SENGUNTHAR ARTS AND SCIENCE COLLEGE

(Autonomous)

(Affiliated to Periyar University, Salem and Approved by AICTE, New Delhi)
An ISO 9001:2015 Certified Institution. Recognised under section 2(f) and 12(B) of the UGC Act, 1956 and Accredited by NAAC with A+
TIRUCHENGODE–637205, NAMAKKAL DT., TAMILNADU.

Website : www.senguarts.co.in Emailid : info@senguarts.co.in

SYLLABUS

M.C.A

(CBCS–LOCF)

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

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 a 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.

PROGRAMME OUTCOMES

REGULATIONS ON LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK FOR POST GRADUATE	
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 the competitive environment. **PO7: Entrepreneurial Skill** Equip with skills and competencies to become an entrepreneur. **PO8: Contribution to Society** Succeed in career endeavors and contribute significantly to society. **PO9: Multicultural competence** Possess knowledge of the values and beliefs of multiple cultures and a global perspective. **PO10: Moral and ethical awareness/reasoning** Ability to embrace moral/ethical values in conducting one‘s life.

Programme Specific Outcomes (PSO)

Programme Specific Outcomes (PSOs)	**PSO1 – Placement** To prepare the students who will demonstrate respectful engagement with Others ideas, behaviours, 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 ofthe 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 SixSigmaTool–CauseandEffectMatrix);*

1–Low,2–Medium,3–High,0–NoCorrelation

I YEAR

SI. No	Course Category	Course Code	Title Of The Course	Credit Distribution			Credits	Total Contact Hours/ Week	Marks		
				L	T	P			CIA	ESE	Total
SEMESTER - I											
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**			

SI. No	Course Category	Course Code	Title Of The Course	Credit Distribution			Credits	Total Contact Hours/ Week	Marks		
				L	T	P			CIA	ESE	Total
SEMESTER II											
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	**24S2PCAE0/ 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 Paper for PG	**24S2PHR01**	Fundamentals of Human Rights	1	1		1	2	25	75	100
			TOTAL	**11**	**09**	**10**	**21**	**30**			

ELECTIVES 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

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

24S4PCASECP01 - Data Visualization Tools

24S4PCASECP02 - Soft Skill Development Lab

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

SEMESTER– I

FIRST YEAR – SEMESTER I

COREI -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

COREI -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		

Text books

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

Reference Books:

- Kimmo Eriksson & Hillevi Gavel, Discrete Mathematics & Discrete Models, Student litteratur 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 percent age of Course Contribution to PSO	2.6	3.0	3.0	2.8	3.0

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, 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 advance 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		

Text book:

- Richard Blum, Christine Bresnahan, ―Linux Command Line and Shell Scripting BIBLE‖, Wiley Publishing, 3rd Edition, 2015.**Chapters:** 3, 11 to 14, 16 to 25.
- MokhtarEbrahim, Andrew Mallett, ―Mastering Linux Shell Scripting‖, Packt Publishing, 2nd Edition, 2018. **Chapter:** 14.
- UNIX Network Programming, W.R. Stevens, PHI. UNIX for Programmers and Users, 3rd Edition, Graham Glass, King Ables, Pearson Education

Reference Books:

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

Web Resources

- https://www.geeksforgeeks.org/introduction-linux-shell-shell-scripting/
- https://www.tecmint.com/understand-linux-shell-and-basic-shell-scripting-language-tips/

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

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		

Text Books

- 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

ELECTIVE I - DATA ENGINEERING AND MANAGEMENT

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

Course Objectives:

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- ❖ To understand Data Management concepts.
- ❖ To get brief knowledge on Data Modelling.
- ❖ To analyse 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		

Text Books

1. Keith Gordon, Principles of Data Management Facilitating Information Sharing,

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

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

Reference Books

1. Peter Ghavami, Big Data Management-Data Governance Principles for Big Data Analytics‖, De Gruyter, 2020.
2. Francis Buttle, Stan Maklan, Customer Relationship Management Concepts and Technologies, Routl edge, 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

ELECTIVE LAB I - DATA ENGINEERING AND MANAGEMENT LAB

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

Learning Objectives

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

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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 DbVisualizer	PO1, PO5
CO4	Assess Zoho CRM features for managing the customer relationships	PO6
CO5	Create a customized application in Zoho CRM	PO5, PO6

ELECTIVE LAB I - DATA ENGINEERING AND MANAGEMENT LAB

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. Design 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

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

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		

Text Books

- Joseph Ingeno, ―Software Architect‘s Handbook‖ Packt Publishing 2018.

