

SENGUNTHAR ARTS AND SCIENCE COLLEGE

(Autonomous)

NAAC Accreditation A⁺ (2nd Cycle)

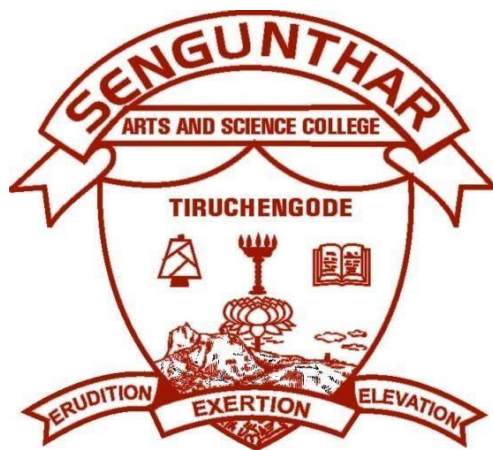
Affiliated to Periyar University, Salem and Approved by AICTE, New Delhi

An ISO 9001:2015 Certified Institution Recognized under section 2(f) and 12(B) of the UGC Act 1956

Tiruchengode – 637 205, Namakkal DT., Tamil Nadu Website:

www.senguarts.edu.in

Email id: info@senguarts.co.in



SYLLABUS

M.C.A

MASTER OF COMPUTER
APPLICATIONS

(CBCS – LOCF)

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

CHAIRMAN

CDC

PRINCIPAL

CORRESPONDENT

INTRODUCTION

MCA (Master of Computer Applications) is a two-year postgraduate degree program approved by AICTE, focusing on advanced computer applications and software development. It aims to provide students with a comprehensive understanding of computer science principles, programming languages, software engineering, and computer applications, as well as expertise in emerging technologies like artificial intelligence, data science, and cloud computing.

The two-year course structure is designed with Foundation courses in computer science, mathematics, and programming, along with core courses in computer applications in the First Year and Specialization courses in areas like AI, Data Science, Cloud Computing, and elective courses, industry internships along with project work in the final year.

The course focuses on industry-ready skills in computer applications, providing a strong foundation for further studies or careers in Software Architect, Technical Lead, Data Scientist, AI/ML Engineer, Cloud Computing Professional, Cyber Security Specialist, IT Consultant Computer Systems Analyst, Network Administrator, Database Administrator Researcher or Academician.

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:

Candidates who have passed in any one of the following or equivalent are eligible to apply:

- i) Bachelor's degree (under 10+2+3/4) in any subject with Mathematics at +2 level.
- ii) Bachelor's degree (under 10+2+3/4-or-10+3-year Diploma + 3 year later entry BE) in any subject with Mathematics / Business Mathematics / Statistics as one of the subjects.

PROGRAM OUTCOMES

REGULATIONS ON LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK FOR POSTGRADUATE	
Programme	M.C.A.
Programme Code	24PCA
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 a 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, beliefs and apply diverse frames of reference to decisions and actions.
	PSO2 - Entrepreneur To create effective entrepreneurs by enhancing their critical thinking, problem solving, decision making and leadership skill that will facilitate start-ups 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.
	PSO5 – 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

**I-YEAR
I SEMESTER**

S. No	Course Category	Course Code	Course	Credit Distribution			Credits	Total Contact Hours/ Week	Marks		
				L	T	P			CI A	ESE	Total
1	CORE - I	24S1PCA01	Discrete Mathematics	3	4	-	5	7	25	75	100
2	CORE - II	24S1PCA02	Linux and shell programming	3	4	-	5	7	25	75	100
3	CORE - III	24S1PCA03	Python Programming	3	3	-	4	6	25	75	100
4	Elective - I	24S1PCAE01/ 24S1PCAE02	Data Engineering and Management/ Architecture and Frameworks	2	1	-	2	3	25	75	100
5	Elective Lab-I	24S1PCAEP01/ 24S1PCAEP02	Data Engineering and Management Lab / Architecture and Frameworks lab	-	-	2	1	2	40	60	100
6	Elective-II	24S1PCAE03/ 24S1PCAE04	Software Development Technologies / Soft Computing	2	1	-	2	3	25	75	100
7	Elective Lab-II	24S1PCAEP03/ 24S1PCAEP04	Software Development Technologies Lab / Soft Computing Lab	-	-	2	1	2	40	60	100
			TOTAL	13	13	04	20	30			700

II SEMESTER

Sl. No	Course Category	Course Code	Course	Credit Distribution			Credits	Total Contact Hours/ Week	Marks		
				L	T	P			CI A	ESE	Total
1	CORE -IV	24S2PCA04	Data Structures and Algorithms	3	3	-	5	6	25	75	100
2	CORE - V	24S2PCA05	Data Mining and Warehousing	3	3	-	5	6	25	75	100
3	CORE Lab-I	24S2PCAP01	Data Structures and Algorithms Lab	-	-	4	4	4	40	60	100
4	Elective-III	24S2PCAE05/ 24S2PCAE06	Internet of Things / Computer Vision	2	1	-	2	3	25	75	100
5	Elective Lab-III	24S2PCAEP05/ 24S2PCAEP06	Internet of Things Lab / Computer Vision Lab	-	-	3	1	3	40	60	100
6	Elective-IV	24S2PCAE07/ 24S2PCAE08	Cyber Security / Block chain Technologies	2	1	-	2	3	25	75	100
7	Elective Lab-IV	24S2PCAEP07/ 24S2PCAEP08	Cyber Security Lab / Block chain Technologies Lab	-	-	3	1	3	40	60	100
8	Common for PG	24S2PHR01	Fundamentals of Human Rights	1	1	-	1	2	25	75	100
			TOTAL	11	09	10	21	30			800

**II-YEAR
III SEMESTER**

Sl. NO	Course Category	Course Code	Course	Credit Distribution			Credits	Total Contact Hours / Week	Marks		
				L	T	P			CIA	ESE	Total
1	CORE -VI	24S3PCA06	Advanced Java Programming	3	3	-	5	6	25	75	100
2	CORE -VII	24S3PCA07	Web Technology	3	3	-	5	6	25	75	100
3	CORE -VIII	24S3PCA08	Advanced Machine Learning	3	3	-	5	6	25	75	100
4	CORE - Lab-II	24S3PCAP02	Advanced Java Programming Lab	-	-	4	4	4	40	60	100
5	CORE - Lab-III	24S3PCAP03	Web Technologies Lab	-	-	4	3	4	40	60	100
6	NME Lab-I	24S3PCANP01	NME Lab I: Integrated Technology (AML) Lab (Self-Study Course)	-	-	4	2	4	40	60	100
7	CORE -IX	24S3PCAI01	Internship and Industrial Activity	-	-	-	2		-	-	100
			TOTAL	9	9	12	26	30			700

IV SEMESTER

Sl. NO	Course Category	Course Code	Course	Credit Distribution			Credits	Total Contact Hours/ Week	Marks		
				L	T	P			CIA	ESE	Total
1	CORE Lab - IV	24S4PCAP04	Industry Dynamics Technology-Data Visualisation Lab	-	-	5	5	5	25	75	100
2	CORE - X	24S4PCA09	Big Data Analytics	3	3		5	6	25	75	100
3	CORE - XI	24S4PCAPR1	Project work and Viva-voce	-	-	10	7	10	50	150	200
4	Elective – V	24S4PCAE09 / 24S4PCAE10	24S4PCAE09 Social Networks / 24S4PCAE10 High Performance Computing	2	1	-	2	3	25	75	100
5	Elective Lab - V	24S4PCAEP09 / 24S4PCAEP10	24S4PCAEP09 Social Networks Lab / 24S4PCAEP10 High Performance Computing Lab	-	-	2	1	2	40	60	100
6	SEC	24S4PCASP01	Soft Skill Development Lab	-	-	4	2	4	40	60	100
7	Extension Activity	24S4PMIEX01	Extension Activity	-	-	-	1				
			TOTAL	5	4	21	23	30			700
	Cumulative Credit Points						90				2900

ELECTIVE LIST

Elective Course – I

24S1PCAE01 Data Engineering and Management
24S1PCAEP01 Data Engineering and Management Lab
24S1PCAE02 Architecture and Frameworks
24S1PCAEP02 Architecture and Frameworks lab

Elective Course – II

24S1PCAE03 Software Development Technologies
24S1PCAEP03 Software Development Technologies Lab
24S1PCAE04 Soft Computing
24S1PCAEP04 Soft Computing Lab

Elective Course – III

24S2PCAE05 Internet of Things
24S2PCAEP05 Internet of Things Lab
24S2PCAE06 Computer Vision
24S2PCAEP06 Computer Vision Lab

Elective Course – IV

24S2PCAE07 Cyber Security
24S2PCAEP07 Cyber Security Lab
24S2PCAE08 Block chain Technologies
24S2PCAEP08 Block chain Technologies Lab

Elective Course – V

24S4PCAE09 Social Networks
24S4PCAEP09 Social Networks Lab
24S4PCAE10 High-Performance Computing
24S4PCAEP10 High-Performance Computing Lab

Skill Enhancement Course - Professional Competency Skill list (anyone)

24S4PCASP01 - Soft Skill Development Lab
24S4PCASP02 - Data Visualization Tools

EDC-EXTRA DISCIPLINARY COURSE LIST

Students are expected to opt EDC (Non major elective) offered to other departments.

1. Principles of Information Technology
2. Fundamentals of Computers and Communications
3. E-Commerce

FIRST YEAR – SEMESTER I

CORE - I - DISCRETE MATHEMATICS

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S1PCA01	Core-I	Theory	Y	Y	-	7	5

Learning Objectives

- ❖ To know the concepts of relations and functions
- ❖ To distinguish among different normal forms and quantifiers
- ❖ To solve recurrence relations and permutations & combinations.
- ❖ To know and solve matrices, rank of matrix & characteristic equations.
- ❖ To study the graphs and its types.

Course Outcomes		
Course Outcomes	On completion of this course, students will	Programme Outcomes
CO1	To understand the concepts of relations and functions distinguish among normal forms	PO2
CO2	To analyze and evaluate the recurrence relations	PO4, PO5
CO3	To distinguish among various normal forms and predicate calculus	PO5
CO4	To solve and know various types of matrices	PO 1
CO5	To evaluate and solve various types of graphs	PO 5

CORE - I - DISCRETE MATHEMATICS

Unit	Details	No. of Hours
I	Relations- Binary relations-Operations on relations- properties of binary relations in a set – Equivalence relations— Representation of a relation by a matrix -Representation of a relation by a digraph – Functions- Definition and examples-Classification of functions-Composition of functions-Inverse function	18
II	Predicate Calculus- Logical connectives- Well-formed formulas – Truth table of well-formed formula –Algebra of proposition – Quine’s method- Normal forms of well-formed formulas- Disjunctive normal form-Principal Disjunctive normal form-Conjunctive normal form-Principal conjunctive normal form- Rules of Inference for propositional calculus – Quantifiers- Universal Quantifiers- Existential Quantifiers	18
III	Recurrence Relations- Formulation -Types of recurrence relations - solving recurrence Relation by Iteration- solving Recurrence Relations- Solving Linear Homogeneous Recurrence Relations of Order Two- Solving Linear Non homogeneous Recurrence Relations. Permutations- Cyclic permutation- Permutations with repetitions- permutations of sets with indistinguishable objects- Combinations- Combinations with repetition Power Point Presentation : Lattices	18
IV	Matrices- special types of matrices-Matrix operations - Determinants-Inverse of a square matrix-Cramer’s rule for solving linear equations-Elementary operations-Rank of a matrix-solving a system of linear equations-characteristic roots and characteristic vectors- Diagonalisation of a matrix - Cayley-Hamilton Theorem-problems.	18
V	Graphs -Connected Graphs -Euler Graphs- Euler line-Hamiltonian circuits and paths –planar graphs – Complete graph-Bipartite graph-Petersen graph-Matrix representation of graphs. Model Presentation : Graphs	18
	Total	90
Power Point Presentation, Model Presentation for the above topic to be considered for Internal Exam Only		

Textbooks

- ❖ N. Chandrasekaran and M. Uma Parvathi, Discrete mathematics, PHI Learning Private Limited, New Delhi, 2015.

Reference Books:

- ❖ Kimmo Eriksson & Hillevi Gavel, Discrete Mathematics & Discrete Models, Student literature AB, 2015.
- ❖ Kenneth H. Rosen Discrete Mathematics and applications, McGraw Hill, 2017

Web Resources

❖ <https://discrete.openmathbooks.org/>

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	2	3	3	3	3	3
CO2	3	3	3	2	3	3	2	3	3	3
CO3	3	2	3	3	2	3	3	2	2	3
CO4	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	2

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	3	2	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	13	15	15	14	15
Weighted percentage of Course Contribution to PSO	2.6	3.0	3.0	2.8	3.0

Course Coordinator

BOS Chairman

CORE - II – LINUX AND SHELL PROGRAMMING

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S1PCA02	Core-II	Theory	Y	Y	-	7	5

Learning Objectives

- ❖ To teach principles of operating system including File handling utilities, Basic Linux commands, Scripts and filters.
- ❖ To familiarize fundamentals of shell (bash), shell programming, pipes, Control structures, arithmetic in shell interrupt processing, functions, and debugging shell scripts.
- ❖ To impart fundamentals of file concepts kernel support for file, File structure related system calls (file API 's).
- ❖ To facilitate students in understanding Inter process communication, semaphore and shared memory.
- ❖ To explore real-time problem solution skills in Shell programming.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	To understand, apply and analyze the concepts and methodology of Linux shell programming	PO1, PO2
CO2	To comprehend, impart and apply fundamentals of control structure and script controls	PO1, PO4
CO3	To understand, analyses and evaluate the functions, graphical desktop interface and editors	PO1-PO6
CO4	To collaborate, apply and review the concepts and methodology of regular expression and advanced gawk	PO6
CO5	To comprehend, use and illustrate the advanced concepts such as alternate shell script, data connectivity and bash scripting using python	PO1- PO6

CORE - II – LINUX AND SHELL PROGRAMMING

Unit	Details	No. of Hours
I	Basic bash Shell Commands: Interacting with the shell-Traversing the file system-Listing files and directories-Managing files and directories-Viewing file contents. Basic Script Building: Using multiple commands-Creating a script file-Displaying messages-Using variables-Redirecting input and output-Pipes-Performing math-Exiting the script. Using Structured Commands: Working with the if-then statement-Nesting ifs-Understanding the test command-Testing compound conditions-Using double brackets and parentheses	18
II	More Structured Commands: Looping with for statement-Iterating with the until statement-Using the while statement-Combining loops-Redirecting loop output. Handling User Input: Passing parameters-Tracking parameters-Being shifty-Working with options-Standardizing options-Getting user input. Script Control: Handling signals-Running scripts in the background-Forbidding hang-ups - Controlling a Job-Modifying script priority-Automating script execution. Practical Implementation : Loops with Example	18
III	Creating Functions: Basic script functions-Returning a value-Using variables in functions-Functions with arguments-Array and variable functions-Function recursion-Creating a library-Using functions on the command line. Writing Scripts for Graphical Desktops: Creating text menus-Building text window widgets-Adding X Window graphics. Introducing sed and gawk: Learning about the sed Editor-Getting introduced to the gawk Editor-Exploring sed Editor basics. Power Point Presentation: Functions	18
IV	Regular Expressions: Defining regular expressions-Looking at the basics-Extending our patterns-Creating expressions. Advanced sed: Using multiline commands-Understanding the hold space-Negating a command-Changing the flow-Replacing via a pattern-Using sed in scripts-Creating sed utilities-Advanced awk. Advanced gawk: Using variables in gawk-Using structured commands-Formatting the printing-Working with functions	18
V	INTER PROCESS COMMUNICATION: Pipe, process pipes, the pipe call, parent and child processes, and named pipes: fifos, semaphores: semget, semop, semctl, message queues: msgget, msgsnd, msgrcv, msgctl, shared memory: shmget, shmat, shmdt, shmctl, Self-Study: ipc status commands.	18
	Total	90
Practical Implementation and Power Point Presentation for the above topic to be considered for Internal Exam Only		

Textbook:

- ❖ Richard Blum, Christine Bresnahan, —Linux Command Line and Shell Scripting BIBLE, Wiley Publishing, 3rd Edition, 2015. **Chapters:** 3, 11 to 14, 16 to 25.
- ❖ Mokhtar Ebrahim, Andrew Mallett, —Mastering Linux Shell Scripting, Packt Publishing, 2nd Edition, 2018. **Chapter:** 14.

