VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN
[AUTONOMOUS]

MCA - MASTER OF COMPUTER APPLICATIONS

(Candidates admitted from 2024 – 2025 onwards)

College Vision & Mission

Vision

- To evolve into a center of excellence in higher education through creative and innovative practices 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.

DEPARTMENT OF MCA

Vision

- To generate groomed, technically competent and skilled intellectual professionals specifically from the rural area to meet the current challenges of the modern computing industry.

Mission

- Enable the students to solve software engineering problems independently.
- To prepare the students for the diverse work place of the Global Environment.
- Empowering the youth in rural communities with computer education.

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.

Programme Outcomes:

1. The broad objective of the programme is to prepare students for challenging careers in computer industry by providing conducive environment of teaching, learning and research in the core and applied areas of the computer applications.
2. To provide an understanding of advanced computer application technologies.
3. To keep a balance between fundamental concepts, core areas of computer science and specialized application oriented skills required to adapt to the needs of the constantly evolving computing industry.
4. To carryout project development in the emerging areas of Computer Applications.
5. The syllabus is focused on providing a strong foundation in theory and applications along with a latest technologies.
6. To learn and evaluate a range of computing technologies, systems and application services.
7. To design, develop and analyze industrial projects and evaluate performance.
8. To undertake challenging research problems and work as active researchers.
9. To identify recent Research / Industry trends.
10. To equip the student with basic knowledge of other domains, disciplines and skills, social and environmental consciousness and a strong value base.

Programme Specific Outcomes:

1. Implement the concept of theory and technology with modern techniques for solving the complex problems in Computer Applications.
2. The learners would to be curious towards learning new and emerging technologies and adapt quickly to changes.
3. Design, execute and evaluate computing and application projects in academia and industries using appropriate emerging technologies.
4. Know the contextual knowledge in computing science and applications research and communicate effectively with stakeholders of 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.

Course Structure:

Two Weeks Bridge Courses for MCA

1. Programming in C
2. Problem Solving Techniques
3. Mathematical Foundations of Computer Science.
4. Information Technology
5. Coding Practices

a. The Departments offering M.C.A. program are encouraged to offer need based bridge courses and foundation courses to meet prerequisite requirements and academic needs.

b. Based on the qualifications of the students admitted, the mentoring team of the department shall recommend to carry out the bridge and foundation courses as mandatory courses for that candidate.

c. Two week bridge courses need to be organized before the commencement of the first semester.

d. Nurturing and evaluation process of bridge and foundation courses is left the respective academic units.

REGULATIONS

I. SCOPE OF THE PROGRAMME

Master of Computer Applications can be considered to be one of the most prominent PG level programs in our country. It is also one of the professional degree. This program mainly deals with the development of computer applications for the purpose of updating computer programming languages. It also aims at creating strong knowledge of theoretical Computer Applications subjects who can be employed in software development and testing units of industries. The course has a time period of 2 years with 4 semesters.

II. SALIENT FEATURES

- 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 like M.Sc, and the Certifications in
- programming languages
- Conduct of Personality Development Program
- Visiting Faculties from Industries

III. OBJECTIVES OF THE COURSE

The Course Objective of the program is to provide advanced and in-depth knowledge of computer 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

Candidates who have secured 55 % of marks or above in any one of the following or equivalent are eligible to apply.

- Bachelor's degree(under 10+2+3/4) in any subject with mathematics at +2 level

or

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

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 July to November and the Second semester from December to March.
- 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 with the approval of Periyar University.
- Each subject will have four to six hours of lecture per week apart from practical training at the end of each semester.

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 when her 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	Seven 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 allied 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) All the remaining successful candidates shall be declared to have passed the examinations in third class.
e) Candidates who pass all the examinations prescribed for the course at the first appearance itself and within a period of three consecutive academic years from the year of admission only will be eligible for University rank.

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 three/two(lateral entry) academic years comprising of six/four(lateral entry) 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 examination in the concerned subject in subsequent semesters and shall pass the examination**.**

XI. COMMENCEMENT OF THESE REGULATIONS

These regulations shall take effect from the academic year 2020 – 21 (i.e.,) for the students who are to be admitted to the first year of the course during the academic year 2020–21 and thereafter.

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.

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
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MCA CURRICULUM
(For candidates admitted from 2024 – 2025 onwards)

First Semester							
Course components	**Course Code**	**Name of Course**	**Hours**	**Credits**	**Max. Marks**		**TOTAL**
					CIA	**EE**	
Core– 1	24P1CAC01	Advanced Python Programming	4	4	25	75	100
Core- 2	24P1CAC02	Internet of Things	4	4	25	75	100
Core- 3	24P1CAC03	Advanced DBMS	4	4	25	75	100
Core- 4	24P1CACP01	Practical–I: Advanced Python Programming Lab.	4	2	40	60	100
Core- 5	24P1CACP02	Practical–II: Internet of Things Lab.	4	2	40	60	100
Extra – Disciplinary- I	24P1CMGE01	Accounting & Financial Management	4	3	25	75	100
Elective I	24P1CADE_	Choose any one from Elective – I List	4	3	25	75	100
Soft Skill-1	24P1CAS_	Choose any one	2	2	40	60	100
Total			**30**	**24**	**245**	**555**	**800**

Second Semester							
Course components	**Course code**	**Name of Course**	**Ins.**	**Credits**	**Max. Marks**		**TOTAL**
					CIA	**EE**	
Core – 6	24P2CAC04	Full Stack Development	4	4	25	75	100
Core – 7	24P2CAC05	Cloud and Data Science	4	4	25	75	100
Core – 8	24P2CAC06	Web Technologies	4	4	25	75	100
Elective II	24P2CADE_	Choose any one from Elective – II List	4	3	25	75	100
Core – 9	24P2CACP03	Practical – III: Full Stack Development Lab	4	2	40	60	100
Core – 10	24P2CACP04	Practical–IV: Cloud and Data Science Lab.	3	2	40	60	100
Extra– Disciplinary-II	24P2CAED02	Operations Research	4	3	25	75	100
Soft Skill-2	24P2CAS	Choose any one from Soft Skills List	2	2	40	60	100
Soft Skill-3	24P2CAS_	Choose any one from Soft Skills List	2	2	40	60	100
Internship		During I year summer vacation– Evaluation will be at the end of third semester.	-	-	-	-	-
Total			**31**	**26**	**285**	**615**	**900**

