL

LIST OF PROGRAMS	Required hours
1. Develop a website for your college using advanced tags of HTML. 2. Write names of several countries in a paragraph and store it as an HTML document, world.html. Each country name must be a hot text. When you click India (for example), it must open india.html and it should provide a brief introduction about India. 3. Develop a HTML document to i)display Text with Bullets / Numbers - Using Lists ii) to display the Table Format Data 4. Develop a Complete Web Page using Frames and Framesets which gives the Information about a Hospital using HTML. 5. Write a HTML document to print your Bio-Data in a neat format using several components. 6. Develop a HTML document to display a Registration Form for an inter-collegiate function. 7. Using HTML form accept Customer details like Name, City, Pin code, Phone number and Email address and validate the data and display appropriate messages for violations using PHP (Eg. Name is Mandatory field; Pin code must be 6 digits, etc.). 8. Write a program to accept two numbers n1 and n2 using HTML form and display the Prime numbers between n1 and n2 using PHP. 9. Create Web Form and pages that properly use HTTP GET and POST Protocol as appropriate. 10. Create a HTML Form and Insert Data Into The Database	75
Total	75

Text books

- ❖ Ivan Bayross, “Web Enabled Commercial Applications Development Using HTML, JavaScript, DHTML and PHP”, BPB Publications, 4th Revised Edition, 2010.

Reference books

- ❖ A.K.Saini and SumintTuli, “Mastering XML”, First Edition, New Delhi, 2002.

Web Resources

- ❖ <https://www.tutorialspoint.com/xml/index.htm>
- ❖ https://www.tutorialspoint.com/internet_technologies/websites_development.htm
- ❖ <https://www.youtube.com/watch?v=PlxWf493en4>

Mapping with Programme Outcomes: 3 Strong, 2 – Medium, 1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	2	2	3	1	2	2	3	2
CO2	3	3	3	3	3	2	3	2	3	2
CO3	3	3	3	3	3	2	3	2	3	2
CO4	3	3	3	3	3	2	3	2	3	2
CO5	3	3	3	3	3	2	3	2	3	2

Mapping with Programme: Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	2	3
CO2	2	2	3	3	3
CO3	3	3	3	3	2
CO4	3	3	2	3	3
CO5	2	3	3	2	3
Weightage	14	14	14	13	14
Weighted percentage of Course Contribution to POs	2.8	2.8	2.8	2.6	2.8

Course Coordinator

BOS Chairman

Elective Courses
Elective III
Semester IV

**ELECTIVE III –
CRITICAL THINKING, DESIGN THINKING AND PROBLEM SOLVING**

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S4PCSE08	Elective-III	Theory	Y	Y	-	4	3

Learning Objectives

- ❖ Learn critical thinking and its related concepts
- ❖ Learn design thinking and its related concepts
- ❖ Develop Thinking patterns, Problem solving & Reasoning.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Understand the concepts of Critical thinking and its related technology	PO1,PO2
CO2	Focus on the explicit development of critical thinking and problem solving skills	PO2,PO3
CO3	Apply design thinking in problems	PO3,PO4
CO4	Make a decision and take actions based on analysis	PO4,PO5
CO5	Analyze the concepts of Thinking patterns, Problem solving & Reasoning in real time applications	P05,PO6

**ELECTIVE III –
CRITICAL THINKING, DESIGN THINKING AND PROBLEM SOLVING**

Unit	Details	No. of Hours
I	Critical Thinking: Definition, Conclusions and Decisions, Beliefs and Claims, Evidence – finding, evaluation, Inferences, Facts – opinion, probable truth, probably false, Venn diagram. Applied critical thinking: Inference, Explanation, Evidence, Credibility, Two Case Studies, critical thinking and science, critical evaluation, self-assessment.	12
II	Design Thinking: Introduction, Need of Design Thinking, problem to question - design thinking process, Traditional Problem Solving versus Design Thinking, phases of Design Thinking, problem exploration, Stake holder assessment, design thinking for manufacturers, smart Idea to implementation.	12
III	Thinking to confidence, fear management, duty Vs passion, Team management, Tools for Thinking, prototype design, Relevance of Design and Design Thinking in engineering, human centered design, case study: apply design thinking in problem.	12
IV	Problem solving: problem definition, problem solving methods, selecting and using information, data processing, solution methods, solving problems by searching, recognizing patterns, spatial reasoning, necessity and sufficiency, choosing and using models, making choices and decisions.	12
V	Reasoning: Deductive and hypothetical reasoning, computational problem solving; generating, implementing, and evaluating solutions, interpersonal problem solving. Advanced problem solving: Combining skills – using imagination, developing models, Carrying out investigations, Data analysis and inference. Graphical methods of solution, Probability, tree diagrams and decision trees	12
	Total	60
Comparative analysis and Model Preparation related to the above topic to be discussed (internal exam only)		