Reference Books:

- ❖ CliffFlynt, Sarath Lakshman, ShantanuTushar, Linux Shell Scripting Cookbook II, Packt Publishing, 3rd Edition, 2017.
- ❖ Stephen G.Kochan, Patrick Wood, Shell Programming in Unix, Linux, and OS XII, Addison Wesley Professional, 4th Edition, 2016.
- ❖ Robert Love, Linux System ProgrammingII, O'Reilly Media, Inc, 2013
- ❖ W.R. Stevens, Advanced Programming in the UNIX environmentII, 2nd Edition, Pearson Education, 2013
- ❖ Graham Glass, King Ables, UNIX for Programmers and UsersII, 3rd Edition, Pearson Education, 2003

Web Resources

- ❖ <https://www.geeksforgeeks.org/introduction-linux-shell-shell-scripting/>

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

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

Mapping with Programme Specific Outcomes:

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

Course Coordinator

BOS Chairman

CORE - III - PYTHON PROGRAMMING

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S1PCA03	Core-III	Theory	Y	Y	-	6	4

Learning Objective

- ❖ To acquire programming skills in core Python
- ❖ To learn Strings and function
- ❖ To develop object oriented skills in Python
- ❖ To comprehend various Python Packages
- ❖ To develop web applications using Django

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Comprehend the programming skills in python and develop applications using conditional branches and loop	PO1, PO2
CO2	Create python applications with strings and functions	PO1, PO4
CO3	Understand and implement the object oriented Programming paradigm with the concept of objects and classes, Inheritance and polymorphism	PO1, PO2
CO4	Evaluate the use of Python packages to perform numerical computations and data visualization	PO6
CO5	Design interactive web applications using Django	PO1- PO6

CORE - III - PYTHON PROGRAMMING

Unit	Details	No. of Hours
I	Introduction : Fundamental ideas of Computer Science - Strings, Assignment, and Comments-Numeric Data types and Character sets – Expressions – Loops and Selection Statements: Definite iteration: the for Loop - selection: if and if-else statements - Conditional iteration: the while Loop	18
II	Strings and Text Files: Accessing Characters and substrings in strings - Data encryption- Strings and Number systems- String methods – Modify strings– Text - Lists and Dictionaries: Lists – Dictionaries – Design with Functions: A Quick review - Problem Solving with top-Down Design - Design with recursive Functions - Managing a Program's namespace - Higher-Order Functions *Practical Implementation : String Functions	18
III	Design with Classes: Getting inside Objects and Classes – Data-Modeling Examples – Building a New Data Structure – The Two Dimensional Grid - Structuring Classes with Inheritance and Polymorphism - Graphical User Interfaces - The Behaviour of terminal-Based programs and GUI-Based programs - Coding Simple GUI-Based programs - Windows and Window Components - Command Buttons and responding to events	18
IV	Python File Operations: Reading files, Writing files in python, Understanding read functions, read(), readline(), readlines(). Understanding write functions, write() and writelines() Manipulating file pointer using seek Programming, using file operations. Database Programming: Connecting to a database, Creating Tables, INSERT, UPDATE, DELETE and READ operations, Transaction Control, Disconnecting from a database, Exception Handling in Databases. Self-Study: File Handling in Python	18
V	Django: Installing Django – Building an Application – Project Creation – Designing the Data Schema - Creating an administration site for models - Working with Query Sets and Managers – Retrieving Objects – Building List and Detail Views Power Point Presentation : Connecting Database	18
	Total	90
Practical Implementation and Power Point Presentation for the above topic to be considered for Internal Exam Only		

Textbooks

- ❖ K.A. Lambert, Fundamentals of Python: first programs, Second Edition, Cengage
- ❖ Learning, 2019 (Unit - I, II and III)
- ❖ Jeeva Jose & P.SojanLal, “Introduction to Computing and Problem Solving with PYTHON”, Khanna Publishers, New Delhi, 2016
- ❖ Antonio Mele, Django 3 By Example, Third Edition, 2020 (Unit - V)

Web Resources

- ❖ <https://pythoninstitute.org/>
- ❖ <https://www.python.org/about/gettingstarted/>
- ❖ <https://www.programiz.com/python-programming/examples>

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

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

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	3	2	3
CO2	3	2	3	2	3
CO3	3	2	3	2	3
CO4	3	2	3	3	3
CO5	3	2	3	3	3
Weightage	15	10	15	12	15
Weighted percentage of Course Contribution to POs	3.0	2.0	3.0	2.4	3.0

Course Coordinator

BOS Chairman

CORE - IV - DATA STRUCTURES AND ALGORITHMS

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S2PCA04	Core-IV	Theory	Y	Y	-	6	5

Learning Objectives

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

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Understand various ADT concepts	PO1
CO2	Familiar with implementation of ADT models with Python language and understanding how to develop ADT for the various real-time problems	PO2, PO4
CO3	Apply with proper ADT models with problem understanding	PO5
CO4	Apply and analyze right models based on the problem domain	PO5, PO6
CO5	Evaluate modern data structures with Python language	PO5, PO6

CORE - IV - DATA STRUCTURES AND ALGORITHMS

Unit	Details	No. of Hours
I	Abstract Data Types: Introduction-Data Abstract Data Type-Bags-Iterators. Arrays: Array Structure-Python List-Two-Dimensional Arrays-Matrix Abstract Data Type. Sets, Maps: Sets-Maps- Multi-Dimensional Arrays.	18
II	Algorithm Analysis: Experimental Studies Seven Functions-Asymptotic Analysis. Recursion: Illustrative Examples-Analyzing Recursive Algorithms-Linear Recursion- Binary Recursion-Multiple Recursion.	18
III	Stacks, Queues, and Deques: Stacks- Queues- Double-Ended Queues Linked- Stack implementation in different Languages. Lists: Singly Linked Lists-Circularly Linked Lists-Doubly Linked Lists. Trees: General Trees-Binary Trees-Implementing Trees-Tree Traversal Algorithms. Practical Implementation: Stack Operations	18
IV	Priority Queues: Priority Queue Abstract Data Type-Implementing a Priority Queue-Heaps-Sorting with a Priority Queue-Efficient way to initialize priority queues. Maps, Hash Tables, and Skip Lists: Maps and Dictionaries-Hash Tables-Sorted Maps-Skip Lists-Sets, Multi sets, and Multi maps.	18
V	SEARCHING, SORTING AND HASHING TECHNIQUES: Searching – Linear Search – Binary Search. Sorting – Bubble sort – Selection sort – Insertion sort – Shell sort – Merge Sort – Hashing – Hash Functions – Separate Chaining – Open Addressing –Rehashing – Extendible Hashing Self-Study: Hash functions*.	18
	Total	90
Practical Implementation for the above topic to be considered for Internal Exam Only		

Textbooks

- ❖ Rance D. Necaise, —Data Structures and Algorithms Using Pythonl, John Wiley & Sons, 2011. (Unit – 1)**Chapters:** 1, 2, 3.
- ❖ Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, —Data Structures and Algorithms in Pythonl, John Wiley & Sons, 2013. (Unit – 2, 3, 4, and 5)
Chapters: 3 to 12, and 14.

Reference books

- ❖ Dr.BasantAgarwal; Benjamin Baka, —Hands-On Data Structures and Algorithms with Python: Write complex and powerful code using the latest features of Python 3.7l, Packt Publishing, 2018.
- ❖ Magnus Lie Hetland, —Python Algorithms: Mastering Basic Algorithms in the Python Language, Apress, 2014.

Web Resources

- ❖ <https://www.geeksforgeeks.org/learn-data-structures-and-algorithms-dsa-tutorial/>
- ❖ <https://techdevguide.withgoogle.com/paths/data-structures-and-algorithms/>
- ❖ <https://www.youtube.com/watch?v=2ZLl8GAk1X4>

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

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

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	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to POs	3.0	3.0	3.0	3.0	3.0

Course Coordinator

BOS Chairman

CORE - V - DATA MINING AND WAREHOUSING

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S2PCA05	Core-V	Theory	Y	Y	-	6	5

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
CO2	Understand the Association rules, Clustering techniques and Data warehousing contents	PO2, PO4
CO3	Compare the evaluate different data mining techniques like classification, prediction, Clustering and association rule mining	PO5
CO4	Design data warehouse with dimensional modelling and apply OLAP operations	PO5
CO5	Identify appropriate data mining algorithms to solve real world problems	PO6

CORE - V - DATA MINING AND WAREHOUSING

Unit	Details	No. of Hours
I	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 – Knowledge management- a statistical perspective on data mining – similarity measures – decision trees – neural networks – genetic algorithms.	18
II	Classification: Introduction – Statistical – based algorithms - distance – based algorithms-decision tree - based algorithms - neural network – based algorithms – rule - based algorithms – combining techniques. PPT Presentation : Classification Methods	18
III	Clustering: Introduction – Types of clustering-Similarity and Distance Measures – Outliers – Hierarchical Algorithms - Partitional Algorithms. Association rules: Introduction - large item sets - basic algorithms – parallel & distributed algorithms – comparing approaches-incremental rules – advanced association rules techniques – measuring the quality of rules. Model Presentation : Clustering Methods	18
IV	Data warehousing: introduction - characteristics of a data warehouse – Issues Occur while Building the Warehouse -data marts – other aspects of data mart. Online analytical processing: introduction - OLTP & OLAP systems Data modeling –star schema for multi dimensional view –data modeling – multi fact star schema or snow flake schema – OLAP TOOLS – State of the market – OLAP TOOLS and the internet. Self-Study: Difference between OLAP and OLTP in DBMS	18
V	Building a Data Warehouse Project Structure of the Data warehouse, Data warehousing and Operational Systems, Organizing for building data warehousing, Important considerations – Tighter integration, Empowerment, Willingness Business Considerations: Return on Investment Design Considerations, Technical Consideration, Implementation Consideration, Benefits of Data warehousing.	18
	Total	90
Power Point Presentation and Model Presentation for the above topic to be considered for Internal Exam Only		

Text Books

- ❖ Margaret H. Dunham, —Data Mining: Introductory and Advanced Topics, Pearson education, 2003.
- ❖ C.S.R. Prabhu, — Data Warehousing Concepts, Techniques, Products and Applications, PHI, Second Edition.
- ❖ George M. Marakas Modern Data Warehousing, Mining, and Visualization: Core Concepts, Prentice Hall, 1st edition

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.
- ❖ Jiawei Han &MichelineKamber, —Data Mining Concepts & Techniques, 2001, Academic press.

Web Resources

- ❖ <https://www.geeksforgeeks.org/difference-between-data-warehousing-and-data-mining/>
- ❖ <https://www.javatpoint.com/data-mining>
- ❖ <https://courses.lumenlearning.com/wm-introductiontobusiness/chapter/reading-managing-data/>

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

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

Mapping with Programme Specific Outcomes:

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

Course Coordinator

BOS Chairman

CORE LAB - I - DATA STRUCTURES AND ALGORITHMS

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S2PCAP01	Core Lab - I	Practical	-	-	Y	4	4

Learning Objectives

- ❖ To understand Stack, Queue and Doubly Linked ADT structures.
- ❖ To implement different ADT structures with real-time scenarios.
- ❖ To analyze the recursion concepts.
- ❖ To apply different sorting and tree techniques.
- ❖ To implement modern data structures with Python language.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Strong understanding in various ADT concepts	PO1
CO2	To become a familiar with implementation of ADT models	PO2- PO6
CO3	Apply sort and tree search algorithms	PO3
CO4	Evaluate the different data structure models	PO4
CO5	Learn how to develop ADT for the various real-time problems	PO1- PO6

CORE LAB - I - DATA STRUCTURES AND ALGORITHMS

Implement the following problems using Python 3.4 and above

Program List	No.Of Hours
1. Recursion concepts i. Linear recursion ii. Binary recursion. 2. Stack ADT. 3. Queue ADT. 4. Doubly Linked List ADT. 5. Heaps using Priority Queues. 6. Merge sort. 7. Quick sort. 8. Binary Search Tree. 9. Minimum Spanning Tree. 10. Depth First Search Tree traversal.	60
Total	60

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

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

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	3
CO2	3	3	2	3	2
CO3	3	3	2	3	2
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	12	15	13
Weighted percentage of Course Contribution to POs	3.0	3.0	2.4	3.0	2.6

Course Coordinator

BOS Chairman

CORE - VI - ADVANCED JAVA PROGRAMMING

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S3PCA06	CORE	Theory	Y	Y	-	6	5

Learning Objectives

- ❖ To gain knowledge of Object-Oriented Programming Concept in Java
- ❖ To understand usages of String functions in Java
- ❖ To familiarize with the applet and swing
- ❖ To grasp the concepts on Java Beans
- ❖ To comprehend the connection between Relational Database and Java.

