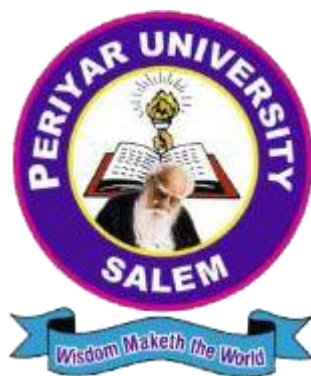


PERIYAR UNIVERSITY

(NAAC 'A++' Grade with CGPA 3.61 (Cycle - 3))

**State University - NIRF Rank 56 - State Public University
Rank 25**

SALEM - 636 011



CENTRE FOR DISTANCE AND ONLINE EDUCATION (CDOE)

M.C.A

[SEMESTER PATTERN]

(2024-25 Onwards)

SYLLABUS

(Effective from the academic year 2024 – 2025)

1. Preamble

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

2. General Graduate Attributes (MCA)

G.A.1. Core Knowledge Enrichment

Train the students with Deep Core subject knowledge(including the fundamental concepts, computational models, advanced core techniques, appropriate Domain expertise).

Apply the knowledge of deep core concepts to conceptualize the computational models.

Accredited or validated against national or international standards.

G.A.2. Critical Analysis and Decision Making

Skilled with strategic thinking, problem solving, making better use of intuition, learning to evaluate better, and recognizing the essence of things

Analyze the complex problems and to evaluate and assess information in a practical and technical way and ends up with the specialized computational models to provide valid decisions.

G.A.3. Real-Time Project Design and development

Investigating the real world problems to design and develop the computational framework to cope with real world expectations; to fit that model to the complex real-time data and to apply appropriate research methods to synthesis the information to make appropriate decisions

G.A.4. Project Management Capabilities

Trained to apply effective management skills to produce specific project outcomes

G.A.5. Tools usage

Capable to learn and apply recent domain specific knowledge in the computer science and applications industry

G.A.6. Leadership and Teamwork

Skilled to work effectively as a member and also as a leader in multi-disciplinary teams.

G.A.7. Communication Skills

Trained to communicate the technical aspects with computing professionals and with society at large. Such ability includes listening, reading, speaking and writing, and the ability to comprehend and effective technical report writing and document preparation.

G.A.8. Professionalism

Trained to think and act professionally to adapt themselves in their work places and society to showcase their talents and skills smartly for their self-up liftmen.

Aware about the cyber regulations and professional ethics, responsibilities and norms of professional computing practice

G.A.9. Advanced Technology Awareness

Trained to update themselves periodically with the current/modern technologies and enrich their knowledge through various online MOOC Courses to cope with the current industrial requirements.

G.A.10. Life Long Learning

To inculcate the passion for continuum learning for a successful professional career

G.A.11. Social Welfare with Ethical Values

Adapt at operating in other cultures, comfortable with different nationalities and social contexts, able to determine and contribute to desirable social outcomes.

Avoiding unethical behavior such as fabrication, falsification of data, committing plagiarism.

G.A.12. Entrepreneurship

Identify the timely opportunity and using innovation to pursue that opportunity to create value and wealth for the betterment of the individual and the society at large.

3. Programme Specific Qualification Attributes

PSQA-GA Mapping

	GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA10	GA11	GA12
K1(Knowledge)												
K2 (Understanding)												
K3 (Application level)												
K4 (Analytical level)												
K5 (Evaluation capability level)												
K6 (Scientific or Synthesis level)												

4. Vision & Mission

Vision:

Achieving excellence in Information Technology Enabled Services through Teaching, Research, Extension and Consultancy.

Mission

- To offer accredited post graduate and research programmes with the state- of-art technology throughout the Nation
- To maintain high academic standards and teaching quality
- To be a centre of excellence for research and innovation in frontier areas of Computer Science and technology relevant to the country.

5. Programme Objectives and Outcomes

Programme Educational Objectives

PEO1 Sound background in fundamental core concepts and Computational principles, which are applied for complex problems Solving

PEO2 Developing the professional skills and entrepreneur skills with Team work, leadership and communication qualities

PEO3 Practicing lifelong learning for successful professional career with Ethical values

Programme Outcomes (POs) for Master of Computer Applications

- P.O.1.** Train the students with Deep Core subject knowledge (including the fundamental concepts, computational models, advanced core techniques, appropriate Domain expertise). Apply the knowledge of deep core concepts to conceptualize the computational models. Accredited or validated against national or international standards.
- P.O.2.** Skilled with strategic thinking, problem solving, making better use of in tuition, learning to evaluate better, and recognizing the essence of things. Analyze the complex problems and to evaluate and assess information in a practical and technical way and ends up with the specialized computational models to provide valid decisions.
- P.O.3.** Investigating the real world problems to design and develop the computational framework to cope with real world expectations; to fit that model to the complex real-time data and to apply appropriate research methods to synthesis the information to make appropriate decisions
- P.O.4.** Trained to apply effective management skills to produce specific project outcomes
- P.O.5.** Capable to learn and apply recent domain specific knowledge in the computer science and applications industry
- P.O.6.** Skilled to work effectively as a member and also as a leader in multi-disciplinary teams.
- P.O.7.** Trained to communicate the technical aspects with computing professionals and with society at large. Such ability includes listening reading, speaking and writing, and the ability to comprehend and effective technical report writing and document preparation.
- P.O.8.** Trained to think and act professionally to adapt themselves in their work places and society to show case their talents and skills smartly for their self up liftmen. Aware about the cyber regulations and professional ethics, responsibilities and norms of professional computing practice.

P.O.12 Identify the timely opportunity and using innovation to pursue that opportunity to create value and wealth for the better men to the individual and the society at large.

[illegible]

PO-GA Mapping

	GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA10	GA11	GA12
PO1												
PO2												
PO3												
PO4												
PO5												
PO6												
PO7												
PO8												
PO9												
PO10												
PO11												
PO12												

Programme Specific Outcomes

P.S.O.1. To develop the abilities to acquire deep knowledge of fundamental and core theoretical and programming concepts for holistic development

P.S.O.2. Design, develop and test the software systems for real-time socio- economic problems

P.S.O.3. Analyze and recommend appropriate IT Solutions

6. Candidate Eligibility for M.C.A. Programme Admission

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

- BCA/Bachelor Degree in Computer Science stream (or) equivalent Degree.(OR)
- B.Sc., /B.Com. / B.A. with Mathematics at 10th, +2 level or at Graduation Level (with additional bridge Courses as per the norms of the concerned University).

Obtained at least 50% marks (45% marks in case of candidates belonging to reserved category) in the qualifying Examination.

7. Duration of the Programme and Medium

The programme shall be of two years duration spread over four semesters under choice based credit system. The Maximum duration to complete the course shall be three academic years after normal completion of the programme. The medium of instruction/study is English.

8. CBCS- Structure

Course Components	No. of courses	Marks	Credits
Core Courses	8	800	40
Elective Courses	4	400	12
Core Practical	9	900	18
Elective Practical	4	400	4
Mini Project	1	100	5
Project	1	200	15
Total	27	2800	94

9. CURRICULUM AND SCHEME OF EXAMINATIONS

SEMESTER -I					
Course	Number of Credits	Examination Duration (hrs)	Marks		
			I. A	ESE	Total
Core Theory 24DLCSA1C01 Discrete Mathematics	5	3	25	75	100
Core Theory 24DLCSA1C02 Linux and shell programming	5	3	25	75	100
Core Theory 24DLCSA1C03 Python Programming	5	3	25	75	100
Core Lab 24DLCSA1P01 Linux and shell programming Lab	2	3	40	60	100
Core Lab 24DLCSA1P02 Python Programming Lab	2	3	40	60	100
Core Lab 24DLCSA1P03 Industry Dynamics Technology-Data Visualisation Lab (self-study course)	2	3	40	60	100
Core Lab 24DLCSA1P04 Soft Skill Development Lab	2	3	100	-	100
Elective – 01 Theory	3	3	25	75	100
Elective – 01 Lab	1	3	40	60	100
TOTAL	27				900

Semester – II					
Course	Number of Credits	Examination Duration (hrs)	Marks		
			I. A	ESE	Total
Core Theory 24DLCSA1C04 Data Structures and Algorithms	5	3	25	75	100
Core Theory 24DLCSA1C05 Big Data Analytics	5	3	25	75	100
Core Lab 24DLCSA1P05 Data Structures and Algorithms Lab	2	3	40	60	100
Core Lab 24DLCSA1P06 Big Data Analytics - Lab	2	3	40	60	100
Core 24DLCSA1P07 Mini Project	5	-	40	60	100
Elective-02 Theory	3	3	25	75	100
Elective-02 Lab	1	3	40	60	100
Elective-03 Theory	3	3	25	75	100
Elective-03 Lab	1	3	40	60	100
TOTAL	27				900