Third Semester							
Course Components	**Course Code**	**Name of Course**	**Hours**	**Credits**	**Max. Marks**		**TOTAL**
					CIA	**EE**	
Core – 11	24P3CAC07	AI & Machine Learning	5	4	25	75	100
Core –12	24P3CAC08	Advanced Java Programming	5	4	25	75	100
Core– 13	24P3CACP05	Practical – V: Advanced Java Programming Lab	4	2	40	60	100
Elective III	24P3CADE_	Choose any one from Elective – III List	4	3	25	75	100
Elective IV	24P3CADE_	Choose any one from Elective – IV List	4	3	25	75	100
Core -14	24P3CAPR01	Practical – VI: Mini Project	4	2	40	60	100
Soft Skill-4	24P3CAS_	Choose any one	2	2	40	60	100
	23P3HR01	Human Rights	2	2	25	75	100
Internship	24P3CAIN01	During I year summer vacation		1			100
Total			**30**	**23**	**245**	**555**	**900**

Fourth Semester						
Course components	**Course Code**	**Name of Course**	**Credits**	**Max. Marks**		**TOTAL**
				CIA	**EE**	
Core-17	24P3CAPR02	Project & Viva-voce	18	50	150	200
Total			**18**	**50**	**150**	**200**

* CIA = Continuous Internal Assessment, UE = University Examination

Elective I

	Course code	Title
Semester I	24P1CADE01	Augmented Reality & Virtual Reality
	24P1CADE02	Data Visualization Techniques
	24P1CADE03	Data Mining and Data Warehousing

Elective II

	Course code	Title
Semester II	24P2CADE04	Cyber Security
	24P2CADE05	Block Chain Technology
	24P2CADE06	Open Source Technologies

Elective III

	Course code	Title
Semester III	24P3CADE07	Natural Language Processing
	24P3CADE08	Sentiment Analysis
	24P3CADE09	Microsoft Azure AI Fundamentals -AI 900

Elective IV

	Course code	Title
Semester III	24P3CADE10	Big Data Analytics using R and Hadoop
	24P3CADE11	Data Analytics using Power BI
	24P3CADE12	Deep Learning and Neural Networks

List of Soft Skill Courses

S.No	Semester	Course code	Title
1.	I	24P1CAS01	Research Methodology
2.	II	24P2CAS02	Communication Skills for Software Engineers
3.	II	24P3CAS03	Self Development and Interpersonal Skills
4.	III	24P3CAS04	Document Preparation and Interview skills
5.	III	24P3CAS05	Team Project

Students are encouraged to do courses from the resources like SWAYAM, NPTEL etc

- Operation 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 soft skills.

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

Learning Outcome Index: Mapping of program outcome with courses

Subject Title	ADVANCED PYTHON PROGRAMMING	Semester	I
Subject Code	24P1CAC01	Specialization	NA
Type	Core: Theory	L:T:P:C	4:0:0:4

Course objective:

- Build basic programs using fundamental programming constructs like variables, conditional logic, looping, and functions
- Work with user input to create fun and interactive programs
- Create simple games with images, animations, and audio using our custom beginner-friendly programming
- Describe the core syntax and semantics of Python programming language.

CO No.	CO Statement	Knowledge Level
CO1	Develop and execute simple Python programs	K1
CO2	Decompose a Python program into functions	K2,K4
CO3	Write simple Python programs using conditionals and looping for solving problems	K3
CO4	Represent compound data using Python lists, tuples, dictionaries etc.	K4
CO5	Read and write data from/to files in Python programs	K4

Unit	Contents	No. of Sessions
I	Introduction : Fundamental ideas of Computer Science - Strings, Assignment and Comments - Numeric Data types and Character sets - Expressions - Loops and Selection Statements: Definite iteration: the for Loop - selection: if and if-else statements -	12

	Conditional iteration: the while Loop	
II	Strings and Text Files: Accessing Characters and substrings in strings - Data encryption-Strings and Number systems- String methods - Text - Lists and Dictionaries: Lists - Dictionaries - Design with Functions: A Quick review - Problem Solving with top-Down Design - Design with recursive Functions	**12**
III	Design with Classes: Getting inside Objects and Classes - Data-Modeling Examples - Structuring Classes with Inheritance and Polymorphism-Graphical User Interfaces-The Behavior of terminal-Based programs and GUI-Based programs - Coding Simple GUI-Based programs.	**12**
IV	Working with Python Packages: NumPy Library-Ndarray- Basic Operations - Indexing, Slicing and Iteration - Array manipulation - Pandas - The Series - The DataFrame - The Index Objects - Data Vizualization with Matplotlib- The Matplotlib Architecture - Pyplot- The Plotting Window - Adding Elements to the Chart - Line Charts - Bar Charts - Pie charts	**12**
V	Django: Installing Django – Creating your first project- Designing the blog Data Schema - Creating an administration site for models - Working with QuerySets and Managers – Building List and Detail Views.	**12**

Learning Resources	
Text Books	1. K.A. Lambert, " Fundamentals of Python: first programs", Second Edition, Cengage Learning, 2018 (Unit - I, II and III) 2. Fabio Nelli, "Python Data Analytics: With Pandas, NumPy, and Matplotlib", Second Edition, Kindle Edition, 2018 (Unit - IV) 3. Antonio Mele, "Django 3 By Example", Third Edition, 2020
Reference Books	1 Beazley, David M. Python: Essential Reference. Addison-Wesley, 2012. 2 Naveen, Kumar, and Taneja Sheet et al. Python Programming: A Modular Approach. Pearson Education India, 2017.
Website/ Link	1 https://www.programiz.com/python-programming/ 2 https://www.tutorialspoint.com/python/index.htm 3 https://onlinecourses.swayam2.ac.in/aic20_sp33/preview

Mapping with Programme Outcomes

	PO01	PO02	PO03	PO04
CO1	S	S	S	-
CO2	S	M	M	S
CO3	S	L	L	M
CO4	M	S	M	S
CO5	S	L	S	S

S-Strong , M- Medium , L – Low

Subject Title	Internet of Things	Semester	I
Subject Code	24P1CAC02	Specialization	NA
Type	Core: Theory	L:T:P:C	4:0:0:4

Course objective:

- To know about the IoT concepts.
- To understand the development of Internet of Things prototypes.
- To understand the concepts of sensing, actuation and communications.
- Students will be explored to the interconnection and integration of the physical and the cyber space.

