VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN
(AUTONOMOUS)

M.Sc., (COMPUTER SCIENCE)
(Candidates admitted from 2024 – 2025 onwards)

COLLEGE VISION & MISSION

VISION

- To evolve into a center of excellence in higher education through creative and innovativepractices to social equity for women.

MISSION

- To provide sufficient learning infrastructure to the students to pursue their studies.
- To provide good opportunity for higher education and conducive environment to the students to acquire education.
- To provide quality academic programs training activities and research facilities.
- To facilitate industry-institute interaction.

PG DEPARTMENT OF COMPUTER SCIENCE

VISION

- To provide high academic goals to the students and make them the world leaders both in educational and research through effective teaching.

MISSION

- To create, share and apply knowledge in Computer Science including inter disciplinary areas that extends the scope of Computer Science and benefit humanity.
- To educate students to be successful, ethical and effective problem solvers.
- To prepare the students to contribute positively to the economic well being of our region and nation.

PROGRAMME EDUCATIONAL OBJECTIVES

PEO 1: To develop the ability to plan, analyze, design, code, test, implement and maintain the software product for real time systems.
PEO 2: To excel in problem solving and programming skills in computing fields of IT industries.
PEO 3: To practice effectively as individuals and as team members in multidisciplinary projects involving technical, managerial, economical and social constraints.
PEO 4: To prepare the students to pursue higher studies in computing and related fields and to work in the fields of teaching and research.

PROGRAMMEOUTCOMES

1. To possess advanced knowledge of Computing, Mathematical basics for contemporary Computing Specialization and Knowledge of defined problem domain.
2. To identify a prospective domain, review research literature and analyze the problems using mathematical methods and suggest.
3. To have the ability to use design tools, design software as per needs and specifications
4. To apply acquired knowledge of the domain in investigating the software design, from design of experiments, analysis of data to provision of valid conclusions.
5. To possess the skills to use modern software and hardware tools to analyze problems
6. To possess the knowledge of ethical and legal principles and cyber regulations.

7. To possess ability for self-education and attitude for life-long learning in the broadcast context of technological change.
8. To possess the skill and acumen for innovative research and be aware of publishing their work in reputed journals.
9. To possess the ability of communicate scientific facts effectively in both verbal and written form to the society.
10. To possess the ability to understand the impact of IT solutions in a global and societal context.
11. To possess the skill to find out the right opportunity for entrepreneurship for the betterment of an individual and society at large

PROGRAMME SPECIFIC OUTCOMES

1. Implement the concept of theory and technology with classical and modern techniques for solving the complex problems in Computer Science
2. Be more curious towards learning new and emerging technologies that adapt quickly to changes.
3. Design, execute and evaluate computing projects in academia and industries using appropriate technologies
4. Know the contextual knowledge in computing science research and communicate effectively with stakeholders with the society at large for enhancing the quality of life.
5. Be honest in upholding the ethical principles and social responsibilities along with socio-economic innovations.

REGULATIONS

I. SCOPE OF THE PROGRAMME

Master of Computer Science can be considered to be one of the most prominent Master's level programs in our country. This program mainly deals with the development of computer applications for the purpose of updating computer programming languages. M.Sc.(CS) also aims at creating strong knowledge of theoretical computer science subjects who can be employed in research and development units of industries. The course has a time period of two years with four semesters.

II. SALIENTFEATURES

- Regular conduct of guest lectures and seminars
- Campus recruitment
- Provides facilities such as internet access and in-house library
- Provides career guidance for Post Graduate Courses and the Certifications inprogramming languages
- Conduct of personality development program
- Visiting faculties from industries

III. OBJECTIVES OF THE COURSE

The course objective of the M.Sc.Computer Science program is to provide advanced and in-depth knowledge of computer science and its applications to enable students pursue a professional career in Information and Communication Technology in related industry, business and research. The course designed to impact professional knowledge and practical skills to the students.

IV. ELIGIBILITY FOR ADMISSION

A Candidate who has passed B.Sc. Computer Science / BCA / B.Sc. Computer Technology / B.Sc. Information Science Degree of Periyar university or any of the Degree of any other university accepted by the syndicate as equivalent thereto subject to such conditions as may be prescribed therefore shall be permitted to appear and qualified for the M.Sc. Computer Science Degree Examinations of the Periyar University after a course of study of two academic years.

V. DURATION OF THE COURSE

The course shall extend over a period of two academic years consisting of four semesters. Each academic year will be divided into two semesters. The First semester will consist of the period from June to November and the Second semester from December to April.

The subjects of the study shall be in accordance with the syllabus prescribed from time to time by the Board of Studies of Vivekanandha College of Arts and Sciences for Women (Autonomous) with the approval of Periyar University.

VI. ASSESSMENT

Assessment of the students would be made through Continuous Internal Assessment (CIA) and External Assessment (EA) for passing each subject both theory and practical papers.

A candidate would be permitted to appear for the External Examination only on earning 75 % of attendance and only whenher conduct has been satisfactory. It shall be open to grant exemption to a candidate for valid reasons subject to conditions prescribed.

A. CONTINUOUS INTERNAL ASSESSMENT (CIA)

The performance of the students will be assessed continuously by the teacher concern and the Internal Assessment Marks will be as follows:

DISTRIBUTION OF CONTINUOUS ASSESMENT MARKS (25/40)

Activity	Marks (25)	Activity	Marks (40)
Attendance	5	Attendance	10
CA Test I	2.5	Observation & Record	10
CA Test II	2.5	Model	20
Model	5		
Assignment	5		
Seminar	5		
Total	**25**		**40**

DISTRIBUTION OF ATTENDANCE MARK

S. No.	Percentage	Marks	
		Theory	Practical
1	76-80	1	2
2	81-85	2	4
3	86-90	3	6
4	91-95	4	8
5	96-100	5	10

B. EXTERNAL ASSESSMENT (EA)

The performance of the students would be assessed by examination at the end of each semester with a written test for theory for three hours and practical examination at the end of even semesters for six hours. Question papers would be set by the selected external examiners in the prescribed format and valuated by the external examiners with the help of the teacher concern. The pattern of assessment is as follows:

DISTRIBUTION OF FINAL ASSESMENT MARKS (75/60)

Section	Activity	Marks (75)	Activity	Marks (60)
A	One mark questions	10	Experiment I	25
B	Five marks (Either or)	35	Experiment II	25
C	Ten marks (any three)	30	Viva Voce	10
Total		**75**	**Total**	**60**

VII. PASSING MINIMUM

INTERNAL

There is no passing minimum for CIA

EXTERNAL

In the EA, the passing minimum shall be 50% out of 75 Marks. (38 Marks)

VIII. CLASSIFICATION OF SUCCESSFUL CANDIDATES

Successful candidates passing the examination of Core Courses (Main and Elective subjects) and securing marks

a) 75% and above shall be declared to have passed the examination in first class with Distinction provided they pass all the examinations prescribed for the course at first appearance itself.
b) 60% and above but below 75% shall be declared to have passed the examinations in first class without Distinction.
c) 50% and above but below 60% shall be declared to have passed the examinations in second class.
d) Candidates who pass all the examinations prescribed for the course at the first appearance itself and within a period of two consecutive academic years from the year of admission only will be eligible for University rank.
e) If she fails to complete her course within the specified period, she can extend for two year's to complete her course.

IX. ELIGIBILITY FOR AWARD OF THE DEGREE

A candidate shall be eligible for the award of the degree only if she has undergone the above degree for a period of not less than two academic years comprising of four semesters and passed the examinations prescribed and fulfilled such conditions have been prescribed therefore.

X. PROCEDURE IN THE EVENT OF FAILURE

If a candidate fails in a particular subject, she may reappear for the semester examination in the concerned subject in subsequent semesters and shall pass the examination.

XI. COMMENCEMENT OF THESE REGULATIONS

The regulations shall take effect from the academic year 2021-2022 (i.e.,) for the students who are to be admitted to the first year of the course during the academic year 2021-22 and thereafter.

Candidates who were admitted to the PG course of study before 2018-19 shall be permitted to appear forthe examinations under those regulations for the period of three years ie., upto and inclusive of the examinations of 2018-19. Thereafter, they will be permitted to appear for the examination only under the regulations then in force.

XII. TRANSITORY PROVISIONS

Candidates who have undergone the PG Course of study before 2021 – 22 shall be permitted to appear for the examinations under those regulations for a period of two years i.e., upto and inclusive of the examination of April/May 2022 – 2023. Thereafter, they will be permitted to appear for the examination only under the regulations then in force.

XIII. SUPPLEMENTARY EXAMINATION

Supplementary examination will be conducted within a month. In case of failure she has to complete within 5 years. (2+5).

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN
(AUTONOMOUS)
M.Sc(CS) CURRICULUM
(For candidates admitted from 2024 – 2025 onwards)

First Semester							
Coursecomponents	**Course Code**	**NameofCourse**	**Ins.hours**	**Credits**	**Max.Marks**		**TOTAL**
					CIA	**EE**	
Core–1	24P1CSC01	Advanced PYTHON Programming	5	4	25	75	100
Core-2	24P1CSC02	Advanced Data Structures and Algorithms	5	4	25	75	100
Core-3	24P1CSC03	TCP/IP Essentials	5	4	25	75	100
Core-4	24P1CSP01	Practical – I : Data Structures and Algorithms Lab	4	2	40	60	100
Core-5	24P1CSP02	Practical – II : Advanced PYTHON Programming Lab	4	2	40	60	100
Extra Disciplinary	24P1MAGE01	Optimization Techniques	5	4	25	75	100
SoftSkill-1	24P1CSS01	Choose from the List Given at the end (Soft skill – 1)	2	2	25	75	100
		Total	**30**	**22**	**205**	**495**	**700**
Second Semester							
Coursecomponents	**Course code**	**NameofCourse**	**Ins. hours**	**Credits**	**Max.Marks**		**TOTAL**
					CIA	**EE**	
Core–6	24P2CSC04	Machine Learning	5	4	25	75	100
Core–7	24P2CSC05	Human Computer Interaction	5	4	25	75	100
Core–8	24P2CSP03	Practical -3: Machine Learning Lab	4	2	40	60	100
Core–9	24P2CSEP01	Practical -4: Elective II Based Lab	4	2	40	60	100
Extra–Disciplinary	24P2CSS02	Discrete Mathematical Structures	4	3	25	75	100
Elective-I	24P2CSDE01	Elective – I (List Given Below)	3	3	25	75	100
Elective-II	24P2CSDE04	Elective – II (List Given Below)	3	3	25	75	100
SoftSkill-2	24P2CSPR01	Choose from the List Given at the end (Soft skill – 2)	2	2	40	60	100
	Internship	Internship during Summer Vacation of 1 Year					
		Total	**30**	**23**	**245**	**555**	**800**

Third Semester							
Coursecomponents	**Course Code**	**NameofCourse**	**Ins. hours**	**Credits**	**Max.Marks**		**TOTAL**
					CIA	**EE**	
Core-10	24P3CSC06	Data Analytics using Power BI	5	5	25	75	100
Core-11	24P3CSC07	Network Security Essentials	5	5	25	75	100
Core-12	24P3CSP05	Practical – 5 : Data Analytics using Power BI Lab	5	3	40	60	100
Elective-III	24P3CSDE_	Elective – 3 (List Given Below)	4	3	25	75	100
Elective-IV	24P3CSDE_	Elective – 4 (List Given Below)	4	3	25	75	100
SoftSkill-3	24P3CSS_	Soft Skill – 3 (Choose from the List Given at the end)	2	2	25	75	100
SoftSkill-4	24P3CSS_	Soft Skill – 4 (Choose from the List Given at the end)	3	2	25	75	100
	24P3HR01	Human Rights	2	2	25	75	100
	Internship	Internship	0	1	0	0	0
		Total	**30**	**26**	**215**	**585**	**800**

Fourth Semester						
Course components	**Course Code**	**Name of Course**	**Credits**	**Max.Marks**		**TOTAL**
				CIA	**EE**	
Core-15	24P4CSCPR02	Project and Viva - Voce	19	90	210	300
		Total	**19**	**90**	**210**	**300**

- CIA = Continuous Internal Assessment
- UE = University Examination

Elective I

	Course code	Title
Semester II	24P2CSDE01	Cloud Computing Technologies
	24P2CSDE02	Internet of Things
	24P2CSDE03	Augmented Reality

Elective II

	Course code	Title
Semester II	24P2CSDE04	MongoDB
	24P2CSDE05	Natural Language Processing
	24P2CSDE06	Data Science

Elective III

	Course code	Title
Semester III	24P3CSDE07	Cyber Security
	24P3CSDE08	Deep Learning and Neural Networks
	24P3CSDE09	Angular JS

Elective IV

	Course code	Title
Semester III	24P3CSDE10	Microsoft Azure AI Fundamentals – AI 900
	24P3CSDE11	Software Testing
	24P3CSDE12	Computer Vision

List of Soft Skill Courses

S.No	Course code	Title
1	24P1CSS01	Research Methodology
2	24P2CSS02	Communication Skills for Software Engineers
3	24P2CSPR01	Team Project
4	24P3CSS03	Personality Development and other Soft Skills for Software Engineers
5	24P3CSS04	Document Preparation and Interview Skills for Software Engineers

Students are encouraged to do courses from there sources like SWAYAM, NPTEL etc

- Operating systems
- Principles of Programming Languages
- Compiler Design
- Natural Language Processing
- Software Engineering
- Software Testing
- Bigdata Analytics
- Robotics
- Robotics Process Automation
- Organizational Behaviors
- Other electives or softskills

The credits earned through on line courses from the platforms SWAYM, NPTEL shall be transferred as per the University Policy.