Referencebooks

- 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

ELECTIVE I - LAB
ARCHITECTURE AND FRAMEWORKS

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

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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 - LAB
ARCHITECTURE AND FRAMEWORKS

Implement the following using Linux / Windows environments

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.

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

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 Ocrlot 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		

Text Books

- Harsh Chawla and HemantKathuria, 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,IngoWeber,LimingZhu,‖DevOps, A Software Architects Perspective‖, AddisonWesley-Pearson Publication, First Ediiton 2015.
- John Ferguson Smart,‖Jenkins, The Definitive Guide‖, O'Reilly Publication, FirstEdiiton 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 percent age of Course Contribution to POs	3.0	3.0	3.0	3.0	2.6

ELECTIVE II - LAB
SOFTWARE DEVELOPMENT TECHNOLOGIES

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

Learning Objectives

- To understand the concept of DevOps with associated technologies and methodologies.
- To be familiarized with Jenkins, which is used to build & test software Applications
- To understand Continuous integration in Devops 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 analyse 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 the Pull based Software Configuration Management	PO1- PO6
CO5	To design, analyze and develop Puppet Manifest	PO1- PO6

ELECTIVE II - LAB
SOFTWARE DEVELOPMENT TECHNOLOGIES

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: 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	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

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		

Text Books

- 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: behavioural 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/
- https://study.com/academy/lesson/what-is-chromatography-definition-typesuses.html
- http://www.rsc.org/learn-chemistry/collections/spectroscopy/introduction
- https://www.javatpoint.com/what-is-soft-computing
- https://www.researchgate.net/publication/309452475_An_Overview_of_Soft_Computing

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

ELECTIVE II – LAB SOFT COMPUTING

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S1PCAEP04	Elective Lab - II	Practical	-	Y	P	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 – LAB SOFT COMPUTING

Program List

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

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

SEMESTER-II

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 understand 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-Date Abstract Data Type-Bags-Iterators. Arrays: Array Structure-Python List-Two Dimensional Arrays-Matrix Abstract Data Type. Sets, Maps: Sets-Maps- Multi-Dimensional Arrays.	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		

Text Books

- Rance D. Necaise, ―Data Structures and Algorithms Using Python‖, John Wiley &Sons, 2011. (Unit – 1)**Chapters:** 1, 2, 3.
- Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, ―Data Structures and Algorithms in Python‖, 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 3.7‖, Packt Publishing, 2018.

❖ Magnus Lie Hetland, ―Python Algorithms: Mastering Basic Algorithms in the Python Language‖, Apress, 2014.

WebResources

- ❖ 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

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.

WebResources

- 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

CORE LAB - I - DATA STRUCTURES AND ALGORITHMS

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

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.

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

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		

Text Books

- 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

- OvidiuVermesan and Peter Friess, ―Internet of Things – From Research and Innovation to Market Deployement, 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 Programm eOutcomes: 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

ELECTIVE III - LAB - INTERNET OF THINGS

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

1. To develop an IoT program to turn ON/OFF LED light (3.3V)

2. To develop an IoT program using IR sensor (Smart Garbage Monitoring, Detecting ParkingAvailability, etc.).

3. To develop an IoT program using Humidity and Temperature Monitoring (Forest fire Detection, Weather Monitoring).

4. To develop an IoT web server program for local hosting.

5. To develop an IoT program using Soil Moisture Sensor.

6. To develop an IoT program using Ultrasonic Sensor (Distance Measurement, etc.).

7. To develop an real-time IoT program using Relay Module (Smart Home Automation with 230V)

8. To develop an IoT program for Fire Detection (Home, Industry,etc.)

9. To develop an IoT program for Gas Leakage detection (Home, Industry, etc.)

10. To develop an IoMT program using Heartbeat Sensor.

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

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: Homographies-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: Epipolar 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

ELECTIVE III – LAB - COMPUTER VISION

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

Program List

Implement the following problems using Python with OpenCV

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.