CO No.	CO Statement	Knowledge Level
CO1	Comprehend the essentials of IoT and its applications	K1
CO2	Analyze and understand the various IoT data link and network layer protocols.	K2,K4
CO3	Understand the concepts of IoT Architecture Reference model and IoT reference architecture.	K3
CO4	Demonstrate the operation of processing unit.	K4
CO5	Recognize the operation of parallel processing.	K4

Unit	Contents	No. of Sessions
I	**Introduction** Introduction to IoT – Pysical Design of IoT : Things in IoT, IoT protocols. Logical Design of IoT : IoT functional blocks – IoT communication models – IoT communication APIs.	12
II	**IoT enabled Technologies** Wireless Sensor Networks, Cloud computing, Big data Analytics, Communication protocols, Embedded Systems. IoT levels & Deployment Templates.	12
III	**Domain Specific IoTs** Home automation, cities, Environment, Energy, Retails, Logistics, Agriculture, Industry, Health and Life style. IoT and M2M - Difference between IoT and M2M,SDN and NFV for IOT.	12

IV	**IoT Platforms design methodology** Introduction, IoT Design methodology, Case study on IoT System on weather monitoring.	12
V	**IoT Systems logical design using Python** Introduction, Installing python, Python data types and data structures: Numbers, Strings , Lists, Control flow, Functions, Modules, Packages, File handling, Date time operations, classes.	12

Learning Resources	
Text Books	1. Internet of Things - A Hands on Approach, Arsdeep Bahga & Vijay Mandisetti, 2015, ISBN : 9788173719547.
Reference Books	1. Building the Internet of Things: Implement New Business Models, Disrupt, Maciej Kranz, Willey Publications, 2016 2. Designing the Internet of Things By Adrian McEwen, Hakim Cassimally, Willey Publications 2015.
Website/Link	1. http://internetofthingsagenda.techtarget.com/ 2. http://www.businessinsider.com/what-is-the-internet-of-things

Mapping with Programme Outcomes

	PO01	**PO02**	**PO03**	**PO04**
CO1	S	S	S	M
CO2	S	M	S	S
CO3	S	S	S	S
CO4	S	S	M	S
CO5	S	S	M	L

S-Strong , M- Medium , L – Low

Subject Title	ADVANCED DBMS	Semester	I
Subject Code	24P1CAC03	Specialization	NA
Type	Core: Theory	L:T:P:C	4:0:0:4

Course objective:

- Impart strong technical understanding of Block chain technologies
- Develop familiarity of current technologies, tools, and implementation strategies
- Introduce application areas, current practices, and research activity.

CO No.	CO Statement	Knowledge Level
CO1	Summarize the basics of advanced at a modeling and Advanced SQL	K1
CO2	Differentiate different Database concepts and Concurrency Control.	K2,K4
CO3	Apply various databases and data models in the different kind	K3
CO4	Analyze each and every databases and database systems	K4
CO5	Analyze different information systems and multimedia and spatial databases	K4

Unit	Contents	No. of Sessions
I	**Relational Databases**: Object oriented databases -Complex data types, Object-oriented data model, Object-oriented languages, Persistent programming languages - Object relational databases - Nested relations, Complex types, Inheritance, Reference types, Querying with complex types, Functions and procedures, Object-oriented Versus object-relational.	12
II	**Distributed databases:** Homogeneous and heterogeneous databases, Distributed data storage, Distributed transactions, Commit protocols, Concurrency control in distributed databases, Availability, Distributed query processing, Heterogeneous distributed databases.	12
III	**Directory systems:** Parallel databases- I/O parallelism, Inter query parallelism, Intra query parallelism, Intra operation parallelism, Inter operation parallelism, Design of parallel systems.	12
IV	**Spatial databases and spatial, Geographic data**: Representation of geometric information- Design databases, Geographic data, Spatial queries, Indexing of Spatial data- Temporal and time series databases- Time in databases- Time specification in SQL, Temporal query language.	12

V	**Multimedia databases:** Multimedia data formats, Continuous media data, Similarity-based retrieval-Web databases-Web fundamentals, URL, HTML, Client side scripting and Applets, Web servers and sessions, Servlets, Server side scripting, Improving performance.	**12**

Learning Resources	
Text Books	1. Henry Korth,F., Abraham Silberchatz, Sudarshan, S. Database System Concepts, 6th Edition,McGraw Hill International Editions,2011. 2. Ramez Elmasri, ShamkantB. Navathe, Fundamentals of Database Systems, Pearson Education,7thEdition ,2016.
Reference Books	1. Gary Hanson,W.,James Hanson,V., Database Management and Design, Prentice Hall of India Pvt.Ltd.,1999. 2. Alex Benson, Stephen mith and Kurt Thearling, Building Data Mining Applications for CRM, Tata McGraw-Hill,2000. 3. Stefano Ceri, Giuseppe Pelagatti, Distributed Databases:Principles and Systems, McGraw-Hill Computer Science Series.
Website/Link	1. onlinecourses.nptel.ac.in/noc16_cs04/preview 2. www.coursera.org/learn/database-management-systems 3. www.astera.com/type/blog/database-management-software 4. www.nibusinessinfo.co.uk/content/types-database-system 5. www.slideshare.net/vikasjagtap3

Mapping with Programme Outcomes

	PO01	**PO02**	**PO03**	**PO04**
CO1	S	S	S	-
CO2	S	M	M	S
CO3	S	L	L	M
CO4	M	S	M	S
CO5	S	L	S	S

S-Strong , M- Medium , L – Low

Subject Title	ADVANCED PYTHON PROGRAMMING LAB	Semester	I
Subject Code	24P1CACP01	Specialization	NA
Type	Core: Practical	L:T:P:C	0:0:4:2

Learning Objectives:

This course enables the students:

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

Course Outcomes:

CO1: To understand the problem solving approaches
CO2: To learn the basic programming constructs in Python

CO3: To practice various computing strategies for Python-based solutions to real world problems

CO4: To use Python data structures - lists, tuples, dictionaries.

CO5: To do input/output with files in Python.

List of Experiments

1. Program using elementary data items, lists, dictionaries and tuples
2. Program using conditional branches, loops
3. Program using functions
4. Program using classes and objects
5. Program using inheritance

6. Program using polymorphism
7. Program using Numpy
8. Program using Pandas
9. Program using Matplotlib
10. Program for creating dynamic and interactive web pages using forms

Subject Title	INTERNET OF THINGS LAB	Semester	I
Subject Code	24P1CACP02	Specialization	NA
Type	Core: Practical	L:T:P:C	0:0:4:2

LIST OF EXPERIMENTS:

1. Introduction to Arduino platform and programming.
2. Interfacing Arduino to Zigbee module.
3. Interfacing Arduino to GSM module.
4. Interfacing Arduino to Bluetooth Module.
5. Introduction to Raspberry PI platform and python programming.
6. Interfacing sensors to Raspberry PI.
7. Communicate between Arduino and Raspberry PI using any wireless medium.
8. Setup a cloud platform to log the data.
9. Log Data using Raspberry PI and upload to the cloud platform.
10. Design an IoT based system.

Subject Title	FULL STACK DEVELOPMENT	Semester	II
Subject Code	24P2CAC04	Specialization	NA
Type	Core: Theory	L:T:P:C	4:0:0:4

Course objective:

- Apply basic design principles to present ideas, information, products, and services on websites
- Apply basic programming principles to the construction of websites
- Effectively manage website projects using available resources
- Demonstrate communication skills, service management skills, and presentation skills
- Complete job preparation tasks including writing resumes and cover letters, conducting job interviews and developing an ePort folio.