Text books

- ❖ John Butterworth and Geoff Thwaites, Thinking skills: Critical Thinking and Problem Solving, Cambridge University Press, 2013. Data science in big data analytics-Wiley 2015 John Wiley & Sons.
- ❖ H. S. Fogler and S. E. LeBlanc, Strategies for Creative Problem Solving, 2nd edition, Pearson, Upper Saddle River, NJ, 2008.

Reference books

- ❖ A. Whimbey and J. Lochhead, Problem Solving & Comprehension, 6th edition, Lawrence Erlbaum, Mahwah, NJ, 1999. Introducing Data Science Davy Cielien, Arno D.B. Meysman, Mohamed Ali 2016 Manning Publication
- ❖ M. Levine, Effective Problem Solving, 2nd edition, Prentice Hall, Upper Saddle River, NJ, 1994.
- ❖ Michael Baker, The Basic of Critical Thinking, The Critical Thinking Co press, 2015.
- ❖ David Kelley and Tom Kelley, Creative Confidence, 2013.

Web Resources

- ❖ https://www.tutorialspoint.com/critical_thinking/index.htm
- ❖ https://www.tutorialspoint.com/design_thinking/design_thinking_quick_guide.htm
- ❖ <https://nptel.ac.in/courses/109/104/109104109/>

Mapping with Programme Outcomes: 3 Strong, 2 – Medium, 1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	3	2	3	1	2	1	3	2
CO2	3	3	3	3	3	2	3	2	3	2
CO3	3	3	3	3	3	2	3	2	3	2
CO4	3	3	3	3	3	2	3	2	3	2
CO5	3	3	3	3	3	2	3	2	3	2

Mapping with Programme: Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	2	3
CO2	2	2	3	3	3
CO3	3	3	3	3	2
CO4	3	3	2	3	3
CO5	2	3	3	2	3
Weightage	14	14	14	13	14
Weighted percentage of Course Contribution to Pos	2.8	2.8	2.8	2.6	2.8

Course Coordinator

BOS Chairman

ELECTIVE III – WEB SERVICES

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S4PCSE09	Elective-III	Theory	Y	Y	-	4	3

Learning Objectives

- ❖ Present the Web Services , Building real world Enterprise applications using Web Services with Technologies XML, SOAP , WSDL , UDDI
- ❖ Get overview of Distributed Computing, XML, and its technologies
- ❖ Update with QoS and its features
- ❖ Develop Standards and future of Web Services

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Understand web services and its related technologies	PO1,PO2
CO2	Understand XML concepts	PO2,PO3
CO3	Analyze on SOAP and UDDI model	PO4,PO5
CO4	Demonstrate the road map for the standards and future of web services	PO5
CO5	Analyze QoS enabled applications in web services	P05,PO6

ELECTIVE III – WEB SERVICES

Unit	Details	No. of Hours
I	Introduction to web services – Overview of Distributed Computing- Evolution and importance of web services-Industry standards, Technologies and concepts underlying web services-Web services and enterprises-web services standards organization-web services platforms.	12
II	XML Fundamentals – XML documents - XML Namespaces- structure in XML documents, Reuse of XML schemes, Document navigation and transformation- XML Schema –Processing XML.	12
III	SOAP: The SOAP model- SOAP messages-SOAP encoding- WSDL: WSDL structure- interface definitions-bindings-services-Using SOAP and WSDL-UDDI: About UDDI- UDDI registry Specification- Core data structures-Accessing UDDI	12
IV	Advanced web services technologies and standards: Conversations overview-web services conversation language-WSCL interface components. Workflow: business process management- workflows and workflow management systems Security: Basics-data handling and forwarding- data storage-errors-Web services security issues.	12
V	Quality of Service: Importance of QoS for web services-QoS metrics-holes- design patterns-QoS enabled web services-QoS enabled applications. Web services management-web services standards and future trends.	
	Total	60
Comparative analysis and Model Preparation related to the above topic to be discussed (internal exam only)		

Text books

- ❖ Sandeep Chatterjee, James Webber, “Developing Enterprise Web Services: An Architects Guide”, Prentice Hall, Nov 2003.
- ❖ Keith Ballinger, “NET Web services: Architecture and Implementation with .Net”, Pearson Education, First Edition, Feb 2003.
- ❖ Gustavo Alonso, Fabio Casati, Harumi Kuno, Vijay Machiraju: Web Services(Concepts Architectures and Applications), Springer International Edition 2009.