Semester – III					
Course	Number of Credits	Examination Duration (hrs)	Marks		
			I. A	ESE	Total
Core Theory 24DLCSA1C06 Advanced Java Programming	5	3	25	75	100
Core Theory 24DLCSA1C07 Web Technologies	5	3	25	75	100
Core Theory 24DLCSA1C08 Advanced Machine Learning (AML)	5	3	25	75	100
Core Lab 24DLCSA1P08 Advanced Java Programming lab	2	3	40	60	100
Core Lab 24DLCSA1P09 Web Technologies Lab	2	3	40	60	100
Core Lab 24DLCSA1P10 Integrated Technology (AML) Lab (Self-study course)	2	3	40	60	100
Elective–04 Theory	3	3	25	75	100
Elective–04 Lab	1	3	40	60	100
TOTAL	25				800

Semester – IV						
Course	Number of Credits	Hours Per Week	Examination Duration (hrs)	Marks		
				I. A	ESE	Total
Core 24DLCSA1P11 Major Project	15	-	-	50	150	200
Total	15					200
Total	94					2800

Centre for Distance and Online Education (CDOE)

Master of Computer Applications (MCA)

(Effective from the academic year 2024 – 2025)

Electives selected for ODL Programmes

Elective – 1

24DLCSA2E01 Network Protocols

24DLCSA2E02 Network Protocols Lab

Elective – 2

24DLCSA2E03 Soft Computing

24DLCSA2E04 Soft Computing Lab

Elective – 3

24DLCSA2E05 Computer Vision

24DLCSA2E06 Computer Vision Lab

Elective – 4

24DLCSA2E07 Cyber Security

24DLCSA2E08 Cyber Security Lab

Option I

The students / Learners those who want to obtain the certificate for the job role / occupation in the name of Analytics Qualification Pack SSC/Q8108 of IT / ITeS Sector Skill Council should appear for the assessment to be conducted at the end of the fourth semester by the IT/ITeS Sector Skill Council of National Skill Development Corporation. In-order to get the above certificate, the students should choose the electives as suggested below:

Elective – 3

24DLCSA2E05 Computer Vision

24DLCSA2E06 Computer Vision Lab

Elective – 4

24DLCSA2E07 Cyber Security

24DLCSA2E08 Cyber Security Lab

The elective course contents cover the required contents in addition to the core courses such as Big Data Analytics, Advanced Machine Learning Techniques (Artificial Intelligence) and Soft Skill Development for the Qualification Pack SSC/Q8108 of IT / ITeS Sector Skill Council of NSDC.

Option II

The students / Learners those who want to obtain the certificate for the job role / occupation in the name of Analytics Qualification Pack SSC/Q0923 of IT / ITeS Sector Skill Council should appear for the assessment to be conducted at the end of the fourth semester by the IT/ITeS Sector Skill Council of National Skill Development Corporation. In-order to get the above certificate, the students should choose the electives as suggested below:

Elective – 1

24DLCSA2E01 Network Protocols

24DLCSA2E02 Network Protocols Lab

Elective – 4

24DLCSA2E07 Cyber Security

24DLCSA2E08 Cyber Security Lab

The elective course contents cover the required contents in addition to the core Soft Skill Development for the Qualification Pack SSC/ Q0923 of IT / ITeS Sector Skill Council of NSDC.

10. Credit Calculation

Method of teaching	Hours	Credits
Lecture	1	1
Tutorial / Demonstration	1	1
Practical / self-Learning	2/1	1

11. Examinations

Examinations are conducted in semester pattern. The examination for the Semester I& III will be held in November/December and that for the Semester II and IV will be in the month of April/May.

Candidates failing in any subject (theory, practical and skill) will be permitted to appear for such failed subjects in the same syllabus structure at subsequent examinations with in next 3 years after normal completion of the programme. Failing which, the candidate has to complete the course in the present existing syllabus structure.

12. Scheme for Evaluation and Attainment Rubrics

Evaluation will be done on a continuous basis with internal evaluation and end semester examination with prescribed question paper pattern.

Attainment of Rubrics for Theory Courses

THEORY EXAMINATION

Evaluation of Internal Assessment

Test :5 Marks
Model Examination :10 Marks
Assignment :10 Marks

Total: 25Marks

*** No Internal Minimum

Evaluation of End Semester Examinations

Question Paper Pattern (Theory)

Section	Question Pattern	Mark Pattern	K Level	CO Coverage
A	25 to 50 words	10X2=20	K1-K2	CO1-CO5
B	100 to 200 words (Answer any three out of five questions)	3X5 = 15 (Analytical type questions)	K4-K6	CO1-CO5
C	500 to 1000 words Either or type	5X8 = 40 (Essay type question)	K2-K3	CO1-CO5

Attainment Rubrics for Lab Courses

PRACTICAL / MINI PROJECT EXAMINATION

Evaluation of Internal Assessment

Test 1 : 20Marks

Test 2 : 20 Marks

Total : 40 Marks

***** No Internal Minimum**

QUESTION PAPER PATTERN

Time duration: 3 Hours

Max. Marks: 60

Two Questions may be taken from the list of practical problems: 60 Marks

Distribution of the Marks

(i) Practical/Mini project

- Record Note Book- 10
- Problem Understanding- 10
- Implementation- 20
- Debugging and Modification- 10
- For correct output and viva - 10

(ii) Industrial Training

- Internal Assessment- 40
- Joint Viva-voce – 60 (Internal Examiner 30 and External Examiner 30)

(iii) Dissertation

- Internal Assessment- 50
- Report Evaluation by External Examiner- 50
- Joint Viva-voce – 100 (Internal Examiner 50 and External Examiner 50)

REGULATIONS FOR DISSERTATION WORK

- Students should attach themselves with well reputed Industry/Company/Institutions to do their five months dissertation work.
- The Candidate should submit the filled in format to the department for approval during the First week of December during the even semester.
- The review of the dissertation will be carried out periodically.
- The student should submit three copies of their dissertation work.
- The students may use OHP/Power Point presentation during their dissertation Viva-Voce examinations.

PASSING MINIMUM

The candidate shall be declared to have passed in the theory/practical/Dissertation examination if the candidate secures:

- (i) 50% marks in the ESE and
- (ii) 50% in ESE and IA put together

13. Grading System

Evaluation of performance of students is based on ten-point scale grading system as given below.

Ten Point Scale			
Grade of Marks	Grade points	Letter Grade	Description
90-100	9.0-10.0	O	Outstanding
80-89	8.0-8.9	D+	Excellent
75-79	7.5-7.9	D	Distinction
70-74	7.0-7.4	A+	Very Good
60-69	6.0-6.9	A	Good
50-59	5.0-5.9	B	Average
00-49	0.0	U	Re-appear
ABSENT	0.0	AAA	ABSENT

Discrete Mathematics

Course Objective

- 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

Unit-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

Unit-II

Mathematical Logic-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

Unit-III

Recurrence Relations- Formulation -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 within distinguishable objects-**Combinations**- Combinations with repetition

Unit-IV

Matrices- special types of matrices-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-Cayley-Hamilton Theorem-problems

Unit-V

Graphs -Connected Graphs -Euler Graphs- Euler line-Hamiltonian circuits and paths –planar graphs – Complete graph-Bipartite graph-Hyper cube graph-Matrix representation of graphs

Text book

1. N.Chandrasekaran and M.Umaparvathi, Discrete mathematics, PHI Learning Private Limited, New Delhi, 2010.

Reference Book

1. Kimmo Eriksson & Hillevi Gavel, Discrete Mathematics & Discrete Models, Student litteratur AB, 2015.
2. Kenneth H. Rosen Discrete Mathematics and applications, Mc Graw Hill, 2012

Course Outcomes

On the successful completion of the course, students will be able

CO1:	To understand the concepts of relations and functions distinguish among normal forms	K2	IO
CO2:	To analyze and evaluate the recurrence relations	K4,K5	HO
CO3:	To distinguish among various normal forms and predicate calculus	K5	HO
CO4:	To solve and know various types of matrices	K1	LO
CO5:	To evaluate and solve various types of graphs	K5	HO

K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create

Course Code-24DLCSA1C02

Credits: 5

Linux and Shell Programming

Course Objective

- 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.

Unit-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-Looking at case.

(Book-1, Chapters: 3, 11, and 12)

Unit-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 shift-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.

(Book-1, Chapters: 13, 14, and 16)

Unit-III

Creating Functions: Basic script functions-Returning a value-Using variables in functions-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.

(Book-1, Chapters: 17, 18, and 19)

Unit-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 gawk:** Reexamining gawk-Using variables in gawk-Using structured commands-Formatting the printing-Working with functions.