Course Outcomes		
Course Outcomes	On completion of this course, students will	Programme Outcomes
CO1	Understand the Object-Oriented Program including classes and methods; inheritance and exception handling	PO2
CO2	Complete comprehension of String functions and I/O Streams	PO4, PO5
CO3	Creation of graphical representation using Applet	PO5
CO4	Application of Servlets for designing Web based applications	PO 1
CO5	Usage of JDBC connectivity and implementation of the concept to get desired results from database	PO 5

CORE - VI - ADVANCED JAVA PROGRAMMING

Unit	Details	No. of Hours
I	An Overview of Java: Object Oriented Programming- Data Types, Variables, and Arrays: Primitive Types-Literals Variables - Type Conversion and Casting- Arrays-Operators: Control Statements-Classes and Methods – Inheritance- Exception Handling	18
II	String Handling: The String Constructors - String Length - Special String Operations - Character Extraction - String Comparison - Searching Strings - Modifying a String - Input/Output: The I/O Classes and Interfaces – File - Byte Streams - Character Streams.	18
III	The Applet Class: Basic Architecture - Applet Skeleton - Display methods - Status Window – Passing Parameters. Introducing GUI Programming with Swing– Introducing Swing - Swing Is Built on the AWT- Two Key Swing Features - The MVC Connection - Components and Containers - The Swing Packages - A Simple Swing Application - Exploring Swing.	18
IV	Java Beans: Introduction - Advantages of Beans – Introspection - The JavaBeans API - A Bean Example. Servlets: Life Cycle Simple Servlet-Servlet API-Packages-Cookies session tracking.	18
V	Network Programming: Working with URLs- Working with Sockets - Remote Method Invocation. Introduction to Database Management Systems - Tables, Rows, and Columns - Introduction to the SQL SELECT Statement - Inserting Rows - Updating and Deleting Existing Rows - Creating and Deleting Tables - Creating a New Database with JDBC - Scrollable Result Sets	18
	Total	90
Power Point Presentation, Model Presentation for the above topic to be considered for Internal Exam Only		

Text books :

1. Herbert Schildt, —Java the Complete Referencel, 10th edition, McGraw Hill Publishing Company
Ltd, New Delhi, 2017.
2. Tony Goddis, —Starting out with Java from Control Structures Through Objectsll 6th Edition,
Pearson Education Limited, 2016

Reference Books:

1. Herbert Schildt, Dale Skrien, —Java Fundamentals – A Comprehensive Introductionll, TMGH Publishing Company Ltd, New Delhi, 2013
2. John Dean, Raymond Dean, —Introduction to Programming with JAVA – A Problem Solving Approachll, TMGH Publishing Company Ltd, New Delhi,20

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	2	3	3	3	3	3
CO2	3	3	3	2	3	3	2	3	3	3
CO3	3	2	3	3	2	3	3	2	2	3
CO4	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	2

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	3	2	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	13	15	15	14	15
Weighted percentage of Course Contribution to PSO	2.6	3.0	3.0	2.8	3.0

Course Coordinator

BOS Chairman

CORE - VII - WEB TECHNOLOGY

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S3PCA07	CORE	Theory	Y	Y	-	6	5

Learning Objectives

- ❖ Understand the fundamentals of the web and thereby develop web applications using various development languages and tools.
- ❖ Enrich knowledge about XHTML control and Cascading Style Sheets.
- ❖ Provide in- depth knowledge about Javascript.
- ❖ To enhance knowledge in XML documents with presentations using CSS and XSLT.
- ❖ Deliver depth knowledge about PHP, Angular JS, JQuery.

Course Outcomes		
Course Outcomes	On completion of this course, students will	Programme Outcomes
CO1	Design dynamic web pages using Javascript, JQuery and Angular Java script	PO2
CO2	Develop Web pages using HTML, CSS and XML	PO4,PO5
CO3	Create web application using PHP and MySQL	PO5
CO4	To design dynamic web pages using Angular javascript	PO 1
CO5	Develop interactive web pages using JQuery	PO 5

CORE - VII - WEB TECHNOLOGY

Unit	Details	No. of Hours
I	WEB FUNDAMENTALS AND HTML: A Brief Introduction to the Internet - The World Wide Web - Web Browsers - Web Servers -URLs, MIME, HTTP, Security- Introduction to HTML- Origins and Evolution of HTML and HTML - Basic Syntax - Standard HTML Document Structure - Basic Text Markup - Images- Hypertext Links - Lists, Tables, Forms, The Audio Element, The Video Element - Organization Elements, The Time Element	18
II	INTRODUCTION TO XHTML AND CSS: Basic syntax, Standard structure, Basic text-markup, Images, Hypertext Links. Lists, Tables, Forms, Frames, syntactic differences between HTML and XHTML-Introduction, Levels of style sheets, Style specification formats, Selector forms, Property value forms, Font properties, List properties, Color, Alignment of text, The box model, Background images, The and <div>tags, Conflict resolution.	18
III	THE BASICS OF JAVASCRIPT: Overview of JavaScript, Object orientation and JavaScript, general Syntactic characteristics, Primitives, operations, and expressions, Screen output and keyboard input, Control statements, Object creation and modification, Arrays, Functions, Constructors, Pattern matching using regular expressions, Errors in scripts. JAVASCRIPT AND XHTML DOCUMENTS: The JavaScript Execution Environment, The Document Object Model, Elements Access in Java Script, Events and Event Handling, Handling Events from Body Elements, Handling Events from Text Box and password Elements, The DOM2 Model	18
IV	DYNAMIC DOCUMENTS WITH JAVASCRIPT AND XML: Introduction, Positioning Elements, Moving Elements, Element Visibility, Changing Color and Fonts, Dynamic Content, Stacking Elements, Locating the Mouse Cursor, Reacting to a Mouse Click, Slow Movement of Elements, Dragging and Dropping Elements. Introduction to XML, Syntax of XML, XML Document Structure, Document type definitions, Namespaces, XML schemas, displaying raw XML documents, Displaying XML documents with CSS, XSLT Style Sheets, Web services.	18
V	PHP, ANGULAR JS AND JQUERY: Introduction to PHP: Overview of PHP -General Syntactic Characteristics - Primitives, Operations, and Expressions - Output - Control Statements - Arrays - Functions - Pattern Matching - Form Handling - Cookies - Session Tracking - Introduction to JQuery, Syntax, selectors, events, JQuery HTML, JQuery Effects, JQuery CSS. Introduction to Angular JS, Directives, Expressions, Controllers, Filters, Services, Events, Forms, Validations, Examples	18
	Total	90
Power Point Presentation, Model Presentation for the above topic to be considered for Internal Exam Only		

Text books :

- Robert W. Sebesta: Programming the World Wide Web, Eighth Edition, Pearson education, 2015.
UNITS: 1,2,3,4
- Dayley Brad, Dayley Brendan ,|AngularJS, JavaScript, and jQuery All in One|, Sams Teach Yourself 1st Edition, Kindle Edition, 2015.**UNIT:** 5

Reference Books:

1. M. Srinivasan: Web Programming Building Internet Applications, 3rd Edition, Wiley India, 2009.
2. Jeffrey C. Jackson: Web Technologies-A Computer Science Perspective, Pearson Education, 7th Impression, 2012.
3. Chris Bates: Web Technology Theory and Practice, Pearson Education, 2012.
4. Raj Kamal: Internet and Web Technologies, McGraw Hill Education.

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	2	3	3	3	3	3
CO2	3	3	3	2	3	3	2	3	3	3
CO3	3	2	3	3	2	3	3	2	2	3
CO4	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	2

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	3	2	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	13	15	15	14	15
Weighted percentage of Course Contribution to PSO	2.6	3.0	3.0	2.8	3.0

Course Coordinator**Bos Chairman**

CORE - VIII ADVANCED MACHINE LEARNING

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S3PCA08	CORE -VIII	Theory	Y	Y	-	6	5

Learning Objectives

- ❖ To understand the concepts of Machine Learning.
- ❖ To understand the theoretical and practical aspects of types of machine learning
- ❖ To teach and get familiarized with supervised learning and their applications.
- ❖ To teach and get familiarized with the concepts and algorithms of unsupervised learning.
- ❖ To appreciate the concepts and algorithms of deep learning.

Course Outcomes		
Course Outcomes	On completion of this course, students will	Programme Outcomes
CO1	To understand, impart and analyze the concepts and of Machine Learning Techniques and types of data.	PO2
CO2	To comprehend, apply and evaluate the classification techniques for real-world applications .	PO4,PO5
CO3	To understand, use and perform evaluation of Regression methods.	PO5
CO4	To recognize, implement and analyse the unsupervised techniques for real-world applications.	PO 1
CO5	To understand, identify, implement and review the deep learning techniques for real-time applications.	PO 5

ADVANCED MACHINE LEARNING

Unit	Details	No. of Hours
I	Introducing Machine Learning: The Origins of Machine Learning, Uses and Abuses of Machine Learning _ Basics of Machine Learning Algorithm Model Works - Steps to apply Machine Learning - Choosing a Machine Learning Algorithm - Using Machine Learning concepts. Managing and Understanding Data: Data Structures, Vectors And Factors: Lists, Data frames, Matrixes and arrays - Managing Data - Exploring and Understanding Data: Exploring the Structure of Data, Exploring Numeric variables - Exploring Categorical Variables- Exploring Relationships between Variables.	18
II	Lazy Learning – Classification Using Nearest Neighbors:The kNN Algorithm- Diagnosing Breast Cancer with the kNN Algorithm- Probabilistic Learning – Classification Using Naive Bayes: Basic concepts of Bayesian Methods- The Naïve Bayes Algorithm- Example – filtering Mobile Phone Spam with the Naive Bayes Algorithm. Divide and Conquer – Classification Using Decision Trees and Rules: Understanding Decision Trees- Example – Identifying Risky Bank Loans using C5.0 Decision Trees- Understanding Classification Rules- Example – Identifying Poisonous Mushrooms with Rule Learners.	18
III	Forecasting Numeric Data – Regression Methods:Understanding Regression- Example – Predicting Medical Expenses using Linear Regression- Understanding Regression Trees and Model Trees- Example – Estimating the Quality of Wines with Regression Trees and Model Trees. Black Box Methods Neural Networks and Support Vector Machines: Understanding Neural Networks, from Biological to Artificial Neurons, Activation Functions, Network Topology, Training Neural Networks with Backpropagation - Modeling the Strength of Concrete with ANNs- Understanding Support Vector Machines- Performing OCR with SVMs- Finding Patterns – Market Basket Analysis Using Association Rules: Understanding Association Rules- Example – Identifying Frequently Purchased Groceries with Association Rules.	18
IV	Finding Groups of Data – Clustering with K-Means: Understanding Clustering- The k-means Algorithm for clustering- Finding teen market segments using k-means Clustering- Evaluating Model Performance: Measuring Performance for Classification- Beyond Accuracy – other Measures of Performance, Visualizing Performance Tradeoffs. Improving Model Performance: Tuning Stock Models for Better Performance- Using Caret for Automated Parameter Tuning- Creating a simple Tuned Model- Customizing the Tuning Process- Improving Model Performance with meta-learning- Understanding Ensembles- Bagging- Boosting- Random forests.	18
V	Introduction to Deep Learning: Introduction to Deep Learning, Single Layer Perceptron Model (SLP), Multilayer Perceptron Model (MLP), Convolutional Neural Networks (CNNs), Recurrent Neural Networks (RNNs), Restricted Boltzmann Machines (RBMs). Convolutional Neural Networks (CNNs): Structure and Properties of CNNs - Components of CNN Architectures- Convolutional Layer, Pooling Layer, Rectified Linear Units (ReLU) Layer, Fully Connected (FC) Layer, Loss Layer - Tuning Parameters ,Notable CNN Architectures, Regularization- Recurrent Neural Networks (RNNs): Fully Recurrent Networks, Training RNNs with Back-Propagation Through Time (BPPT)- Elman Neural Networks, Neural History Compressor, Long Short-Term Memory (LSTM), Traditional and Training LSTMs - Structural Damping Within RNNs, Tuning Parameter Update Algorithm	18
	Total	90
Power Point Presentation, Model Presentation for the above topic to be considered for Internal Exam Only		

Textbooks

- ❖ Brett Lantz, —Machine Learning with R, Addison-Wesley Packt Publishing, 2013.
- ❖ TawehBeysolow, —Introduction to Deep Learning Using R: A Step-by-Step Guide to Learning and Implementing Deep Learning Models Using R, San Francisco, California, USA, 2017.

Reference Books:

- ❖ Daniel T. Larose, Chantal D. Larose, —Data mining and Predictive analytics, Second Ed., Wiley Publication, 2015.
- ❖ Bertt Lantz, —Machine Learning with R: Expert techniques for predictive modeling, 3rd Edition, April 15, 2019,
- ❖ Jason Bell, —Machine Learning: Hands-On for Developers and Technical Professionals, Wiley Publication, 2015.

Web Resources

- ❖ <https://www.geeksforgeeks.org/machine-learning/machine-learning/>

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	2	3	3	3	3	3
CO2	3	3	3	2	3	3	2	3	3	3
CO3	3	2	3	3	2	3	3	2	2	3
CO4	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	2

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	3	2	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	13	15	15	14	15
Weighted percent age of Course Contribution to PSO	2.6	3.0	3.0	2.8	3.0

Course Coordinator**BOS Chairman**

CORE - LAB II: ADVANCED JAVA PROGRAMMING LAB

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S3PCAP02	CORE Lab II	Practical	-	-	Y	4	4

Learning Objectives

- ❖ To implement object oriented concepts in JAVA.
- ❖ Develop the program using concepts Network programme.
- ❖ Learn how to create a program in java beans.
- ❖ Learn how to connect relational database to Java.
- ❖ Develop the program using concepts Applet.

Course Outcomes		
Course Outcomes	On completion of this course, students will	Programme Outcomes
CO1	Implement classes, objects, members of a class and the relationships among them needed for a finding the solution to specific problem	PO1,PO2
CO2	Apply Applets and Swing programs.	PO3
CO3	Develop Servlets and JSP for creating Web based applications using JDBC.	PO4.PO5

CORE - LAB II: ADVANCED JAVA PROGRAMMING LAB

Program List	No. of Hours
1. Implementation of and Exception handling concepts with different type of Exception. 2. Build a Swing application to implement metric conversion. 3. Use Grid Layout to design a calculator and simulate the functions of a simple calculator. 4. Create a Color palette with a matrix of buttons using Applet. 5. To invoke a servlet from HTML forms. 6. To invoke servlet from Applets. 7. To invoke servlet from JSP. 8. Implement message communication using Network Programming. 9. Write a program to connect databases using JDBC. 10. Implementation of Java Beans.	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	1	1	1	1	1	3	2	2
CO2	3	2	3	2	2	1	1	2	3	1
CO3	3	3	3	1	1	1	2	2	2	2
CO4	3	3	3	1	1	3	2	2	3	3
CO5	3	3	3	3	1	2	3	2	2	2

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	3	2	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	13	15	15	14	15
Weighted percentage of Course Contribution to PSO	2.6	3.0	3.0	2.8	3.0

Course Coordinator

BOS Chairman

CORE - LAB III: WEB TECHNOLOGIES LAB

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S3PCAP03	CORE Lab III	Practical	-	-	Y	4	3

Learning Objectives

- ❖ Learn how to create web pages using HTML, CSS and Javascript.
- ❖ Implement dynamic web pages using Javascript, JQuery and Angular Java script.
- ❖ To create web applications using PHP and MySQL.
- ❖ Create web pages using XML and Cascading Style Sheets.
- ❖ Create XML documents and Schemas.