Reference books

- ❖ Ramesh Nagappan, “Developing Java Web Services: Architecting and developing secure Web Services Using Java”, John Wiley and Sons, first Edition Feb 2003.
- ❖ Eric A Marks and Mark J Werrell, “Executive Guide to Web services”, John Wiley and sons, March 2003.
- ❖ Anne Thomas Manes, “Web Services: A managers Guide”, Addison Wesley June 2003.

Web Resources

- ❖ <https://www.tutorialspoint.com/webservices/index.htm>
- ❖ <https://www.javatpoint.com/web-services-tutorial>
- ❖ <https://www.btechguru.com/training--programming--xml--web-services--web-services-part-1-video-lecture--11801--24--147.html>

Mapping with Programme Outcomes: 3 Strong, 2 – Medium, 1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	3	2	3	1	2	1	3	2
CO2	3	3	3	3	3	2	3	2	3	2
CO3	3	3	3	3	3	2	3	2	3	2
CO4	3	3	3	3	3	2	3	2	3	2
CO5	3	3	3	3	3	2	3	2	3	2

Mapping with Programme: Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	2	3
CO2	2	2	3	3	3
CO3	3	3	3	3	2
CO4	3	3	2	3	3
CO5	2	3	3	2	3
Weightage	14	14	14	13	14
Weighted percentage of Course Contribution to Pos	2.8	2.8	2.8	2.6	2.8

Course Coordinator

BOS Chairman

ELECTIVE III – ROBOTIC PROCESS AUTOMATION FOR BUSINESS

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S4PCSE10	Elective-III	Theory	Y	Y	-	4	3

Learning Objectives

- ❖ Learn the concepts of RPA, its benefits, types and models.
- ❖ Gain the knowledge in application of RPA in Business Scenarios.
- ❖ Identify measures and skills required for RPA

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Demonstrate the benefits and ethics of RPA	PO1,PO2
CO2	Understand the Automation cycle and its techniques	PO2
CO3	Draw inferences and information processing of RPA	PO3,PO4
CO4	Implement & Apply RPA in Business Scenarios	PO5
CO5	Analyze on Robots & leveraging automation	P05,PO6

ELECTIVE III – ROBOTIC PROCESS AUTOMATION FOR BUSINESS

Unit	Details	No. of Hours
I	INTRODUCTION: Introduction to RPA - Overview of RPA - Benefits of RPA in a business environment - Industries & domains fit for RPA - Identification of process for automation - Types of Robots - Ethics of RPA & Best Practices - Automation and RPA Concepts - Different business models for implementing RPA - Centre of Excellence – Types and their applications - Building an RPA team - Approach for implementing RPA initiatives.	12
II	AUTOMATION: Role of a Business Manager in Automation initiatives - Skills required by a Business Manager for successful automation - The importance of a Business Manager in automation - Analyzing different business processes - Process Mapping frameworks - Role of a Business Manager in successful implementation – Part 1 - Understanding the Automation cycle – First 3 automation stages and activities performed by different people.	12
III	AUTOMATION IMPLEMENTATION: Evaluating the Automation Implementation Detailed description of last 3 stages and activities performed by different people - Role of a Business Manager in successful completion – Part 2 - Activities to be performed post-implementation - Guidelines for tracking the implementation success - Metrics/Parameters to be considered for gauging success - Choosing the right licensing option - Sending emails - Publishing and Running Workflows.	12
IV	ROBOT : Ability to process information through scopes/systems - Understand the skill of information processing and its use in business - Leveraging automation - Creating a Robot - New Processes. Establish causality by variable behavior - Understand the skill of drawing inference or establishing causality by tracking the behavior of a variable as it varies across time/referenced variable - Leveraging automation for this skill - Robot & new process creation.	12
V	ROBOT SKILL : Inference from snapshots of curated terms – Omni-source data curation - Multisource trend tracking - Understand the skill of drawing inference from the behavior of curated terms by taking snapshots across systems in reference to time/variable(s) - Leveraging automation for this skill – Robot creation and new process creation for this skill.	12
	Total	60
Comparative analysis and Model Preparation related to the above topic to be discussed (internal exam only)		

Text books

- ❖ Alok Mani Tripathi” Learning Robotic Process Automation: Create Software robots and automate usiness processes with the leading RPA tool” Packt Publishing Limited March 2018.
- ❖ Tom Taulli “The Robotic Process Automation Handbook” Apress , February 2020.