(Book-1, Chapters: 20, 21, and 22)

Unit-V

Working with Alternative Shells: Understanding the dash shell-Programming in the dash shell-Introducing the zsh shell-Writing scripts for zsh.**Writing Simple Script Utilities:** Automating backups-Managing user accounts-Watching disk space. **Producing Scripts for Database, Web, and E-Mail:** Writing database shell scripts-Using the Internet from your scripts-Emailing reports from scripts. **Using Python as a Bash Scripting Alternative:** Technical requirements-Python Language-Hello World the Python way-Pythonic arguments-Supplying arguments-Counting arguments-Significant whitespace-Reading user input-Using Python to write to files-String manipulation.

(Book-1, Chapters: 23, 24, 25, and Book-2, Chapter: 14)

Text book:

1. Richard Blum, Christine Bresnahan, —Linux Command Line and Shell Scripting BIBLE, Wiley Publishing, 3rd Edition, 2015.**Chapters:** 3, 11 to 14, 16 to 25.

2. Mokhtar Ebrahim, Andrew Mallett, —Mastering Linux Shell Scripting, Packt Publishing, 2nd Edition, 2018. **Chapter:** 14.

Reference Books:

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

Course Outcomes

On the successful completion of the course, students will be able

CO1:	To understand, apply and analyze the concepts and methodology of Linux shell programming	K1-K6
CO2:	To comprehend, impart and apply fundamentals of control structure and script controls	K1-K6
CO3:	To understand, analyses and evaluate the functions, graphical desktop interface and editors	K1-K6
CO4:	To collaborate, apply and review the concepts and methodology of regular expression and advanced gawk	K1-K6
CO5:	To comprehend, use and illustrate the advance concepts such as alternate shell script, data connectivity and bash scripting using python	K1-K6

K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create

Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	-	S	L	-	M	M	M	M	S
CO2	S	S	M	-	S	L	-	M	M	M	M	S
CO3	S	S	M	-	S	L	-	M	M	S	S	S
CO4	S	S	M	-	S	L	-	M	M	M	M	S
CO5	S	S	M	-	S	L	-	M	M	M	M	S

S- Strong; M-Medium; L-Low

Python Programming**Course Objectives:**

- 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

Unit 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

Unit II

Strings and Text Files: Accessing Characters and substrings in strings - Data encryption-Strings and Number systems- String methods - Text - Lists and Dictionaries: Lists - Dictionaries - Design with Functions: A Quick review - Problem Solving with top-Down Design - Design with recursive Functions - Managing a Program's namespace - Higher-Order Functions

Unit 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 Behavior of terminal-Based programs and GUI-Based programs - Coding Simple GUI-Based programs - Windows and Window Components - Command Buttons and responding to events

Unit IV

Working with Python Packages: NumPy Library-Ndarray - Basic Operations - Indexing, Slicing and Iteration - Array manipulation - Pandas -The Series - The DataFrame - The Index Objects - Data Vizualization with Matplotlib - The Matplotlib Architecture - pyplot - The Plotting Window - Adding Elements to the Chart - Line Charts - Bar Charts - Pie charts

Unit V

Django: Installing Django – Building an Application – Project Creation – Designing the Data Schema - Creating an administration site for models - Working with QuerySets and Managers – Retrieving Objects – Building List and Detail Views

Text Book:

1. K.A. Lambert, — Fundamentals of Python: first programs, Second Edition, Cengage Learning, 2018 **(Unit - I, II and III)**
2. Fabio Nelli, —Python Data Analytics: With Pandas, NumPy, and Matplotlib, Second Edition, Kindle Edition, 2018 **(Unit - IV)**
3. Antonio Mele, —Django 3 By Example, Third Edition, 2020 **(Unit - V)**

Course Outcomes

On the successful completion of the course, students will be able to

C01	Comprehend the programming skills in python and develop applications using conditional branches and loop	K1- K6
C02	Create python applications with strings and functions	
C03	Understand and implement the Object Oriented Programming paradigm with the concept of objects and classes, Inheritance and polymorphism	
C04	Evaluate the use of Python packages to perform numerical computations and data vizualization	
C05	Design interactive web applications using Django	

K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create

Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01	S	S	M	S	M	S	S	S	S	M	S	S
C02	S	S	S	M	S	S	S	S	S	S	M	S
C03	S	M	S	S	M	S	M	S	S	M	S	S
C04	S	S	S	S	S	S	S	M	S	S	M	S
C05	S	S	S	S	S	S	S	S	S	M	M	S

S- Strong; M-Medium; L-Low

Linux and Shell Programming - Lab**Course Objectives**

- To enable the students to study and understand the efficiency of Linux shell script.
- To demonstrate the File Backup process.
- To develop and implement the shell script for GUI processing.
- To develop and implement the shell script for IPC and Networking.
- To demonstrate PostgreSQL.

List of Programs

1. Write a Shell Script program to calculate the number of days between two dates.
2. Write a Shell Script program to check systems on local network using control structures with user input.
3. Write a Shell Script program to check systems on local network using control structures with file input.
4. Write a Shell Script program to demonstrate the script control commands.
5. Write a Shell Script program to demonstrate the Shell script function.
6. Write a Shell Script program to demonstrate the Regular Expressions.
7. Write a Shell Script program to demonstrate the sed and awk Commands.
8. Write a Shell Script program to demonstrate the File Backup process through creating a daily archive location.
9. Write a Shell Script program to create a following GUI tools.
 - a) Creating text menus
 - b) Building text window widgets
10. Write a Shell Script program to demonstrate to connect a PostgreSQL database and performing CRUD operations.

Course Outcomes

On the successful completion of the course, students will be able to

CO1:	To understand, apply and analyze the concepts and methodology of Linux shell programming	K1-K6
CO2:	To comprehend, impart and apply fundamentals of control structure and script controls	K1-K6
CO3:	To understand, analyses and evaluate the functions, graphical desktop interface and editors	K1-K6
CO4:	To collaborate, apply and review the concepts and methodology of regular expression and advanced gawk	K1-K6
CO5:	To comprehend, use and analyze the advance concepts such as alternate shell script, dy and bash scripting using PostgreSQL	K1-K6

K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create

Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	-	S	-	-	-	M	-	-	-
CO2	S	S	S	-	S	-	-	-	M	-	-	-
CO3	S	S	S	-	S	-	-	-	M	S	S	S
CO4	S	S	S	-	S	-	-	-	M	-	-	-
CO5	S	S	S	-	S	-	-	-	M	S	S	S

S- Strong; M-Medium; L-Low

Python Programming Lab**Course Objectives:**

This course enables the students:

- To master the fundamentals of writing python scripts
- To create program using elementary data items
- To implement Python programs with conditionals and loops
- To use functions for structuring Python programs
- To develop web programming with Django

Implement the following in Python:

1. Program using elementary data items, lists, dictionaries and tuples
2. Program using conditional branches, loops
3. Program using functions
4. Program using classes and objects
5. Program using inheritance
6. Program using polymorphism
7. Program using Numpy
8. Program using Pandas
9. Program using Matplotlib
10. Program for creating dynamic and interactive web pages using forms

Course Outcomes

On the successful completion of the course, students will be able to

C01	Comprehend the programming skills in python and write scripts	K1- K6
C02	Create python applications with elementary data items, lists, dictionaries and tuples	
C03	Implement the Object Oriented Programming programming concepts such as objects and classes, Inheritance and polymorphism	
C04	Assess the use of Python packages to perform numerical computations and perform data vizualization	
C05	Create interactive web applications using Django	

K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create

Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	M	S	S	S	S	S	S	M	S	S
CO2	S	S	S	S	S	S	S	S	S	S	M	S
CO3	S	S	S	S	S	S	M	S	S	M	L	S
CO4	S	S	S	S	S	S	S	M	S	S	S	S
CO5	S	S	S	S	L	S	M	S	S	M	M	S

S- Strong; M-Medium; L-Low

Industry Dynamics Technology (Data Visualizations) Lab**Course Objectives**

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

List of Programs

Note: Use the following Dataset

http://www.tableau.com/sites/default/files/training/global_superstore.zip

Implement the following using Excel

1. Create Pie chart for Sales and Sales % by Country (sorted in descending order)
2. Create Bar chart for Sales by Country by Year (rounded to nearest thousand and sorted by Grand Total)
3. Create Line char for Sales by Ship Mode (First Class, Same Day, Second Class and Standard Class)
4. Create Scatter chart for Sales by Ship Mode by Country (rounded to the nearest dollar and sorted by First Class)
5. Create heat map for Sales by Category by Sub-Category (in thousands and sorted by sales value in descending order)
6. Design and create the label for vendor list
7. Design and create the dash board