Course Outcomes		
Course Outcomes	On completion of this course, students will	Programme Outcomes
CO1	Design dynamic web pages using JavaScript, JQuery and Angular Java script	PO1
CO2	Develop Web pages using HTML, CSS and XML.	PO2
CO3	Create web application using PHP and MySQL .	PO3.PO4
CO4	Develop interactive web pages using JQuery	PO2,PO4
CO5	To design dynamic web pages using Angular javascript	PO4,PO5

CORE - LAB III: WEB TECHNOLOGIES LAB

Program List	No. of Hours
1. Develop a web page to display your education details in a tabular format. 2. Develop a web page to display your CV on a web page. 3. Design a Homepage having three links: About Us, Our Services and Contact Us Create separate web pages for the three links. 4. Design a web page to demonstrate the usage of inline CSS, internal CSS and external CSS. 5. Design an XML document and create a style sheet in CSS & display the document in the browser. 6. Develop a web page to Create image maps. 7. Design a web page to perform input validation using Angular Javascript. 8. Develop a web page in PHP to fetch details from the database. 9. Design a web page to hide paragraph using JQuery 10. Create a web page and add Javascript to handle mouse events and form events	60
Total	60

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

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

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	3	2	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	13	15	15	14	15
Weighted percentage of Course Contribution to PSO	2.6	3.0	3.0	2.8	3.0

Course Coordinator**BOS Chairman**

CORE - LAB- IV
INDUSTRY DYNAMICS TECHNOLOGY-DATA VISUALISATION LAB

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S4PCAP04	CORE – Lab - IV	Practical	-	-	Y	5	5

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	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

CORE - LAB- IV
INDUSTRY DYNAMICS TECHNOLOGY-DATA VISUALISATION LAB

Program List	No.of 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 char 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)	75
Total	75

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	2	1	2	3	0	0	0	0
CO2	3	2	3	3	3	2	0	0	0	0
CO3	3	3	3	3	3	3	0	0	0	0
CO4	3	2	2	3	2	1	0	0	0	0
CO5	2	3	2	1	3	2	0	0	0	0

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	3	2	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	13	15	15	14	15
Weighted percentage of Course Contribution to PSO	2.6	3.0	3.0	2.8	3.0

Course Coordinator

BOS Chairman

CORE – X BIG DATA ANALYTICS

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S4PCA09	CORE -- X	Theory	Y	Y	-	6	5

Learning Objectives

- ❖ To introduce big data tools & Information Standard formats.
- ❖ To understand the basic concepts of big data.
- ❖ To learn Hadoop, HDFS and MapReduce concepts.
- ❖ To teach the importance of NoSQL.
- ❖ To explore the big data tools such as Hive, HBase and Pig.

Course Outcomes		
Course Outcomes	On completion of this course, students will	Programme Outcomes
CO1	To understand, illustrate and evaluate the concepts and techniques of Data Science, Big Data Analytics and its tools	PO1-PO6
CO2	To collaborate, apply and review the computing for big data in Hadoop, and NoSQL environment.	PO1-PO6
CO3	To comprehend, implement and review the concepts of data science and big data analytics projects using MapReduce, and MongoDB	PO1-PO6
CO4	To understand, use and analyze the concepts of big data analytics projects using HIVE database.	PO1-PO6
CO5	To illustrate, develop and review the concepts of PIG database in Hadoop environment.	PO1-PO6

BIG DATA ANALYTICS

Unit	Details	No. of Hours
I	Big Data and Analytics: Classification of Digital Data: Structured Data- Semi Structured Data and Unstructured Data. Introduction to Big Data: Characteristics – Evolution – Definition - Challenges with Big Data - Other Characteristics of Data - Big Data - Traditional Business Intelligence versus Big Data - Data Warehouse and Hadoop. Environment Big Data Analytics: Classification of Analytics – Challenges - Big Data Analytics important - Data Science - Data Scientist - Terminologies used in Big Data Environments – Basically Available Soft State Eventual Consistency - Top Analytics Tools	18
II	Technology Landscape:NoSQL, Comparison of SQL and NoSQL, Hadoop - RDBMS Versus Hadoop - Distributed Computing Challenges – Hadoop Overview - Hadoop Distributed File System - Processing Data with Hadoop - Managing Resources and Applications with Hadoop YARN - Interacting with Hadoop Ecosystem	18
III	Mongodb and Mapreduce Programming:MongoDB: Mongo DB - Terms used in RDBMS and Mongo DB - Data Types - MongoDB Query Language. MapReduce: Mapper – Reducer – Combiner – Partitioner – Searching – Sorting – Compression	18
IV	Hive: Introduction – Architecture - Data Types - File Formats - Hive Query Language Statements – Partitions – Bucketing – Views - Sub- Query – Joins – Aggregations - Group by and Having – RCFile - Implementation - Hive User Defined Function - Serialization and Deserialization.	18
V	Pig: Introduction - Anatomy – Features – Philosophy - Use Case for Pig - Pig Latin Overview - Pig Primitive Data Types - Running Pig - Execution Modes of Pig - HDFS Commands - Relational Operators - Eval Function - Complex Data Types - Piggy Bank - User-Defined 33 Functions - Parameter Substitution – Diagnostic Operator - Word Count Example using Pig - Pig at Yahoo! - Pig Versus Hive	18
	Total	90
Power Point Presentation, Model Presentation for the above topic to be considered for Internal Exam Only		

Text books

- ❖ Seema Acharya, Subhashini Chellappan, —Big Data and Analytics, Wiley Publications, First Edition,2015

Reference Books:

- ❖ Judith Huruwitz, Alan Nugent, Fern Halper, Marcia Kaufman, —Big data for dummies, John Wiley & Sons, Inc. (2013)
- ❖ Tom White, —Hadoop The Definitive Guidel, O'Reilly Publications, Fourth Edition, 2015

- ❖ Dirk Deroos, Paul C.Zikopoulos, Roman B.Melnky, Bruce Brown, Rafael Coss, Hadoop For Dummies®, Wiley Publications, 2014
- ❖ Robert D.Schneider, —Hadoop For Dummies®, John Wiley & Sons, Inc. (2012)
- ❖ Paul Zikopoulos, —Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data, McGraw Hill, 2012 Chuck Lam, —Hadoop In Action®, Dreamtech Publications, 2010

Web Resources

- ❖ <https://www.coursera.org/in/articles/big-data-analytics>

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	0	0	0	0	1	0	0	0	0
CO2	3	0	2	0	2	1	0	0	0	0
CO3	3	0	3	0	3	1	0	0	0	3
CO4	3	0	3	0	3	1	0	0	0	3
CO5	3	0	3	0	3	1	0	0	0	0

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	3	2	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	13	15	15	14	15
Weighted percent age of Course Contribution to PSO	2.6	3.0	3.0	2.8	3.0

Course Coordinator

BOS Chairman

ELECTIVE - I - DATA ENGINEERING AND MANAGEMENT

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S1PCAE01	Elective – I	Theory	Y	Y	-	3	2

Learning Objective

- ❖ To understand Data Management concepts.
- ❖ To get brief knowledge on Data Modelling.
- ❖ To analyses the techniques used in Distributed Databases.
- ❖ To assess Distributed database and Business Modelling.
- ❖ To get familiar with CRM tools.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Comprehend the Data Management concepts and analyze the relationship with the enterprise	PO1, PO3
CO2	Analyze Data Modeling concepts and assess its quality	PO4
CO3	Understand and implement business modeling techniques	PO1, PO2
CO4	Evaluate the use of Artificial Intelligence and Machine Learning in CRM	PO6
CO5	Develop CRM applications in cloud	PO6

ELECTIVE - I - DATA ENGINEERING AND MANAGEMENT

Unit	Details	No. Of Hours
I	DATABASE DEVELOPMENT: Database architecture of an information system-Overview of the database development process-Conceptual data modeling - Relational data analysis-Roles of a data model-Physical database design. DATA MANAGEMENT: Problems encountered without data management-Data management responsibilities-Data management activities-Roles within data management-Benefits of data management-Relationship between data management and enterprise.	9
II	CORPORATE DATA MODELLING: Need for a corporate data model-Nature of a corporate data model- Develop a corporate data model - Corporate data model principles. DATA DEFINITION AND NAMING: Elements of a data definition-Data naming conventions. DATA QUALITY: Issues associated with poor data quality-Causes of poor data quality-Dimensions of data quality-Data model quality-Improving data quality. DATA ACCESSIBILITY: Data security-Data integrity-Data recovery. Model Presentation : Data Modelling	9
III	USE OF PACKAGED APPLICATION SOFTWARE: Application software packages-Impact on data management. DISTRIBUTED DATA AND DATABASES: Rationale for distributing data-Perfect distributed database system-Top down fragmentation and partitioning. Bottom up integration-The management of replication. BUSINESS INTELLIGENCE: Data warehousing-Multidimensional model of data-Standard reporting tools-Online analytical processing OLAP-Relational schema for a data warehouse.	9
IV	CRM: Three main pillars of CRM. GETTING TO KNOW YOUR CUSTOMER: 360-degree client view. UTILIZING ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING IN YOUR CRM STRATEGY: Evolution of AI-Current state of AI-Teaming up AI with people-Applying AI to your CRM solution-ethical aspects of AI-An example of AI in CRM processes. Field Visit : Implementation of AI in CRM	9
V	CLOUD VERSUS ON PREMISE VERSUS HYBRID: Factors influencing vendor selection-Hybrid deployment-what are your options. CRM DIFFERENTIATORS: It's not about the feature list; it's about the ecosystem-Fourth industrial revolution and CRM-AI and smart cloud-To cloud or not to cloud-Leveraging smart cloud into CRM-Big data-Social selling and advertising-Implementation tools-Sustainable CRM platform. Self-Study: Differences between ERP and CRM*.	9
	Total	45
Model Presentation and report on field Visit for the above topic to be considered for Internal Exam Only		

Textbooks

- ❖ Keith Gordon, Principles of Data Management Facilitating Information Sharing, BCS

Learning, 2022. (Chapters:1-5, 7,8,12,13,14)

❖ Max Fatouretchi, The Art of CRM, Packt Publishing, 2019.(Chapters: 1,2,5,8,9)

Reference Books

- ❖ Peter Ghavami, Big Data Management-Data Governance Principles for Big Data Analytics, De Gruyter, 2020.
- ❖ Francis Buttle, Stan Maklan, Customer Relationship Management Concepts and Technologies, Routledge, 2019.

Web Resources

- ❖ <https://expert360.com/articles/what-is-engineering-data-management>
- ❖ <https://www.dremio.com/resources/guides/intro-data-engineering/>
- ❖ <https://www.coursera.org/in/articles/what-does-a-data-engineer-do-and-how-do-i-become-one>

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

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

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	3	2	2
CO2	3	3	3	3	3
CO3	2	3	3	2	2
CO4	2	3	3	2	2
CO5	3	3	3	3	3
Weight age	12	15	15	12	12
Weighted percentage of Course Contribution to POs	2.4	3.0	3.0	2.4	2.4

Course Coordinator

BOS Chairman

ELECTIVE - I - DATA ENGINEERING AND MANAGEMENT LAB

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S1PCAEP01	Elective Lab - I	Practical	-	-	Y	2	1

Learning Objectives

- ❖ To acquire basic scripting knowledge in MongoDB
- ❖ To learn CRUD Operation on MongoDB database
- ❖ To comprehend MongoDB using dB Visualizer
- ❖ To be familiar with Zoho CRM features
- ❖ To customize your application using Zoho CRM

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Comprehend the scripting knowledge in MongoDB and perform basic operations in shell prompt	PO1, PO2
CO2	Implement, Create, Read, Update and Delete Operations on MongoDB database	PO4
CO3	Analyze MongoDB using dB Visualizer	PO1, PO5
CO4	Assess Zoho CRM Features for Managing Customer Relationships	PO6
CO5	Create a customized application in Zoho CRM	PO5, PO6

ELECTIVE - I - DATA ENGINEERING AND MANAGEMENT LAB

Program List	No.of Hours
1. Write a script to create a Mongo DB database and perform insert operation 2. Write a Mongo DB script to perform query operations 3. Write a Mongo DB Script to perform update operations 4. Write a Mongo DB Script to update documents with aggregation pipeline 5. Write a Mongo DB script to delete single and multiple documents 6. Write a Mongo DB script to perform string aggregation operations 7. Designing a Data Model for Mongo DB using Db Visualizer 8. Perform CRUD operations using Db Visualizer 9. Create a Zoho CRM account and organize your Tasks, Meetings and Deals 10. Create and maintain a project using Zoho CRM features	30
Total	30

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

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

Mapping with Programme: Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	3	2	3
CO2	3	2	3	3	3
CO3	3	2	3	2	3
CO4	3	2	3	2	3
CO5	3	2	3	3	3
Weightage	15	10	15	12	15
Weighted percentage of Course Contribution to POs	3.0	2	3.0	2.4	3.0

Course Coordinator

BOS Chairman

ELECTIVE - I - ARCHITECTURE AND FRAMEWORKS

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S1PCAE02	Elective – I	Theory	Y	Y	-	3	2

Learning Objectives

- ❖ To understand the basics, benefits and purpose of software architecture.
- ❖ Understand the quality attributes to fulfil the software requirements and relates the software with an organization.
- ❖ Explore the design patterns, best practice and paradigms of efficient software development.
- ❖ Understand the performance and security measures of software architecture.
- ❖ Enable the developers to advance their carrier in software domain.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Understand, analyze and evaluate the purpose of Software architecture and development methodologies with consideration of risk management	PO1
CO2	Comprehend, apply and evaluate the domain knowledge for software development process and determine the impact of quality attributes.	PO2, PO3
CO3	Understand, track and examine the systematic approach for various software design models with effective document process	PO4
CO4	Illustrate and summarize the functions of orthogonal systems with complexity, design principles and design pattern for software architecture	PO5
CO5	Comprehend, analyze and evaluate the performance and security measures for Server Web and Database applications in order to create the secure software systems for various domain applications	PO6

ELECTIVE - I - ARCHITECTURE AND FRAMEWORKS

Unit	Details	No. of Hours
I	Software architecture introduction – Importance of Software architecture –Software architecture consumers – Architect role - software architecture in an organization – Types of software architects – Software development methodologies – Project management – Office politics – Software risk management – Configuration management – Software product lines	9
II	Domain Knowledge – Developing business acumen – Domain-driven design – requirement engineering – requirement elicitation – Software Quality attributes: Maintainability – Usability – Availability – Portability – Interoperability - Testability	9
III	Software Architectures design – Importance - Top-down Versus bottom-up design approaches – Architectural drivers – Documenting the Software architecture design – Systematic approach - Attribute-driven design – Microsoft’s technique for architecture and design – Architecture-centric design method – Architecture development method – Tracking the progress of the software architecture’s design. PPT Presentation : Software Design	9
IV	Designing orthogonal software systems – Minimizing complexity – SOLID design principles – Software architecture patterns – layered – Event-driven architecture – Model-View patterns – Service-oriented architecture.	9
V	Architecting Modern Applications.- Importance of Performance – Performance improvement Server side caching – Web application performance – Database performance -Securing software systems – Threat modeling – Secure by design Practical Implementation : Security by Design Self-Study: Orthogonality in Programming Languages*.	9
	Total	45
Practical Implementation and Power Point Presentation for the above topic to be considered for Internal Exam Only		

Textbooks

- ❖ Joseph Ingeno, —Software Architect’s Handbook|| Packt Publishing 2018.