Learning Outcome Index : Mapping of program outcome with courses

Table 1														
Program Outcomes	**Core Courses**													
	CO 1	CO 2	CO 3	CO 4	CO 5	CO 6	CO 7	CO 8	CO 9	CO 10	CO 11	CO 12	CO 13	CO 14
Outcomes 1	X		X			X					X			X
Outcomes 2	X	X			X	X	X	X				X		X
Outcomes 3		X	X	X			X			X	X		X	
Outcomes 4		X			X	X		X	X			X		X
Outcomes 5	X		X	X			X				X		X	
Outcomes 6		X		X	X			X		X		X		X
Outcomes 7	X					X	X		X		X		X	X
Outcomes 8	X			X		X	X			X		X		
Outcomes 9		X	X	X	X			X	X		X		X	X

COi –ithCore Course

Table 2		
Program Outcomes	**Extra-Disciplinary Courses**	
	Course 1	**Course 2**
Outcomes 1	X	
Outcomes 2		X
Outcomes 3	X	
Outcomes 4		X
Outcomes 5		X
Outcomes 6	X	
Outcomes 7	X	
Outcomes 8		X
Outcomes 9	X	X

Table 3												
Program Outcomes	**Elective Courses**											
	CO 1	CO 2	CO 3	CO 4	CO 5	CO 6	CO 7	CO 8	CO 9	CO 10	CO 11	CO 12
Outcomes 1	X		X			X					X	
Outcomes 2		X			X			X	X		X	X
Outcomes 3	X		X	X			X			X	X	
Outcomes 4		X	X		X			X	X			
Outcomes 5	X		X			X	X			X	X	
Outcomes 6		X		X	X			X		X		X
Outcomes 7	X					X	X		X	X		X
Outcomes 8				X		X	X					X
Outcomes 9		X	X	X	X			X	X		X	

COi–ithElective Course

Table 4					
Program Outcomes	**SoftSkill Courses**				
	Course 1	**Course 2**	**Course 3**	**Course 4**	**Course 5**
Outcomes 1	X		X	X	
Outcomes 2		X		X	X
Outcomes3		X			
Outcomes 4	X				X
Outcomes 5		X	X		
Outcomes 6	X			X	X
Outcomes 7	X		X		
Outcomes 8		X		X	X
Outcomes 9	X	X	X		

Course type	Course code	Title of the Course /Paper	Semester	Credit
Core–1	24P1CSC01	Advanced PYTHON Programming	I	4

OBJECTIVES

- To Provide advanced programming knowledge in python environment
- To Make interactive Python programs.
- To develop GUI based applications
- To utilise libraries and APIs for rapid application development
- To use python as an analytical tool for different mathematical models

OUTCOMES

- Learn modern data structures to include collections, array, and queues
- Be able to set up a client-server program and also multiprocess applications.
- Be able to use python as an analytical and presentation tool

UNIT I: Introduction to Object Orientation: Classes-What are Classes for?- How Is an OO System Constructed?- Where Is the Structure in an OO Program?- What is Python?-Python versions-Python Programming-Python Libraries-Python Execution Model-Running Python Programs- Setting Up the Python Environment: Introduction- Check to See If Python Is Installed- Installing Python on a Windows PC- Setting Up on a Mac.

UNIT II: Python Strings: What Are Strings?- Representing Strings- What Type Is String-What Can You Do with Strings?- Hints on Strings- String Formatting- String Templates-Numbers, Booleans and None: Introduction- Types of Numbers-Integers- Floating Point Numbers- Complex Numbers- Boolean Values- Arithmetic Operators- Assignment Operators

UNIT III: Flow of Control Using If Statements: Introduction - Comparison Operators-Logical Operators- The If Statement- Nesting If Statements- If Expressions-Iteration/Looping: Introduction- While Loop- For Loop- Break Loop Statement- Continue Loop Statement- For Loop with Else- A Note on Loop Variable Naming.

UNIT IV: Python Modules and Packages: Introduction: Modules- Python Modules-Importing Python Modules- Module Properties- Standard Modules- Python Module Search Path - Modules as Scripts - Python Packages. ADTs, Queues and Stacks: Introduction-Abstract Data Types - Data Structures – Queues – Stacks. Map, Filter and Reduce: Introduction-Filter-Map-Reduce.

UNIT V: Numpy: What is NumPy? - Features of NumPy- Basics of NumPy Arrays- Creating NumPy Array- Matrix in NumPy- Operations on NumPy Array. Pandas: Introduction – Pandas Getting Started - Pandas Series- Pandas DataFrames- Pandas Read CSV- Pandas Read JSON- Pandas - Analyzing DataFrames-Cleaning Data-Correlations-Plotting.

RECOMMENDED TEXTS

1. John Hunt; Advanced Guide to Python 3 Programming; Springer Nature Switzerland AG; 2019

REFERENCE BOOKS

1) Eric Matthes, Python Crash Course: A Hands-On, Project-Based Introduction to Programming, 2nd Edition, No starch Press, 2019.
2) Mark Lutz; Learning Python, 5th Edition; O'Reilly Media, 2013
3) Mark Lutz, "Programming Python", 4th edition, O'Reilly Media, 2010.

WEB REFERENCES

1. https://realpython.com/tutorials/advanced/
2. https://www.w3schools.com/python/pandas/pandas_exercises.asp (Pandas concept in Unit-V)

MAPPING WITH PROGRAMME OUTCOMES

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

S-Strong M-Medium L-Low

Course type	Course code	Title of the Course /Paper	Semester	Credit
Core–2	24P1CSC02	Advanced Data Structure and Algorithms	I	4

OBJECTIVES

- Define the basic concepts of algorithms and analyze the performance of algorithms.
- Discuss various algorithm design techniques for developing algorithms.
- Discuss various searching, sorting and graph traversal algorithms.
- Understand NP completeness and identify different NP complete problems.
- Discuss various advanced topics on algorithms.

OUTCOMES

- Analyze programming problem statements.
- Comprehend and select algorithm design approaches in a problem specific manner.
- Choose appropriate data structures for a specific problem
- Utilize necessary mathematical abstractions to solve problems
- Come up with analysis of efficiency and proofs of correctness

UNIT I: Introduction: Algorithm, Pseudo code for expressing algorithms, Performance Analysis-Space complexity, Time complexity, Asymptotic Notation- Big oh notation, Omega notation, Theta notation and Little oh notation, Probabilistic analysis, Amortized analysis.

UNIT II: Insertion and deletion and merging with 1) binary search tree, 2) AVL tree, 3) Red Black tree, 4) B tree, 5) B+ tree and Comparison of previous tree structures . Fibonacci Heap, Fibonacci Heap Operations: Find minimum, merge, insert, extract minimum, decrease key and delete, Complexity analysis of the above data structure operations.

UNIT III: Representations of Graphs, Minimum Spanning Trees: Growing a Minimum Spanning Tree – Kruskal and Prim- Single-Source Shortest Paths: The Bellman-Ford algorithm – Single-Source Shortest paths in Directed Acyclic Graphs – Dijkstra ‘s Algorithm, Divide and conquer: General method, applications - Quick sort, Merge sort, Strassen’s matrix multiplication, External Sort: External merge sort, K-Way Merge sorting

UNIT IV: Greedy method: General method, applications-Job sequencing with deadlines, 0/1, knapsack problem, Huffman Codes, Dynamic Programming: General method, applications-Matrix chain multiplication, 0/1 knapsack problem, Traveling salesperson problem, Reliabilitydesign.

UNIT V: Backtracking: General method, applications-n-queen problem, sum of subsets problem, graph coloring, Hamiltonian cycles. Branch and Bound: General method,applications - Traveling salesperson problem, 0/1 knapsack problem- LC Branch and Bound solution, FIFO Branch and Bound solution. NP-Hard and NP-Complete problems

RECOMMENDED TEXTS

1. PeterBrass; Advanced Data Structures; CAMBRIDGE UNIVERSITY PRESS;2008
2. S. Dasgupta, C. Papadimitrou, U Vazirani; Algorithms; Mc Graw Hill;2022
3. J. Klienberg and E. Tardos, Algorithm Design, Pearson Education Limited;2013

REFERENCE BOOKS

1. Sartaj Sahni, Data Structures Algorithms and Applications in C++, 2nd Edition, Universities Press, 2007.
2. Ellis Horowitz, Sartaj Sahni, Rajasekharan, Fundamentals of Algorithms, 2nd Edition, Universities Press, 2009.
3. Aho V Alfred, Hapcroft E John, Ullman D Jeffry, Data Structures and Algorithms, Pearson Education, 2001.
4. Adam Drozdek, Thomson, Data Structures and Algorithms in JAVA, 3rd Edition, Cengage Learning, 2008.
5. Horowitz, Sahni, Mehta, Fundamentals of Data Structures in C++, 2nd Edition, Universities Press, 2007.

WEB REFERENCES

1. https://nptel.ac.in/courses/106102064

MAPPING WITH PROGRAMME OUTCOMES

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

S-Strong M-Medium L-Low

Course type	Course code	Title of the Course /Paper	Semester	Credit
Core–3	24P1CSC03	TCP/IP Essentials	I	4

OBJECTIVES

- This course provides a solid foundation for understanding the communication process of the Internet.
- The student will understand the fundamental concepts of computer networking in the context of the TCP/IP model and protocols.
- To study classful and classless addressing, IPV4, IPv6, UDP, TCP, congestion control and flow control.

OUTCOMES

- Summarize basic principles of IPv4 and its Addressing mechanisms
- Understand UDP Services and Applications in Transport Layer
- Describe the services, and features of TCP
- Discuss various Flow, Error and Congestion control mechanisms of TCP
- Understand the Principles of IPv6 Addressing, IPv6 and ICMPv6 Protocols

UNIT I: The OSI Model and the TCP/IP Protocol Suite - Protocol Layers, The OSI Model, TCP/IP Protocol suite and Addressing.IPV4 Addresses- Introduction, Classful and Classless Addressing, Internet Protocol Version4(IPv4) – Datagrams, Fragmentation, Options, Checksum, Security, IP Package.

UNIT II: Introduction to the Transport Layer – Transport Layer Services and Protocols. User Datagram Protocol(UDP) – Introduction, User Datagram, UDP Services and Applications,UDP Package.

UNIT III: Transmission Control Protocol – I : TCP Services, Features, Segment, TCP Connection,Windows in TCP.

UNIT IV:: Transmission Control Protocol – II : Flow Control, Error Control, Congestion Control, TCP Timers, Options and TCP Package.

UNIT V: IPv6 Addressing – Introduction, Address Space Allocation, Global Unicast Addresses, Autoconfiguration and Renumbering. IPv6 Protocol - Introduction , Packet Format, Transition from IPv4 to IPv6. ICMPv6 - Introduction, Error Messages, Informational Messages, Neighbor-Discovery Messages, Group Membership Messages.

RECOMMENDED TEXTS

1. TCP/IP Protocol Suite, Behrouz A. Forouzan, 4th Edition, Tata McGraw-Hill Edition.

REFERENCE BOOKS

1. Fall Kevin R., Stevens W. Richard TCP/IP Illustrated: The Protocols, Volume 1 (Addison-Wesley Professional Computing Series) 2nd Edition, Kindle Edition, Addison-Wesley Professional, 2011.
2. Douglas E.Comer, Internetworking with TCP/IP Volume I 6th Edition, Pearson Education India, 2015.

WEB REFERENCES

1. https://www.slideshare.net/slideshow/tcpip-network-ppt/31111866
2. https://www.slideshare.net/slideshow/tcpip-71722814/71722814

MAPPING WITH PROGRAMME OUTCOMES

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

S-Strong M-Medium L-Low

Course type	Course code	Title of the Course /Paper	Semester	Credit
Core–4	24P1CSP01	Practical-1: Data Structure and Algorithms Lab	I	2

OBJECTIVES

- To provide the foundations of the practical implementation and usage of Algorithms and Data Structures.
- To ensure that the student evolves into a competent programmer capable of designing and analyzing implementations of algorithms and data structures for different kinds of problems.
- To expose the student to the algorithm analysis techniques,
- To make the students understand the theory of reductions, and to the classification of problems.
- To make the students to be sure of complexity classes like NP.

OUTCOMES

- Design and analyze programming problem statements.
- C hoose appropriate data structures and algorithms, understand the ADT/libraries, and use it to design algorithms for a specific problem.
- Be familiar with programming language constructs available for rapid application development,
- Understand the necessary programmatic abstraction to solve problems.
- Gain the capacity to solve real life problems by matching to the available algorithms.