Implement the following using Tableau

8. Sales by Ship Mode (First Class, Same Day, Second Class and Standard Class)
9. Sales by Ship Mode by Country (rounded to the nearest dollar and sorted by First Class)
10. Sales by Category by Sub-Category (in thousands and sorted by sales value in descending order)

Course Outcomes

On the successful completion of the course, students will be able to:

CO1:	Enable to create and apply Spread sheet and Tableau for various data processing	K1-K6
CO2:	Gains knowledge to create and design various visualization tools in Excel and Tableau.	K1-K6
CO3:	Comprehend, create and deploy labels and heat map.	K1-K6
CO4:	Enable to create and apply dashboard for various data processing	K1-K6
CO5:	Illustrate and apply data visualization tool for any data set	K1-K6

K1- Remember, K2- Understand, K3- Apply , K4- Analyze, K5- evaluate and K6- Create

Mapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	M	L	M	S	-	-	-	-	-	-
CO2	S	M	S	S	S	M	-	-	-	-	-	-
CO3	S	S	S	S	S	S	-	-	-	-	-	-
CO4	S	M	M	S	M	L	-	-	-	-	-	-
CO5	M	S	M	L	S	M	-	-	-	-	-	-

S – Strong, M – Medium, L - Low

Soft Skill Development Lab**Course Objective**

This course enables the students:

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

Exercises

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

Text Books

1. Uma Narula, —Development Communication: Theory and Practice||, Revised Edition, Har-Aanad Publication, 2019.
2. Annette Capel and Wendy Sharp, —Cambridge English: Objective First||, Fourth Edition, Cambridge University Press, 2013.
3. Emma Sue-Prince, —The Advantage: The 7 Soft Skills You Need to Stay One Step Ahead||, First Edition, FT Press, 2013.

4. Guy Brook-Hart, —Cambridge English: Business Benchmark, Second Edition, Cambridge University Press, 2014.
5. Norman Lewis, —How to Read Better & Faster, Binny Publishing House, New Delhi, 1978.

Reference Books

1. Michael McCarthy and Felicity O'Dell, —English Vocabulary in Use: 100 Units of Vocabulary Reference and Practice, Cambridge University Press, 1996.
2. Murphy, Raymond, —Intermediate English Grammar, Second Edition, Cambridge University Press, 1999.

Data Structures and Algorithms

Course 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.

Unit-I

Abstract Data Types: Introduction-Data Abstract Data Type-Bags-Iterators.

Arrays: Array Structure-Python List-Two Dimensional Arrays-Matrix Abstract Data Type. **Sets, Maps:** Sets-Maps- Multi-Dimensional Arrays.

Unit-II

Algorithm Analysis: Experimental Studies-Seven Functions-Asymptotic Analysis. **Recursion:** Illustrative Examples-Analyzing Recursive Algorithms-Linear Recursion- Binary Recursion-Multiple Recursion.

Unit-III

Stacks, Queues, and Deques: Stacks- Queues- Double-Ended Queues Linked. **Lists:** Singly Linked Lists-Circularly Linked Lists-Doubly Linked Lists. **Trees:** General Trees-Binary Trees-Implementing Trees-Tree Traversal Algorithms.

Unit-IV

Priority Queues: Priority Queue Abstract Data Type- Implementing a Priority Queue- Heaps-Sorting with a Priority Queue. **Maps, Hash Tables, and Skip Lists:** Maps and Dictionaries-Hash Tables- Sorted Maps-Skip Lists-Sets, Multisets, and Multimaps.

Unit-V

Search Trees: Binary Search Trees-Balanced Search Trees-AVL Trees-Splay Trees. **Sorting and Selection:** Merge sort-Quick sort-Sorting through an Algorithmic Lens- Comparing Sorting Algorithms-Selection. **Graph Algorithms:** Graphs-Data Structures for Graphs-Graph Traversals-Shortest Paths-Minimum Spanning Trees.

Text book:

1. Rance D. Necaise, —Data Structures and Algorithms Using Python||, John Wiley & Sons, 2011. (Unit – 1) **Chapters:** 1, 2, 3.
2. 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:

1. Dr. Basant Agarwal; 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.
2. Magnus Lie Hetland, —Python Algorithms: Mastering Basic Algorithms in the Python Language||, Apress, 2014.

Course Outcome:

On the successful completion of the course, students will be able to,

CO1	Understand various ADT concepts	K1-K6
CO2	Familiar with implementation of ADT models with Python language and understand how to develop ADT for the various real-time problems	
CO3	Apply with proper ADT models with problem understanding	
CO4	Apply and Analyze right models based on the problem domain	
CO5	Evaluate modern data structures with Python language	

K1- Remember, K2 - Understand, K3 - Apply , K4 - Analyze, K5 - Evaluate, K6 -Create

Mapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	L	L	L	L	S	S	S	L	M	M
CO2	S	M	S	M	M	L	L	L	L	L	M	M
CO3	S	S	S	L	L	L	M	M	M	M	M	L
CO4	S	S	S	L	L	L	M	M	M	L	L	L
CO5	S	S	S	L	M	M	S	S	S	S	M	L

L - Low, M- Medium, S - Strong

Big Data Analytics

Course Objectives

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

UNIT I

Big Data and Analytics: Classification of Digital Data: Structured Data- Semi Structured Data and Unstructured Data.

Introduction to Big Data: Characteristics – Evolution – Definition - Challenges with Big Data - Other Characteristics of Data - Big Data - Traditional Business Intelligence versus Big Data - Data Warehouse and Hadoop.

Environment Big Data Analytics: Classification of Analytics – Challenges - Big Data Analytics important - Data Science - Data Scientist - Terminologies used in Big Data Environments – Basically Available Soft State Eventual Consistency - Top Analytics Tools

UNIT II

Technology Landscape: NoSQL, Comparison of SQL and NoSQL, Hadoop - RDBMS Versus Hadoop - Distributed Computing Challenges – Hadoop Overview - Hadoop Distributed File System - Processing Data with Hadoop - Managing Resources and Applications with Hadoop YARN - Interacting with Hadoop Ecosystem

UNIT III

Mongodb and Mapreduce Programming: MongoDB: Mongo DB - Terms used in RDBMS and Mongo DB - Data Types - MongoDB Query Language.

MapReduce: Mapper – Reducer – Combiner – Partitioner – Searching – Sorting – Compression

UNIT IV

Hive: Introduction – Architecture - Data Types - File Formats - Hive Query Language Statements – Partitions – Bucketing – Views - Sub- Query – Joins – Aggregations - Group by and Having – RCFile - Implementation - Hive User Defined Function - Serialization and Deserialization.

UNIT V

Pig: Introduction - Anatomy – Features – Philosophy - Use Case for Pig - Pig Latin Overview - Pig Primitive Data Types - Running Pig - Execution Modes of Pig - HDFS Commands - Relational Operators - Eval Function - Complex Data Types - Piggy Bank - User-Defined Functions - Parameter Substitution – Diagnostic Operator - Word Count Example using Pig - Pig at Yahoo! - Pig Versus Hive

Text Book:

1. Seema Acharya, Subhashini Chellappan, —Big Data and Analytics||, Wiley Publications, First Edition, 2015

Reference Book:

1. Judith Huruwitz, Alan Nugent, Fern Halper, Marcia Kaufman, —Big data for dummies||, John Wiley & Sons, Inc. (2013)
2. Tom White, —Hadoop The Definitive Guide||, O'Reilly Publications, Fourth Edition, 2015
3. Dirk Deroos, Paul C.Zikopoulos, Roman B.Melnky, Bruce Brown, Rafael Coss, —Hadoop For Dummies||, Wiley Publications, 2014
4. Robert D.Schneider, —Hadoop For Dummies||, John Wiley & Sons, Inc. (2012)
5. Paul Zikopoulos, —Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data, McGraw Hill, 2012 Chuck Lam, —Hadoop In Action||, Dreamtech Publications, 2010

Course Outcomes

On the successful completion of the course, students will be able to

CO1:	To understand, illustrate and evaluate the concepts and techniques of Data Science, Big Data Analytics and its tools	K1-K6
CO2:	To collaborate, apply and review the computing for big data in Hadoop, and NoSQL environment.	K1-K6
CO3:	To comprehend, implement and review the concepts of data science and big data analytics projects using MapReduce, and MongoDB	K1-K6
CO4:	To understand, use and analyze the concepts of big data analytics projects using HIVE database.	K1-K6
CO5:	To illustrate, develop and review the concepts of PIG database in Hadoop environment.	K1-K6

K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5 Evaluate, K6- Create

Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	-	-	-	-	L	-	-	-	-	-	-
CO2	S	-	M	-	M	L	-	-	-	-	-	-
CO3	S	-	S	-	S	L	-	-	-	S	S	S
CO4	S	-	S	-	S	L	-	-	-	S	S	S
CO5	S	-	S	-	S	L	-	-	-	S	S	S

S- Strong; M-Medium; L-Low

Data Structures and Algorithms Lab

Course 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.