CO No.	CO Statement	Knowledge Level
CO1	Understand the basics of full stack web development	K1
CO2	Develop responsive web pages using HTML and CSS	K2,K4
CO3	Implement client-side scripting using JavaScript	K3
CO4	Build interactive web pages using React JS	K4
CO5	Use jQuery to create web pages	K4

Unit	Contents	No. of Sessions
I	**BASICS OF FULL STACK :** Understanding the Basic Web Development Framework – User – Browser – Web server – Backend Services – MVC Architecture – Understanding the different stacks –The role of Express–Angular– Node – Mongo DB – React.	12
II	**NODE JS :** Basics of Node JS – Installation – Working with Node packages – Using Node package manager – Creating a simple Node.js application – Using Events – Listeners –Timers – Callbacks –Handling Data I/O – Implementing HTTP services in Node.js.	12
III	**MONGO DB :** Understanding NoSQL and MongoDB – Building MongoDB Environment – User accounts –Access control –	12

	Administering databases – Managing collections – Connecting to MongoDB from Node.js – simple applications.	
IV	**EXPRESS AND ANGULAR :** Implementing Express in Node.js – Configuring routes – Using Request and Response objects – Angular – Typescript – Angular Components – Expressions – Data binding – Built-in directives.	**12**
V	**REACT:MERN STACK** – Basic React applications – React Components – React State – Express RESTAPIs – Modularization and Web pack – Routing with React Router – Server-side rendering.	**12**

Learning Resources	
Text Books	1. Brad Dayley, Brendan Dayley, Caleb Dayley, 'Node.js, MongoDB and Angular WebDevelopment', Addison-Wesley, Second Edition, 2018 2. Vasan Subramanian, 'Pro MERN Stack, Full Stack Web App Development with Mongo,Express, React, and Node', Second Edition, Apress, 2019
Website/Link	1. *https://www.edureka.co/blog/knowledge-representation-in-ai/* 2. *https://www.edureka.co/blog/knowledge-representation-in-ai/* 3. *https://www.brainkart.com/article/Symbolic-Reasoning_8586/* 4. *https://www.geeksforgeeks.org/game-playing-in-artificial-intelligence/*

Mapping with Programme Outcomes

	PO01	**PO02**	**PO03**	**PO04**
CO1	**M**	**S**	**M**	**L**
CO2	**M**	**H**	**L**	**L**
CO3	**M**	**M**	**M**	**H**
CO4	**H**	**M**	**H**	**L**
CO5	**M**	**H**	**M**	**H**

S-Strong , M- Medium , L – Low

Subject Title	CLOUD AND DATA SCIENCE	Semester	II
Subject Code	24P2CAC05	Specialization	NA
Type	Core: Theory	L:T:P:C	4:0:0:4

Course objective:

1. The fundamental ideas behind Cloud Computing, The evolution of the applicability; benefits, as well as current and future challenges;
2. Acquire knowledge to use Virtualization, Task Scheduling algorithms, apply Map- Reduce concept to applications.
3. Develop ideas to build Private Cloud and to know the impact of engineering on legal and societal issues involved.
4. To provide strong foundation for data science and application area related to it and understand the underlying core concepts and emerging technologies in data science.

CO No.	CO Statement	Knowledge Level
CO1	Interpret the key dimensions of the challenges of Cloud Computing	K1
CO2	Examine the economics, financial, and technological implications for selecting cloud computing for own organization	K2,K4
CO3	Assessing the technological, and organizational capacity of employer's for actively initiating and installing cloud-based applications	K3
CO4	Explore the fundamental concepts of data science	K4
CO5	Understand data analysis techniques for applications handling large data	K4

Unit	Contents	No. of Sessions
I	**High-Performance Computing Paradigms:** Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing, Bio-computing, Mobile Computing, Quantum Computing, Optical Computing, Nano-computing, Network Computing.	12
II	**Cloud Computing Fundamentals:** Motivation for Cloud Computing, The Need for Cloud Computing. Defining Cloud Computing: NIST Definition of Cloud Computing, Cloud Computing Is a Service, Cloud Computing Is a Platform 5-4-3 Principles of Cloud computing: Five Essential Characteristics, Four Cloud Deployment Models, Three Service Offering Models Cloud Ecosystem, Requirements for Cloud Services, Cloud Application, Benefits and Drawbacks	12
III	**Cloud Computing Architecture and Management:** Cloud	12

	Architecture, Anatomy of the Cloud, Network Connectivity in Cloud Computing, Applications on the Cloud, Managing the Cloud, Migrating Application to Cloud. Cloud Deployment Models Private Cloud, Public Cloud, Community Cloud, Hybrid Cloud Service Models: Infrastructure as a Service - Platform as a Service - Software as a Service - Other Cloud Service Models	
IV	**Introduction to core concepts and technologies:** Introduction, Terminology, data science process, data science toolkit, Types of data, Example applications, Mathematical Foundations for Data Science: linear algebra; Analytical and numerical solutions of linear equations; Mathematical structures, concepts and notations used in discrete mathematics. Introduction to Statistical Methods: basic and some advanced concepts of probability and statistics; Concepts of statistics in solving problems arising in data science.	**12**
V	**Data collection and management:** Introduction, Sources of data, Data collection and APIs, Exploring and fixing data, Data storage and management, using multiple data sources	**12**

Learning Resources	
Text Books	1. K. Chandrasekaran, Essentials of Cloud Computing, CRC Press Taylor & Francis Group , 2015 2. Distributed and Cloud Computing, Kai Hwang, Geoffry C. Fox, Jack J. Dongarra, MK Elsevier, 2012 3. Cathy O'Neil, Rachel Schutt, Doing Data Science, Straight Talk from The Frontline. O'Reilly, 2013. 4. Introducing Data Science, Davy Cielen, Arno D. B. Meysman, Mohamed Ali, Manning Publications Co., 1st edition, 2016
Reference Books	1. Cloud Computing, A Hands on approach, ArshadeepBahga, Vijay Madisetti, University Press, 2014 2. Data Science from Scratch: First Principles with Python, Joel Grus, O'Reilly, 1st edition, 2015. 3. Jure Leskovek, Anand Rajaraman, Jeffrey Ullman, Mining of Massive Datasets. v2.1, Cambridge University Press, 2014.
Website /Link	1. https://books.google.co.in/books?id=7JvNBQAAQBAJ&pg=PA1&source=gbs_toc_r&cad=2#v=onepage&q&f=false 2. https://books.google.co.in/books?id=vcVKAQAAQBAJ&pg=PT12&source=gbs_toc_r&cad=2#v=onepage&q&f=false