Reference books

- ❖ Oliver Vogel, Indo Arnold, ArifChughtai and TimoKehrer, —Software Architecture|| Springer-Verlag, 2011.
- ❖ Ian Gorton, —Essential Software architecture||, Second Edition, Springer, 2011
- ❖ Len Bass, Paul Clements and Rick Kazman, —Software architecture in practice||, Third edition, Addison-Wesley, 2013

Web Resources

- ❖ <https://www.techtarget.com/searchapparchitecture/definition/enterprise-architecture-framework>
- ❖ <https://www.infoq.com/articles/frameworks-require->

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	2	3	2	3	3	3	3	3
CO2	3	3	3	2	3	3	2	3	3	3
CO3	3	2	3	3	2	3	3	2	2	3
CO4	3	3	3	3	3	3	3	3	3	3
CO5	0	0	2	0	0	0	0	0	0	2

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	2
CO2	3	3	2	3	3
CO3	3	3	2	3	2
CO4	3	3	3	3	2
CO5	3	3	3	3	3
Weightage	15	15	10	15	12
Weighted percentage of Course Contribution to POs	3.0	3.0	2.4	3.0	2.4

Course Coordinator

BOS Chairman

ELECTIVE - I - ARCHITECTURE AND FRAMEWORKS LAB

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S1PCAEP02	Elective Lab - I	Practical	-	-	Y	2	1

Learning Objectives

- ❖ To understand and implement the basic concepts of Software architecture and its functions.
- ❖ To acquire programming skills to develop Implement various technologies and services associated with network protocols along with the challenges of data transfer.
- ❖ Implement the importance and functioning of Routing Protocols over communication service.
- ❖ To acquire skills to connect two routers and any two switches.
- ❖ To comprehend related to SSH protocols and accessing the remote device.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Comprehend the programming skills of Software architecture tools and packages	PO1
CO2	Understand and implement the user profiles and authentication with recovery mechanism.	PO2, PO3
CO3	Comprehend and evaluate the access control and content representation use of FTP server	PO4
CO4	Understand and implement reading and writing resources for various applications	PO5, PO6
CO5	Create a customized application in Zoho CRM	PO6

Note: Use the solid servers and client specification for implementation
<https://github.com/solid/specification/>

ELECTIVE - I - ARCHITECTURE AND FRAMEWORKS LAB

Implement the following using Linux / Windows environments

Program List	No.of Hours
1. Find the Web ID profile document and display the necessary attributes. 2. Set and access the primary authentications with account recovery mechanisms. 3. Set and access the secondary authentications with account recovery mechanisms. 4. Design authorization and web access control. 5. Find the content representation. 6. Reading resources from HTTP REST API and Web Sockets API. 7. Writing resources from HTTP REST API and Web Sockets API. 8. Data notification using Social Web App protocol. 9. Managing subscriptions and friends list using Social Web App protocol. 10. Managing list of followers and following list using Social Web App protocol.	30
Total	30

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

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

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	2
CO2	3	3	3	3	2
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	10	15	12	15
Weighted percentage of Course Contribution to POs	3.0	3.0	3.0	3.0	2.6

Course Coordinator

BOS Chairma

ELECTIVE - II - SOFTWARE DEVELOPMENT TECHNOLOGIES

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S1PCAE03	Elective – II	Theory	Y	Y	-	3	2

Learning Objectives

- ❖ To learn and Implementing Micro services.
- ❖ To analysing the Azure Kubernetes Service.
- ❖ To learn and analyse .NET DevOps for Azure and its applications.
- ❖ To building code for .NET core applications.
- ❖ To get familiarized with Azure pipelines.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	To understand, apply and summarize the basic concepts of Micro services communication Microsoft Azure and Dev Ops for software development life cycle	PO1, PO2
CO2	To illustrate, and implement Azure Kubernetes Service tools for software development life cycle	PO3
CO3	To recognize, analyse and summarize the functionalities of .NET Dev Ops for Azure applications	PO4
CO4	To understand, design and evaluate the principles and architecture service tools for software development life cycle.	PO1- PO6
CO5	To comprehend, implement and review the functionalities of API and API gateways for cloud and Azure applications	PO6

ELECTIVE - II - SOFTWARE DEVELOPMENT TECHNOLOGIES

Unit	Details	No. of Hours
I	Implementing Micro services: Client to micro services communication, Inter service communication, data considerations, security, monitoring, micro services hosting platform options. Azure Service Fabric: Introduction, core concepts, supported programming models, service fabric clusters, develop and deploy applications of service fabric. Monitoring Azure Service Fabric Clusters: Azure application, resource manager template, Adding Application Monitoring to a Stateless Service Using Application Insights, Cluster monitoring, Infrastructure monitoring.	9
II	Azure Kubernetes Service (AKS): Introduction to kubernetes and AKS, AKS development tools, Deploy applications on AKS. Monitoring AKS: Monitoring, Azure monitor and analytics, monitoring AKS clusters, native kubernetes dashboard, Prometheus and Grafana. Securing Micro services: Authentication in micro services, Implementing security using API gateway pattern, Creating application using Ocrlo and securing APIs with Azure AD. Database Design for Micro services: Data stores, monolithic approach, micro services approach, harnessing cloud computing, database options on MS Azure, overcoming application development challenges. Building micro services on Azure Stack: Azure stack, Offering IaaS, PaaS on-premises simplified, SaaS on Azure stack. Practical Implementation : Stack Services	9
III	.NET DevOps for Azure: DevOps introduction, Problem and solution. Professional Grade DevOps Environment: The state of DevOps, professional grade DevOps vision, DevOps architecture, tools for professional DevOps environment, DevOpscentred application. Tracking work: Process template, Types of work items, Customizing the process, Working with the process. Tracking code: Number of repositories, Git repository, structure, branching pattern, Azure repos configuration, Git and Azure.	9
IV	Building the code: Structure of build, using builds with .NET core and Azure pipelines, Validating the code: Strategy for defect detection, Implementing defect detection. Release candidate creation: Designing release candidate architecture, Azure artifacts workflow for release candidates, Deploying the release: Designing deployment pipeline, Implementing deployment in Azure pipelines. Operating and monitoring release: Principles, Architectures for observability, Jumpstarting observability. PPT Presentation : Code building	9
V	Introduction to APIs: Introduction, API economy, APIs in public sector. API Strategy and Architecture: API Strategy, API value chain, API architecture, API management. API Development: Considerations, Standards, kick-start API development, team orientation. API Gateways: API Gateways in public cloud, Azure API management, AWS API gateway. API Security: Request-based security, Authentication and authorization. Self-Study: Tools and Automation*	9
	Total	45
Practical Implementation and Power Point Presentation for the above topic to be considered for Internal Exam Only		

Textbooks

- ❖ Harsh Chawla and Hemant Kathuria, Building Microservices Applications on Microsoft Azure-Designing, Developing, Deploying, and Monitoring, Apress, 2019.
- ❖ Jeffrey Palermo , NET DevOps for Azure A Developer's Guide to DevOps Architecture the Right Way, Apress, 2019.
- ❖ Thurupathan and Vijayakumar, Practical API Architecture and Development with Azure and AWS – Design and Implementation of APIs for the Cloud, Apress, 2018.

Reference books

- ❖ Karl Matthias and Sean P. Kane, Docker: Up and Running, O'Reilly Publication, Second Edition 2018.
- ❖ Len Bass, Ingo Weber, Liming Zhu, DevOps, A Software Architects Perspective, Addison Wesley-Pearson Publication, First Editions 2015.
- ❖ John Ferguson Smart, Jenkins, The Definitive Guide, O'Reilly Publication, First Editions 2011.

Web Resources

- ❖ <https://www.geeksforgeeks.org/software-development-technology-trends/>
https://www.tutorialspoint.com/software_engineering/index.htm

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

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

Mapping with Programme Specific Outcomes:

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

Course Coordinator

BOS Chairman

ELECTIVE - II - SOFTWARE DEVELOPMENT TECHNOLOGIES LAB

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S1PCAEP03	Elective Lab - II	Practical	-	-	Y	2	1

Learning Objectives

- ❖ To understand the concept of Dev Ops with associate technologies and methodologies.
- ❖ To be familiarized with Jenkins, which is used to build & test software Applications
- ❖ To understand Continuous integration in Dev ops environment.
- ❖ To understand Docker to build, ship and run containerized images
- ❖ To use Docker to deploy and manage Software applications running on Container.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	To Understand and analyses the importance of Jenkins to Build, Deploy and Test Software Applications	PO1- PO6
CO2	To synthesis and summarize the importance of Software Configuration Management in DevOps	PO1- PO6
CO3	To identify, analyze and illustrate the Containerization of OS images and deployment of applications over Docker	PO1- PO6
CO4	To design, analyze and develop Pull based Software Configuration Management	PO1- PO6
CO5	To design, analyze and develop Puppet Manifest	PO1- PO6

ELECTIVE - II - SOFTWARE DEVELOPMENT TECHNOLOGIES LAB

List of Programs

1. Deploy Version Control System / Source Code Management, install git and create a GitHub account
2. Perform various GIT operations on local and Remote repositories using GIT Cheat-Sheet
3. Continuous Integration: install and configure Jenkins with Maven/Ant/Gradle to setup a build Job.
4. Build the pipeline of jobs using Maven / Gradle / Ant in Jenkins, create a pipeline script to Test and deploy an application over the tomcat server.
5. Implement Jenkins Master-Slave Architecture and scale your Jenkins standalone implementation by implementing slave nodes.
6. Setup and Run Selenium Tests in Jenkins Using Maven.
7. Implement Docker Architecture and Container Life Cycle, install Docker and execute docker commands to manage images and interact with containers.
8. Implement Docker file instructions; build an image for a sample web application using Docker file.
9. Install and Configure Pull based Software Configuration Management and provisioning tools using Puppet.
10. Implement LAMP/MEAN Stack using Puppet Manifest

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	2	3	3	3	3	3
CO2	3	3	3	2	3	3	2	3	3	3
CO3	3	2	3	3	2	3	3	2	2	3
CO4	3	3	3	3	3	3	3	3	3	3
CO5	0	0	0	0	0	3	3	3	3	0

Mapping with Programme Specific Outcomes:

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

Course Coordinator

BOS Chairman

ELECTIVE - II - SOFT COMPUTING

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S1PCAE04	Elective – II	Theory	Y	Y	-	3	2

Learning Objectives

- ❖ Develop the skills to gain a basic understanding of neural network theory and fuzzy logic theory.
- ❖ To understand supervised and unsupervised learning algorithms
- ❖ To enable the students to gain a basic understanding of neural networks.
- ❖ To know about fuzzy logic, fuzzy inference systems, and their functions.
- ❖ To impart basic knowledge on Genetic algorithms and their applications.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	To provide an introduction to the basic principles, techniques, and applications of soft computing	PO1, PO2
CO2	To get familiar with Neural network architectures and supervised learning algorithms	PO3
CO3	To understand the architectures and algorithms of Unsupervised Learning techniques	PO3, PO4
CO4	Develop the skills to gain a basic understanding of fuzzy logic theory and fuzzy inference systems	PO4
CO5	Ability to learn traditional optimization and search techniques and genetic programming	PO5

ELECTIVE - II - SOFT COMPUTING

Unit	Details	No. of Hours
I	INTRODUCTION TO SOFT COMPUTING: Artificial Neural Networks- Biological Neurons- Basic Models of Artificial Neural Networks-Connections-Learning-Activation Functions- Important Terminologies of ANNs- Muculloch and Pitts Neuron-Linear Separability- Hebb Network-Flowchart of Training Process-Training Algorithm.	9
II	SUPERVISED LEARNING NETWORK : Perceptron Networks–Perceptron Learning Rule-Architecture-Flowchart for Training Process-Perceptron Training Algorithms for Single Output Classes-Perceptron Training Algorithm for Multiple Output Classes-Perceptron Network Testing Algorithm - Adaptive Linear Neuron-Delta Rule for Single Output Unit-Flowchart for training algorithm-Training Algorithm – Testing Algorithm - Multiple Adaptive Linear Neurons-Architecture-Flowchart of Training Process-Training Algorithm-Back Propagation Network-Architecture-Flowchart for Training Process-Training Algorithm-Learning Factors of Back-Propagation Network-Radial Basis Function Network-Architecture-Flowchart for Training Process-Training Algorithm.	9
III	UNSUPERVISED LEARNING NETWORK: Associative Memory Networks - Auto Associative Memory Network-Architecture-Flowchart for Training Process-Training Algorithm-Testing Algorithm- Bidirectional Associative Memory- Architecture-Discrete Bidirectional Associative Memory-Iterative Auto Associative Memory Networks - Linear Auto Associative Memory- Kohonen Self-Organizing Feature Map- Architecture-Flowchart for Training Process-Training Algorithm. Model Presentation : Supervised and Unsupervised Learning	9
IV	INTRODUCTION TO FUZZY LOGIC: Classical Sets –Operations on Classical Sets-Fuzzy sets - Fuzzy Sets- Properties of Fuzzy Sets-Fuzzy Relations –Membership Functions: Fuzzification- Methods of Membership Value Assignments – Defuzzification – Lambda-Cuts for Fuzzy sets and Fuzzy Relations – Defuzzification Methods–Max-Membership Principle-Centroid Method-Weighted Average Method-Mean Max Membership-Center of Sums-Centre of Largest Area-First of Maxima - Fuzzy Set Theory - Fuzzy Arithmetic And Fuzzy Measures: Fuzzy Measures – Belief and Plausibility Measures-Probability Measures- Possibility and Necessity Measures-Formation of Rules –Fuzzy Inference Systems (FIS) – Fuzzy Decision Making – Fuzzy Logic Control Systems. PPT Presentation : Implementation of Fuzzy Logic	9
V	GENETIC ALGORITHM: Introduction - Biological Background - Traditional Optimization and Search Techniques -Gradient Based Local Optimization Method-Random Search-Stochastic Hill Climbing-Simulated Annealing-Symbolic Artificial Intelligence-Operators in Genetic Algorithm -Encoding-Selection-Crossover-Mutation - Stopping Conditions for Genetic Algorithm Flow-Genetic Programming-Working of Genetic Programming-Characteristics of Genetic Programming-Data Representation. Self-Study: Real-Life Applications of Fuzzy Logic*.	9
	Total	45
Practical Implementation and Power Point Presentation for the above topic to be considered for Internal Exam Only		

Textbooks

- ❖ Principles of Soft Computing, S.N. Sivanandam, S.N.Deepa, Wiley, Third Edition, 2019.