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.

Course Outcome:

On the successful completion of the course, students will be able to,

CO1	Strong understanding in various ADT concepts	K1-K6
CO2	To become a familiar with implementation of ADT models	
CO3	Apply sort and tree search algorithms	
CO4	Evaluate the different data structure models	
CO5	Learn how to develop ADT for the various real-time problems	

K1- Remember, K2 - Understand, K3 - Apply , K4 - Analyze, K5 - Evaluate, K6 -Create

Mapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	L	L	L	L	S	S	M	M	S	S
CO2	S	M	S	M	M	L	S	M	S	L	M	M
CO3	S	S	S	L	L	L	M	M	M	M	S	L
CO4	S	S	S	M	M	S	M	M	S	S	S	L
CO5	S	S	S	S	L	M	S	M	M	M	M	L

L - Low, M- Medium, S - Strong

Big Data Analytics Lab

Course Objectives

- To teach the fundamental techniques for handling the big data tools.
- To familiarize the tools required to manage big data.
- To analyse big data using Hadoop, MapReduce, Hive, and Pig
- To teach the fundamental principles in achieving big data analytics with scalability and streaming capability
- To enable students to have skills that will help them to solve complex.

List of Programs

1. Implement File System Shell Commands for HDFS in Hadoop Environment
2. Write a Mapreduce program using single reduce function for finding Maximum and Minimum Number
3. Write a Mapreduce program using multiple reduce function for Word Count in an given Text document
4. Implement the following using Pig Latin Input and Output Operations Relational Operations
5. Implement the following using Pig Latin User Defined Functions Advanced Relational Operations
6. Write a Word Count program using Pig Latin Script
7. Write a program to find a maximum temperature using Pig Latin Script
8. Implement the following using Hive commands Handling the Database Creating and Manipulating table
9. Implement Simple Queries for database using Mongo
10. Implement Simple Queries for collections using Mongo

Course Outcomes

On the successful completion of the course, students will be able to

CO1:	Understand and develop conceptually how Big Data is stored and implement it using different tools	K1-K6
CO2:	Comprehend and implement programs for data storage in HDFS and table manipulation using Big Data tools in Hadoop environment	K1-K6
CO3:	Understand and Critically analyse existing Big Data datasets and implementations the solutions for it using MongoDB	K1- K6
CO4:	Understand and examine existing Big Data datasets and implementations the solutions using HIVE Database	K1- K6
CO5:	Comprehend and review existing datasets and implementations the solutions to handle it using PIG	K1- K6

K1- Remember, K2- Understand, K3- Apply , K4- Analyze, K5- Evaluate, K6- Create

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	M		M	S	-	-	-	-	-	-
CO2	S	M	S	S	S	M	-	-	-	-	-	-
CO3	S	S	S	S	S	S	-	-	-	-	-	-
CO4	S	M	S	S	S	M	-	-	-	-	-	-
CO5	S	S	S	S	S	S	-	-	-	-	-	-

S- Strong; M-Medium; L-Low

Advanced Java Programming

Course Objectives

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

Unit – I

An Overview of Java: Object Oriented Programming- Data Types, Variables, and Arrays: Primitive Types-Literals Variables - Type Conversion and Casting- Arrays-Operators: Control Statements-Classes and Methods – Inheritance- Exception Handling.

Unit – II

String Handling: The String Constructors - String Length - Special String Operations - Character Extraction - String Comparison - Searching Strings - Modifying a String - Input/Output: The I/O Classes and Interfaces – File - Byte Streams - Character Streams.

Unit – III

The Applet Class: Basic Architecture - Applet Skeleton - Display methods - Status Window – Passing Parameters. Introducing GUI Programming with Swing– Introducing Swing - Swing Is Built on the AWT- Two Key Swing Features - The MVC Connection - Components and Containers - The Swing Packages - A Simple Swing Application - Exploring Swing.

Unit- IV

Java Beans: Introduction - Advantages of Beans – Introspection - The JavaBeans API - A Bean Example. Servlets: Life Cycle Simple Servlet-Servlet API-Packages-Cookies session tracking.

Unit – V

Network Programming: Working with URLs- Working with Sockets - Remote Method Invocation. Introduction to Database Management Systems - Tables, Rows, and Columns - Introduction to the SQL SELECT Statement - Inserting Rows - Updating and Deleting Existing Rows - Creating and Deleting Tables - Creating a New Database with JDBC - Scrollable Result Sets.

Text Books:

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

Reference books :

1. Herbert Schildt, Dale Skrien, —Java Fundamentals – A Comprehensive Introduction||, TMGH Publishing Company Ltd, New Delhi, 2013
2. John Dean, Raymond Dean, —Introduction to Programming with JAVA – A Problem Solving Approach||, TMGH Publishing Company Ltd, New Delhi, 2012.

Course Outcomes

On the successful completion of the course, students will be able

CO1:	Understand the Object Oriented Program including classes and methods; inheritance and exception handling	K1-K6
CO2:	Complete comprehension of String functions and I/O Streams	K1-K6
CO3:	Creation of graphical representation using Applet	K1-K6
CO4:	Application of Servlets for designing Web based applications	K1- K6
CO5:	Usage of JDBC connectivity and implementation of the concept to get desired results from database	K1-K6

K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create

Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	-	M	S	-	-	-	S	M	-
CO2	S	S	S	-	M	S	-	-	-	L	M	-
CO3	S	S	M	-	L	S	-	-	-	M	M	-
CO4	M	S	M	-	S	S	-	-	-	M	S	-
CO5	S	M	M	-	M	L	-	-	-	M	M	-

S- Strong; M-Medium; L-Low

Web Technologies

COURSE OBJECTIVES:

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

UNIT -I

WEB FUNDAMENTALS AND HTML: A Brief Introduction to the Internet - The World Wide Web - Web Browsers - Web Servers -URLs, MIME, HTTP, Security- Introduction to HTML- Origins and Evolution of HTML and HTML - Basic Syntax - Standard HTML Document Structure - Basic Text Markup - Images- Hypertext Links - Lists, Tables, Forms, The Audio Element, The Video Element - Organization Elements, The Time Element

UNIT – II

INTRODUCTION TO XHTML AND CSS: Basic syntax, Standard structure, Basic text-markup, Images, Hypertext Links. Lists, Tables, Forms, Frames, syntactic differences between HTML and XHTML-Introduction, Levels of style sheets, Style specification formats, Selector forms, Property value forms, Font properties, List properties, Color, Alignment of text, The box model, Background images, The and <div>tags, Conflict resolution.

UNIT - III

THE BASICS OF JAVASCRIPT: Overview of JavaScript, Object orientation and JavaScript, general Syntactic characteristics, Primitives, operations, and expressions, Screen output and keyboard input, Control statements, Object creation and modification, Arrays, Functions, Constructors, Pattern matching using regular expressions, Errors in scripts.

JAVASCRIPT AND XHTML DOCUMENTS: The JavaScript Execution Environment, The Document Object Model, Elements Access in Java Script, Events and Event Handling, Handling Events from Body Elements, Handling

Events from Text Box and password Elements, The DOM2 Model

UNIT- IV

DYNAMIC DOCUMENTS WITH JAVASCRIPT AND XML: Introduction, Positioning Elements, Moving Elements, Element Visibility, Changing Color and Fonts, Dynamic Content, Stacking Elements, Locating the Mouse Cursor, Reacting to a Mouse Click, Slow Movement of Elements, Dragging and Dropping Elements. Introduction to XML, Syntax of XML, XML Document Structure, Document type definitions, Namespaces, XML schemas, displaying raw XML documents, Displaying XML documents with CSS, XSLT Style Sheets, Web services.

UNIT - V

PHP, ANGULAR JS AND JQUERY: Introduction to PHP: Overview of PHP - General Syntactic Characteristics - Primitives, Operations, and Expressions - Output - Control Statements - Arrays - Functions - Pattern Matching - Form Handling - Cookies - Session Tracking - Introduction to JQuery, Syntax, selectors, events, JQuery HTML, JQuery Effects, JQuery CSS. Introduction to Angular JS, Directives, Expressions, Controllers, Filters, Services, Events, Forms, Validations, Examples.