IMPLEMENT THE FOLLOWING USING JAVA

1. Write a program to perform the following operations on a heterogeneous singly linked list. i) Creation ii) Insertion iii) Deletion iv) Traversal.\
2. Write a program to perform the following operations on a heterogeneous doubly linked list. i) Creation ii) Insertion iii) Deletion iv) Traversal in both ways
3. Write a program that implements using java generic class, the stack (its operations)
4. Write a program that implements using java generic class, the queue (its operations)
5. Write a program that implements the Quick sort method.
6. Write a program that implement the Merge sort method.
7. Write a program that implement the SHELL sort method.
8. Write a program to perform the following: i) Creating a Binary Tree of integers ii) Traversing the above binary tree in preorder, inorder and postorder.
9. Write a program to perform the following: i) Creating a AVL Tree ii) insertion iii) deletion iv) Traversing the above AVL tree in preorder, inorder and postorder.
10. Write a program that uses functions to perform the following: i) Creating a SplayTree ii) traverse
11. Write a program to perform the following: i) Creating a B-Tree of integers ii) insertion iii) deletion
12. Write a program that implements Kruskal's algorithm using a disjoint set data structure. The program takes as input a file (data.txt), in which each line either represents a vertex or an edge. For the edge lines, the first integer on that line representing the starting \vertex, the second the ending vertex, and the third the weight of the edge. Use this file to construct, line by line, the graph upon which Kruskal's

algorithm will be run (do NOT hardcode this graph!).

13. Write a program to simulate various graph traversing algorithms.
14. Write a program to find the minimal spanning tree of a graph using the Prim's algorithm.
15. Write a program to find shortest path using Bellman Ford's Algorithm

RECOMMENDED TEXTS

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++:Pearson Education; 4th Edition,

REFERENCE BOOKS

1. Sartaj Sahni, Data Structures Algorithms and Applications in C++, 2nd Edition, Universities Press, 2007.
2. Ellis Horowitz, Sartaj Sahni, Rajasekharan, Fundamentals of Algorithms, 2nd Edition, Universities Press, 2009.
3. Aho V Alfred, Hapcroft E John, Ullman D Jeffry, Data Structures and Algorithms, 1st Edition, Pearson Education, 2002.
4. Adam Drozdek, Thomson, Data Structures and Algorithms in JAVA, 3rd Edition, Cengage Learning, 2008.
5. Horowitz, Sahni, Mehta, Fundamentals of Data Structures in C++, 2nd Edition, Universities Press, 2007.

WEB REFERENCES

1. https://nptel.ac.in/courses/106102064

MAPPING WITH PROGRAMME OUTCOMES

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

S-Strong M-Medium L-Low

Course type	Course code	Title of the Course /Paper	Semester	Credit
Core–5	24P1CSP02	Practical - 1 : Advanced PYTHON Programming Lab	I	2

OBJECTIVES

- Design, implement and test readable, efficient programs that take advantage of Python built-in capabilities and follow Python best practices.
- Understand implementation differences and performance tradeoffs associated with various Python data structures.
- Develop Python applications using the modules and packages available in the Python standard library.
- Develop Python applications using third party libraries.
- Design, implement and test Python programs that include a graphical user interface, data analysis and visualization, web data extraction and web applications.

OUTCOMES

- Possess an ability to write database applications in Python
- Implement Object Oriented concepts in programming Apply Collection modules for the data types
- Possess the Object-oriented programming skills in Python. and the skill of to design graphical-user interfaces (GUI) in Python.
- Make use of Pandas.

LIST OF PROGRAMS

1. String Operations
   a. String concatenation
   b. Length of a string
   c. Splitting Strings
   d. Replacing Strings
   e. Finding Sub Strings
   f. Comparing Strings
2. Types of Numbers
   a. Integers
   b. Floating Point Numbers
   c. Complex Numbers
   d. Arithmetic Operators
3. If then statement
   a. Check Input Is Positive or Negative
   b. Test if a Number Is Odd or Even
4. Iteration/Looping
   a. Calculate the Factorial of a Number
   b. Print All the Prime Numbers in a Range
5. Python Modules
   a. Write a Python program to generate a random color hex, a random alphabetical string, random value between two integers (inclusive) and a random multiple of 7 between 0 and 70. Use random.randint()

6. Pandas Programs
    a. Write a Pandas program to add, subtract, multiple and divide two Pandas Series.
    b. Write a Pandas program to join the two given dataframes along rows and assign all data.
    c. Write a Pandas program to join the two given dataframes along columns and assign all data.
7. Numpy Libraries
    a. Matrix Operation add,subtract and multiply.
    b. Binary Operations
    c. Mathematical Functions
    d. String Operations

RECOMMENDED TEXTS

1. Martin C. Brown (Author), "Python: The Complete Reference" McGraw Hill Education, Fourth edition , 2018

REFERENCE BOOKS

1. R. Nageswara Rao , "Core Python Programming" Dreamtech Press India Pvt Ltd 2018.

WEB REFERENCES

1. https://realpython.com/tutorials/advanced/
2. https://onlinecourses.nptel.ac.in/noc19_cs40/preview
3. https://onlinecourses.nptel.ac.in/noc19_cs41/preview

MAPPING WITH PROGRAMME OUTCOMES

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

S-Strong M-Medium L-Low

Course type	Course code	Title of the Course /Paper	Semester	Credit
Core-6	24P2CSC04	Machine Learning	II	4

OBJECTIVES

- To provide mathematical base for Machine learning
- To provide theoretical knowledge on setting hypothesis for pattern recognition. To impart Knowledge of machine learning techniques for data handling
- To provide the skill to evaluate the performance of algorithms and to provide solution for various real-world applications.
- To impart the knowledge of identifying similarities and differences in various patterns of data

OUTCOMES

- Recognize the characteristics of machine learning strategies.
- Apply various supervised learning methods to appropriate problems.
- Identify and integrate more than one technique to enhance the performance of learning.
- Create probabilistic and unsupervised learning models for handling unknown pattern.
- Analyze the co-occurrence of data to find interesting frequent patterns.
- Preprocess the data before applying to any real-world problem and can evaluate its performance.

UNIT I: Basic Mathematics For Machine Learning: Regression Correlation and Regression, types of correlation – Pearson's, Spearman's correlations –Ordinary Least Squares, Fitting a regression line, logistic regression, Rank Correlation Partial and Multiple correlation-Multiple regression, multicollinearity. Gradient descent methods, Newton method, interior point methods, active set, proximity methods, accelerated gradient methods, coordinate descent, cutting planes, stochastic gradient descent. Discriminant analysis, Principal component analysis, Factor analysis, k means.

UNIT II: Introduction To Machine Learning: Introduction, Examples of various Learning Paradigms, Perspectives and Issues, Version Spaces, Finite and Infinite Hypothesis Spaces, PAC Learning, VC Dimension.

UNIT III: Supervised Learning Algorithms Learning a Class from Examples, Linear, Non-linear, Multi-class and Multi-label classification, Decision Trees: ID3, Classification and Regression Trees (CART), Regression: Linear Regression, Multiple Linear Regression, Logistic Regression. Neural Networks: Introduction, Perceptron, Multilayer Perceptron, Support vector machines: Linear and Nonlinear, Kernel Functions, K-Nearest Neighbors

UNIT IV: Ensemble Learning: Ensemble Learning Model Combination Schemes, Voting, Error-Correcting Output Codes, Bagging: RandomForest Trees, Boosting: Adaboost, Stacking:UNSUPERVISEDLEARNING: Introduction to clustering, Hierarchical: AGNES, DIANA, Partitional: K-means clustering, K-Mode Clustering, Self-Organizing Map, Expectation Maximization, Gaussian Mixture Models, PrincipalComponent Analysis (PCA), Locally Linear Embedding (LLE), Factor Analysis

UNIT V: Probabilistic Learning: Bayesian Learning, Bayes Optimal Classifier, Naïve Bayes Classifier, Bayesian Belief Networks, Mining Frequent Patterns: MACHINE LEARNING IN PRACTICE: Design, Analysis and Evaluation of Machine Learning Experiments, Other Issues: Handling imbalanced data sets

RECOMMENDED TEXTS

1. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, Prentice Hall of India, Third Edition 2014.
2. Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar "Foundations of Machine Learning", MIT Press, 2012.

REFERENCE BOOKS

1. Tom Mitchell, "Machine Learning", McGraw Hill, 3 rd Edition,1997.
2. Charu C. Aggarwal, "Data Classification Algorithms and Applications", CRC Press, 2014.
3. Stephen Marsland, "Machine Learning – An Algorithmic Perspective", 2nd Edition, CRC Press, 2015.
4. Kevin P. Murphy "Machine Learning: A Probabilistic Perspective", The MIT Press, 2012
5. Jiawei Han and MichelineKambers and Jian Pei, "Data Mining –Concepts and Techniques", 3 rd Edition,Morgan Kaufman Publications, 2012.
6. Marc Peter Deisenroth, A. Aldo Faisal, Cheng Soon Ong, "Mathematics for Machine Learning", Cambridge University Press, 2019.

WEB REFERENCES

1. https://www.youtube.com/watch?v=r4sgKrRL2Ys&list=PL1xHD4vteKYVpaIiy295pg6_SY5qznc77

MAPPING WITH PROGRAMME OUTCOMES

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

S-Strong M-Medium L-Low

Course type	Course code	Title of the Course /Paper	Semester	Credit
Core-7	24P2CSC05	Human Computer Interaction	II	4

OBJECTIVES

- To facilitate communication between students of psychology, design, and computer science on user interface development projects.
- To provide the future user interface designer with concepts and strategies for making design decisions.
- To expose the future user interface designer to tools, techniques, and ideas for interface design.
- To introduce the student to the literature of human-computer interaction.
- To stress the importance of good user interface design.

OUTCOMES

- To understand the GUI & UI.
- How to make a good design and information about design process.
- Components involved in designing a process or GUI
- To learn about device navigation and window constraints.
- How to use Software Tools for creating powerful HCI.

Unit I :. Introduction to HCI: Importance of user Interface – definition, importance of good design. Benefits of good design. A brief history of Screen design, The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface.

Unit II : Design process: Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, and understanding business junctions.

Unit III: Screen Designing : Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design.

Unit IV: Windows: New and Navigation schemes selection of window, selection of devices based and screen based controls, Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors

Unit V: Software tools: Specification methods, interface – Building Tools, Interaction Devices – Keyboard and function keys – pointing devices – speech recognition digitization and generation – image and video displays – drivers

RECOMMENDED TEXTS

1. The essential guide to user interface design, Wilbert O Galitz, Wiley DreamaTech. 2007
2. Designing the user interface. 3rd Edition Ben Shneidermann , Pearson Education Asia, 2005

REFERENCE BOOKS

1. Human – Computer Interaction. ALAN DIX, JANET FINCAY, GRE GORYD, ABOWD, RUSSELL BEALG, PEARSON.
2. Interaction Design PRECE, ROGERS, SHARPS. Wiley Dreamtech,
3. User Interface Design, Soren Lauesen , Pearson Education.

WEB REFERENCES

1. https://slideplayer.com/slide/7414966/
2. https://www.coursehero.com/file/43538322/unit3ppt/
3. https://slideplayer.com/slide/7414966/

MAPPING WITH PROGRAMME OUTCOMES

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

S-Strong M-Medium L-Low

Course type	Course code	Title of the Course /Paper	Semester	Credit
Core-8	24P2CSP03	Practical -3: Machine Learning Lab	II	2

OBJECTIVES

- Make use of Data sets in implementing the machine learning algorithms
- Implement the machine learning concepts and algorithms in any suitable language of choice
- The programs can be implemented in either JAVA or Python.
- For Problems 1 to 6 and 10, programs are to be developed without using the builtin classes or APIs of Java/Python.
- Data sets can be taken from standard repositories or constructed by the students .(https://archive.ics.uci.edu/ml/datasets.html).

OUTCOMES

- Understand the implementation procedures for the machine learning algorithms. Design Java/Python programs for various Learning algorithms.
- Apply appropriate data sets to the Machine Learning algorithms.
- Identify and apply Machine Learning algorithms to solve real world problems.
- Be capable of confidently applying common Machine Learning algorithms inpractice and implementing their own;

LIST OF PROGRAMS

1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.
2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
4. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.
5. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
6. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.
7. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
8. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
9. Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.

10. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

RECOMMENDED TEXT

1. Dr. Kamlesh Namdev, LAP LAMBERT ; Lab manual of Machine Learning: Machine Learning Practicals in Python; Academic Publishing; 2021.

REFERENCE BOOKS

1. Introduction to Machine Learning with Python by Andreas C. Müller, Sarah Guido Released October 2016 Publisher(s): O'Reilly Media, Inc. ISBN: 9781449369415.