Reference books

- ❖ Steve Kaelble” Robotic Process Automation” John Wiley & Sons, Ltd., 2018

Web Resources

- ❖ https://www.tutorialspoint.com/uiopath/uiopath_robotic_process_automation_introduction.htm
- ❖ <https://www.javatpoint.com/rpa>
- ❖ https://onlinecourses.nptel.ac.in/noc19_me74/preview

Mapping with Programme Outcomes: 3 Strong, 2 – Medium, 1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	3	2	3	1	2	1	3	2
CO2	3	3	3	3	3	2	3	2	3	2
CO3	3	3	3	3	3	2	3	2	3	2
CO4	3	3	3	3	3	2	3	2	3	2
CO5	3	3	3	3	3	2	3	2	3	2

Mapping with Programme: Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	2	3
CO2	2	2	3	3	3
CO3	3	3	3	3	2
CO4	3	3	2	3	3
CO5	2	3	3	2	3
Weightage	14	14	14	13	14
Weighted percentage of Course Contribution to Pos	2.8	2.8	2.8	2.6	2.8

Course Coordinator

BOS Chairman

ELECTIVE III – CYBER SECURITY

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S4PCSE11	Elective-III	Theory	Y	Y	-	4	3

Learning Objectives

- ❖ To understand the basics of Cybercrime and Computer forensics with protecting mechanism
- ❖ To explore the working principles of WLAN, Email and Smartphone along with security mechanism and guidelines
- ❖ To gain the ability to understand the importance of cyber investigations with its functioning role and learn the basics of Wi Fi and its security measures
- ❖ To understand and learn the method of seize the digital evidence
- ❖ To learn and analyze the concepts of digital forensics with cybercrime prevention techniques

	Course Outcomes	
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Understand, describe, analyze and examine the basics of Cyber security concepts and its implementation in India	PO1-PO6
CO2	Comprehend and demonstrate the security tips in browsers, WLAN, social networks, Email security and Smart phone. Apply the investigations in post mortem and Forensics	PO1-PO6
CO3	Understand, apply and evaluate the various investigation roles and Wi Fi protecting mechanisms.	PO1-PO6
CO4	Understand, illustrate and evaluate the method of seize the digital information and evidences forensics data and evaluate the forensics reports	PO1-PO6
CO5	Comprehend, apply and appraise the methods digital forensics with cybercrime prevention techniques	PO1-PO6

ELECTIVE III – CYBER SECURITY

Unit	Details	No. of Hours
I	Introduction to cybercrime: Classification of cybercrimes – reasons for commission of cybercrime – malware and its type – kinds of cybercrime – authentication – encryption – digital signatures – antivirus – firewall – steganography – computer forensics – why should we report cybercrime – introduction counter cyber security initiatives in India – generating secure password – using password manager-enabling two-step verification – security computer using free antivirus.	12
II	Tips for buying online: Clearing cache for browsers – wireless LAN-major issues with WLAN-safe browsing guidelines for social networking sites – email security tips – introduction-smartphone security guidelines – purses, wallets, smart phones – platforms, setup and installation-communicating securely with a smartphone.	12
III	Cyber investigation roles: Introduction – role as a cybercrime investigator – the role of law enforcement officers – the role of the prosecuting attorney – incident response: introduction-post mortem versus live forensics – computer analysis for the hacker defender program-network analysis – legal issues of intercepting Wi-Fi transmission – Wi-Fi technology – Wi-Fi RF-scanning RF – eavesdropping on Wi-Fi – fourth amendment expectation of privacy in WLAN	12
IV	Seizure of digital information: introduction – defining digital evidence – digital evidence seizure methodology – factors limiting the wholesale seizure of hardware – other options for seizing digital evidence – common threads within digital evidence seizure – determining the most appropriate seizure method– conducting cyber investigations–demystifying computer/cyber crime – IP addresses – the explosion of networking – interpersonal communication.	12
V	Digital forensics and analyzing data: introduction – the evolution of computer forensics– phases of digital forensics-collection – examination-analysis – reporting – Cyber crime prevention: Introduction – crime targeted at a government agency	12
	Total	60
Comparative analysis and Model Preparation related to the above topic to be discussed (internal exam only)		