TEXT BOOKS:

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

REFERENCE BOOKS:

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

COURSE OUTCOMES:

On the successful completion of the course, students will be able

CO1	Design dynamic web pages using Javascript, JQuery and Angular Java script	K1	LO
CO2	Develop Web pages using HTML, CSS and XML	K2	IO
CO3	Create web application using PHP and MySQL	K3, K4	HO
CO4	To design dynamic web pages using Angular javascript	K2,K3	HO
CO5	Develop interactive web pages using JQuery	K4,K5	HO

MAPPING WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	S	S	S	S	M	M	S	M	M	S	S
CO2	S	S	M	S	S	S	M	S	S	S	S	S
CO3	S	S	S	M	S	S	M	M	S	M	M	S
CO4	S	S	S	M	S	M	M	S	S	M	S	M
CO5	S	S	S	M	S	S	M	S	M	S	S	M

S- STRONG; M-MEDIUM; L-LOW

Advanced Machine Learning Techniques

Course Objectives

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

Unit I:

Introducing Machine Learning: The Origins of Machine Learning, Uses and Abuses of Machine Learning _ Basics of Machine Learning Algorithm Model Works - Steps to apply Machine Learning - Choosing a Machine Learning Algorithm - Using Machine Learning concepts.

Managing and Understanding Data: Data Structures, Vectors And Factors: Lists, Data frames, Matrixes and arrays - Managing Data - Exploring and Understanding Data: Exploring the Structure of Data, Exploring Numeric variables - Exploring Categorical Variables- Exploring Relationships between Variables.

Unit II:

Lazy Learning – **Classification Using Nearest Neighbors:** The kNN Algorithm- Diagnosing Breast Cancer with the kNN Algorithm- Probabilistic Learning – Classification Using Naive Bayes: Basic concepts of Bayesian Methods- The Naïve Bayes Algorithm- Example – filtering Mobile Phone Spam with the Naive Bayes Algorithm.

Divide and Conquer – **Classification Using Decision Trees and Rules:** Understanding Decision Trees- Example – Identifying Risky Bank Loans using C5.0 Decision Trees- Understanding Classification Rules- Example – Identifying Poisonous Mushrooms with Rule Learners.

Unit III:

Forecasting Numeric Data – **Regression Methods:** Understanding Regression- Example – Predicting Medical Expenses using Linear Regression- Understanding Regression Trees and Model Trees- Example – Estimating the Quality of Wines with Regression Trees and Model Trees.

Black Box Methods Neural Networks and Support Vector Machines: Understanding Neural Networks, from Biological to Artificial Neurons, Activation Functions, Network Topology, Training Neural Networks with Back propagation - Modeling the Strength of Concrete with ANNs- Understanding Support Vector Machines- Performing OCR with SVMs- Finding Patterns – Market Basket Analysis Using Association Rules: Understanding Association Rules- Example – Identifying Frequently Purchased Groceries with Association Rules.

Unit IV:

Finding Groups of Data – **Clustering with K-Means:** Understanding Clustering- The k-means Algorithm for clustering- Finding teen market segments using k-means Clustering- Evaluating Model Performance: Measuring Performance for Classification- Beyond Accuracy – other Measures of Performance, Visualizing Performance Tradeoffs.

Improving Model Performance: Tuning Stock Models for Better Performance- Using Caret for Automated Parameter Tuning- Creating a simple Tuned Model- Customizing the Tuning Process- Improving Model Performance with meta-learning- Understanding Ensembles- Bagging- Boosting- Random forests.

Unit V:

Introduction to Deep Learning: Introduction to Deep Learning, Single Layer Perceptron Model (SLP), Multilayer Perceptron Model (MLP), Convolutional Neural Networks (CNNs), Recurrent Neural Networks (RNNs), Restricted Boltzmann Machines (RBMs).

Convolutional Neural Networks (CNNs): Structure and Properties of CNNs - Components of CNN Architectures- Convolutional Layer, Pooling Layer, Rectified Linear Units (ReLU) Layer, Fully Connected (FC) Layer, Loss Layer - Tuning Parameters ,Notable CNN Architectures, Regularization- Recurrent Neural Networks (RNNs): Fully Recurrent Networks, Training RNNs with Back-Propagation Through Time (BPPT)- Elman Neural Networks, Neural History Compressor, Long Short-Term Memory (LSTM), Traditional and Training LSTMs - Structural Damping Within RNNs, Tuning Parameter Update Algorithm.

Text Books:

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

Reference Books:

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

Course Outcomes

On the successful completion of the course, students will be able to

CO1	To understand, impart and analyze the concepts and of Machine Learning Techniques and types of data	K1-K6
CO2	To comprehend, apply and evaluate the classification techniques for real-world applications	K1-K6
CO3	To understand, use and perform evaluation of Regression methods	K1-K6
CO4	To recognize, implement and analyse the unsupervised techniques for real-world applications	K1-K6
CO5	To understand, identify, implement and review the deep learning techniques for real-time applications	K1-K6

K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create

Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	-	-	S	L	-	S	-	-	-	-
CO2	S	S	M	-	S	L	-	S	-	-	-	-
CO3	S	S	S	-	S	L	-	S	-	S	S	S
CO4	S	S	M	-	S	L	-	S	-	-	-	-
CO5	S	S	S	-	S	L	-	S	-	S	S	S

S- Strong; M-Medium; L-Low

Advanced Java Programming Lab**COURSE OBJECTIVES:**

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

List of Experiments:

1. Implementation of and Exception handling concepts with different type of Exception.
2. Build a Swing application to implement metric conversion.
3. Use Grid Layout to design a calculator and simulate the functions of a simple calculator.
4. Create a Color palette with a matrix of buttons using Applet.
5. To invoke a servlet from HTML forms.
6. To invoke servlet from Applets.
7. To invoke servlet from JSP.
8. Implement message communication using Network Programming.
9. Write a program to connect databases using JDBC.
10. Implementation of Java Beans.

Course Outcomes

On the successful completion of the course, students will be able to

CO1:	Implement classes, objects, members of a class and the relationships among them needed for a finding the solution to specific problem	K1, K2	LO
CO2:	Apply Applets and Swing programs	K3	IO
CO3:	Develop Servlets and JSP for creating Web based applications using JDBC	K4, K5	HO

K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create

Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	S	S	S	S	M	M	S	M	M	S	S
CO2	S	S	M	S	S	S	M	S	S	S	S	S
CO3	S	S	S	M	S	S	M	M	S	M	M	S

S- Strong; M-Medium; L-Low

Web Technologies Lab

COURSE OBJECTIVES:

At the end of the course, the student should be able to do:

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

PROGRAM LIST

1. Develop a web page to display your education details in a tabular format.
2. Develop a web page to display your CV on a web page.
3. Design a Homepage having three links: About Us, Our Services and Contact Us. Create separate web pages for the three links.
4. Design a web page to demonstrate the usage of inline CSS, internal CSS and external CSS.
5. Design an XML document and create a style sheet in CSS & display the document in the browser.
6. Develop a web page to Create image maps.
7. Design a web page to perform input validation using Angular Javascript.
8. Develop a web page in PHP to fetch details from the database.
9. Design a web page to hide paragraph using JQuery
10. Create a web page and add Javascript to handle mouse events and form events

COURSE OUTCOMES:

On the successful completion of the course, students will be able

CO1	Design dynamic web pages using JavaScript, JQuery and Angular Java script	K1	L O
CO2	Develop Web pages using HTML, CSS and XML	K2	IO
CO3	Create web application using PHP and MySQL	K3, K4	H O
CO4	Develop interactive web pages using JQuery	K2,K3	H O
CO5	To design dynamic web pages using Angular javascript	K4,K5	H O

MAPPING WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	S	S	S	S	M	M	S	M	M	S	M
CO2	S	S	M	S	S	S	M	S	S	S	M	S
CO3	S	S	S	M	M	S	M	M	S	M	M	S
CO4	S	M	S	M	S	M	M	S	S	M	S	M
CO5	M	M	S	M	S	S	M	S	M	M	S	M

S- STRONG; M-MEDIUM; L-LOW

Integrated Technology (AML) Lab**Course Objectives**

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

List of Programs

1. Write a python program to compute the Central Tendency Measures: Mean, Median, Mode, Measure of Dispersion: Variance, Standard Deviation
2. Implement a Linear Regression and Multiple Linear Regression with a Real Dataset
3. Implementation of Logistic Regression using sklearn
4. Implement a binary classification model.
5. Classification with Nearest Neighbours and NavieBaye Algorithm
6. Implementation Decision tree for classification using sklearn and its parameter tuning
7. Implement the k-means algorithm.
8. Implement an Image Classifier using CNN in TensorFlow/Keras.
9. Implement an Autoencoder in TensorFlow/Keras.
10. Implement a SimpleLSTM using TensorFlow/Keras.