Mapping with Programme Outcomes

	PO01	PO02	PO03	PO04
CO1	**M**	**S**	**M**	**L**
CO2	**M**	**H**	**L**	**L**
CO3	**M**	**M**	**M**	**H**
CO4	**H**	**M**	**H**	**L**
CO5	**M**	**H**	**M**	**H**

S-Strong , M- Medium , L – Low

Subject Title	WEB TECHNOLOGY	Semester	II
Subject Code	24P2CAC06	Specialization	NA
Type	Core: Theory	L:T:P:C	4:0:0:4

Course objective:

1. Identify the basics of internet.
2. Understand the role of web browsers and web servers.
3. Practiced client side programming
4. Practiced server side programming and web services

CO No.	CO Statement	Knowledge Level
CO1	Recognize Basics of internet and the significance of Web Technology.	K1
CO2	Express the knowledge on Java script, JSP and ASP.	K2,K4
CO3	Employ the understanding of the Client and Server side scripts and actively participate in teams for the creation of static and dynamic web pages.	K3
CO4	Utilize the web designing tools effectively in the real world applications.	K4
CO5	Design and Establish the Website or Web based Software.	K4

Unit	Contents	No. of Sessions
I	The internet: Basics of Internet – Addresses and Names for the Internet, Objects and sites – E-mail - World Wide Web – File Transfer – The Telnet – The Usenet – Gopher- Wais - Archie -Veronica – Internet Chat.	12
II	Web Servers, Browsers and Security: The Wed server – The Proxy Server – The fast ready connections on the web – Web Browsers – Netscape Communication Suite – Microsoft Internet Explorer – The Virus Menace in the Internet – Firewalls – Data Security.	12
III	Client Side Programming: The JavaScript Language: Introduction to JavaScript - JavaScript in Perspective – Basic Syntax – Variables & Data types – Statements – Operators – literals – Functions – Objects – Arrays – Built-in Objects – JavaScript Debuggers.	12
IV	Server-Side Programming: Java Servlets: Servlet Architecture Overview – Servlet Generating Dynamic contents – Servlet Life Cycle – Parameter Data – sessions – Cookies.	12
V	Web Services: JAX – RPC, WSDL, XML Schema and soap, Web Service Concepts – Writing a Java Web Service Client – Describing web Services: WSDL – Related Technologies.	12

Learning Resources	
Text Books	1. Rajkamal, " Internet and Web Technologies", Tata McGraw Hill, 2002. [UNIT – I & II] 2. Jeffrey C.Jackson, "Web Technologies – A Computer Science Perspective"- Pearson Education 2012
Reference Books	1. R.N. Srivastava, "Web Technology" – Global academic Publishers & Distributors, 2015. 2. Ramesh Nagappan, Robert Skoczylas, Rima Patel Sriganesh, " Developing Java Web Services" - Wiley-India edition 2012
Website/Link	1 https://differential.com/.../14-technologies-every-web-developer-should-be-able-to-ex... 2 https://usersnap.com/blog/best-web-development-trends-2018/

Mapping with Programme Outcomes

	PO01	PO02	PO03	PO04
CO1	S	S	S	-
CO2	S	M	M	S
CO3	S	L	L	M
CO4	M	S	M	S
CO5	S	L	S	S

S-Strong , M- Medium , L – Low

Subject Title	Full Stack Development Lab	Semester	II
Subject Code	24P2CACP03	Specialization	NA
Type	Core: Practical	L:T:P:C	0:0:4:2

LIST OF EXPERIMENTS:

1. Create a Simple Login form with validations and verification using AngularJS
2. Create a student mark entry form with validation and verification using AngularJS
3. Create a employee payroll form with validation and verification using AngularJS
4. Create a Simple Login form using React JS
5. Creating the collection in MongoDB on fly.
6. MongoDB insert single document and multiple document
7. Create a custom server using http module and explore the other modules of Node JS like OS, path, event.
8. Build a navigation menu that highlights the selected entry using Angular's directives.
9. Create a simple inline editor - clicking a paragraph will show a tooltip with a text field u sing AngularJS.
10. Switch between different layout modes (grid or list) with a click of a button using Angul arJS .

Subject Title	CLOUD AND DATA SCIENCE LAB	Semester	II
Subject Code	24P2CACP04	Specialization	NA
Type	Core: Practical	L:T:P:C	0:0:3:2

1. Install Virtual box/VMware Workstation with different flavours of linux or windows OS on top of windows7 or8
2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
3. Install Google App Engine. Create hello world app and other simple web applications using python/java
4. Use GAE launcher to launch the web applications.
5. Simulate a cloud scenario using Cloud Sim and run a scheduling algorithm that is not present in Cloud Sim.
6. Working with Numpy arrays using python.
7. Working with Pandas data frames
8. Basic plots using Matplotlib

Subject Title	AI & Machine Learning	Semester	III
Subject Code	24P3CAC07	Specialization	NA
Type	Core: Theory	L:T:P:C	5:0:0:4

Course objective:

1. To Learn about Machine Intelligence and Machine Learning applications.
2. To implement and apply machine learning algorithms to real-world applications.
3. To identify and apply the appropriate machine learning technique to classification, pattern recognition, optimization and decision problems.
4. To create instant based learning.
5. To apply advanced learning.

CO No.	CO Statement	Knowledge Level
CO1	Explain intelligent agent frameworks and apply game playing and CSP techniques.	K1
CO2	Perform logical reasoning.	K2,K4
CO3	To introduce students to the basic concepts and techniques of Machine Learning.	K3
CO4	To learn Decision trees, KNN and Ensemble Techniques	K4
CO5	To understand the problems using various machine learning techniques.	K4

Unit	Contents	No. of Sessions
I	INTELLIGENT AGENT: Introduction to AI – Agents and Environments – concept of rationality – nature of environments – structure of agents - Problem solving agents – search algorithms – uninformed search strategies - Heuristic search strategies – heuristic functions - Search in complex environments - Game Playing And CSP - Constraint satisfaction problems.	12
II	LOGICAL REASONING: Knowledge-based agents – propositional logic – propositional theorem proving – propositional model checking – agents based on propositional logic. First-order logic – syntax and semantics – knowledge representation and engineering – inferences in first-order logic – forward chaining – backward chaining – resolution. **Case Study: Societal impacts of artificial intelligence.**	12
III	FUNDAMENTALS OF MACHINE LEARNING: What Is Machine Learning?-Why Use Machine Learning?-Examples of	12