WEB REFERENCES

1. https://www.youtube.com/watch?v=RnFGwxJwx-0

MAPPING WITH PROGRAMME OUTCOMES

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

S-Strong M-Medium L-Low

Course type	Course code	Title of the Course /Paper	Semester	Credit
Core-10	24P3CSC06	Data Analytics using Power BI	III	5

OBJECTIVES

- To Acquire the knowledge on Data Science and its Foundations
- To explore about the various Data process and evaluation methods
- To understand Distinct Analysis tool and practice ethical decision and action

OUTCOMES

- Analyze the key issues in data and its associated applications in intelligent business and scientific computing
- Comprehend and apply the methods
- Comprehend the Fundamentals of data analytics
- Analyze privacy issues on Business Intelligence
- Build Interactive Dashboard for Business

UNIT-I: Introduction to big data: Data, Characteristics of data and Types of digital data: Unstructured, Semi-structured and Structured, Sources of data, Working with unstructured data, Evolution and Definition of big data, Characteristics and Need of big data, Challenges of big data, Data environment versus big data environment

UNIT-II: Big data analytics: Overview of business intelligence, Data science and Analytics, Meaning and Characteristics of big data analytics, Need of big data analytics, Classification of analytics, Challenges to big data analytics, Importance of big data analytics, Basic terminologies in big data environment

UNIT-III: Introducing Power BI: Introducing Power BI, Why Use Power BI?, The xVelocity In-Memory Analytics Engine, Setting Up the Power BI Environment, Exploring the Power BI Desktop Interface, Importing Data into Power BI Desktop, Importing Data from Text Files, Importing Data from a Data Feed

UNIT-IV: Data Munging with Power Query: Discovering and Importing Data, Transforming, Cleansing, and Filtering Data, Merging Data, Appending Data, Splitting Data, Unpivoting Data, Grouping and Aggregating Data, Inserting Calculated Columns, Creating the Data Model, Creating Table Relations, Creating a Star Schema

UNIT-V: Creating Calculations with DAX: What Is DAX?, Implementing DAX Operators, Working with Text Functions, Using DAX Date and Time Functions, Using Informational and Logical Functions, Getting Data from Related Tables, Using Math, Trig, and Statistical Functions, Creating Measures with DAX: Measures vs. Attributes, Creating Common Aggregates, Mastering Data Context, Altering the Query Context, Using Filter Functions, Using Variables in DAX

RECOMMENDED TEXTS

1. Seema Acharya, Subhashini Chellappan, “Big Data Analytics”, 2nd Edition, Wiley, 2019.
2. Beginning Microsoft Power BI A Practical Guide to Self-Service Data Analytics — Third Edition — Dan Clark

REFERENCE BOOKS

1. Chris Eaton, Dirk Deroos et. al., "Understanding Big data", Indian Edition, McGraw Hill, 2015
2. Alberto Ferrari and Marco Russo, Introducing Microsoft Power BI, Microsoft Press, 2016
3. Devin Knight, Brian Knight, Mitchell Pearson, Manuel Quintana, Brett Powell, Microsoft Power BI Complete Reference- Bring your data to life with the powerful features of Microsoft Power BI, Packt Publishing, 2018

WEB REFERENCES

1. http://powerbi.tips/
2. https://powerbi.microsoft.com/en-us/learning/
3. https://intellipaat.com/power-bi-training/

MAPPING WITH PROGRAMME OUTCOMES

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

S-Strong M-Medium L-Low

Course type	Course code	Title of the Course /Paper	Semester	Credit
Core-11	24P3CSC07	Network Security Essentials	III	5

OBJECTIVES

- To learn the emerging concepts of cryptography
- Categorize and analyze the key concepts in network and wireless security

OUTCOMES

- Explain the various security aspects and its importance
- Outline the several types of security attacks and various cryptographic algorithms
- Summarize about message authentication and security practices.
- Apply symmetric key and public key cryptographic algorithms to perform the process of cryptography.
- Analyze the various cryptographic algorithms and apply them accordingly

Unit-I: Computer security concepts-The OSI Security Architecture- Security attacks-security services-Security Mechanisms – A model for Network Security.Classical Encryption Techniques: Symmetric Cipher model-substitution techniques, transposition techniques, steganography.

Unit-II: Block Ciphers and the Data Encryption Standard:Block cipher Principles-The Data Encryption Standard-A Des Example- Strength of DES – Differential and linear cryptanalysis - Block cipher design principles – Advanced Encryption Standard -Block cipher mode of operation .

Unit-III: Asymmetric Key Ciphers: Primes – Primality Testing-Fermat,,s and Euler,,s Theorem - Chinese Remainder Theorem – Public key Cryptography and RSA:Principles of public key cryptosystems.RSAAlgorithm–Diffie Hellman key exchange -ElGamal cryptosystem – Elliptic curve arithmetic-Elliptic curve cryptography.

Unit-IV: Data Integrity Algorithms: Simple Hash function – Security of hash function – SHA. Authentication requirement – Authentication function – MAC . Digital signature and authentication protocols – DSS- user Authentication.

Unit- V: Security Practice And System Security:: Electronic Mail security – PGP, S/MIME – IP security .System Security: Intruders – Malicious software – Firewalls.

RECOMMENDED TEXTS

1. William Stallings, Cryptography and Network Security: Principles and Practice, PHI3rd Edition, 2006.

REFERENCE BOOKS

1. BehrouzA.Foruzan, Cryptography and Network Security, Tata McGraw Hill 2007.
2. C K Shyamala, N Harini and Dr. T R Padmanabhan: Cryptography and NetworkSecurity, Wiley India Pvt.Ltd

WEB REFERENCES

1. https://onlinecourses.swayam2.ac.in/aic20_sp06/preview
2. https://onlinecourses.swayam2.ac.in/arp19_ap79/preview

MAPPING WITH PROGRAMME OUTCOMES

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

S-Strong M-Medium L-Low

Course type	Course code	Title of the Course /Paper	Semester	Credit
Core-12	24P3CSP05	Practical – 5 : Data Analytics using Power BI Lab	III	3

OBJECTIVES

- To Acquire the knowledge on Data Science and its Foundations
- To explore about the various Data process and evaluation methods
- To understand Distinct Analysis tool and practice ethical decision and action

OUTCOMES

- Analyze the key issues in data science and its associated applications in intelligent business and scientific computing
- Comprehend and apply the methods
- Comprehend the Fundamentals of data analytics
- Analyze privacy issues on Business Intelligence
- Build Interactive Dashboard for Business

LIST OF PROGRAMS

1. Prepare Data in Power BI Desktop
2. Load Data in Power BI Desktop
3. Model Data in Power BI Desktop
4. Create DAX Calculations in Power BI Desktop – Part 1
5. Create DAX Calculations in Power BI Desktop – Part 2
6. Design a Report in Power BI Desktop – Part 1
7. Design a Report in Power BI Desktop – Part 2
8. Create a Power BI Dashboard
9. Perform Data Analysis in Power BI Desktop
10. Enforce Row-Level Security
11. Real time-project

RECOMMENDED TEXTS

1. Beginning Microsoft Power BI A Practical Guide to Self-Service Data Analytics - Third Edition — Dan Clark

MAPPING WITH PROGRAMME OUTCOMES

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

S-Strong M-Medium L-Low

Course type	Course code	Title of the Course /Paper	Semester	Credit
Core-15	24P4CSCPR02	Project and Viva – Voce	IV	12

FIRST REVIEW: **(10 Marks)**

1. Problem Identification
2. Problem definition
3. Presentation

SECOND REVIEW: **(10 Marks)**

1. Project Analysis
2. Design & Module description

FINAL REVIEW: **(20 Marks)**

1. DFD / ERD / System Flow Diagram (Whichever Applicable)
2. Coding and Implementation
3. Presentation
4. Final Project Report (with executable format including complete source code)

The Passing minimum shall be 40% out of 60 marks (24 Marks)

ourse type	Course code	Title of the Course /Paper	Semester	Credit
Elective -1	24P2CSDE01	Cloud Computing Technologies	II	3

OBJECTIVES

- To introduce the cloud computing concepts and map reduce programming model.
- To provide skills and knowledge about operations and management in cloud technologies so as to implement large scale systems.
- To provide skills to design suitable cloud infrastructure that meets the business services and customer needs.
- To provide Knowledge of different CPU, memory and I/O virtualization techniques that serve in offering software, computation and storage services on the cloud; Software Defined Networks (SDN) and Software Defined Storage (SDS); cloud storage technologies and relevant distributed file systems, NoSQL databases and object storage;
- To introduce the variety of programming models and develop working experience in several of them.

OUTCOMES

- Understand the evolution, principles, and benefits of Cloud Computing in order to assess existing cloud infrastructures to choose an appropriate architecture that meets business needs.
- Decide a suitable model to capture the business needs by interpreting different service delivery and deployment models.
- Understand virtualization foundations to cater the needs of elasticity, portability and resilience by cloud service providers.
- Infer architectural style, work flow of real-world applications and to implement the cloud applications using map reduce programming models.
- Compare operation and economic models of various trending cloud platforms prevailing in IT industry.

UNIT I: Foundations of cloud: Inception and need for cloud computing: Motivations from distributed computing predecessors - Evolution - Characteristics - Business Benefits – Challenges in cloud computing - Exploring the Cloud Computing Stack - Fundamental Cloud Architectures – Advanced Cloud Architectures - Specialized Cloud Architectures.

UNIT II: Service Delivery and Deployment Models: Service Models (XaaS): Infrastructure as a Service (IaaS) - Platform as a Service (PaaS) - Software as a Service(SaaS) -Deployment Models: Types of cloud - Public cloud - Private cloud - Hybrid cloud – Service level agreements - Types of SLA – Lifecycle of SLA- SLA Management

UNIT III: Cloud Resource Virtualization: Virtualization as Foundation of Cloud – Understanding Hypervisors – Understanding Machine Image and Instances - Managing Instances – Virtual Machine Provisioning and Service Migrations Cloud Computing Applications and Paradigms: Existing Cloud Applications and Opportunities for New

Applications - Architectural Styles for Cloud Applications - Workflows: Coordination of Multiple Activities - Coordination Based on a State Machine Model: The ZooKeeper - The MapReduce Programming Model - A Case Study: The Grep The Web Application

UNIT IV: Resource Management and Scheduling in Cloud: Policies and Mechanisms for Resource Management – Stability of a Two-Level Resource Allocation Architecture-Feedback Control Based on Dynamic Thresholds - Coordination of Specialized Autonomic Performance Managers - A Utility-Based Model for Cloud-Based Web Services -Resource Bundling: Combinatorial Auctions for Cloud Resources – Scheduling Algorithms for Computing Clouds - Resource Management and Dynamic Application Scaling

UNIT V: Cloud Platforms and Application Development: Comparing Amazon web services, Google AppEngine, Microsoft Azure from the perspective of architecture (Compute, Storage Communication) services and cost models. Cloud application development using third party APIs, Working with EC2 API – Google App Engine API - Facebook API, Twitter API. Advances is Cloud: Media Clouds - Security Clouds - Computing Clouds -Mobile Clouds – Federated Clouds – Hybrid Clouds.

RECOMMENDED TEXTS

1. Rajkumar Buyya, James Broberg, Andrzej, M. Goscinski, Cloud Computing: Principles and Paradigms, Wiley, 1st Edition, 2013.
2. Sosinsk, Barrie, Cloud Computing Bible, John Wiley & Sons, 1st Edition, 2011.

REFERENCE BOOKS

1. Marinescu, Dan C. Cloud Computing: Theory and Practice. Morgan Kaufmann, 2017.
2. Toby Velte, Anthony Velte, Robert Elsenpeter, Cloud Computing: A Practical Approach, Mc Graw Hill Education, 1st Edition, 2017.
3. Buyya, Rajkumar, Christian Vecchiola, and S. Thamarai Selvi. Mastering Cloud Computing: Foundations and Applications Programming, Tata Mcgraw Hill, 1st Edition, 2017.

WEB REFERENCES

1. https://www.youtube.com/watch?v=-8O32k26RWA

Mapping with Programme Outcomes:

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

S-Strong M-Medium L-Low

Course type	Course code	Title of the Course /Paper	Semester	Credit
Elective -I	24P2CSDE02	Internet of Things	II	3

OBJECTIVES

- To understand Smart Objects and IoT Architectures
- To learn about various IOT-related protocols
- To build simple IoT Systems using Arduino and Raspberry Pi.
- To understand data analytics and cloud in the context of IoT
- To develop IoT infrastructure for popular applications

OUTCOMES

- Explain the concept of IoT.
- Analyze various protocols for IoT.
- Design a PoC of an IoT system using Raspberry Pi/Arduino Apply data analytics and use cloud offerings related to IoT.
- Analyze applications of IoT in real time scenario

UNIT-I: Introduction: Internet Layers - Protocols - Packets - Services - Performance parameters – Peer to peer networks - Sensor networks - Multimedia - IOT Definitions and Functional Requirements – Motivation – Architecture - Web 3.0 View of IoT– Ubiquitous IoT Applications – Four Pillars of IoT – DNA of IoT - The Toolkit Approach for End-user Participation in the Internet of Things. Middleware for IoT: Overview – Communication middleware for IoT –IoT Information Security.

UNIT-II: IoT protocols: Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Issues with IoT Standardization – Unified Data Standards – Protocols – IEEE 802.15.4 – BACNet Protocol – point-to-point protocols - Ethernet protocols - cellular Internet access protocol - Machine-to-machine protocol - Modbus – KNX – Zigbee Architecture – Network layer – APS layer – Security.

UNIT - III : Web of Things: Web of Things versus Internet of Things – Two Pillars of the Web – Architecture Standardization for WoT– Platform Middleware for WoT – Unified Multitier WoT Architecture – WoT Portals and Business Intelligence. Cloud of Things: Grid/SOA and Cloud Computing – Cloud Middleware – Cloud Standards – Cloud Providers and Systems – Mobile Cloud Computing – The Cloud of Things Architecture.