Course Outcomes

On the successful completion of the course, students will be able to

CO1	To understand and implement the mathematical and statistical prospective of machine learning algorithms through python programming	K1-K6
CO2	To recognize and develop the machine learning models through python in built functions	K1-K6
CO3	To understand, impart and develop the machine learning models for real-time dataset	K1-K6
CO4	To comprehend , impart and implement the deep learning models for real-time applications	K1-K6
CO5	To identify and evaluate the performance machine learning models for real-time dataset	K1-K6

K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create

Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	-	S	-	-	-	M	-	-	-
CO2	S	S	S	-	S	-	-	-	M	-	-	-
CO3	S	S	S	-	S	-	-	-	M	S	S	S
CO4	S	S	S	-	S	-	-	-	M	-	-	-
CO5	S	S	S	-	S	-	-	-	M	S	S	S

S- Strong; M-Medium; L-Low

Network Protocols

Course Objectives

- To understand the basic concepts of Transmission Control Protocol/Internet Protocol and associated functions
- Explore to describe the internet architecture and its processes associated with the data transfer and to provide the quality of service
- To understand technologies and services associated with network protocols along along with the challenges of dat transfer.
- Learners will understand the importance and functioning of Routing Protocols over communication service.
- Empower the learners to comprehend and manage the issues associated with IP protocols like data traffic problems, security and mobility.

Unit I

Transmission Control Protocol/Internet Protocol : Fundamental Architecture - Internet Protocol Basics - Routing - Transport-Layer Protocols : Transmission Control Protocol - User Datagram Protocol - Stream Control Transmission Protocol - Real-Time Transport Protocol.

Unit II

Internet Architecture: Internet Exchange Point - History of Internet Exchange Points - Internet Service Provider Interconnection Relationships - Peering and Transit - IP Routing Protocols: Overview of Routing Protocols - Routing Information Protocol - Open Shortest Path First - Border Gateway Protocol - Multiprotocol Label Switching.

Unit III

IP Quality Of Service : Introduction - Quality of Service in IP Version 4 - Integrated Services - Differentiated Services - Quality of Service with Nested Differentiated Services Levels - IP Multicast and Any cast: Addressing - Multicast Routing - Routing Protocols –Any casting- IPv6 Any cast Routing Protocol: Protocol Independent Any cast—Sparse Mode - Transport over Packet: Draft-Martini Signaling and Encapsulation - Layer-2 Tunneling Protocol.

Unit IV

Virtual Private Wired Service - Types of Private Wire Services - Generic Routing Encapsulation - Layer-2 Tunneling Protocol - Layer-3 Virtual Private Network 2547bis, Virtual Router - IP and Optical Networking: IP/Optical Network Evolution - Challenges in Legacy Traditional IP/Optical Networks - Automated Provisioning in IP/Optical Networks - Control Plane Models for IP/Optical Networking - Next-Generation MultiLayer Network Design Requirements - Benefits and Challenges in IP/Optical Networking - IP Version 6: Addresses in IP Version 6 - IP Packet Headers - IP Address Resolution - IP Version 6 Deployment: Drivers and Impediments.

Unit V

IP Traffic Engineering: Models of Traffic Demands - Optimal Routing with Multiprotocol Label Switching - Link-Weight Optimization with Open Shortest Path First - Extended Shortest-Path-Based Routing Schemes - IP Network Security: Introduction - Detection of Denial-of-Service Attack - IP Trace back- Edge Sampling Scheme - Advanced Marking Scheme - Mobility Support for IP: Mobility Management Approaches - Security Threats Related to IP Mobility - Mobility Support in IPv6 - Reactive Versus Proactive Mobility Support - Relation to Multihoming - Protocols Supplementing.

Text Book :

1. —Advanced Internet Protocols, Services and Applications||, Eiji Oki, Roberto Rojas-Cessa, Mallikarjun Tatipamula, Christian Vogt, Copyright © 2012 by John Wiley & Sons, Inc.

Reference Books :

1. —TCP/IP Protocol Suite||, Behrouz A. Forouzan, Fourth Edition, Tata Mcgraw-Hill Edition 2010.
2. —Computer Communications and Networking Technologies|| - Michael A. Gallo & William M. Hancock- BROOKS&COLE
3. —Computer Networks and Internets|| -Douglas E. Comer- PEARSON.
4. Data and Computer Communications- Eighth Edition- William Stallings- Pearson Education.
5. Network Security Bible, 2nd edition, Eric Cole, Wiley Publishers.
6. Data communication and networks –James Irvine and David Harley- Publishers: Wiley India

Course Outcomes:

On the successful completion of the course, students will be able to

CO1	Understand, analyse and examine the concepts of Communication Protocols with its architecture and functions	K1- K6
CO2	Illustrate and apply the appropriate internet architecture along with efficient protocol models for the user defined communication environment	K1- K6
CO3	Comprehend, categorize and formulate the appropriate IP routing protocol to establish a efficient data transfer	K1- K6
CO4	Comprehend, analyse and evaluate the concepts of Virtual wired service and IP/optical networking with its functions and deployment	K1- K6
CO5	Elucidate, analyse and inspect the IP traffic engineering and its models along with the security mechanisms	K1- K6

K1- Remember, K2- Understand, K3- Apply , K4- Analyze, K5- evaluate and K6- Create

Mapping with Programme Outcome

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	S	-	L	M	S	M	M	-	S	-	-
CO2	S	M	-	S	M	L	M	S	-	M	-	-
CO3	S	S	-	M	S	S	S	M	-	S	-	-
CO4	S	M	L	S	M	L	S	L	-	M	L	-
CO5	M	S	M	L	S	L	M	S	-	S	L	

S- Strong; M-Medium; L-Low

Network Protocols Lab**Course Objectives**

- To understand and implement the basic concepts of Transmission Control Protocol/Internet Protocol and associated functions.
- To acquire programming skills in 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.

Implement the following using Linux / Windows environments

1. Implement the following commands
 - a. ipconfig
 - b. ping
 - c. traceroute
 - d. netsat
 - e. nslookup
2. Implement the following server commands
 - a. ifconfig
 - b. ip
 - c. tracepath
 - d. ss
 - e. tcpdump
3. Connect and place the given file in the FTP server
4. Install packet tracer and connect a computer to router, switch and get a Icmp request
5. Implement the SSH protocols and accessing the remote device
6. Connect any two switches and get the status of each switches
7. Connect two routers and get packets from the routers.
8. Get the access of the router by connecting with working computer
9. Identify the route password of server and get the connection using telnet
10. Install wire shark for capture and analyse the packets (TCP /UDP)

Course Outcomes

On the successful completion of the course, students will be able to

CO1:	Comprehend the programming skills the SSH protocols and accessing the remote device	K1-K6
CO2:	Understand and implement the various functioning of Routing Protocols over communication service.	K1-K6
CO3:	Evaluate the use of FTP server	K1-K6
CO4:	Design to Connect any two switches and get the status of each switches	K1-K6
CO5:	Solve to Connect two routers and get packets from the routers.	K1-K6

K1- Remember, K2- Understand, K3- Apply , K4- Analyze, K5- Evaluate, K6- Create

Mapping Course outcomes with Programme outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	-	-	-	-	L	-	-	-	-	-	-
CO2	S	-	M	-	M	L	-	-	-	-	-	-
CO3	S	-	S	-	S	L	-	-	-	S	S	S
CO4	S	-	S	-	S	L	-	-	-	S	S	S
CO5	S	-	S	-	S	L	-	-	-	S	S	S

S- Strong; M-Medium; L-Low

Soft Computing**COURSE 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.

UNIT-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.

UNIT - 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.

UNIT-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 AutoAssociative Memory-Kohonen Self-Organizing Feature Map- Architecture-Flowchart for Training Process-Training Algorithm.

UNIT-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-Center 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.

UNIT-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.

TEXT BOOKS

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

UNIT I: Chapter 1: 2.1,2.3,2.4,2.5,2.6,2.7

UNIT II: Chapter 2: 3.2,3.3,3.4,3.5,3.6

UNIT III: Chapter 3: 4.3,4.4,4.7,5.3

UNITIV: Chapter 4: 7.2,7.3,8.4,9.3,9.4,10,10.2,10.3,10.4,11.4,12.8,14

UNIT V: Chapter 5: 15,15.2,15.3,15.4,15.9,15.10

REFERENCE BOOKS

1. Das, A. (2018). Artificial Intelligence and Soft Computing for Beginners.
2. Amit, K. (2018). Artificial intelligence and soft computing: behavioral and cognitive modeling of the human brain. CRC press.
3. Rajasekaran, S., &Pai, G. V. (2011). Neural networks, fuzzy logic and genetic algorithm: synthesis and applications (with cd). PHI Learning Pvt. Ltd.
4. 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.

5. Gupta, M. M. (2004). Soft computing and intelligent systems: theory and applications. Elsevier.
6. 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.