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

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

ELECTIVE IV-LAB-CYBER SECURITY LAB

SubjectCode	MAJOR	Category	L	T	P	HOURS	Credit
24S2PCAEP07	Elective Lab - IV	**Practical**	-	Y	P	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 LAB

Program List

Implement the following using any cyber security tools

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 metaspolit
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

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

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 Paymentstechnology 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 - EthereumVirtual 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. Bitcoinand 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

ELECTIVE IV - LAB BLOCK CHAIN TECHNOLOGIES

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

Program List

Implement the following

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 MultiChain 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 Regtest 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 Metamask.

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

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

Mapping with Programme Specific Outcomes:

CO/PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	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

FIRST YEAR - SEMESTER II

COMPULSORY PAPER – FUNDAMENTALS OF HUMAN RIGHTS

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S2PHR01	COMPULSORY 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 disadvantagedpeop
- 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

COMPULSORY 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.

- JayantChudhary, 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

EXTRA DISCIPLINARY COURSES (NON-MAJOR ELECTIVES)
EDC I– PRINCIPLES OF INFORMATION TECHNOLOGY

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S2PCAN01	EDC I	Theory	Y	Y	-	4	4

Learning Objectives

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

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

EXTRA DISCIPLINARY COURSES (NON-MAJOR ELECTIVES)
EDC I– PRINCIPLES OF INFORMATION TECHNOLOGY

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

Text Books

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

Reference books

- V. Rajaraman, "Introduction to Information Technology, "Prentice Hall of India,2007 SujitChakrabarty(2018). Organic Home Gardening Made Easy, 1st Edition,

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

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

Mapping with Programme Specific Outcomes:

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

EDC II– FUNDAMENTALS OF COMPUTERS AND COMMUNICATIONS

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S2PCAN02	EDC II	Theory	Y	Y	-	4	4

Learning Objectives

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

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

EDC II– FUNDAMENTALS OF COMPUTERS AND COMMUNICATIONS

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

Text Books

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

Reference books

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

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

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

Mapping with Programme Specific Outcomes:

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

EXTRA DISCIPLINARY COURSES (NON-MAJOR ELECTIVES)
EDC III– E-COMMERCE

Subject Code	Subject	Category	L	T	P	Hours	Credit
24S2PCSN03	EDC III	Theory	Y	Y	-	4	4

Learning Objectives

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

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

EXTRA DISCIPLINARY COURSES (NON-MAJOR ELECTIVES)
EDC III– E-COMMERCE

Unit	Details	No. of Hours
I	Electronic Commerce – Electronic Commerce Frame work – The Anatomy of Electronic Commerce Applications - Electronic Equipment Consumer Applications - Electronic Commerce Organization Applications - Components of I-Way – Network Access Equipment	12
II	Architecture Framework for Electronic Commerce- World Wide Web as the Architecture – Consumer Oriented Applications – Mercantile Process Models – Mercantile Models from the Consumer's Perspective and Merchant's Perspective. Model Preparation : Types of E-Commerce	12
III	Electronic Payment Systems: Types of Electronic Payment Systems – Digital Token based Electronic Payment Systems–Smart Card and Credit Card Based Electronic Payment Systems – Risk and Electronic Payment Systems – Designing Electronic Payment Systems.	12
IV	Electronic Data Interchange – EDI Applications in Business – EDI: Legal, Security and Privacy issues EDI and Electronic Commerce – Standardization and EDI-EDI Software Implementation. PPT Presentation : Electronic Data Interchange.	12
V	Internet and World Wide Web: origin of the Internet – New uses for the Internet – Commercial use of the Internet–Growth of the Internet – Advertising on the Internet. Self Study: Block chain in E-Commerce*	12
	Total	**60**
Model Preparation and Power Point Presentation for the above topic to be considered for Internal Exam Only.		

Text Books

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

Reference books

- Kamalesh K. Baja, Debjani Nag, "E-Commerce–The Cutting Edge of Business", TMH Publications, 2005.
- Agarwala, K.N, DeekshaAgarwala, "Business on the Net: What‟s and How‟s of ECommerce;" Macmillan, New Delhi, 2000.
- 3Parag Diwan, Sunil Sharma, "Electronic Commerce: A Manager's Guide to EBusiness", Excel books, 2005.

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

Mapping with Programme Specific Outcomes:

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