Text books

- ❖ Dr. Jeetendra Pande, "Introduction to Cyber Security" Published by Uttarakhand Open University, 2017
- ❖ Anthony reyes, Kevin o'shea, Jim steele, Jon R. Hansen, Captain Benjamin R. Jean Thomas Ralph, —Cyber-crime investigations – bridging the gaps between security professionals, law enforcement, and prosecutors, 2007

Reference books

- ❖ Sebastian Klipper, —Cyber Security – Ein Einblick für Wirtschaftswissenschaftler Fachmedien Wiesbaden, 2015
- ❖ John G. Voller Black and Veatch, —Cyber Security – Published by John Wiley & Sons, Inc., Hoboken, New Jersey Published simultaneously in Canada ©2014.

Web Resources

- ❖ https://www.tutorialspoint.com/fundamentals_of_science_and_technology/cyber_crime_and_cyber_security.htm
- ❖ <https://www.geeksforgeeks.org/cyber-security-tutorial/>
- ❖ https://onlinecourses.nptel.ac.in/noc23_cs127/preview

Mapping with Programme Outcomes: 3 Strong, 2 – Medium, 1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	3	2	3	1	2	1	3	2
CO2	3	3	3	3	3	2	3	2	3	2
CO3	3	3	3	3	3	2	3	2	3	2
CO4	3	3	3	3	3	2	3	2	3	2
CO5	3	3	3	3	3	2	3	2	3	2

Mapping with Programme: Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	2	3
CO2	2	2	3	3	3
CO3	3	3	3	3	2
CO4	3	3	2	3	3
CO5	2	3	3	2	3
Weightage	14	14	14	13	14
Weighted percentage of Course Contribution to Pos	2.8	2.8	2.8	2.6	2.8

SKILL ENHANCEMENT COURSES

SEMESTER IV

SEC I & II

**SKILL ENHANCEMENT COURSE
PRACTICAL VIII: DATA VISUALIZATION LAB**

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S4PCSSP01	SEC Practical - I	Practical	-	-	Y	4	2

Learning Objectives

- ❖ To learn the basic functions and operations of Excel and tableau
- ❖ To explore to design, build, and deploy various charts for applications,
- ❖ To comprehend, design and deploy the label and heat map
- ❖ To understand and deploy dashboard
- ❖ To understand the functions of tableau for data process.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Enable to create and apply Spread sheet and Tableau for various data processing	PO1- PO6
CO2	Gains knowledge to create and design various visualization tools in Excel and Tableau.	PO1- PO6
CO3	Comprehend, create and deploy labels and heat map.	PO1- PO6
CO4	Enable to create and apply dashboard for various data processing	PO1- PO6
CO5	Illustrate and apply data visualization tool for any data set	PO1- PO6

PRACTICAL VIII: DATA VISUALIZATION LAB

LIST OF PROGRAMS	Required hours
Note: Use the following Dataset http://www.tableau.com/sites/default/files/training/global_superstore.zip Implement the following using Excel 1. Create Pie chart for Sales and Sales % by Country (sorted in descending order) 2. Create Bar chart for Sales by Country by Year (rounded to nearest thousand and sorted by Grand Total) 3. Create Line chart for Sales by Ship Mode (First Class, Same Day, Second Class and Standard Class) 4. Create Scatter chart for Sales by Ship Mode by Country (rounded to the nearest dollar and sorted by First Class) 5. Create heat map for Sales by Category by Sub-Category (in thousands and sorted by sales value in descending order) 6. Design and create the label for vendor list 7. Design and create the dash board Implement the following using Tableau 8. Sales by Ship Mode (First Class, Same Day, Second Class and Standard Class) 9. Sales by Ship Mode by Country (rounded to the nearest dollar and sorted by First Class) 10. Sales by Category by Sub-Category (in thousands and sorted by sales value in descending order)	60
Total	60

Mapping with Programme Outcomes: 3 Strong, 2 – Medium, 1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	3	2	3	1	2	1	3	2
CO2	3	3	3	3	3	2	3	2	3	2
CO3	3	3	3	3	3	2	3	2	3	2
CO4	3	3	3	3	3	2	3	2	3	2
CO5	3	3	3	3	3	2	3	2	3	2

Mapping with Programme: Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	2	3
CO2	2	2	3	3	3
CO3	3	3	3	3	2
CO4	3	3	2	3	3
CO5	2	3	3	2	3
Weightage	14	14	14	13	14
Weighted percentage of Course Contribution to Pos	2.8	2.8	2.8	2.6	2.8