Reference books

- ❖ Das, A. (2018). Artificial Intelligence and Soft Computing for Beginners.
- ❖ Amit, K. (2018). Artificial intelligence and soft computing: behavioral and cognitive modelling of the human brain. CRC press.
- ❖ Rajasekaran, S., &Pai, G. V. (2011). Neural networks, fuzzy logic and genetic algorithm: synthesis and applications (with cd). PHI Learning Pvt. Ltd.
- ❖ Jang, J. S. R., Sun, C. T., &Mizutani, E. (2004). Neuro-fuzzy and soft computing-a computational approach to learning and machine intelligence [Book Review]. IEEE Transactions on automatic control, 42(10), 1482-1484.
- ❖ Gupta, M. M. (2004). Soft computing and intelligent systems: theory and applications. Elsevier.
- ❖ Jang, J. S. R., Sun, C. T., &Mizutani, E. (1997). Neuro-fuzzy and soft computing-a computational approach to learning and machine intelligence [Book Review]. IEEE Transactions on automatic control, 42(10), 1482-1484

Web Resources

- ❖ <http://www.biologydiscussion.com/biochemistry/centrifugation/centrifuge introduction-types-uses-and-other-details-with-diagram/12489>
- ❖ <https://www.watelectrical.com/biosensors-types-its-working-andapplications/>
- ❖ <http://www.wikiscales.com/articles/electronic-analytical-balance/>

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	2	3	3	3	3	3
CO2	3	3	3	2	3	3	2	3	3	3
CO3	3	2	3	3	2	3	3	2	2	3
CO4	3	3	3	3	3	3	2	3	3	3
CO5	3	3	3	3	3	3	3	3	3	2

Mapping with Programme Specific Outcomes:

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

Course Coordinator

BOS Chairman

ELECTIVE - II – SOFT COMPUTING LAB

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S1PCAEP04	Elective Lab - II	Practical	-	-	Y	2	1

Learning Objectives

- ❖ To implement various Supervised Neural Network-based approaches.
- ❖ To apply the fuzzy-based logical operations and arithmetic operations.
- ❖ To implement unsupervised neural network approaches.
- ❖ To solve a problem using a simple genetic algorithm.
- ❖ To implement logic gates.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	To apply supervised learning algorithms for real datasets	PO1, PO2
CO2	To implement Unsupervised Learning techniques	PO3
CO3	To apply fuzzy based arithmetic and logical operations	PO3, PO4
CO4	To find solutions for problems using Genetic algorithm	PO4
CO5	To implement DE Morgan's Law	PO5

ELECTIVE - II – SOFT COMPUTING LAB

Program List	No.of Hours
1. Implementation of Logic gates using Artificial Neural Network. 2. Implementation of Perception Algorithm. 3. Implementation of Back Propagation Algorithm. 4. Implementation of Self Organizing Maps. 5. Implementation of Radial Basis Function Network. 6. Implementation of De-Morgan's Law. 7. Implementation of McCulloch Pits Artificial Neuron model 8. Implementation of Simple genetic algorithm 9. Implementation of fuzzy based Logical operations 10. Implementation of fuzzy based arithmetic operations	30
TOTAL	30

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

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

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	3	3	3
CO2	2	3	2	3	3
CO3	2	3	2	3	3
CO4	3	3	2	3	3
CO5	3	3	3	3	3
Weightage	12	15	12	15	15
Weighted percentage of Course Contribution to POs	2.4	3.0	2.4	3.0	3.0

Course Coordinator

BOS Chairman

ELECTIVE III - INTERNET OF THINGS

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S2PCAE05	Elective – III	Theory	Y	Y	-	3	2

Learning Objectives

- ❖ To get familiar with the evolution of IOT with its design principles
- ❖ To outline the functionalities and protocols of internet communication
- ❖ To analyze the hardware and software components needed to construct IOT applications
- ❖ To identify the appropriate protocol for API construction and writing embedded code
- ❖ To realize various business models and ethics in Internet of Things

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Comprehend the IoT evolution with its architecture and sensors	PO1- PO3
CO2	Understand the networking concepts for communication and underlying IoT protocols	PO2
CO3	Assess the embedded technologies and develop prototypes for the IoT products	PO4
CO4	Evaluate the use of Application Programming Interface and design an API for IoT in real time	PO3- PO5
CO5	Recognize the ethics of business models and perform security analysis	PO5, PO6

ELECTIVE III - INTERNET OF THINGS

Unit	Details	No.of Hours
I	FUNDAMENTALS OF IOT Evolution of Internet of Things – Enabling Technologies – IOT Architectures: oneM2M, IOT World Forum (IOTWF) and Alternative IOT models – Simplified IOT Architecture and Core IOT Functional Stack – Fog, Edge and Cloud in IOT – Functional blocks of an IOT ecosystem – Sensors, Actuators, Smart Objects and Connecting Smart Objects. Model Preparation : IOT Architecture	9
II	IOT PROTOCOLS IOT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN – Network Layer: IP versions, Constrained Nodes and Constrained Networks – Optimizing IP for IOT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks – Application Transport Methods: Supervisory Control and Data Acquisition – Application Layer Protocols: CoAP and MQTT.	9
III	DESIGN AND DEVELOPMENT Prototyping Embedded Devices: Electronics - Embedded Computing Basics – Arduino - Raspberry Pi - Beagle Bone Black - Electric Imp. Prototyping the Physical Design: Non digital Methods - Laser Cutting - 3D printing - CNC Milling - Repurposing/Recycling. Practical Presentation : IOT Implementation	9
IV	Prototyping Online Components: Getting started with an API - Writing a New API - Real-Time Reactions - Other Protocols. Techniques for Writing Embedded Code: Memory Management - Performance and Battery Life – Libraries - Debugging	9
V	Business Models: History of Business Models – Model – Internet of Starting up – Lean Start-ups. Moving to Manufacture: Designing Kits - Designing Printed circuit boards – Certification – Costs - Scaling Up Software. Ethics: Privacy – Control – Environment – Solutions. Self-Study: IOT Data Analytics & Visualization.	9
	Total	45
Model Preparation and Practical Presentation for the above topic to be considered for Internal Exam Only		

Textbooks

- ❖ David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Cisco Press, 2017 (UNIT I and II)
- ❖ 2. Adrian McEwen and Hakim Cassimally,-Designing the Internet of Things, Wiley, 2014. (UNIT III, IV and V)

Reference books

- ❖ Ovidiu Vermesan and Peter Friess, —Internet of Things – From Research and Innovation to Market Deployment, River Publishers, 2014.
- ❖ 2. Peter Waher, —Learning Internet of Things, Packt Publishing, 2015.
- ❖ 3. Donald Norris, —The Internet of Things: Do-It-Yourself at Home Projects for Arduino, Raspberry Pi and BeagleBoneBlack, McGraw Hill, 2015.

Web Resources

- ❖ <https://www.techtarget.com/iotagenda/definition/Internet-of-Things-IoT>
- ❖ <https://www.geeksforgeeks.org/introduction-to-internet-of-things-iot-set-1/>
- ❖ <https://www.techopedia.com/definition/28247/internet-of-things-iot>

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

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

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	3	2	3
CO2	2	3	3	3	3
CO3	2	3	3	2	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	12	15	15	13	15
Weighted percentage of Course Contribution to POs	2.4	3.0	3.0	2.6	3.0

Course Coordinator

BOS Chairman

ELECTIVE III - LAB - INTERNET OF THINGS

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S2PCAEP05	Elective Lab - III	Practical	-	-	Y	3	1

Learning Objectives

- ❖ To create IoT program to turn ON/OFF LED
- ❖ To implement IoT program for object detection
- ❖ To develop IoT programs for agricultural purpose
- ❖ To create web server program for local hosting
- ❖ To design IoT application for health monitoring

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Implement IoT programs to turn ON/OFF LED	PO1- PO6
CO2	Develop IoT programs for object detection	PO1- PO6
CO3	Create IoT programs for agricultural purpose	PO2, PO3
CO4	Implement web server program for local hosting	PO4, PO5
CO5	Design IoT application for health monitoring	PO5, PO6

ELECTIVE III - LAB - INTERNET OF THINGS

Program List	No.Of Hours
1. Find the Web ID profile document and display the necessary attributes. 2. Set and access the primary authentications with account recovery mechanisms. 3. Set and access the secondary authentications with account recovery mechanisms. 4. Design authorization and web access control. 5. Find the content representation. 6. Reading resources from HTTP REST API and Web Sockets API. 7. Writing resources from HTTP REST API and Web Sockets API. 8. Data notification using Social Web App protocol. 9. Managing subscriptions and friends list using Social Web App protocol. 10. Managing list of followers and following list using Social Web App Protocol.	45
TOTAL	45

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

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

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	2	3	3	3
CO2	2	3	3	3	3
CO3	3	2	3	3	3
CO4	3	2	3	3	3
CO5	3	3	3	3	3
Weightage	13	12	15	15	15
Weighted percentage of Course Contribution to POs	2.6	2.4	3.0	3.0	3.0

Course Coordinator

BOS Chairman

ELECTIVE III - COMPUTER VISION

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S2PCAE06	Elective – III	Theory	Y	Y	-	3	2

Learning Objectives

- ❖ To get understanding about Computer vision techniques behind a wide variety of real-world applications.
- ❖ To get familiar with various Computer Vision fundamental algorithms and how to implement and apply.
- ❖ To get an idea of how to build a computer vision application with Python language.
- ❖ To understand various machine learning techniques that are used in computer vision tasks.
- ❖ To incorporate machine learning techniques with computer vision systems.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	To understand and recall computer vision and its application areas	PO1
CO2	To develop build a computer vision system	PO2- PO6
CO3	To apply and analyze a design range of algorithms for image processing and computer vision	PO1- PO5
CO4	To develop incorporate machine learning techniques with computer vision system	PO1- PO4
CO5	To apply and analyze image segmentation and image registration	PO5, PO6

ELECTIVE III - COMPUTER VISION

Unit	Details	No. of Hours
I	Basic Image Handling and Processing: PIL – the Python Imaging Library- Matplotlib- NumPy- SciPy-Advanced example: Image de-noising. Local Image Descriptors: Harris corner detector-SIFT - Scale-Invariant Feature Transform-Matching Geotagged Images.	9
II	Image to Image Mappings: Hymnographies-Warping images-Creating Panoramas. Camera Models and Augmented Reality: The Pin-hole Camera Model-Camera Calibration-Pose Estimation from Planes and Markers-Augmented Reality. Model Presentation : Image Mapping	9
III	Multiple View Geometry: Peripolar Geometry-Computing with Cameras and 3D Structure-Multiple View Reconstruction-Stereo Images. Clustering Images: K-means Clustering-Hierarchical Clustering-Spectral Clustering.	9
IV	Searching Images: Content based Image Retrieval-Visual Words-Indexing Images-Searching the Database for Images-Ranking Results using Geometry-Building Demos and Web Applications. Classifying Image Content: K-Nearest Neighbors- Bayes Classifier-Support Vector Machines-Optical Character Recognition. PPT Presentation : Image searching using one of the above method	9
V	Image Segmentation: Graph Cuts-Segmentation using Clustering-Variational Methods. OpenCV: Python Interface- OpenCV Basics-Processing Video-Tracking. Self-Study: Image processing, Image warping*.	9
	Total	45
Power Point Presentation for the above topic to be considered for Internal Exam Only		

Text Books

- ❖ Programming Computer Vision with Python – Jan Erik Solem, Shroff/O'Reilly-2012

Reference books

- ❖ Mastering OpenCV 4 with Python : A practical guide – Alberto Fernandez Villan 2019.

Web Resources

- ❖ <https://www.geeksforgeeks.org/computer-vision/>
- ❖ <https://www.kaggle.com/learn/computer-vision>
- ❖ https://www.tutorialspoint.com/artificial_intelligence_with_python/artificial_intelligence_with_python_computer_vision.htm

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

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

Mapping with Programme Specific Outcomes:

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

Course Coordinator

BOS Chairman

ELECTIVE III – LAB - COMPUTER VISION

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S2PCAEP06	Elective Lab - III	Practical	-	-	Y	3	1

Learning Objectives

- ❖ To get an idea of how to build a computer vision application with Python language.
- ❖ To learn the basic image handling and processing
- ❖ To get familiar with various Computer Vision fundamental algorithms and how to implement and apply.
- ❖ To get an idea of how to implement the image transforms.
- ❖ To understand various image segmentation algorithms.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	To develop and implement the image loading and exploring	PO1, PO2, PO3
CO2	To Evaluate the image transforms	PO3, PO4
CO3	To apply and analyze for image processing denoising algorithms	PO5
CO4	To design and develop the Image Segmentation using Edge	PO5, PO6
CO5	To apply and analyze image clustering and classification algorithms	PO4, PO6

ELECTIVE III – LAB - COMPUTER VISION

Implement the following problems using Python with OpenCV

Program List	No. Of Hours
1. Image Loading, Exploring, and displaying an Image. 2. Access and Manipulate of Image Pixels. 3. Image Transformations. a) Resizing b) Rotation 4. Addition operation of Two Images. 5. Image filtering operations a) Mean Filtering b) Gaussian Filtering 6. Image Binarization Using Simple Thresholding method. 7. Edge Detection operation using Sobel and Scharr Gradients. 8. Find Grayscale and RGB Histograms of an Image. 9. Segment an Image using K-means Clustering algorithm. 10. Write a program to classify an Image using KNN Classification algorithm.	45
TOTAL	45

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

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

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	2	3	3
CO5	3	3	3	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

ELECTIVE IV - CYBER SECURITY

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S2PCAE07	Elective – IV	Theory	Y	Y	-	3	2

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	PO2- PO6
CO3	Understand, apply and evaluate the various investigation roles and Wi Fi protecting mechanisms.	PO4, PO5, 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 IV - 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.	9
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. Model Preparation : Safety measures when buying online	9
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.	9
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.	9
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. Power Point Presentation : Cyber crime Prevention. Self-Study: e-commerce and digital payments	9
	Total	45
Model Preparation and Power Point Presentation for the above topic to be considered for Internal Exam Only.		