	Applications- Supervised / Unsupervised Learning : Classification and Regression - Generalization, Overfitting, and Underfitting - Supervised Machine Learning Algorithms : k-Nearest Neighbors - Naive Bayes Classifiers - Decision Trees - Ensembles of Decision Trees.	
IV	UNSUPERVISED LEARNING: Types of Unsupervised learning & its Challenges - Clustering - k - Means Clustering - Agglomerative Clustering. IMPLEMENTING MACHINE LEARNING ALGORITHMS: k –means Algorithm - KNN versus k-means. Naïve Bayes Classification Algorithm: Understanding conditional probability – The Bayes Rule – types of events – Algorithm – Laplace correction –Applications.	**15**
V	NEURAL NETWORKS: Working of Neural Networks – Pros and Cons - Applications – Support Vector Machine: How does SVM work? - Advantages and Disadvantages of SVM - Working with Text Data - Role of Machine Learning in Social media.	9

Learning Resources	
Text Books	1. Stuart Russell and Peter Norvig, "Artificial Intelligence – A Modern Approach", Fourth Edition, Pearson Education, 2021. 2. "Hands-On Machine Learning with Scikit-Learn, Keras, and Tensor-Flow", Aurélien Géron, O'Reilly Media, 2019.
Reference Books	1. "Data Science and Machine Learning in R",Reema Thareja McGraw-Hill India, 2021. 2. "Introduction to Machine Learning with Python ",Andreas C. Müller and Sarah Guido, O'Reilly Media,2017. 3. Ethem Alpaydin, Introduction to Machine Learning (Adaptive Computation and Machine Learning),The MIT Press 2004.
Website/Link	1.https://www.simplilearn.com/10-algorithms-machine-learning-engineers-need-to-know-article. 2.https://www.javatpoint.com 3.https://www.mathworks.com/discovery/machine-learning-models.html.

Mapping with Programme Outcomes

	PO01	**PO02**	**PO03**	**PO04**
CO1	S	S	S	S
CO2	S	S	S	M
CO3	S	S	S	S
CO4	S	S	M	S
CO5	S	S	S	S

S-Strong, M- Medium, L – Low

Subject Title	Advanced Java Programming	Semester	III
Subject Code	24P3CAC08	Specialization	NA
Type	Core : Theory	L:T:P:C	5:0:0:4

Course objective:

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

CO No.	CO Statement	Knowledge Level
CO1	Understand the Object Oriented Program including classes and methods; inheritance and exception handling	K1
CO2	Complete comprehension of String functions and I/O Streams	K2,K4
CO3	Creation of graphical representation using Applet	K3
CO4	Application of Servlets for designing Web based applications	K4
CO5	Usage of JDBC connectivity and implementation of the concept to get desired results from database	K4

Unit	Contents	No. of Sessions
I	**The Genesis of Java**: Why Java Is Important to the Internet-The Java Buzzwords. **An Overview of Java**: Object-Oriented Programming. **Introducing Classes:** Class Fundamentals- Declaring Objects - Introducing Methods – Constructors. **A Closer Look at Methods and Classes**- Overloading Methods **Inheritance:** Inheritance Basics **Packages and Interfaces**: Packages –Interfaces **Exception Handling:** Fundamentals-Types-Using try and catch-Built in Exceptions -Throwing our own Exception	**12**
II	Multithreaded Programming: The Java Thread Model- Creating a Thread- The Applet Class- Event Handling-Introducing the AWT: Working with Windows, Graphics and Text-Using AWT Controls, Layout Manager and Menus-A tour of SWING	**12**
III	**Servlet:** The Life Cycle of a Servlet-A Simple Servlet-The Servlet API-The javax.servlet Package-Reading Servlet Parameters- The javax.servlet.http Package-Handling HTTP Requests and Responses-	**12**

	Using Cookies-Session Tracking	
IV	**JSP -JSP Syntax and Semantics**- Components of a JSP Page **Expressions and Scriptlets Declarations-Request Dispatching**-JSP Tag Extensions: Introduction to Custom Tag-Developing your first Custom Tag	**12**
V	Database Access with JDBC-Overview of JDBC-JDBC Drivers-Connecting to a Database with Driver Manager-The Statement Interface-Result Sets-Using Metadata-**JSP and XML-JSP Testing and Debugging-Deploying Web Applications**.	**12**

Learning Resources	
Text Books	1. H. Schildt, 2002, Java 2 Complete Reference, 5th Edition, Tata McGraw Hill, New Delhi.(Unit I,UnitII,Unit III) 2. Phil Hanna ,JSP 2.0: The Complete Reference, Tata McGraw Hilll Edition,2003 New Delhi,(Unit IV, Unit V)
Reference Books	1. James Koegh,2003, J2Me: The complete Reference, Tata McGraw Hill, New Delhi. 2. J.McGovern, R.Adatia,Y.Fain,2003,J2EE 1.4 Bible, Wiley-Dreamtech India Pvt.Ltd, New Delhi
Website/Link	1.www.w3schools.com 2.www.javatpoint.com 3.https://java-made-easy.com 4.www.geeksforgeeks.com

Mapping with Programme Outcomes

	PO01	**PO02**	**PO03**	**PO04**
CO1	S	S	S	-
CO2	S	M	M	S
CO3	S	L	L	M
CO4	M	S	M	S
CO5	S	L	S	S

S-Strong , M- Medium , L – Low

Subject Title	Advanced Java Programming Lab	Semester	III
Subject Code	24P3CACP05	Specialization	NA
Type	Core : Practical – V	L:T:P:C	0:0:4:2

Course objective:

- Design & develop core java applications such as packages, multithreading, exception handling, applets & event handling
- Design and develop network communications, JDBC & simple server side scripting programs using Servlets & JSP
- Design and develop database connectivity and simple web applications:

1	Write a Program to prepare student mark list for at least 5 students and print the same using classes and objects
2	Write a Program to implement packages and interfaces
3	Write a Program to implement multithreading
4	Write a program to implement the concept of Exception Handling by creating user defined exceptions
5	Write a To implement applets
6	Write a Program to implement event handling
7	Write a Program to implement Swing
8	Write a HTML to Servlet Applications
9	Develop an application to perform insert, update, retrieve and delete the record from the database in JDBC
10	Designing online applications with JSP

Subject Title	Augmented Reality & Virtual Reality	Semester	I
Subject Code	24P1CADE01	Specialization	NA
Type	Elective	L:T:P:C	4:0:0:3

Course objective:

1. To understand the importance of augmented reality in Industry 4.0 with real-time examples
2. To describe the history and recent developments of AR
3. To provide the need on emerging technologies AR and VR
4. To discuss the revolution and impact of AR
5. To understand the applications of AR and VR

CO No.	CO Statement	Knowledge Level
CO1	To provide students the right skills and knowledge needed to develop Augmented Reality	K1
CO2	Enlighten the detailed hardware, display & imaging technologies related to AR.	K1, K2
CO3	To be learned how to integrate AR solutions with existing technologies and strategies for the successful implementation of AR projects.	K2, K3
CO4	To identify suitable scenarios and contexts for integrating AR and VR into microlearning initiatives.	K4
CO5	To be trained about AR Applications and Tools.	K5