Course Coordinator

BOS Chairman

SKILL ENHANCEMENT COURSE
PRACTICAL VIII: SOFT SKILL DEVELOPMENT LAB

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S4PCSSP02	SEC Practical- II	Practical	-	-	Y	4	2

Learning Objectives

- ❖ To enable students to gain basic communication skills in professional and social contexts effectively.
- ❖ To acquire useful words and apply them in situational context
- ❖ To develop listening and reading skills through comprehension passages
- ❖ To enrich the leadership qualities and interpersonal communication
- ❖ To enhance essential characteristics in writing

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Improves the professional communication skills	PO1- PO6
CO2	Apply useful words in the correct situation	PO1- PO6
CO3	Improves the listening and reading skills	PO1- PO6
CO4	Acquire the leadership qualities	PO1- PO6
CO5	Improves the writing ability	PO1- PO6

PRACTICAL VIII : SOFT SKILL DEVELOPMENT LAB

LIST OF PROGRAMS	Required hours
1. Characteristics of Technical Writing 2. Development of Employability Skills 3. Vocabulary Development 4. Sentence Completion 5. Error Spotting 6. Interpretation of Verbal Analogy 7. Interpretation of Reading (Comprehension -Conception) 8. Interpretation of Reading (Comprehension -Reasoning) 9. Practice for writing E-mails/Technical Blogs/Forums 10. PPT Preparation / Demonstration of Technical Presentation 11. Preparation of Resume 12. Preparation for Job Interviews / Mock Interview Section 13. Group Discussion Skills 14. Developing Listening Skill(Comprehension) 15. Practice for Short Speeches / Situational Conversation 16. English through Mass Media 17. Essential Grammar 18. Communicating and collaborating with peer members 19. Team Empowerment 20. Persuasive Communication	60
Total	60

Text books

- ❖ Uma Narula, “Development Communication: Theory and Practice”, Revised Edition, Har-Aanad Publication, 2019.
- ❖ Annette Capel and Wendy Sharp, “Cambridge English: Objective First”, Fourth Edition, Cambridge University Press, 2013.
- ❖ Emma Sue-Prince, “The Advantage: The 7 Soft Skills You Need to Stay One Step Ahead”, First Edition, FT Press, 2013.
- ❖ Guy Brook-Hart, “Cambridge English: Business Benchmark”, Second Edition, Cambridge University Press, 2014.
- ❖ Norman Lewis, “How to Read Better & Faster”, Binny Publishing House, New Delhi, 1978.

Reference books

- ❖ Michael McCarthy and Felicity O., Dell, “English Vocabulary in Use: 100 Units of Vocabulary Reference and Practice”, Cambridge University Press, 1996.
- ❖ Murphy, Raymond, “Intermediate English Grammar”, Second Edition, Cambridge University Press, 1999.

Mapping with Programme Outcomes: 3 Strong, 2 – Medium, 1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	3	2	3	1	2	1	3	2
CO2	3	3	3	3	3	2	3	2	3	2
CO3	3	3	3	3	3	2	3	2	3	2
CO4	3	3	3	3	3	2	3	2	3	2
CO5	3	3	3	3	3	2	3	2	3	2

Mapping with Programme: Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	2	3
CO2	2	2	3	3	3
CO3	3	3	3	3	2
CO4	3	3	2	3	3
CO5	2	3	3	2	3
Weightage	14	14	14	13	14
Weighted percentage of Course Contribution to Pos	2.8	2.8	2.8	2.6	2.8

Course Coordinator

BOS Chairman

EDC-EXTRA DISCIPLINARY COURSE LIST

EDC I– PRINCIPLES OF INFORMATION TECHNOLOGY

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S2PCSN01	EDC I	Theory	Y	Y	-	4	4

Learning Objectives

- ❖ To learn the basic concept and skills associated with information technology
- ❖ To know the Computer hardware and software technologies
- ❖ To gain the knowledge of organizing data
- ❖ To assess the current role of Information Science in an organization
- ❖ To understand how IT relates to organizational goals

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Understand the basics of information technology	PO1, PO2
CO2	Gain the knowledge of Hardware and Software technologies	PO2
CO3	Learn the method of organizing data	PO3,PO4
CO4	Assess the role of Information Science to an organization.	PO5
CO5	Understanding the role of IT in organizations	PO5,PO6