Text Books

- ❖ Dr.JeetendraPande, “Introduction to Cyber Security” Published by Uttarakhand Open University, 2017.(Chapter: 1.2-6.4,9.3-12.2)
- ❖ Sebastian Klipper, —Cyber Security” Ein Einblick fur Wirtschaftswissenschaftler Fachmedien Wiesbaden,2015

Reference books

- ❖ 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.(Chapter: 4, 5, 6, 7, 8, 9,10)
- ❖ 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.w3schools.com/cybersecurity/>
- ❖ <https://www.simplilearn.com/tutorials/cyber-security-tutorial>
- ❖ <https://intellipaat.com/blog/tutorial/ethical-hacking-cyber-security-tutorial/>

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

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

Mapping with Programme Specific Outcomes:

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

Course Coordinator

BOS Chairman

ELECTIVE IV-LAB-CYBER SECURITY

Subject Code	MAJOR	Category	L	T	P	HOURS	Credit
24S2PCAEP07	Elective Lab - IV	Practical	-	-	Y	3	1

Learning Objectives:

- ❖ To learn and implement to Change the wireless device mode as monitor mode
- ❖ To develop in multiple vulnerabilities web server
- ❖ To understand and implement the open ports in the network
- ❖ To acquire programming skills in Implement various wireless device modes
- ❖ To comprehend related to find the sub domains of webpage

Course Outcomes		
Course Outcomes	On completion of this course, students will be able to	Program 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	PO2-PO6
CO3	Understand, apply and evaluate the various investigation roles and Wi-Fi protecting mechanisms.	PO4,PO5,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 IV-LAB-CYBER SECURITY

Implement the following using any cyber security tools

Program List	No.Of Hours
1. Install virtual box (kali Linux) 2. Generate a secure password using keepass 3. Change the wireless device mode as monitor mode 4. Find the known and open vulnerabilities of system using metasploit 5. Identify the multiple vulnerabilities webserver using nikto tool 6. Identify the open ports in the network using nmap tools 7. List all the network around us and display the information about the networks 8. Sniff and capture the packet sent over HTTP requests 9. Find the owners of internet resources using Whois Lookup tool 10. Find the subdomains of webpage using knock tool	45
TOTAL	45

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

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

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	2	2
CO2	3	3	3	2	3
CO3	3	3	3	2	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	12	14
Weighted percentage of Course Contribution to POs	3.0	3.0	3.0	2.4	2.8

Course Coordinator

BOS Chairman

ELECTIVE IV - BLOCK CHAIN TECHNOLOGIES

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S2PCAE08	Elective – IV	Theory	Y	Y	-	3	2

Learning Objectives

- ❖ To understand about Block chain is an emerging technology platform for developing decentralized applications and data storage.
- ❖ To comprehend fundamentals of Public Key Cryptography technology and Consensus algorithms.
- ❖ To familiarize with Bit coin Network, Bitcoin Clients, APIs and Payments technology of block chain operations.
- ❖ To engage with Components of the Ethereum ecosystem.
- ❖ To grasp about Development Tools and Frameworks.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Understand, apply and examine the characteristics of block chain, bitcoin and consensus algorithm decentralized methods.	PO1- PO6
CO2	Comprehend and demonstrate the application of hashing and public key cryptography in protecting the block chain.	PO1- PO6
CO3	Understand and analyse the elements of trust in a Blockchain: validation, verification, and consensus.	PO1- PO6
CO4	Comprehend and evaluate the alternate coin, Ethereum and smart contract.	PO1- PO6
CO5	Grasp and apply the knowledge of Tools and languages for applications	PO1- PO6

ELECTIVE IV - BLOCK CHAIN TECHNOLOGIES

Unit	Details	No. of Hours
I	Block chain: The growth of block chain technology - Distributed systems - The history of block chain and Bit coin - Block chain - Consensus - CAP theorem and block chain. Decentralization: Decentralization using block chain - Methods of decentralization - Routes to decentralization - Block chain and full ecosystem decentralization - Pertinent terminology - Platforms for decentralization - Innovative trends.	9
II	Public Key Cryptography, Consensus Algorithms and Smart Contracts Public Key Cryptography: Asymmetric cryptography - Cryptographic constructs and block chain technology. Consensus Algorithms: Introducing the consensus problem - Analysis and design - Classification - Algorithms - Choosing an algorithm. Smart Contracts: History - Definition - Ricardian contracts - Smart contract templates – Oracles - Deploying smart contracts – DAO PPT Presentation : Cryptography	9
III	Bit coin: Bit coin—an overview - Cryptographic keys - Transactions – Block chain – Mining. Bit coin Network and Payments: The Bit coin network - Wallets – Bit coin payments - Innovation in Bit coin - Advanced protocols – Bit coin investment and buying and selling Bit coin. Bit coin Clients and APIs: Bit coin client installation - Experimenting further with bit coin-cli – Bit coin programming. Model Preparation : Wallets	9
IV	Alternative Coins: Alternative Coins: Theoretical foundations - Difficulty adjustment and retargeting algorithms - Bitcoin limitations - Extended protocols on top of Bitcoin -Development of altcoins. Ethereum: Ethereum – an overview - Ethereum network - Components of the Ethereum ecosystem - Ethereum Virtual Machine (EVM) - Smart contracts. - Blocks and blockchain - Wallets and client - Nodes and miners - APIs, tools, and DApps - Supporting protocols - Programming languages.	9
V	Development Tools and Frameworks, Use Cases & Security Development Tools and Frameworks : Languages - Compilers - Tools and libraries - Frameworks - Contract development and deployment - Layout of a Solidity source code file - Solidity language. Use Cases: IoT – Government - Health -Finance – Media. Scalability and Other Challenges: Scalability - Privacy - Security - Other challenges. Self-Study: Bitcoin and Blockchain 1. Hyperledger 2. Setting up development environment using Hyperledger Composer*	9
	Total	45
Power Point Presentation and Model Preparation for the above topic to be considered for Internal Exam Only		

Text Books

- ❖ Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, Steven Goldfeder. Bitcoin and Cryptocurrency Technologies. Princeton University Press, 2016. ISBN 978-0691171692

Reference books

- ❖ Andreas Antonopoulos. Mastering Bitcoin: Programming the open block chain. Oreilly Publishers, 2017. ISBN 978-9352135745

Web Resources

- ❖ <https://www.geeksforgeeks.org/blockchain/>
- ❖ <https://www.javatpoint.com/blockchain-tutorial>
- ❖ <https://www.youtube.com/watch?v=AWPisuBx1Zo>

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

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

Mapping with Programme Specific Outcomes:

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

Course Coordinator**BOS Chairman**

ELECTIVE IV - LAB BLOCK CHAIN TECHNOLOGIES

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S2PCAEP08	Elective Lab - IV	Practical	-	-	Y	3	1

Learning Objectives

- ❖ To learn the basics of Block chain and apply cryptographic algorithms
- ❖ To design, build, and deploy smart contracts and distributed applications,
- ❖ To deploy Private Block chain and smart contracts on Ethereum.
- ❖ To understand and deploy crypto currencies and their functions in applications
- ❖ To implement Block chain for various use cases.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Enable to setup your own private Blockchain and deploy smart contracts on Ethereum.	PO1- PO2
CO2	Gains familiarity and implement with cryptography and Consensus algorithms.	PO3, PO4
CO3	Create and deploy projects using Web3j.	PO5
CO4	Recall and deploy the structure and mechanism of Bitcoin, Ethereum, Hyperledger	PO5
CO5	Implement Blockchain for various use cases	PO6

ELECTIVE IV – LAB - BLOCK CHAIN TECHNOLOGIES

Implement the following

Program List	No.Of Hours
1. Create a Public Ledger and Private Ledger with the various attributes like Access, Network Actors, Native token, Security, Speed and examples. 2. Building and Deploying Multi Chain private Block chain 3. Write Hello World smart contract in a higher programming language (Solidity) 4. Construct the Naïve block chain 5. Construct and deploy your contract (Use deploy method) 6. Set up a Reg test environment 7. Build a payment request URI 8. Hash cash implementation 9. Develop a toy application using Block chain 10. Create simple wallet transaction from one account to another account using Meta mask.	45
TOTAL	45

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

	PO1	PO2	P O3	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	2	2	3	3
CO2	3	2	3	3	3
CO3	3	2	3	3	3
CO4	3	3	3	2	3
CO5	3	3	3	3	3
Weightage	15	12	14	14	15
Weighted percentage of Course Contribution to POs	3.0	2.4	2.8	2.8	3.0

Course Coordinator

BOS Chairman

ELECTIVE V - SOCIAL NETWORKS

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S4PCAE09	Elective V	Theory	Y	Y	-	3	2

Learning Objectives

- ❖ To learn about Social media, Social networking and Webcasts.
- ❖ To understanding and building a Word Press Powered Website.
- ❖ To analysis the Social Networking & Micro-Blogging.
- ❖ To learn and analysis the Widgets & Badges.
- ❖ To explore the importance of Website optimization.

Course Outcomes		
Course Outcomes	On completion of this course, students will	Programme Outcomes
CO1	To understand, impart and summarize the concepts of Social media, Social networking and Webcasts .	PO1-PO6
CO2	To comprehend, design and develop a Word Press Powered Website.	PO1-PO6
CO3	To understand, implement and perform evaluation of Social Networking and Micro-Blogging.	PO1-PO6
CO4	To collaborate, implement and analyse the Widgets and Badges in social networking environment.	PO1-PO6
CO5	To understand, illustrate and perform evaluation of web optimization for social networks.	PO1-PO6

SOCIAL NETWORKS

Unit	Details	No. of Hours
I	Introduction: Social Media Strategy-Important First Decisions - Websites, Blogs - RSS Feeds Mapping -Preparation - Multimedia Items Gathering Content for Blog Posts RSS Feeds & Blogs-RSS Feeds-The Feed Reader-The Feed-Options for Creating an RSS Feed-Planning Feed-Blogs-Options for Starting. Blog and RSS Feed-Feed or Blog Content-Search Engine Optimization (SEO)-Feed Burner-RSS Feed and Blog Directories-An Optimization Plan for Blog or RSS Feed	9
II	Building a Word Press Powered Website: Word Press as A CMS - Diversity of Word Press Sites-The Anatomy of a Word Press Site -a Brief Look at the Word Press Dashboard Planning - Site Themes Plug-ins setting up Sidebars Building Pages- Posting Blog Entries. Podcasting, Vidcasting, & Webcasting- Publishing Options for Podcast-Creating and Uploading Podcast Episodes-Publishing Podcast Optimizing Podcast- Webcasting	9
III	Social Networking & Micro-Blogging: Facebook-The Facebook Profile -Myspace LinkedIn-Twitter-Niche Social Networking Sites-Creating Own Social Network-Promoting Social Networking Presence- Social Bookmarking & Crowd-Sourcing - Social Bookmarking-A Social Bookmarking Strategy- Crowd-Sourced News Sites- Preparation And Tracking Progress Media Communities-Image Sharing Sites-Image Sharing Strategy-Video Sharing Sites-Video Sharing Strategy-Searching And Search Engine Placement-Connecting With Others.	9
IV	Widgets & Badges: Highlighting Social Web Presence-Sharing And Syndicating Content Making Site More Interactive-Promoting Products And Making Money-Using Widgets In Word Press-Widget Communities And Directories- Working Widgets Into Strategy Social Media Newsrooms-Building Social Media Newsroom - Populating The Newsroom-Social Media News Releases-Social Media Newsroom Examples. More Social Tools-Social Calendars-Social Pages Wikis-Social Search Portals-Virtual Worlds.	9
V	Website optimization: A Website Optimization Plan-Streamlining Web Presence-An Integration Plan- Looking to the Future-Life streaming: The Future of Blogging-Distributed Social Networking-Social Ranking, Relevancy, and —Defriending-Web 3.0 or The Semantic Web-Mobile Technology- Measuring Your Success-A Qualitative Framework-A Quantitative Framework-Tools to Help You Measure-Come To Your Own Conclusions	9
	Total	45
Power Point Presentation, Model Presentation for the above topic to be considered for Internal Exam Only		

Text books

- ❖ Deltina hay —A Survival Guide To social Media and Web 2.0 Optimization, Dalton Publishing, 2009

Reference Books:

- ❖ Miriam Salpeter —Social Networking for Career Success|| Learning Express, 2011.
- ❖ Miles, Peggy, —Internet world guide to webcasting|| Wiley, 2008 Professionals||, Wiley Publication,2015..

Web Resources

- ❖ https://www.tutorialspoint.com/internet_technologies/social_networking.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	0	3	1	0	3	0	3
CO2	3	3	3	0	3	1	0	3	0	3
CO3	3	3	3	0	3	1	0	3	0	3
CO4	3	3	3	0	3	1	0	3	0	3
CO5	3	3	3	0	3	1	0	3	0	3

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	3	2	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	13	15	15	14	15
Weighted percent age of Course Contribution to PSO	2.6	3.0	3.0	2.8	3.0

Course Coordinator**BOS Chairman**

ELECTIVE V SOCIAL NETWORKS LAB

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S4PCAEP09	Elective Lab - V	Practical	-	-	Y	2	1

Learning Objectives

- ❖ To familiarize the tools required to manage social network applications
- ❖ To analyze social networks like Facebook, LinkedIn, Google+, GitHub
- ❖ To teach the fundamental techniques and principles in achieving social networking environment.
- ❖ To enable students to have skills that will help them to solve real time applications.
- ❖ To get explore in the Github API.

Course Outcomes		
Course Outcomes	On completion of this course, students will	Programme Outcomes
CO1	To understand, implement and review the fundamental techniques and principles for social networks.	PO1-PO6
CO2	To design and develop the programs using the tools required to develop and manage social network like Facebook, LinkedIn, Google+, GitHub	PO1-PO6
CO3	To create and explore the functionality of social networking tools such as GitHub	PO1-PO6
CO4	To understand, implement and review the fundamental principles for social network graph.	PO1-PO6
CO5	To comprehend and critically analyse the existing API for social networks	PO1-PO6

SOCIAL NETWORKS LAB

Program List	No. of Hours
1. Creating and Exploring Twitter's API 2. To analyzing and visualizing tweets and tweet entities with frequency analysis 3. Creating and Exploring Facebook's Social Graph API 4. To analyzing the Facebook's Social Graph connections 5. Creating and Exploring LinkedIn API 6. To downloading LinkedIn connections as a CSV file 7. Creating and Exploring Google+ API 8. To create and querying Human Language Data with TF-IDF 9. Creating and Exploring GitHub's API 10. To analyzing GitHub interest graph	30
Total	30

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	2	0	2	3	2	2	2	3
CO2	3	2	3	3	3	2	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3
CO4	3	2	3	3	3	2	3	3	3	3
CO5	3	3	3	3	3	3	2	2	2	3

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	3	2	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	13	15	15	14	15
Weighted percentage of Course Contribution to PSO	2.6	3.0	3.0	2.8	3.0

Course Coordinator

BOS Chairman

ELECTIVE V - HIGH-PERFORMANCE COMPUTING

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S4PCAE10	Elective V	Theory	Y	Y	-	3	2

Learning Objectives

- ❖ To get a clear idea of High Performance Computing concept.
- ❖ To get brief knowledge about how to function the HPC systems.
- ❖ To get idea of what techniques used in HPC models.
- ❖ To understand a Parallel computing concepts.
- ❖ To get familiar with OpenMP technology that is widely used in HPC technology.