COURSE OUTCOMES:

- On the successful completion of the course, students will be able to

CO1	To provide an introduction to the basic principles, techniques, and applications of soft computing	K- 1 K2	LO
CO2	To get familiar with Neural network architectures and supervised learning algorithms	K3	IO
CO3	To understand the architectures and algorithms of Unsupervised Learning techniques	K3- K4	H O
CO4	Develop the skills to gain a basic understanding of fuzzy logic theory and fuzzy inference systems	K4	IO
CO5	Ability to learn traditional optimization and search techniques and genetic programming	K5	H O

MAPPING WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	S	M	S	S	S	M	S	M	S	S
CO2	M	S	M	S	M	M	M	S	M	S	S	M
CO3	M	M	S	S	S	M	M	S	S	S	S	S
CO4	S	S	M	M	M	S	S	S	S	M	M	M
CO5	S	S	S	S	S	M	S	M	M	S	S	M

S- STRONG; M-MEDIUM; L-LOW

Soft Computing Lab**COURSE 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.

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

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

CO1	To apply supervised learning algorithms for real datasets	K- 1K2	LO
CO2	To implement Unsupervised Learning techniques	K3	IO
CO3	To apply fuzzy based arithmetic and logical operations	K3- K4	HO
CO4	To find solutions for problems using Genetic algorithm	K4	IO
CO5	To implement DeMorgan's Law	K5	HO

MAPPING WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M	S	M	S	S	S	M	S	M	S	S
CO2	M	S	M	M	M	M	M	S	M	S	M	M
CO3	M	M	S	S	S	M	M	S	S	S	S	S
CO4	S	S	S	M	M	S	S	M	S	S	S	M
CO5	S	S	S	S	S	M	M	M	M	S	M	M

S- STRONG; M-MEDIUM; L-LOW

Computer Vision

Course 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.

Unit-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.

Unit-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.

Unit-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.

Unit-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.

Unit-V

Image Segmentation: Graph Cuts-Segmentation using Clustering-Variational Methods. **OpenCV:** Python Interface-OpenCV Basics-Processing Video-Tracking.

Course Outcome:

On the successful completion of the course, students will be able to,

CO1	To understand and recall computer vision and its application areas	K1-K6
CO2	To develop build a computer vision system	
CO3	To apply and analyze a design range of algorithms for image processing and computer vision	
CO4	To develop incorporate machine learning techniques with computer vision system	
CO5	To apply and analyze image segmentation and image registration	

K1- Remember, K2 - Understand, K3 - Apply , K4 - Analyze, K5 - Evaluate, K6 -Create

Mapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	L	M	L	L	L	M	M	M	S	S	L
CO2	S	M	L	M	M	L	S	L	S	L	S	L
CO3	S	S	S	M	M	L	M	L	M	L	M	L
CO4	S	S	S	M	M	L	M	L	M	L	S	L
CO5	S	S	S	M	M	L	S	L	S	L	S	L

L - Low, M- Medium, S - Strong

Computer Vision Lab

Course 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.

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.
 - i) Resizing
 - ii) Rotation
4. Addition operation of Two Images.
5. Image filtering operations
 - i) Mean Filtering
 - ii) 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.

Course Outcome:

On the successful completion of the course, students will be able to,

CO1	To develop and implement the image loading and exploring	K1-K6
CO2	To Evaluate the image transforms	
CO3	To apply and analyze for image processing denoising algorithms	
CO4	To design and develop the Image Segmentation using Edge	
CO5	To apply and analyze image clustering and classification algorithms	

K1- Remember, K2 - Understand, K3 - Apply , K4 - Analyze, K5 - Evaluate, K6 -Create

Mapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	L	M	L	L	L	M	M	M	S	S	L
CO2	S	M	L	M	M	L	S	L	S	L	S	L
CO3	S	S	S	M	M	L	M	L	M	L	M	L
CO4	S	S	S	M	M	L	M	L	M	L	S	L
CO5	S	S	S	M	M	L	S	L	S	L	S	L

L - Low, M- Medium, S - Strong

Cyber Security

Course 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

Unit – 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.

Unit – 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-smart phone security guidelines – purses, wallets, smart phones – platforms, setup and installation-communicating securely with a smart phone.

Unit – 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.

Unit – 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.

Unit – 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.

Text books:

1. Dr.JeetendraPande, "Introduction to Cyber Security" Published by Uttarakhand Open University, 2017.(Chapter: 1.2-6.4,9.3-12.2)
2. 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)

Reference Books:

1. Sebastian Klipper, –Cyber Security" EinEinblickfur Wirtschafts wissens chaftler Fachmedien Wiesbaden,2015
2. John G.Voller Black and Veatch, –Cyber Security" Published by John Wiley & Sons, Inc., Hoboken, New Jersey Published simultaneously in Canada ©2014.

Course Outcomes

On the successful completion of the course, students will be able to

CO1:	Understand, describe, analyze and examine the basics of Cyber security concepts and its implementation in India	K1- K6
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	K1- K6
CO3:	Understand, apply and evaluate the various investigation roles and Wi Fi protecting mechanisms.	K1- K6
CO4:	Understand, illustrate and evaluate the method of seize the digital information and evidences forensics data and evaluate the forensics reports	K1- K6
CO5:	Comprehend, apply and appraise the methods digital forensics with cybercrime prevention techniques	K1- K6

K1- Remember, K2- Understand, K3- Apply , K4- Analyze, K5- Evaluate, K6- Create

Mapping with Programme Outcomes

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
CO1	S	L	-	L	M	L	M	M	-	M	-	-
CO2	M	S	-	L	M	L	M	M	-	M	-	-
CO3	M	S	L	L	M	L	M	M	-	M	M	L
CO4	S	M	L	S	M	L	S	M	-	M	-	-
CO5	M	S	M	L	S	L	M	S	-	S	-	-

S- Strong; M-Medium; L-Low

Cyber Security Lab**COURSE 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

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 metasploit
5. Identify the multiple vulnerabilities webserver using nikto tool
6. Identify the open ports in the network using nmap tools
7. List all the network around us and display the information about the networks
8. Sniff and capture the packet sent over HTTP requests
9. Find the owners of internet resources using Whois Lookup tool
10. Find the sub domains of webpage using knock tool

Course Outcomes

On the successful completion of the course, students will be able to

CO1:	Comprehend the programming skills in Change the wireless device mode as monitor mode	K1-K6
CO2:	Understand and implement multiple vulnerabilities web server	K1-K6
CO3:	Evaluate the use of different wireless device modes	K1-K6
CO4:	Design to Solve related to find the sub domains of webpage	K1-K6
CO5:	Create and apply open ports in the network	K1-K6

K1- Remember, K2- Understand, K3- Apply , K4- Analyze, K5- Evaluate, K6- Create

Mapping Course outcomes with Programme outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	-	-	-	-	L	-	-	-	-	-	-
CO2	S	-	M	-	M	L	-	-	-	-	-	-
CO3	S	-	S	-	S	L	-	-	-	S	S	S
CO4	S	-	S	-	S	L	-	-	-	S	S	S
CO5	S	-	S	-	S	L	-	-	-	S	S	S

S- Strong; M-Medium; L-Low

MODEL QUESTION PAPER
DATA STRUCTURES AND ALGORITHMS

Section A (10 × 2 = 20 Marks)

(Answer all questions in 25–50 words. K1–K2 level)

1. Define an abstract data type.
2. What is the difference between a stack and a queue?
3. List any two applications of recursion.
4. What is the use of a hash table in Python?
5. Define AVL Tree.
6. What is asymptotic analysis in algorithms?
7. Write any two operations performed on a Python list.
8. What is a skip list?
9. Differentiate between singly and doubly linked lists.
10. Mention the time complexity of merge sort in the worst case.

Section B (3 × 5 = 15 Marks)

(Answer any three out of five. 100–200 words. K4–K6 level. Analytical type)

11. Analyze the time complexity of binary recursion with a suitable example.
12. Compare the performance of Quick Sort and Merge Sort using theoretical analysis.
13. Explain how AVL trees ensure balance during insertion and deletion.
14. Design a Python class for a priority queue using a heap and explain its working.
15. Evaluate the efficiency of hash tables with chaining versus open addressing.

Section C (5 × 8 = 40 Marks)

(Answer any five questions. Essay type: 500–1000 words. K2–K3 level)

16. a) Describe the structure and implementation of two-dimensional arrays in Python.

OR

- b) Explain the matrix abstract data type and its operations.

17. a) Describe the different types of recursion with examples.

OR

- b) Discuss linear and binary recursion with illustrative examples and their analysis.

18. a) Explain various tree traversal algorithms with example trees.

OR

- b) Describe the implementation of binary trees using linked structures.

19. a) Explain the working of skip lists. How are they used for implementing sets and maps?

OR

- b) Describe how hash tables work. Explain with Python code for insertion and search.

20. a) Explain how Dijkstra's algorithm finds the shortest path in a graph.

OR

- b) Write an essay on AVL trees and their rotations with diagrams and use-cases.