EDC I– PRINCIPLES OF INFORMATION TECHNOLOGY

Unit	Details	No. of Hours
I	Business Environment: Business and Information technology – business in the information age– about information technology– what is an information system– Information Technology in the Modern Organization	12
II	Computer Hardware – Significance of Hardware – Central Processing Unit– Computer Memory – Computer Hierarchy – Input Technologies – Output Technologies. Computer Software: Software History and Significance–System Software– Application Software–Software issues–Programming languages– Enterprise Software.	12
III	Managing Organizational Data and Information: Basics of Data arrangement and Access – Traditional file environment – modern approach: database management systems – logical data models – data warehouses – Networks– Internet- Evolution of the Internet –Operation of the Internet– WWW-Intranets and Extranets.	12
IV	Functional, Enterprises, and Inter organizational Systems: Information system to support business functions – transaction processing information systems – accounting and finance system – marketing and sales system – production and operations management system –Integrated information system and enterprises resource planning– Inter organizational/Global information system -Electronic Commerce.	12
V	Information Systems Development: Information system planning–Traditional systems development life cycle – alternative methods for system development –system development outside the IS department – building Internet and Intranet applications – Implementing: Ethics, Impacts and Security.	12
	Total	60

Text Books

- ❖ “Introduction to Information Technology”, Efraim Turban, R. Kelly Rainer, and Richard E.Potter, Fourth Edition, Wiley, 2015

Reference books

- ❖ V. Rajaraman, “Introduction to Information Technology, ”Prentice Hall of India,2007

Mapping with Programme Outcomes: 3 Strong, 2 – Medium, 1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	3	2	3	3
CO2	3	3	3	3	3	3	3	2	3	3
CO3	3	3	3	3	3	3	3	2	3	3
CO4	3	3	3	3	3	3	3	2	3	3
CO5	3	3	3	3	3	3	3	2	3	3

Mapping with Programme: Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	2	3
CO4	3	3	3	3	3
CO5	3	2	3	3	3
Weightage	15	14	15	14	15
Weighted percentage of Course Contribution to POS	3.0	2.8	3.0	2.8	3.0

Course Coordinator

BOS Chairman

EDC II– FUNDAMENTALS OF COMPUTERS AND COMMUNICATIONS

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S2PCSN02	EDC II	Theory	Y	Y	-	4	4

Learning Objectives

- ❖ Know the basics of Computers
- ❖ Learn the internal Components of Computers
- ❖ Understand the OS and its types
- ❖ Study the basics of networks and Internet
- ❖ Get a clear idea on DBMS and its concepts

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Know the basics and internal parts of Computers	K1, K2
CO2	Gain the knowledge on OS and its types	K2
CO3	Understand the basics of networks and Internet	K3,K4
CO4	Learn the databases and DBMS concepts	K5
CO5	Understand the role of RDBMS in IT	K5,K6

EDC II– FUNDAMENTALS OF COMPUTERS AND COMMUNICATIONS

Unit	Details	No. of Hours
I	Introduction: What is computer – Components of Computers – Advantages and Disadvantages of using computers – Computer Software – Categories of Computers - Elements of information systems. The Components of the Systems Unit: Processor – Data representation – Memory – Mobile Computers and Devices.	12
II	Input and Output Device: What is input – what are input devices – keyboard – pointing device – mouse – other pointing devices – Voice input –Digital Cameras – Video input – Scanners and Reading devices Terminals – Biometric input - Input devices for physically challenged users-Output: What is output – display devices – Monitors – Printers –Speakers, Headphones and Ear phones – output device for physically challenged users – Storage devices.	12
III	Operating Systems and Utility Programs: System software – Operating system – Operating system functions – types of operating systems – standalone operating systems–network operating systems – embedded operating system. Application Software: Application software – Business software – Graphics and Multimedia Software–Application software for Communication.	12
IV	Internet and World Wide Web: Internet – History of the Internet – How the Internet works –WWW– E-commerce– Communications and Networks: Communications – Uses of Computer Communications – Networks - Communication software – Communication devices – Communications Channel – Physical transmission media and Wireless transmission media.	12
V	Database Management: Databases, Data and Information, The Hierarchy of data–Maintaining data – File processing versus databases – database management systems–relational, object oriented and multi dimensional databases – web databases – database administration. Computer Security: Computer security risks – Internet and network attacks –Unauthorized access and use.	12
	Total	60

Text Books

- ❖ “Introduction to Computers”, Gary B. Shelly, Thomas J. Cashman, and Misty E. Vermaat, Tenth Edition, Cengage Learning, 2021

Reference books

- ❖ Reema Thareja, “Fundamentals of Computers”, Oxford Univ. Press, 2015
- ❖ Deborah Morley, Charles S. Parker, “Understanding Computers-Today and Tomorrow”, 14th Edition, Thomson Course Technology, 2012
- ❖ Alexis Leon, Mathew’s Leon, “Fundamentals of Computer Science and Communication Engineering”, Vikas Publishing House, New Delhi, 1998.