Unit	Contents	No. of Hours
I	**Introduction to Augmented Reality** : History of AR- Augmented reality characteristics– Difference between Augmented Reality and Virtual Reality - AR technological components – Technologies	12

	used in AR– Feature Extraction – Hardware components – AR devices – Importance of AR - Real world uses of AR – AR types – Software tools available for AR.	
II	**Need of technologies for Augmented Reality:** Hardware technology – Virtual scenes – 3D objects – AR components – Display – HMD – Eyeglasses – Contact Lenses – significance of AR – AR powered devices – AR application development drawbacks – Compatibility – Performance – AR libraries – Motion tracking – Environmental understanding – Anchors.	**12**
III	**Technology Integration and Implementation of AR**: Technology use and integration in industrial settings – Assistive training to faculty members – Planning and administration for implementation – AR implications – Practical data– AR labs – Platforms to form AR content – Coordinated utilization of AR applications – Hands-on preparation.	**12**
IV	**Augmented Reality and Virtual Reality for Micro Learning:** Micro learning techniques – Utilizing VR for learning – VR for Practical online assessment – VR info graphics – Virtual case considerations - Utilizing AR for learning– Accessible learning – sensible data – elevated learner engagement - VR technology – Components of VR – VR Hardware – VR applications – Civil Engineering – Real Estate – Biology and Medicine – Virtual Mall – VR in Education – Virtual Laboratory – Factory Planning – Automobile Industry.	**12**
V	**Tools and Applications of Augmented Reality:** Tools available for Augmented Reality and Recognition– Software Tools – Google Poly – Unity – software approaches – recognition types– native software solutions – ARKit– ARCore – software development kit - Cloud services - AR business applications – weather prediction – market prediction– smart cities - AR application for Education - AR application for Healthcare sector – Agriculture – Civil Engineering – Architecture – Archaeology – Crime and Security– Games – IoT – Use cases – Social Media – Gaming – Education – Healthcare– Shopping and Business.	**12**

Learning Resources	
Text Books	1.Kaliraj P, Devi T, (2021). Innovating with Augmented Reality: Applications in Education and Industry (P. Kaliraj, Ed.) (1st ed.). Auerbach Publications.
Reference Books	1. The Open Augmented Reality Teaching Book Create and Code Augmented Reality!

	2. Augmented Reality: Principles and Practice, Dieter Schmalstieg and Tobias Hollerer. Addison-Wesley Professional 3. Multiple View Geometry in Computer Vision, Second Edition. Richard Hartley and Andrew Zisserman, Cambridge University Press, March 2004 4. Virtual & Augmented Reality by Paul Mealy.
Website/Link	1. https://codereality.net/ar-for-eu-book/toc/# 2. https://doi.org/10.1201/9781003175896

Mapping with Programme Outcomes

	PO01	PO02	PO03	PO04	PO05
CO1	S	S	S	S	M
CO2	S	M	M	L	S
CO3	M	M	L	M	L
CO4	M	L	M	S	S
CO5	L	M	S	S	S

S – Strong, M – Medium, L – Low

Subject Title	Data Visualization Techniques	Semester	I
Subject Code	24P1CADE02	Specialization	NA
Type	Elective	L:T:P:C	4:0:0:3

Course objective:

- The main goal of data visualization is to make it easier to identify patterns, trends and outliers in large datasets.
- The term is often used interchangeably with others, including information graphics, information visualization and statistical graph

CO No.	CO Statement	Knowledge Level
CO1	Design and create data visualizations.	K1
CO2	Conduct exploratory data analysis using visualization.	K2,K4
CO3	Craft visual presentations of data for effective communication.	K3
CO4	Use knowledge of perception and cognition to evaluate visualization design alternatives.	K4
CO5	Data visualization allows business users to gain insight into their vast amounts of data.	K4

Unit	Contents	No. of Sessions
I	Introduction to Data Visualization Why Data Visualization? What Can You Believe? Some Pictures Are More Persuasive, Different Shades of the Truth in	12

	visualization, Start Sketching Your Data Story, Recommended Tools for data visualization and demonstration of Tools.	
II	Data Management for data visualization Select Your Spreadsheet Tools, Download to CSV or ODS Format, Make a Copy of a Google Sheet, Share Your Google Sheets, Upload and Convert to Google Sheets, Geocode Addresses in Google Sheets, Collect Data with Google Forms, Sort and Filter Data, Calculate with Formulas, Summarize Data with Pivot Tables Match Columns with VLOOKUP, Spreadsheet Versus Relational Database	**12**
III	Data sources and Data processing for data visualization Open Data Repositories, Source Your Data, Recognize Bad Data Smart Cleanup with Google Sheets, Find and Replace with Blank, Transpose Rows and Columns, Split Data into Separate Columns, Combine Data into One Column, souring data and processing data for Banking data, Retail data and Healthcare data.	**12**
IV	Advanced Data processing and Basic Charting Extract Tables from PDFs with Tabula, Clean Data with Open Refine, Set Up Open Refine, Load Data and Start a New Project, Convert Dollar Amounts from Text to Numbers, Cluster Similar Spellings Precisely Describe Comparisons, Normalize Your Data Chart Design Principles, Deconstruct a Chart, Some Rules Are More Important Than Others, Chart Aesthetics, Google Sheets Charts, Bar and Column Charts	**12**
V	Interactivity Charting and Storyboard Visualization Histograms, Pie, Line, and Area Charts, Data wrapper Charts, Annotated Charts, Range Charts, Scatter Bubble Charts. Map Design Principles: Deconstructing a Map, Clarify Point-Versus-Polygon Data, Map One Variable, Not Two, Choose Smaller Geographies for Choropleth Maps Storyboard: Build a Narrative on a Storyboard, Draw Attention to Meaning, Acknowledge Sources and Uncertainty Decide on Your Data Story Format	**12**

Learning Resources	
Text Books	Hands On Data Visualization by Jack Dougherty Ilya Ilyankou

Reference Books	The Truthful Art Data Charts and Maps for Communication– Pearson Education 2016 Few Stephen Show Me the Numbers Designing Tables and Graphs to Enlighten Second edition Burlingam CA Analytics Press, 2012
Website/Link	https://www.analyticsvidhya.com/blog/2021/06/must.known-data- visyalisation.techniques-for-data-science/

Mapping with Programme Outcomes

	PO01	**PO02**	**PO03**	**PO04**
CO1	S	S	S	-
CO2	S	M	M	S
CO3	S	L	L	M
CO4	M	S	M	S
CO5	S	L	S	S

S-Strong , M- Medium , L – Low

Subject Title	DATA MINING AND DATA WAREHOUSING	Semester	I
Subject Code	24P1CADE03	Specialization	NA
Type	Elective	L:T:P:C	4:0:0:3

Course objective:

1. To fully understand standard data mining methods and techniques such as association rules, data clustering and classification.