UNIT – IV: Integrating IOT: Integrated Billing Solutions in the Internet of Things Business Models for the Internet of Things - Network Dynamics: Population Models – Information Cascades - Network Effects - Network Dynamics: Structural Models - Cascading Behavior in Networks - The Small World Phenomenon.

Unit – V: Applications: The Role of the Internet of Things for Increased Autonomy and Agility in Collaborative Production Environments - Resource Management in the Internet of Things: Clustering, Synchronisation and Software Agents. Applications - Smart Grid – Electrical Vehicle Charging - Case studies: Sensor body-area-network and Control of a smart home.

RECOMMENDED TEXTS

1. Honbo Zhou;The Internet of Things in the Cloud:A Middleware Perspective-CRC Press 2012.
2. Architecting the Internet of Things - Dieter Uckelmann; Mark Harrison; Florian Michahelles- (Eds.) – Springer – 2011.

REFERENCE BOOKS

1. David Easley and Jon Kleinberg; Networks, Crowds, and Markets: Reasoning About a Highly Connected World ; Cambridge University Press - 2010.
2. Olivier Hersent, Omar Elloumi and David Boswarthick ; The Internet of Things: Applications to the Smart Grid and Building Automation ; Wiley2012.
3. Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things – Key applications and Protocols", Wiley, 2012.

WEB REFERENCES

1. https://www.youtube.com/watch?v=b7GC4Zr74M0

MAPPING WITH PROGRAMME OUTCOMES

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

S-Strong M-Medium L-Low

Course type	Course code	Title of the Course /Paper	Semester	Credit
Elective -I	24P2CSDE03	Augmented Reality	II	3

OBJECTIVES

- Understand Augumented Reality fundamentals, its future.
- Programming Languages of AR.
- Learn hardware technologies, display technologies, imaging technologies.
- Development of AP Applications.
- Gain Applications of AR, Wearable Applications.

OUTCOMES

- To provide students the right skills and knowledge needed to develop Augumented Reality
- To supply programming languages for AR development and software development for the students.
- Enlighten the detailed hardware ,display & imaging technologies related to AR.
- Recognize the AR applications in various area's like mobile, web etc.
- To be trained about AR Application design.

Unit-I: History of Augumented Reality, Future of AR, Perceptual Foundations of AR, Human Computer Interaction, The Iterative Cycle of Human-Centered Design, Prototyping AR Applications.

Unit-II: Programming Languages for AR Development , Software Architecture, Introduction to Computer Graphics, Geometry Representation of Objects , Rendering Pipeline

Unit-III: Hardware Foundations, Display Technologies, Imaging Technologies, Application Taxonomy, Tracking Technologies, Light-based, Mechanical, Electromagnetic, Inertial, Setups

Unit-IV: Development of AR Applications Mobile AR, Techniques, Image Targets , Lenses & AR Filters , Scene Tracking, AR for the Web, Enabling Technologies, WebVR, WebXR, 3D Graphics Frameworks on the Web , WebGl, three.js, A-Frame

Unit-V: AR Application Design, Wearable Interaction, Introduction, Rapid Prototyping, Production, Design and Evaluation, Gamification

RECOMMENDED TEXTS

1. The Open Augmented Reality Teaching Book Create and Code Augmented Reality.

REFERENCE BOOKS

1. Augmented Reality: Principles and Practice, Dieter Schmalstieg and Tobias Hollerer. Addison-Wesley Professional
2. Multiple View Geometry in Computer Vision, Second Edition. Richard Hartley and Andrew Zisserman, Cambridge University Press, March 2004

WEBSITE REFERENCES

1. https://www.youtube.com/watch?v=UYK9nUqePuQ
2. https://www.investopedia.com/terms/a/augmented-reality.asp
3. https://mobidev.biz/blog/augmented-reality-trends-future-ar-technologies

MAPPING WITH PROGRAMME OUTCOMES

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

S-Strong M-Medium L-Low

Course type	Course code	Title of the Course /Paper	Semester	Credit
Elective -II	24P2CSDE04	MongoDB	II	3

OBJECTIVES

- Understand MongoDB's fundamentals, including its architecture and basic CRUD operations.
- Master advanced querying techniques such as aggregation pipelines & geospatial queries.
- Learn scalability strategies like indexing, sharding, & replication for optimal performance.
- Develop proficiency in data modeling and schema design to build robust MongoDB databases.
- Gain practical skills to integrate MongoDB into real-world applications and deploy them effectively.

OUTCOMES

- To provide students the right skills and knowledge needed to develop Applications MongoDB
- To provide students the right skills and knowledge needed to run on Applications
- Explain the detailed architecture, define objects, load data, query data and performance
- Understand replication and sharding in MongoDB
- To learn about deployment and administration

Unit-I: A database for the modern web: Born in the cloud - MongoDB's Key Features - MongoDB's core server and Tools - Why MongoDB – MongoDB through the JavaScript shell: - Diving into the MongoDB shell - Creating and querying with indexes - Basic administration - Writing programs using MongoDB: - MongoDB through the Ruby lens - How the drivers work - Building a simple application.

Unit-II: Document-oriented data: Principles of schema design - Designing an E-Commerce data model - Nuts and bolts on databases, collections, and documents - Queries and aggregation: E-commerce queries - MongoDBs query language - Aggregating orders - Aggregation in detail.

Unit-III: A brief tour of document updates - E-commerce updates - Atomic document processing - Nuts and bolts: MongoDB updates and deletes. - Indexing and query optimization: Indexing theory - Indexing in practice - Query optimization.

Unit-IV: Replication: Replication overview - Replica sets - Master-slave replication - Drivers and replication - Sharding: Sharding overview - A sample shard cluster- Querying and indexing a shard cluster - Choosing a shard key - Sharding in production.

Unit-V: Deployment - Monitoring and diagnostics – Maintenance - Performance troubleshooting - Design patterns - MongoDB in PHP, Java, and C++ - Spatial indexing.

RECOMMENDED TEXTS

1. Kyle Banker "MongoDB in Action" Manning Publications Co, 2012.
2. Rick Copeland "MongoDB Applied Design Patterns", 1st Ed, O-Reilly Media Inc, 2013.

REFERENCE BOOKS

1. Gautam Rege (2012). Ruby and MongoDB Web Development Beginners Guide. Packt Publishing Ltd.
2. David Hows (2009) The definitive guide to MongoDB, 2nd edition, Apress Publication

MAPPING WITH PROGRAMME OUTCOMES

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

S-Strong M-Medium L-Low

Course type	Course code	Title of the Course /Paper	Semester	Credit
Elective -II	24P2CSEP01	Practical – 4 MongoDB Lab (Elective II Based Lab)	II	2

OBJECTIVES

1. Understand MongoDB's fundamentals, including its architecture and basic CRUD operations.
2. Master advanced querying techniques such as aggregation pipelines & geospatial queries.
3. Learn scalability strategies like indexing, sharding, & replication for optimal performance.
4. Develop proficiency in data modeling and schema design to build robust MongoDB databases.
5. Gain practical skills to integrate MongoDB into real-world applications and deploy them effectively.

OUTCOMES

- Understanding what MongoDB is and its core features.
- Step-by-step guidance on setting up MongoDB on a local system.
- Practical hands-on tasks for data insertion and retrieval operations.

LIST OF PROGRAMS

All the programs will execute using Python Language

1. Write a MongoDB query to create a Database.
2. Write a MongoDB query to create a collection “customers” in mydatabase.
3. Write a MongoDB query to insert record in collection “customers”.
4. Write a MongoDB query to find the customers from Erode in “customers”.
5. Write a MondoDB query to insert multiple Documents in collection “customers”.
6. Write a MongoDB query to update multiple documents with the update() method in collection “customers”.
7. Delete Document from a Collection
   a) Delete Document using remove() method
   b) Remove only one document matching your criteria
   c) Remove all documents
8. Find the cities in Tamilnadu with population less than 10 Lakh, sort by cities’ name by ascending and limit to 5.
9. Write a MongoDB query to create a sort the list of Record in ascending & descending order.
10. Write a MongoDB query to limit the record retrieving from collection “customers”.
11. Write a MongoDB query to documents
    a. Where the "address" field starts with the letter "S" or higher (alphabetically).
    b. Find documents where the address starts with the letter "S"
12. Write a MongoDB query
    a. Delete one document from the collection.
    b. Delete many documents from the collection.

RECOMMENDED TEXTS

1. Kyle Banker "MongoDB in Action" Manning Publications Co, 2012.
2. Rick Copeland "MongoDB Applied Design Patterns", 1st Ed, O-Reilly Media Inc, 2013.

REFERENCE BOOKS

3. Gautam Rege (2012). Ruby and MongoDB Web Development Beginners Guide. Packt Publishing Ltd.
4. David Hows (2009) The definitive guide to MongoDB, 2nd edition, Apress Publication

MAPPING WITH PROGRAMME OUTCOMES

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

S-Strong M-Medium L-Low

Course type	Course code	Title of the Course /Paper	Semester	Credit
Elective -II	24P2CSDE05	Natural Language Processing	II	3

OBJECTIVES

- To learn the fundamentals of natural language processing
- To understand the use of CFG and PCFG in NLP
- To understand the role of semantics of sentences and pragmatics
- To apply the NLP techniques to IR applications

OUTCOMES

- To tag a given text with basic Language features
- To design an innovative application using NLP components
- To implement a rule-based system to tackle morphology/syntax of a language
- To design a tag set to be used for statistical processing for real-time applications
- To compare and contrast the use of different statistical approaches for different types of NLP applications.

UNIT-I: Introduction: Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM - Regular Expressions, Finite-State Automata – English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance

UNIT-II: Word Level Analysis: Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models.

UNIT-III: Syntactic Analysis: Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing – Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs - Feature structures, Unification of feature structures.

UNIT-IV: Semantics And Pragmatics: Requirements for representation, First-Order Logic, Description Logics – Syntax-Driven Semantic analysis,Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selection restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods.

UNIT-V: Discourse Analysis And Lexical Resources: Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Coreference Resolution – Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill's Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC).

RECOMMENDED TEXTS

1. Daniel Jurafsky, James H. Martin;Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech; Pearson Publication; 2014.
2. Steven Bird, Ewan Klein and Edward Loper, ―Natural Language Processing with Python , First Edition, OReilly Media, 2009.

REFERENCE BOOKS

1. Breck Baldwin, ―Language Processing with Java and LingPipe Cookbook, Atlantic Publisher, 2015.
2. Richard M Reese, ―Natural Language Processing with Java , O_Reilly Media, 2015.
3. Nitin Indurkhya and Fred J. Damerau, ―Handbook of Natural Language Processing, Second Edition, Chapman and Hall/CRC Press, 2010.
4. Tanveer Siddiqui, U.S. Tiwary, ―Natural Language Processing and Information Retrieval, Oxford University Press, 2008.

WEB REFERENCES

1. https://www.youtube.com/watch?v=oWsMIW-5xUc&list=PLLssT5z_DsK8HbD2sPcUIDfQ7zmBarMYv

MAPPING WITH PROGRAMME OUTCOMES

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

S-Strong M-Medium L-Low

Course type	Course code	Title of the Course /Paper	Semester	Credit
Core-9	24P2CSEP01	Practical -4: Natural Language Processing (Elective II Based Lab)	II	2

OBJECTIVES

- To understand the algorithms available for the processing of linguistic information and computational properties of natural languages.
- To conceive basic knowledge on various morphological, syntactic and semantic NLP tasks.
- To familiarize various NLP software libraries and datasets publicly available.
- To develop systems for various NLP problems with moderate complexity.
- To learn various strategies for NLP system evaluation and error analysis.

OUTCOMES

- Describe the concepts of morphology, syntax, semantics, discourse & pragmatics of natural language.
- Demonstrate understanding of the relationship between NLP and statistics & machine learning.
- Discover various linguistic and statistical features relevant to the basic NLP task, namely, spellingcorrection, morphological analysis, parts-of-speech tagging, parsing and semantic analysis.
- Develop systems for various NLP problems with moderate complexity.

LIST OF PROGRAMS

1. How to tokenize a given text?
2. How to get the sentences of a text document?
3. How to tokenize text with stop words as delimiters?
4. How to remove stop words and punctuations in a text? 5. How to perform stemming?
5. How to lemmatize a given text?
6. How to extract usernames from emails?
7. How to find the most common words in the text excluding stop words?
8. How to do spell correction in a given text?
9. How to classify a text as positive/negative sentiment? 11. How to extract Noun and Verb phrases from a text?
10. How to find the ROOT word of any word in a sentence?
11. Write a Python program to load the iris data from a given csv file into a dataframe and print the shape of the data, type of the data and first 3 rows.
12. Write a Python NLTK program to find the sets of synonyms and antonyms of a given word.
13. Write a Python NLTK program to print the first 15 random combine labeled male and labeled female names from names corpus.