Mapping with Programme Outcomes: 3 Strong, 2 – Medium, 1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	3	2	3	3
CO2	3	3	3	3	3	3	3	2	3	3
CO3	3	3	3	3	3	3	3	2	3	3
CO4	3	3	3	3	3	3	3	2	3	3
CO5	3	3	3	3	3	3	3	2	3	3

Mapping with Programme: Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	2	3	2	3
CO4	2	3	3	3	3
CO5	3	3	3	3	3
Weightage	14	14	15	14	15
Weighted percentage of Course Contribution to POs	2.8	2.8	3.0	2.8	3.0

Course Coordinator

BOS Chairman

EDC III– E – COMMERCE

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S3PCSN03	EDC III	Theory	Y	Y	-	4	4

Learning Objectives

- ❖ Know the mercantile and consumer process model
- ❖ Understand the Consumer's and Merchant's perspective
- ❖ Understand the Electronic payment system
- ❖ Earn an in depth idea on electronic data interchange
- ❖ Gain the knowledge on Internet, growth of internet and its commercial uses

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Learn the introduction on e-commerce	PO1, PO2
CO2	Understand the mercantile and consumer process models	PO2
CO3	Analyse the consumers and merchant's perspective on e-commerce	PO3,PO4
CO4	Getting an idea on Electronic Data Interchange	PO5
CO5	Gaining the knowledge on Internet	PO5,PO6

EDC III– E – COMMERCE

Unit	Details	No. of Hours
I	Electronic Commerce – Electronic Commerce Frame work – The Anatomy of Electronic Commerce Applications - Electronic Equipment Consumer Applications - Electronic Commerce Organization Applications - Components of I-Way – Network Access Equipment	12
II	Architecture Framework for Electronic Commerce- World Wide Web as the Architecture – Consumer Oriented Applications – Mercantile Process Models – Mercantile Models from the Consumer’s Perspective and Merchant’s Perspective.	12
III	Electronic Payment Systems: Types of Electronic Payment Systems – Digital Token based Electronic Payment Systems– Smart Card and Credit Card Based Electronic Payment Systems – Risk and Electronic Payment Systems – Designing Electronic Payment Systems.	12
IV	Electronic Data Interchange – EDI Applications in Business – EDI: Legal, Security and Privacy issues EDI and Electronic Commerce – Standardization and EDI-EDI Software Implementation.	12
V	Internet and World Wide Web: origin of the Internet – New uses for the Internet – Commercial use of the Internet–Growth of the Internet – Advertising on the Internet.	12
	Total	60

Text Books

- ❖ “Frontiers of Electronic Commerce”, Ravi Kalakota and Marcia Robinson, Third Edition, Pearson, 2017
- ❖ “Electronic Commerce”, Gray P. Schneider, Fifth Edition, Cengage Learning, 2008

Reference books

- ❖ Kamalesh K. Baja, Debjani Nag, "E-Commerce–The Cutting Edge of Business", TMH Publications, 2005.
- ❖ Agarwala, K.N, Deeksha Agarwala, "Business on the Net: What's and How's of ECommerce;" Macmillan, New Delhi, 2000.
- ❖ Parag Diwan, Sunil Sharma, "Electronic Commerce: A Manager's Guide to EBusiness", Excel books, 2005.

Mapping with Programme Outcomes: 3 Strong, 2 – Medium, 1 – Low

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	3	2	3	3
CO2	3	3	3	3	3	3	3	2	3	3
CO3	3	3	3	3	3	3	3	2	3	3
CO4	3	3	3	3	3	3	3	2	3	3
CO5	3	3	3	3	3	3	3	2	3	3

Mapping with Programme: Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	2
CO2	2	3	3	3	3
CO3	3	2	3	2	2
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	14	14	15	14	13
Weighted percentage of Course Contribution to POs	2.8	2.8	3.0	2.8	2.6

Course Coordinator

BOS Chairman