Course Outcomes		
Course Outcomes	On completion of this course, students will	Programme Outcomes
CO1	Understand of the HPC and ccNUMA concepts.	PO1-PO6
CO2	Design and develop a parallel programming with modern C, C++ and new version of FORTRAN.	PO1-PO6
CO3	Apply with parallel computing.	PO1-PO6
CO4	Develop an efficient OpenMP programming.	PO1-PO6
CO5	Evaluate an efficient MPI programming .	PO1-PO6

HIGH-PERFORMANCE COMPUTING

Unit	Details	No. of Hours
I	Modern processors: Stored-program computer architecture-General purpose cache based microprocessor architecture-Memory hierarchies-MultiCORE - processors-Multithreaded processors-Vector processors. Basic optimization techniques for serial code: Scalar profiling-Common sense optimizations-Simple measures, large impact-The role of compilers-C++ optimizations.	9
II	Data access optimization: Balance analysis and light speed estimates-Storage order-Algorithm classification and access optimizations-The Jacobi algorithm-Algorithm classification and access optimizations-Sparse matrix-vector multiply. Parallel computers: Taxonomy of parallel computing paradigms-Shared-memory computers-Distributed memory computers-Hierarchical systems-Networks.	9
III	Basics of parallelization: Introduction to Parallelism -Parallel scalability. Shared memory parallel programming with OpenMP: Short introduction to OpenMP-OpenMP-parallel Jacobi algorithm.	9
IV	Efficient OpenMP programming: Profiling OpenMP programs-Performance pitfalls-Parallel sparse matrix-vector multiply. Locality optimizations on ccNUMA architectures: Locality of access on ccNUMA-ccNUMA optimization of sparse MVM-Placement pitfalls-ccNUMA issues with C++.	9
V	Distributed-memory parallel programming with MPI: Message passing-A short introduction to MPI-MPI parallelization of a Jacobi solver. Efficient MPI programming: MPI performance tools-Communication parameters-Synchronization, serialization, contention-Reducing communication overhead-Understanding intranode point-to-point communication.	9
	Total	45
Power Point Presentation, Model Presentation for the above topic to be considered for Internal Exam Only		

Text books

1. Georg Hager, Gerhard Wellein —Introduction to High Performance Computing for Scientists and Engineers, CRC Press, 2011.**Chapters:** 1 to 10.

Reference Books:

1. Michael W. Berry, Kyle A. Gallivan, Efstratios Gallopoulos, Ananth Grama, Bernard Philippe, Yousef Saad, Faisal Saied, —High-performance scientific computing: algorithms and applications, Springer, 2012.
2. Victor Eijkhout, —Introduction to High Performance Scientific Computing, MIT Press, 2011.

Web Resources

1. <https://www.geeksforgeeks.org/computer-organization-architecture/high-performance-computing/>

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

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

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	3	2	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	13	15	15	14	15
Weighted percentage of Course Contribution to PSO	2.6	3.0	3.0	2.8	3.0

Course Coordinator**BOS Chairman**

ELECTIVE V HIGH-PERFORMANCE COMPUTING LAB

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S4PCAEP10	Elective Lab - V	Practical	-	-	Y	2	1

Learning Objectives

- ❖ To understand concepts of High-Performance Computing
- ❖ To get brief knowledge about PB and Slurm.
- ❖ To understand techniques of OpenMP and OpenMPI.
- ❖ To understand Parallel computing concepts.
- ❖ To get familiar with CUDA.

Course Outcomes		
Course Outcomes	On completion of this course, students will	Programme Outcomes
CO1	Apply and Evaluate the HPC Programs	PO1-PO6
CO2	Design and Develop a MPI Programs	PO1-PO6
CO3	Design and develop a different programming concept of OpenMP	PO1-PO6
CO4	Develop an efficient PB and Slurm programming	PO1-PO6
CO5	Evaluate an efficient CUDA programming	PO1-PO6

HIGH-PERFORMANCE COMPUTING LAB

Program List	No. of Hours
IMPLEMENTED EITHER PB, SLURM, OPENMP, OPENMPI AND CUDA 1. Demo: - Access and best practices on HPC 2. Matrix multiplication with Job scheduling (PB or Slurm) 3. Vectors add with malloc shared 4. Vector add program with MPI 5. Hello world task for Multithreading with openMP 6. openMP shared memory on Host and Device 7. openMP Matrix Multiplication with parallelism and Barrier 8. openMP with Reduction on operands and aggregate functionality 9. Vector and Matrix multiplication on CUDA 10. Feed forward computing on CUDA	30
Total	30

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

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

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	3	2	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	13	15	15	14	15
Weighted percentage of Course Contribution to PSO	2.6	3.0	3.0	2.8	3.0

Course Coordinator

BOS Chairman

**SKILL ENHANCEMENT COURSE
SOFT SKILL DEVELOPMENT LAB**

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S4PCASP01	SEC LAB	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 the successful completion of the course, student will be 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

SOFT SKILL DEVELOPMENT LAB

List of Experiments	No. of 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-Anand 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

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	1	2	1	1	1	3	3	3	3
CO2	3	2	1	2	2	1	3	1	3	1
CO3	3	3	3	2	2	1	2	1	2	1
CO4	3	3	3	2	3	1	2	1	2	3
CO5	3	3	3	2	2	1	2	2	2	2

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	3	2	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	13	15	15	14	15
Weighted percentage of Course Contribution to PSO	2.6	3.0	3.0	2.8	3.0

Course Coordinator**BOS Chairman**

FIRST YEAR - SEMESTER II
COMMON PAPER – FUNDAMENTALS OF HUMAN RIGHTS

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S2PHR01	COMMON PAPER	Theory	Y	Y	-	2	1

Learning Objectives

- ❖ To learn about Basic Facets of Human Rights.
- ❖ To understand the development of human rights in India.
- ❖ To know the various rights pertaining to marginalized and other disadvantaged
- ❖ To help the students to know various human rights movements
- ❖ To make the students to be aware of human rights redressal mechanisms.

Course Outcomes		
Course Outcomes	On completion of this course, students will able to	Programme Outcomes
CO1	Understand the basic facets of human rights	PO1
CO2	Comprehend the Constitutional provisions of human rights in India	PO1,PO2
CO3	Grasp the rights of the marginalized and other disadvantaged people in India	PO4,PO6
CO4	Know the historical background of the various human rights movement in India.	PO4,PO5,PO6
CO5	Understand the redressal mechanism of the human rights violations	PO3,PO8

FIRST YEAR - SEMESTER II
COMMON PAPER – 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. 7. AshaKiran, The History of Human Rights, Mangalam Publications, Delhi, 2011.
- ❖ BaniBorgohain, Human Rights, Kanishka Publishers & Distributors, New Delhi-2, 2007.
- ❖ Jayant Chudhary, A Textbook of Human Rights, Wisdom Press, New Delhi, 2011.

Web Resources

- ❖ <http://www.marketsandmarkets.com/PressReleases/compound-biofertilizers-customized-fertilizers.asp>
- ❖ <http://www.transparencymarketresearch.com/pressrelease/global-biofertilizers-market.htm>

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	2	3	3	3	3	3
CO2	3	3	3	3	3	3	2	3	3	3
CO3	3	2	3	3	3	3	3	3	3	3
CO4	2	3	3	3	3	3	3	2	3	3
CO5	3	3	3	3	2	3	2	3	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	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to POs	3.0	3.0	3.0	3.0	3.0

Course Coordinator

BOS Chairman

NME LAB I: INTEGRATED TECHNOLOGY(AML) LAB (SELF-STUDY COURSE)

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S3PCANP01	NME Lab I	Practical	-	-	Y	4	2

Learning Objectives

- ❖ To formulate machine learning problems corresponding to different applications.
- ❖ To understand a range of machine learning algorithms along with their strengths and weaknesses.
- ❖ To apply machine learning algorithms to solve problems of moderate complexity.
- ❖ To apply CNN to solve problems of moderate complexity.
- ❖ To apply LSTM and RNN to solve problems.

Course Outcomes		
Course Outcomes	On completion of this course, students will	Programme Outcomes
CO1	To understand and implement the mathematical and statistical prospective of machine learning algorithms through python programming.	PO1-PO6
CO2	To recognize and develop the machine learning models through python in built functions	PO1-PO6
CO3	To understand, impart and develop the machine learning models for real-time dataset	PO1-PO6
CO4	To comprehend , impart and implement the deep learning models for real-time applications	PO1-PO6
CO5	To identify and evaluate the performance machine learning models for real-time dataset	PO1-PO6

**NME LAB I: INTEGRATED TECHNOLOGY(AML) LAB
(SELF-STUDY COURSE)**

Program List	No. of Hours
1. Write a python program to compute the Central Tendency Measures: Mean, Median, Mode, Measure of Dispersion: Variance, Standard Deviation 2. Implement a Linear Regression and Multiple Linear Regression with a Real Dataset 3. Implementation of Logistic Regression using sklearn 4. Implement a binary classification model. 5. Classification with Nearest Neighbours and NavieBaye Algorithm 6. Implementation Decision tree for classification using sklearn and its parameter tuning 7. Implement the k-means algorithm. 8. Implement an Image Classifier using CNN in TensorFlow/Keras. 9. Implement an Autoencoder in TensorFlow/Keras. 10. Implement a Simple LSTM using TensorFlow/Keras.	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	3	3	0	3	0	0	0	2	0
CO2	3	3	3	0	3	0	0	0	2	0
CO3	3	3	3	0	3	0	0	0	2	3
CO4	3	3	3	0	3	0	0	0	2	0
CO5	3	3	3	0	3	0	0	0	2	3

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	3	2	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	13	15	15	14	15
Weighted percentage of Course Contribution to PSO	2.6	3.0	3.0	2.8	3.0

Course Coordinator

BOS Chairman

ASSESSMENT OF PROJECT WORK

Continuous Internal Assessment : 50 Marks

Review I : 25 Marks

Review II : 25 Marks

External Assessment :

Evaluation & Viva-Voce (Jointly) : 150 Marks

➤ Common instruction for the project work

- The Candidate should submit the filled in format as given in Annexure-I to the department for approval during the 1st Week of IV Semester.
- Periodically the project should be reviewed.
- The Student should submit three copies of their Project work.
- A Sample format is enclosed in Annexure-II.
- Format of the Title page and Certificate are enclosed in Annexure-III.
- The students may use power point presentation during their viva voce examination.

PASSING MINIMUM

The candidate shall be declared to have passed in the Theory / Practical / Project Work examination, if the candidate secures not less than 50% marks in EA and also in total of the prescribed marks. However submission of a record note book is a must.

CLASSIFICATION OF SUCCESSFUL CANDIDATES

Candidates who obtain 75% and above in the aggregate shall be deemed to have passed the examination in **First Class with Distinction** provided they pass all the examinations prescribed for the programme at the first appearance. Candidates, other than the above, who secure not less than 60% of the aggregate marks in the whole examinations, shall be declared to have passed the examination in **First Class**. The remaining successful candidates shall be declared to have passed in **Second Class**.

Candidates who pass all the examinations prescribed for the programme in first instance and within a period of two academic years from the year of admission are only eligible for **University Ranking**.

MAXIMUM DURATION FOR THE COMPLETION OF THE PROGRAMME

The maximum duration to complete the programme shall be three academic years after normal completion of the programme.

COMMENCEMENT OF THIS REGULATION

These regulations shall take effect from the academic year 2023-24, that is, for students who are admitted to the first year of the programme during the academic year 2023-24 and thereafter.

Sengunthar Arts and Science College
(Autonomous)

ANNEXURE - I

Name of the College :
Programme :
Name of the Student :
Register Number :
Title of the Project Work :
Address of Organization / Institution :

Name of the External Guide :
Designation :

Place :

Date:

Signature of External Guide
(With seal)

Name of the Internal Guide :
Qualification :
Teaching Experience :

Place :

Date:

Signature of Internal Guide

Chapter	CONTENTS	Page No
	COLLEGE BONAFIDE	
	CERTIFICATE COMPANY	
	ATTENDANCE CERTIFICATE	
	ACKNOWLEDGEMENT	
	SYNOPSIS	
1.	INTRODUCTION	
	ORGANIZATION PROFILE	
	SYSTEM SPECIFICATION	
	HARDWARE CONFIGURATION	
	SOFTWARE SPECIFICATION	
2.	SYSTEM STUDY	
	EXISTING SYSTEM	
	DESCRIPTION	
	DRAWBACKS	
	PROPOSED SYSTEM	
	DESCRIPTION	
	FEATURES	
3.	SYSTEM DESIGN AND DEVELOPMENT	
	FILE DESIGN	
	INPUT DESIGN	
	OUTPUT DESIGN	
	CODE DESIGN	
	DATABASE DESIGN	
	SYSTEM DEVELOPMENT	
	DESCRIPTION OF	
	MODULES (Detailed explanation	
	about the project work)	
4.	SYSTEM DESIGN AND DEVELOPMENT	
5.	CONCLUSION	
6.	BIBLIOGRAPHY	
	APPENDICES	
	A. DATA FLOW DIAGRAM	
	B. TABLE STRUCTURE	
	C. SAMPLE CODING	
	D. SAMPLE INPUT	
	E. SAMPLE OUTPUT	

A. Format of the title page

TITLE OF THE PROJECT WORK

A Project work submitted in partial fulfilment of the requirements for the degree

of

Master of Computer Applications

to the

Periyar University, Salem – 11

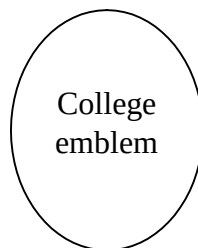
Submitted by

Name of the Student

Reg. No.

Under the Guidance of

Name of the guide
(Designation, Name of the department)



Name of the Department

College Name
(Affiliated to Periyar University)

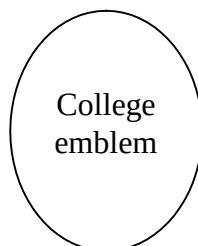
Place with Pin Code

Month – Year

B. Format of the Certificate

College Name
(Affiliated to Periyar University)

Place with Pin Code



This is to certify that the Project Work entitled **Title of the Project** submitted in partial fulfillment of the requirements of the degree of **Master of Computer Applications** to the Periyar University, Salem is a record of bonafide work carried out by **Name of the student** **Reg. No.**_____ under my supervision and guidance.

Head of the Department

Internal Guide

Submitted for Viva-Voce Examinations held on _____ at
Name of the college, Place with pincode.

External Examiner

Internal Examiner