RECOMMENDED TEXTS

1. Jurafsky Dan and Martin James H. "Speech and Language Processing",3rd Edition, 2018.

REFERENCE BOOKS

1. Jurafsky D. and Martin J. H., "Speech and language processing: An Introduction to Natural Language Processing, ComputationalLinguistics,and Speech Recognition", 2nd Edition, Upper Saddle River, NJ: Prentice-Hall, 2008.
2. Goldberg Yoav "A Primer on Neural Network Models for Natural Language Processing".
3. Natural Language Processing with Python, Steven Bird, Ewan Klein, and Edward Loper

WEB REFERENCES

1. https://www.youtube.com/watch?v=dIUTsFT2MeQ

MAPPING WITH PROGRAMME OUTCOMES

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

S-Strong M-Medium L-Low

Course type	Course code	Title of the Course /Paper	Semester	Credit
Elective -II	24P2CSDE06	Data Science	II	3

OBJECTIVES

- Provide with the necessary knowledge of Data Science Concepts.
- Learns how to collect, store and manage data from different sources.
- Identify the techniques for analysing different types ofData.
- Provide the concepts and need of Data Visualization.
- Provide different Use cases of Data Science Applications.

OUTCOMES

- Identify the various steps of Data Science project development.
- Understand the need of data collection, storage and processing of data for better insights.
- Apply the different statistical measures for data analysis with confidence
- Identify the appropriate techniques for understanding data throughVisualization
- Identify the type of Data Science applications.

Unit-I: Introduction to Data Science: Introduction to Data Science, Data Science Terminology, Data Science Process, Data Science Project Roles, Industrial applications of Data Science.

Use cases:

1. Credit Risk Analytics for Banking
2. Fraud detection of claims for Insurance
3. Smart Healthcare,
4. Customer churn Analytics for Marketers.
5. Analytics as Disruptive innovation for Pharma R&D

Unit-II: Data Collection and Management: Introduction, Sources of data, Data collection and APIs, Exploring and fixing data, Data storage and management-Distributed Storage and Retrieval- noSQL, GraphDB, Cloud based storage and computing environment practices like Azure, Amazon and IBM based services, Using multiple data sources.

Unit-III: Data Analysis: Data – Matrix, Attributes, algebraic, geometric and probabilistic view of data. Data Analysis :Univariate, Bivariate, Muti-variate Analysis of Numerical and Categorical Attributes. Graph Data Concepts, Topological attributes and Centrality analysis. Introduction to statistics, Central tendencies and distributions, Variance, Distribution properties and arithmetic, Samples/CLT.

Unit-IV: Data Visualization: Introduction of visual perception, visual representation of data, Principles of Data Visualization for business. Optimal presentation of analytic results, Gestalt principles, information overloads. Creating visual representations, visualization reference model, visual mapping, visual analytics, Design of visualization applications. CRISP model of data mining, Exploratory Data Analysis.

Unit-V: Practices and Case Studies in Data Science: Applications of Data Science, Technologies for visualization, Recent trends in various data collection and analysis techniques, various visualization techniques, application development methods used in data science. Demonstrate some case studies like Marketing, Finance, HR, Manufacturing, Healthcare etc.

RECOMMENDED TEXTS

1. Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk from the Frontline. O'Reilly.
2. Jure Leskovek, AnandRajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1, Cambridge University Press.

REFERENCE BOOKS

1. Joel Grus, Data Science from Scratch, O'Reilly Publications.
2. Davy Ceilen, Introducing Data Science: Big Data, Machine Learning, and More, Using Python Tools, DreamTech Publications.

WEB REFERENCES

1. https://www.slideshare.net/slideshow/introduction-to-data-sciencepptx 255463195/255463195
2. https://dsg.uwaterloo.ca/CDSW/slides/Data%20Science%20Presentation.pdf

MAPPING WITH PROGRAMME OUTCOMES

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

S-Strong M-Medium L-Low

Course type	Course code	Title of the Course /Paper	Semester	Credit
Elective -II	24P2CSEP01	Practical -4: Data Science (Elective II Based Lab)	II	2

OBJECTIVES

- Understand the process of Importing and Exporting thedata.
- Learn how to collect, store and manage data from multiple data sources.
- Know the insights of data using statistical methods
- Identify different techniques for data analysis and data visualization.
- Discuss the applications of Data Science for real world problems.

OUTCOMES

- On completion of the course the student should be able to
- Examine the process for importing and exporting the data.
- Apply appropriate data collection and pre-processing methods.
- Identify different data analysis Techniques suitable for a given applications
- Demonstrate data visualization techniques for Data Analysis.

LIST OF PROGRAMS

1.
   a) Write program to create a list, manipulate and slicesit.
   b) Create a new list and add elements to it from another list, and creates a matrix from two lists
   c) Create same a, b steps for Tuple and Dictionary

2. Write a program for Accessing/Importing and Exporting Data
3. Apply basic statistical methods on Sample Datasets
4. Develop an application to analyze Stock Market Data using Python tools.
5. Demonstrate Object detection in an image.
6. Develop an application to Analyse twitter data with Python tools.
7. Develop an application to a Recommendation system using PythonTools
8. Develop an application to a Text Data Analyis using PythonTools

RECOMMENDED BOOKS

1. Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk from The Frontline. O'Reilly.
2. Jure Leskovek, AnandRajaraman and Jeffrey Ullman.Mining of Massive Datasets. v2.1, Cambridge University Press.

REFERENCE BOOKS

1. Joel Grus, Data Science from Scratch, O'Reilly Publications.
2. Davy Ceilen, Introducing Data Science: Big Data, Machine Learning, and More, Using Python Tools, DreamTech Publications.

WEB REFERENCES

1. https://www.slideshare.net/slideshow/introduction-to-data-sciencepptx 255463195/255463195
2. https://dsg.uwaterloo.ca/CDSW/slides/Data%20Science%20Presentation.pdf

MAPPING WITH PROGRAMME OUTCOMES

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

S-Strong M-Medium L-Low

Course type	Course code	Title of the Course /Paper	Semester	Credit
Elective-III	24P3CSDE07	Cyber Security	III	3

OBJECTIVES

- To understand Cyber security Theories, Methods and Forensics.
- To understand necessary Approaches and Techniques to build protection
- Mechanisms for Cyber crime.
- To know about the Cyber Investigation, Law and Crime.

OUTCOMES

- Describe the basics of Cyber security concepts and Implementation in India
- Demonstrate the security tips in browsers, WLAN, social networks, Email security and Smart phone.
- Apply the investigations in post mortem and forensics
- Examine the various Investigation roles, response. Evaluate the information and devices to conduct the investigations
- Explain the forensics data and evaluate the forensics reports.

UNIT-I: Introduction to cyber crime: Classification of cyber crimes – reasons for commission of cyber crime – malware and its type – kinds of cyber crime – authentication – encryption – digital signatures – antivirus – firewall – steganography – computer forensics – why should we report cyber crime – introduction: counter cyber security initiatives in india .

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-smartphone security guideling – purses,wallets,smartphones – platforms,setup and installation-communicating securely with a smartphone.

UNIT-III: Cyber investigation roles: Introduction – role as a cyber crime investigator – the role of law enforcement officers – the role of the prosecuting attorney – incident response: introduction-post mortmem versus live forensics – computer analysis for the hacker defender program-network analysis – legal issues of intercepting wifi transmission – wifi technology – wifi RF-scanning RF – eavesdropping on wifi – 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 crimeprevention:introduction – crime targeted at a government agency.

RECOMMENDED TEXT

1. Dr.JeetendraPande, "Introduction to Cyber Security‖ Published by Uttarakhand Open University, 2017.(Chapter: 1.2-5.2, 9.3-12.2)(1-2 units)
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)(3,4,5 units)

REFERENCE BOOKS

1. Sebastian Klipper ―Cyber Security‖ EinEinblick fur WirtschaftswissenschaftlerFachmedien 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.

WEB REFERENCES

1. https://www.researchgate.net/publication/375075414_Cyber_Security_for_Beginners
2. https://www.scribd.com/document/435110979/Cyber-Security-Notes

MAPPING WITH PROGRAMMERS OUTCOMES

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

S-Strong M-Medium L-Low

Course type	Course code	Title of the Course /Paper	Semester	Credit
Elective-III	24P3CSDE08	Deep Learning and Neural Networks	III	3

OBJECTIVES

- To understand the theoretical foundations, algorithms and methodologies of Neural Network
- To design and develop an application using specific deep learning models
- To provide practical knowledge in handling and analyzing real world applications.
- To recognize the characteristics of deep learning models that are useful to solve real-world problems.
- To introduce Various paradigms of earning problems, Perspectives and Issues in deep learning framework, review of fundamental learning techniques.

OUTCOMES

- Understand different methodologies to create applications using deep nets.
- Identify and apply appropriate deep learning algorithms for analyzing the data for a variety of problems.
- Implement different deep learning algorithms
- Design the test procedures to assess the efficacy of the developed model.
- Combine several models in to gain better results

Unit I: Basics of artificial neural networks (ANN): Artificial neurons, Computational models of neurons, Structure of neural networks, Functional units of ANN for pattern recognition tasksFeedforward neural networks: Pattern classification using perceptron, Multilayer feedforward neural networks (MLFFNNs), Backpropagation learning, Empirical risk minimization, Regularization, Autoencoders

Unit II: Deep neural networks (DNNs): Difficulty of training DNNs, Greedy layer wise training, Optimization for training DNNs, Newer optimization methods for neuralnetworks (AdaGrad, RMSProp, Adam), Second order methods for training, Regularization methods (dropout, drop connect, batch normalization)

Unit III: Convolution neural networks (CNNs): Introduction to CNNs – convolution, pooling, Deep CNNs, Different deep CNN architectures – LeNet, AlexNet, VGG, PlacesNet, training a CNNs: weights initialization, batch normalization, hyperparameter optimization, Understanding and visualizing CNNs.

Unit IV: Recurrent neural networks (RNNs): Sequence modeling using RNNs, Backpropagation through time, Long Short Term Memory (LSTM), Bidirectional LSTMs, Bidirectional RNNs, Gated RNN Architecture - Generative models: Restricted Boltzmann Machines (RBMs), Stacking RBMs, Belief nets.

Unit V: Learning sigmoid belief nets, Deep belief nets Under complete - Auto encoder, Regularized Auto encoder, stochastic Encoders and Decoders, Contractive Encoders. Applications: Applications in vision, speech and natural language processing

RECOMMENDED TEXTS

1. S. Haykin, Neural Networks and Learning Machines , Prentice Hall of India, 2016
2. Ian Goodfellow, Yoshua Bengio and Aaron Courville, " Deep Learning", MITPress, 2017

REFERENCE BOOKS

1. Satish Kumar, Neural Networks - A ClassRoom
2. B. Yegnanarayana, Artificial Neural Networks, Prentice- Hall of India, 1999
3. Giancarlo Zaccone, Md. RezaulKarim, Ahmed Menshawy "Deep Learning with TensorFlow: Explore neural networks with Python", Packt Publisher, 2017.
4. Antonio Gulli, Sujit Pal "Deep Learning with Keras", Packt Publishers, 2017.
5. Francois Chollet "Deep Learning with Python", Manning Publications, 2017.

WEB REFERENCES

1. https://www.youtube.com/watch?v=aPfkYu_qiF4&list=PLEAYkSg4uSQ1r-2XrJ_GBzzS6I-f8yfRU

MAPPING WITH PROGRAMMERS OUTCOMES

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

S-Strong M-Medium L-Low

Course type	Course code	Title of the Course /Paper	Semester	Credit
Elective-III	24P3CSDE09	Angular JS	III	3

OBJECTIVES

- To learn about various concepts of AngularJS

OUTCOMES

- To acquire knowledge about Javascript and AngularJS
- To Learn about MVC
- Understand Directives and HTML Forms
- Recognize about services
- Gain knowledge about AngularJS animation

Unit-I: Introduction: JavaScript Introduction, The Basics of AngularJS Framework?, Downloading and Installing AngularJS, Browser pplication, Declarative vs. Procedural Programming, Directives and Expressions Directive?, What Are Expressions ? JavaScript Primer - Including Scripts on a Page, Statements, Functions, Parameters and Return Values, Types and Variables, Primitive Types and Null, JavaScript Operators, Equality vs. Identity, Pre Objects - Creating Objects, Reading and Modifying an Objects Properties, Adding M Objects, Enumerating PropertiesArrays - Array Literals, Enumerating and Modifying Array Values, Callbacks,JSON

Unit-II: Introduction to MVC: Design Patterns, Model View Controller Separation of Concerns, Why MVC Matters, MVC the AngularJS Way Introduction to Filters, Built-in Filters, The Number Filter AngularJS Modules - What Is a Module?

Unit-III: Directives: Directives - The Basics of Directives, Using Directives, Built ngInclude, ngShow and ngHide, ngRepeat, Event Documentation, Creating a Custom Directive link Option, Build Angular Forms, Controllers and Directives, filters, and scopes-time and run-time errors-Working with Forms - HTML Forms Overview, The form Element submit, text, checkbox, password, radio Element, Model Binding, AngularJS Forms,Validating Forms.

Unit-IV: Server Communication: Services and Server Communication Service, The $document Service, Why Use Services? Communication, Handling Returned Data Organizing Views - Installing the ngRoute Module, Using URL Routes Parameters, Eager vs. Conservative Routes, Route Configuration Options

Unit-V: Animation: AngularJS Animation - Installing the Transforms, Transitions, Applying AnimationsTesting, Error Handling, Hide Unprocessed Templates, Minification and Bundling, Managinthe Build Process,Deployment

RECOMMENDED TEXTS

1. AngularJS Essentials- Rodrigo Branas, Packt Publishing Ltd Open Source, 2010
2. Learn AngularJS Learn in 24 Hours â€“ Alex Nordeen, 2020.

WEB REFERENCES

1. https://www.tutorialspoint.com
2. https://www.javatpoint.com
3. www.w3schools.com

MAPPING WITH PROGRAMMERS OUTCOMES

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

S-Strong M-Medium L-Low

Course type	Course code	Title of the Course /Paper	Semester	Credit
Elective-IV	24P3CSDE10	Microsoft Azure AI Fundamentals– AI 900	III	3

OBJECTIVES

- Describe considerations for fairness in an AI solution
- Describe considerations for reliability and safety in an AI solution
- Describe considerations for privacy and security in an AI solution
- Describe considerations for inclusiveness in an AI solution
- Describe considerations for transparency in an AI solution

CO No.	CO Statement	Knowledge Level
CO1	Describe Artificial Intelligence workloads and considerations	K1
CO2	Describe fundamental principles of machine learning on Azure	K2,K3
CO3	Describe Azure Tools and Services for Computer Vision on Azure	K3,k4
CO4	Describe features of Natural Language Processing (NLP) workloads on Azure	K4
CO5	Describe features of conversational AI workloads on Azure	K4

Unit-I: Introduction to Artificial Intelligence Workloads and Responsible AI

Features of Common AI Workloads - Anomaly Detection Workloads - Computer Vision Workloads - Natural Language Processing Workloads - Knowledge Mining Workloads.**Guiding Principles for Responsible AI -** Fairness in AI Solutions - Reliability and Safety in AI Solutions - Privacy and Security in AI Solutions - Inclusiveness in AI Solutions - Transparency in AI Solutions - Accountability in AI Solutions.

Unit-II: Fundamentals of Machine Learning on Azure

Common Machine Learning Types - Regression Scenarios - Classification Scenarios - Clustering Scenarios. **Core Machine Learning Concepts -** Features and Labels in a Dataset - Training and Validation Datasets.**Capabilities of Visual Tools in Azure Machine Learning Studio -** Automated Machine Learning - Azure Machine Learning Designer.

Unit-III: Computer Vision Workloads on Azure

Common Types of Computer Vision Solutions - Image Classification - Object Detection - Optical Character Recognition (OCR) - Facial Detection and Analysis. **Azure Tools and Services for Computer Vision -** Computer Vision Service - Custom Vision Service - Face Service - Form Recognizer Service.

Unit-IV: Natural Language Processing (NLP) Workloads on Azure Common NLP Workload Scenarios - Key Phrase Extraction - Entity Recognition - Sentiment Analysis - Language Modeling - Speech Recognition and Synthesis –Translation.
Azure Tools and Services for NLP Workloads - Language Service - Speech Service - Translator Service.

Unit-V: Conversational AI Solutions on Azure - Features and Uses for Bots- Capabilities of Power Virtual Agents and Azure Bot Service.

RECOMMENDED TEXTS

1. Michael Collier and Robin Shahan, "Fundamentals of Azure", 2nd Edition, Microsoft Azure Essential, 2016.

WEB REFERENCES

1. https://learn.microsoft.com/en-us/training/modules/get-started-ai-fundamentals/
2. https://learn.microsoft.com/en-us/azure-data-studio/quickstart-sql-database?toc=%2Fazure%2Fazure-sql%2Ftoc.json
3. https://github.com/alfredodeza/ai-fundamentals/blob/main/1-get-started-with-ai.md

MAPPING WITH PROGRAMME OUTCOMES

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

S-Strong , M- Medium , L – Low

Course type	Course code	Title of the Course /Paper	Semester	Credit
Elective-IV	24P3CSDE11	Software Testing	III	3

OBJECTIVES

- To learn about software testing core concepts and understand the various software testing tools.

OUTCOMES

- Identify the Models in Software Life Cycle
- Clarify the Testing Methods
- Understand the concepts of System, Acceptance, Performance testing and its Practices
- Acquire knowledge about testing tools
- Learn about software testing automation tools

Unit-I: Software Development Lifecycle Models: Phases of Software Project - Life Cycle Models -Testing Concepts, Issues, and Techniques: Purposes, Activities, Processes, and Context -Questions about Testing - Functional vs. Structural Testing-Coverage Based vs. Usage Based Testing - Test Activities, Management, and Automation: Test Planning and Preparation - Test Execution, Result Checking, and Measurement - Analysis and Follow up-Activities,People, and Management - Test Automation.

Unit-II: White Box Testing: Meaning - Static Testing - Structural Testing - Challenges - Black Box Testing: Meaning - When & How to do Black Box Testing - Integration Testing: Meaning -Integration Testing as type of Testing - As a Phase of Testing - Scenario Testing - Defect Bash

Unit-III: System and Acceptance Testing: Overview - Functional vs. Non-Functional Testing - Functional System Testing - Non-Functional Testing - Acceptance Testing - Summary of Testing Phases - Performance Testing: Introduction - Factors Governing Performance Testing - Methodology - Tools - Process - Regression Testing: Meaning - Types - When & How to do Regression - Testing - Best Practices

Unit-IV: Software Testing Tools: A Classification Scheme Scripting Tools -CppTest - SilkTest- Record-and-Replay Tools –Test Complete -Selenium IDE -Performance-Testing Tools -LoadRunner - Grinder -QF-Test - Appvance PerformanceCloud - JMeter .

Unit-V: Introduction To Automation Testing – Selenium: Software TestAutomation: Fundamentals of Test Automation, Manual Testing Vs TestAutomation. Introduction to Selenium, Installation and configuration of Eclipse,Java and Selenium Learning, Introduction to Webdriver, How to run tests in IE,Firefox and Google Chrome. Introduction to Locators and object finding: Importance of Locator Identifiers in Selenium, Identifying locators (ID, Name, ClassName, LinkText). Overview of other automation Tools.

RECOMMENDED TEXTS

1. Srinivasan Desikan and Gopalaswamy Ramesh, Software Testing Principles and Practices, Pearson Education, 2007.
2. Software testing Concepts and Operations " Ali Mili & Fairouz Tchier , Wiley Publications, 2015.

REFERENCE BOOKS

1. Software Test Automation Effective use of test execution tools- Mark Fewster & Dorathy Graham ,Addision â€"Welsky Publication.
2. Software Testing " A CraftManula Approach" Paul C. Jorenson, CRC Press, Fourth Edition, 2014

WEB REFERENCES

1. https://www.javatpoint.com/software-testing-tutorial
2. https://www.softwaretestingmaterial.com/software-testing
3. https://www.softwaretestinghelp.com
4. https://www.selenium.dev/

MAPPING WITH PROGRAMME OUTCOMES

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

S-Strong M-Medium L-Low

Course type	Course code	Title of the Course /Paper	Semester	Credit
Elective-IV	24P3CSDE12	Computer Vision	III	3

OBJECTIVES

- To enable computing devices to correctly
- To identify an object or person in a digital image and take appropriate action.

OUTCOMES

- To study about imaging and image representation
- To learn about the techniques of Binary Image Analysis and Morphology
- To gain the knowledge about the Pattern Recognition and classifier of the image.
- To implement the Image Filtering and Enhancing Techniques
- To gain the knowledge about the image Color and Shading of an image.

Unit-I: Introduction: Machines that see?- Application Problems-Operations on Images- The Good, the Bad, and the Ugly- Use of Computers and Software. Imaging and Image Representation: Sensing Light – Imaging Devices- Problems in Digital Images- Picture Functions and Digital Images- Digital Image Formats- Richness and Problems of Real Imagery- 3D Structure from 2D Images.

Unit-II: Pattern Recognition: Pattern Recognition Problems- Common model for classification- Precision versus recall- Features used for representation- Feature Vector Representation- Implementing the Classifier- Structural Techniques- The Confusion Matrix- Decision Trees- Bayesian decision Making- Decisions using Multidimensional Data- Machines the Learn- Artificial Neural Nets.

Unit-III: Pattern Recognition: Pattern Recognition Problems- Common model for classification- Precision versus recall- Features used for representation- Feature Vector Representation- Implementing the Classifier- Structural Techniques- The Confusion Matrix- Decision Trees- Bayesian decision Making- Decisions using Multidimensional Data- Machines the Learn- Artificial Neural Nets.

Unit-IV: Filtering and Enhancing Images: What needs fixing- Grey level mapping- Histogram equalization- Removal of Small Image Regions- Removal of Salt and Pepper Noise- Removal of Small Components - Image smoothing- Detecting Edges using Differencing Masks. Texure: Texture, Texels, and Statistics- Texel Based Texture Descriptions- Quantitative Texture Measures: Edge Density and Direction- Texture Segmentation.

Unit-V: Color and Shading: Some Physics of Color- Sensing Illuminated Objects – Additional Factors – Sensitivity of Receptors- The RGB Basis for Color- Other Color Bases- CMY Subtractive Color System- HSI- YIQ, YUV for TV Signals- Color Histograms- Color Segmentation. Virtual Reality: Features of Virtual Reality Systems- Applications of VR- Augmented Reality- Teleoperation- Virtual Reality Devices.

RECOMMENDED TEXTS

1. Linda Shapiro, George Stockman, “Computer Vision”, 2000.

REFERENCE BOOKS

1. Mubarak Shah, “Fundamentals of Computer Vision” –, 1992.
2. Richard Szeliski, “Computer Vision: Algorithms and Applications”, Springer, 2010.

WEBSITE REFERENCES

1. **https://www.slideshare.net/slideshow/computer-vision-11687562/11687562**
2. **https://www.slideshare.net/slideshow/computer-vision-ppt-250376992/250376992**

MAPPING WITH PROGRAMME OUTCOMES

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

S-Strong M-Medium L-Low

Course type	Course code	Title of the Course /Paper	Semester	Credit
Soft Skill - 1	24P1CSS01	Research Methodology	I	2

OBJECTIVES

- To find solution to the research problem.
- Determine appropriateness of the methods applied with a view to ascertain solution.
- Clear and concise statement of the specific goals and aims of a research study

OUTCOMES

- Understand research problem formulation.
- Analyze research-related information.
- Understand and follow research ethics.
- Understand that IPR protection provides an incentive to inventors for further
- Research work and investment in R & D, for economic growth and social benefits.
- Apply basic data analytics techniques: probability distribution, linear regression, ANOVA

Unit-I: Introduction to Research: The concept of research, characteristics of good research, Application of Research, Meaning and sources of Research problem, characteristics of good Research problem, Research process, outcomes, application of Research, Meaning and types of Research hypothesis, Importance of Review of Literature, Organizing the Review of Literature.

Unit-II: Types of Research: Types of research, pure (basic, fundamental) and applied research, qualitative and quantitative. Research Design: Meaning, need, types of research design – Exploratory, Descriptive, Casual research Design, Components of research design, and Features of good Research design. Experiments, surveys and case study Research design.

Unit-III: Sampling, Data Collection and analysis: Types and sources of data – Primary and secondary, Methods of collecting data, Concept of sampling and sampling methods – sampling frame, sample, characteristics of good sample, simple random sampling, purposive sampling, convenience sampling, snowball sampling, classification and tabulation of data, graphical representation of data, graphs and charts – Histograms, frequency polygon and frequency curves, bell shaped curve and its properties. Statistical Methods for Data Analysis: Applications of Statistics in Research, measures of central tendency and dispersion

Unit-IV: Research Report: Research report and its structure, journal articles – Components of journal article. Explanation of various components. Structure of an abstract and keywords. Thesis and dissertations components of thesis and dissertations. Referencing styles and bibliography.

Unit-V: Ethics in Research - Plagiarism - Definition, different forms, consequences, unintentional plagiarism, copyright infringement, collaborative work. Qualities of good Researcher.

RECOMMENDED TEXTS

1. Donald Cooper and PS Schindler (2009) Business Research Methods, 9th edition, Tata McGraw Hill.
2. Kothari C. R Research Methodology
3. Uma Sekaran (2010) Research Methods for Business, 4th edition, Wiley.

REFERENCE BOOKS

1. Ranjit Kumar (2009) Research Methodology, 2nd edition, Pearson Education
2. Naresh Malhotra and S Dash (2009) Marketing Research, 5th edition, Pearson Prentice Hall.
3. Michael V. P Research Methodology.
4. Fred N. Kerlinger : Foundations of Behavioral Research.

WEB REFERENCES

1. **https://www.slideshare.net/slideshow/research-methods-methodology/237970380**
2. **https://www.slideshare.net/slideshow/research-methodology-23101947/23101947**

MAPPING WITH PROGRAMME OUTCOMES

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

S-Strong M-Medium L-Low

Course type	Course code	Title of the Course /Paper	Semester	Credit
Soft Skill - 1	24P2CSS02	Communication Skills for Software Engineers - I	II	2

OBJECTIVES

- Understand the need of current soft skills
- Generalize self development and implementation procedure
- Demonstrate narration skills
- Design simple comprehension with given requirements
- Develop implementations in latest technologies
- Demonstrate the applications with varied soft skills like debate, oration, tell about yourself etc.

OUTCOMES

- Enumerate varied soft skills needed for employment
- Identify the lack in oneself and improve it
- Learn the current technical implementations
- Summarize the different requirements for employability
- Calculate self performance ,Generalize narration , oration and debate skills
- Conceptualize the representation of current technologies

1. **Basics of Communication**
   - 1.1 Definition and process of communication
   - 1.2 Types of communication - formal and informal, oral and written, verbal and non-verbal
   - 1.3 Communications barriers and how to overcome them
   - 1.4 Barriers to Communication, Tools of Communication
2. **Application of Grammar**
   - 2.1 Parts of Speech (Noun, verb, adjective, adverb) and modals
   - 2.2 Sentences and its types
   - 2.3 Tenses
   - 2.4 Active and Passive Voice
   - 2.5 Punctuation
   - 2.6 Direct and Indirect Speech
3. **Reading Skill**
   - 3.1 Unseen passage for comprehension (one word substitution, prefixes, suffixes, antonyms, synonyms etc. based upon the passage to be covered under this topic)
4. **Writing Skill**
   - 4.1 Picture composition
   - 4.2 Writing paragraph
   - 4.3 Notice writing

5. **Listening and Speaking Exercises**
   5.1. Self and peer introduction
   5.2. Newspaper reading
   5.3. Just a minute session-Extempore
   5.4. Greeting and starting a conversation
   5.5. Leave taking
   5.6. Thanking
   5.7. Wishing well
   5.8. Talking about likes and dislikes
   5.9. Group Discussion
   5.10. Listening Exercises.

- Student should be encouraged to participate in role play and other student centred activities in class room and actively participate in listening exercises
- Assignments and quiz/class tests, mid-semester and end-semester written tests − Actual practical work, exercises and viva-voce − Presentation and viva-voce

RECOMMENDED TEXTS:

1. Communicating Effectively in English, Book-I by RevathiSrinivas; Abhishek Publications, Chandigarh.
2. Communication Techniques and Skills by R. K. Chadha; DhanpatRai Publications, New Delhi.

REFERENCE BOOKS:

1. High School English Grammar and Composition by Wren & Martin; S. Chand & Company Ltd., Delhi.
2. Excellent General English-R.B.Varshnay, R.K. Bansal, Mittal Book Depot, Malhotra
3. The Functional aspects of Communication Skills – Dr. P. Prsad, S.K. Katria & Sons, New Delhi
4. Q. Skills for success – Level & Margaret Books, Oxford University Press.
5. e-books/e-tools/relevant software to be used as recommended by AICTE/ NITTTR, Chandigarh.

Web References:

1. http://www.mindtools.com
2. http://www.letstalk.com.in
3. http://www.englishlearning.com
4. http://learnenglish.britishcouncil.org/en/
5. http://swayam.gov.in

MAPPING WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L	L	M	S	M	S	L	S	S	M
CO2	S	M	L	M	L	S	M	L	M	S

CO3	M	S	S	L	M	S	L	M	S	M
CO4	S	L	S	M	S	L	L	M	M	S
CO5	S	M	L	S	L	M	S	L	M	S

S-Strong M-Medium L-Low

Course type	Course code	Title of the Course /Paper	Semester	Credit
Soft Skill - 3	24P2CSPR01	Team Project	III	2

OBJECTIVES

- Understand programming language concepts, particularly object-oriented concepts or go through research activities.
- Plan, analyze, design and implement a software project or gather knowledge over the field of research and design or plan about the proposed work.
- Learn to work as a team and to focus on getting a working project done on time with each student being held accountable for their part of the project.
- Learn about and go through the software development cycle with emphasis on different processes - requirements, design, and implementation phases.

OUTCOMES

- Demonstrate the ability to locate and use technical information from multiple sources. Demonstrate the ability to communicate effectively in speech and writing.
- To demonstrate a depth of knowledge of modern technology.
- To do the Project Scheduling, tracking, Risk analysis, Quality management and Project Cost estimation using different techniques.
- To complete an independent research project, resulting in at least a thesis publication, and research outputs in terms of publications in high impact factor journals, conference proceedings.

PROJECT

- Any Computer related project has to be developed using latest software as a team.
- The project must be presented for viva-voce at the end of the semester.
- Students will write up a project report, which is an essay to provide a complete record of all the work carried out in their projects.
- The student project reports will be assessed solely according to academic marking guidelines by the supervisor(s) of the student project.
- If the work of the candidate is found to be insufficient and plagiarism, the supervisor(s) will decide the further process.

Course type	Course code	Title of the Course /Paper	Semester	Credit
Soft Skill - 3	24P3CSS03	Personality Development and other Soft Skills for Software Engineers	III	2

OBJECTIVES

- The course intends to develop talent, facilitate employability enabling the incumbent to excel and sustain in a highly competitive world of business.
- The programme aims to bring about personality development with regard to the different behavioural dimensions that have far reaching significance in the direction of organisational effectiveness.
- To make students know about self-awareness, life skills, soft skills, need for personal development etc**.**

OUTCOMES

- The student will be able to understand, analyse develop and exhibit accurate sense of self. Think critically.
- Demonstrate knowledge of personal beliefs and values and a commitment to continuing personal reflection and reassessment.
- Learn to balance confidence with humility and overcome problems associated with personality

Unit-I: Personality Development : A Must for Leadership and Career Growth

Case 1: One's Personality Sends Out a Signal that Others Read
Case 2: Same Person: Consciously Different Personalities can be Powerful
Case 3: There isn't One Right Personality
Learnings About Personality Development from the Three Cases
Personality Analysis - Freudian Analysis of Personality Development - Swami Vivekananda's Concept of Personality Development - Physical Self- Energy Self -Intellectual Self - Mental Self - Blissful Self - Personality Begets Leadership Qualities -Interpersonal Skills - Resolving Conflict - A Smiling Face - Appreciative Attitude -Assertive Nature - Communication - Skills-Listening Skills -Developing Empathy - The Personality Attribute of Taking Bold Decisions - Personality Types and Leadership Qualities - Mapping the Different Personality Types - Perfectionists-Helpers-Achievers-Romantics-Observers -Questioners - Enthusiasts or Adventurers-Bosses or-Asserters-Mediators or Peacemakers - Personality Tests - Example of a Personality Test: Jung Typology Test -Personality Assessment

Unit-II: Soft Skills: Demanded by Every Employer

Case I: Dr Devi Shetty
Case II: Abraham Lincoln
Case III: Jeff Immelt

Lessons from the Three Case Studies - Change in Today's Workplace: Soft Skills as a Competitive Weapon - Antiquity of Soft Skills - Classification of Soft Skills - Time Management -Attitude -Responsibility - Ethics, Integrity, Values, and Trust -Self-confidence and Courage - Consistency and Predictability - Teamwork and Interpersonal Skills - Communication and Networking - Empathy and Listening Skills - Problem Solving, Troubleshooting and Speed-reading - Leadership

Unit-III: Your Resume or Curriculum Vitae: The First Step Forward The Strategy of Resume Writing—From an Employer's Perspective
Strategy I: The Resume Should Reveal ose Personality Traits that Align with the Organization's Values
Strategy II: The Resume Should Convince the Potential Employer of Right Fitment to the Opening
Strategy III: The Resume Should Show to the Employer the Bene ts that the Candidate Will Bring in
A Favourable First Impression—The 'Career Objective' in the Resume- The Main Body of the Resume - Clarity and Crispness of the Resume - Format and Content of the Resume- A Fresher's Resume - Examples - Example of a Well-written Resumeby an Experienced Professional -Example of a Well-written Resumeof a Fresh Graduate - Example of a Poorly Written Resume - Writing a Modern Resume - How is the Modern CV Different from the Traditional One? - Various Modern ResumeFormats -

Unit-IV: Group Discussion: A Test of Your Soft Skills
Case Studies - Learnings from the Three Case Studies - Ability to Work as a Team - Communication Skills, Including Active Listening - Non-verbalCommunication-Leadership and Assertiveness - Reasoning - Ability to Influence - Innovation, Creativity and Lateral Thinking - Flexibility - Group Discussion Types - The Responsibility of the First Speaker - Concluding the Discussion — The Technique of Summing Up

RECOMMENDED TEXTS

1. Personality Development and SOFT SKILLS, BARUN K. MITRA, Oxford University Press

REFERENCE BOOKS

1. Communicating Effectively in English, Book-I by Revathi Srinivas; Abhishek Publications, Chandigarh.
2. Communication Techniques and Skills by R. K. Chadha; Dhanpat Rai Publications, New Delhi.

WEB REFERENCES

1. http://www.mindtools.com
2. http://www.letstalk.com.in
3. http://www.englishlearning.com
4. http://learnenglish.britishcouncil.org/en/
5. http://swayam.gov.in

MAPPING WITH PROGRAMME OUTCOMES

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

S-Strong M-Medium L-Low

Course type	Course code	Title of the Course /Paper	Semester	Credit
Soft Skill - 5	24P3CSS04	Document Preparation and Interview Skills for Software Engineers	III	2

OBJECTIVES

- Ensure that you understand what the job involves, and that you have the necessary skills Make sure you do want to work for the company
- Check that the philosophy/values of the company match your personal requirements
- Find out more about the job, training, career structure etc.

OUTCOMES

- Understand the purpose of interviews
- Be aware of the processes involved in different types of interviews
- Know how to prepare for interview
- Be clear about the importance of self presentation

Unit-I: Job Interviews: The Gateway to the Job Market

Types of Interviews - Groundwork Before the Interview - Abide by the Dress Code - Importance of Body Language in Interviews - Need for Proper Articulation - **Probable Interview Questions**: Tell Us about Yourself - Would You Call Yourself a Team Player? - **Few Tricky Questions and Possible Answers:**Why Should We Employ You? - Do You Have Off ers from Other Companies? - What Salary are You Expecting? - How Much do You ink You are Worth? - What Kind of a Culture are You Comfortable with? - What is More Important to You—Salary or Growth Opportunities? - What do You Know about Our Company? - Tell Us about Your Strengths and Weaknesses - Where do You See Yourself in 5 or 10 Years? - What are Your Plans for Higher Studies? - When Leading a Team, How Will You Motivate Your Team Members and Resolve Any Differences between them? -What Has Been the Biggest Challenge You Have Faced, and How Did You Handle It? -What Do You ink are the Essential Qualities of a Good Employee? - You Claim to be Computer-savvy. Can You Mention Any Innovative Way to Enhance the Sales of the Company Using Your Computer Knowledge and Skills? — Concluding an Interview -Telephonic or Video Interview—A Growing Trend - Disadvantages of Telephonic or Video Interview - **A Mock Interview:**Why did the Interview Team Select Vikram? - Why did the Interview Team not Select Chandra and Amit?

Unit-II:Body Language: Reveals Your Inner Self and Personality

Emotions Displayed by Body Language:Aggressive - Submissive - Attentive - Nervous - Upset - Bored - Relaxed - Power - Defensive—Handshake—The Most Common Body Language— Eyes— A Powerful Reflection of One's Inner Self —Entry to My Space— Personal Zones May Vary: Intimate Zone - Personal Zone - Social Zone - Public Zone - Typical Body Language when Zones are Intruded — Body Language Exhibited During Different Professional Interactions -Interview - Manager's Discussions with a Subordinate

Employee - Discussions with Supervisor - Presentation to a Large Audience - Group Discussions - Video-conference

Unit-III: Enhance Your Writing Skill to Create an Impression

Fifteen Principles to Increase Clarity of Communication - Use Short, Simple and Clear Words - Use Short Sentences - Do not Cram Di erent Points into One Sentence - Using Compact Substitutes for Wordy Phrases - Remove Redundant Words and Expressions -Avoid Use of Mixed Metaphors - Avoid Hackneyed and Stilted Phrases - Avoid Verbosity in the Use of Common Prepositions - Do not Twist the Word Order - Present Similar Ideas in a Sentence with Same Structural and Grammatical Form - Make Positive Statements Without Being Hesitant or Non-committal - e Statements Without Being Hesitant or Non-committal - Avoid Pompous Words and Phrases - Use Active Instead of Passive Voice -Ensure Correct Spelling and Grammar in the Text - Substitute Easily-understood Words for Words Imported from Other Fields - Edit-Edit-Edit - The Reader's Perspective - Clarity of Thought - Clarity of Text - Example of Poorly and Well-written Texts

Unit-IV: Fog Index: Provides Guidance for Proper Writing

Fog Index or Clarity Index -Examples of Passages with High and LowFog Index - Infogineering Clarity Rating - Flesch Kincaid Reading Ease Index - Other Readability Indices - Checking Grammar, Spelling and Voice - Clarity of Verbal Communication-Case 1 - Case 2

RECOMMENDED TEXTS

1. Personality Development and SOFT SKILLS, BARUN K. MITRA, Oxford University Press

REFERENCE BOOKS

1. Communicating Effectively in English, Book-I by Revathi Srinivas; Abhishek Publications, Chandigarh.
2. Communication Techniques and Skills by R. K. Chadha; Dhanpat Rai Publications, New Delhi.

Web References:

1. http://www.mindtools.com
2. http://www.letstalk.com.in
3. http://www.englishlearning.com
4. http://learnenglish.britishcouncil.org/en/
5. http://swayam.gov.in

MAPPING WITH PROGRAMMES OUTCOMES

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

CO4	S	L	S	M	S	L	L	M	M	S
CO5	S	M	L	S	L	M	S	L	M	S

S-Strong M-Medium L-Low