2. Understand the functionality of the various data mining and data warehousing component.

CO No.	CO Statement	Knowledge Level
CO1	To understand the principles of Data warehousing and Data Mining.	K1
CO2	To be familiar with the Data warehouse architecture and its Implementation.	K2
CO3	To know the Architecture of a Data Mining system.	K3
CO4	To understand the various Data preprocessing Methods.	K4
CO5	To perform classification and prediction of data.	K4

Unit	Contents	No. of Sessions
I	**Data Mining**: - Data Mining Functionalities – Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation- Architecture Of A Typical Data Mining Systems- Classification Of Data Mining Systems.Association Rule Mining: - Efficient and Scalable Frequent Item set Mining Methods – Mining Various Kinds of Association Rules – Association Mining to Correlation Analysis – Constraint-Based Association Mining.	12
II	**Classification and Prediction**: - Issues Regarding Classification and Prediction – Classification by Decision Tree Introduction – Bayesian	12
	Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction – Evaluating the Accuracy of a Classifier or Predictor – Ensemble Methods.	
III	**Cluster Analysis**: - Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods – Model-Based Clustering Methods – Clustering High-Dimensional Data – Constraint-Based Cluster Analysis – Outlier Analysis.	12

IV	**Data Warehousing and Business Analysis**: -Data warehouse Basic concepts–Differences between Operational Database Systems and Data Warehouse-Data Warehouse architecture – Data Warehouse Modeling: Data Cube and OLAP-Data Warehouse Implementation.	**12**
V	**Mining Object, Spatial, Multimedia, Text and Web Data**: Multidimensional Analysis and Descriptive Mining of Complex Data Objects – Spatial Data Mining – Multimedia Data Mining – Text Mining – Mining the World Wide Web.	**12**

Learning Resources	
Text Books	Jiawei Han, Micheline Kamber and Jian Pei"Data Mining Concepts and Techniques", Third Edition, Elsevier, 2011.
Reference Books	1.Alex Berson and Stephen J. Smith "Data Warehousing, Data Mining & OLAP", Tata McGraw – Hill Edition, Tenth Reprint 2007. 2.K.P. Soman, Shyam Diwakar and V. Ajay "Insight into Data mining Theory and Practice", Easter Economy Edition, Prentice Hall of India, 2006. 3.G. K. Gupta "Introduction to Data Mining with Case Studies", Easter Economy Edition, Prentice Hall of India, 2006. 4.Pang-Ning Tan, Michael Steinbach and Vipin Kumar "Introduction to Data Mining", Pearson Education, 2007
Website/Link	**https://spoken-tutorial.org/tutorial** **www.w3schools.com** **https://www.coursera.org**

Mapping with Programme Outcomes

	PO01	**PO02**	**PO03**	**PO04**
CO1	S	S	S	-
CO2	S	M	M	S
CO3	S	L	L	M
CO4	M	S	M	S
CO5	S	L	S	S

S-Strong , M- Medium , L – Low

SubjectTitle	Cyber security	Semester	II
SubjectCode	24P2CADE04	Specialization	NA
Type	Elective	L:T:P:C	4:0:0:3

Courseobjective:

CO No.	CO Statement	Knowledge Level
CO1	Gain a foundational understanding of cybersecurity concepts	K1
CO2	Understanding of firewalls and concepts	K1,k2
CO3	Familiarize with a range of forensic tools and techniques used in digital investigations,	K2,k3
CO4	Gain expertise in investigating network-related security incidents	K4
CO5	Gain expertise in investigating network-related security incidents	K4,k5

Unit	Contents	No. of Hours
I	**Introduction:** Introduction To Cybercrime: Classification Of Cybercrimes- Reasons For Commission Of Cybercrimes- Malware And Its Type- Kinds Of Cybercrime- Authentication- Encryption- Digital Signatures- Antivirus- Firewall- Steganography- Computer Forensics- Why Should We Report Cybercrime.	12
II	**Working With Windows Firewall In Windows:** Firewall in windows7- Configuring windows firewall-?- Finding The Best Browser According To The Users Requirement- Safe Browsing- clearing cache for browsers- What is wireless LAN- major issues with WLAN-smart phone security guidelines.	12
III	**Forensics:** Evolution Of Computer Forensics- Stages Of Computer Forensics Process- Benefits Of Computer Forensics- Uses Of Computer Forensics- Objectives Of Computer Forensics- Role Of Forensics Investigator-. Forensics Readiness- Computer Crime Investigation :Introduction to Computer Crime Investigation-Assess the	12
IV	Network components and their Forensics importance-OSI- Forensics information from network-Forensics tools-wireless fidelity-wireless security-wireless attacks detection techniques-wireless intrusion detection systems-	12
V	Cyber attack-cyber warfare and cyber terriosm-Types of Web attack forensics-web application forensics tools- Email attacks and crimes-privacy in emails-email forensics- mobile forensics process	12

Learning Resources	
Text Books	1.Introduction to Cyber Security(FCS), Dr.JeetendraPande, UttarakhandOpenUniversity,2017. (UnitI & Unit II) 2.Digital Forensics , Dr.JeetendraPande,Dr.Ajay Prasad, Uttarakhand Open University, 2016 (Unit III, IV,V)
Reference Books	1. "Research Methods in Cybersecurity" by Greg White, Alan Rea, Dwayne Williams. 2. "Cyber Security Research Methods: Concepts and Practice" by Feng Liu, Geraldine Clarebout, WeizhiMeng. 3. Handbook of Researach on Digital Crime, Cyberspace Security, and Information Assurance" by Joel Samick. 4. "Cyber Security : A Practical Guide to the Law of Cyber Risk" by Sherri Davidoff, Jonathan L.Sander.
Website/Link	1. https://www.sciencedirect.com/book/9780128053492/research-methods-for-cyber-security 2. https://books.google.co.in/books/about/Research_Methods_for_Cyber_Security.html? 3. https://books.google.co.in/books?hl=en&lr=&id=aRl2DQAAQBAJ&oi=fnd&pg=PP1&dq=cyber+security+reference+books+pdf&ots=SmTP0zOBz0&sig=Tn8vaD9qV-O8oqE2a8G5KNVbzwk&redir_esc=y#v=onepage&q&f=false

Mappingwith ProgrammeOutcomes

	PO01	PO02	PO03	PO04	PO05
CO1	M	M	S	S	M
CO2	L	L	S	S	M
CO3	S	S	S	S	L
CO4	S	S	S	M	L
CO5	L	L	S	M	L

S–Strong, M–Medium,L–Low

Subject Title	BLOCK CHAIN TECHNOLOGY	Semester	II
Subject Code	24P2CADE05	Specialization	NA
Type	Elective	L:T:P:C	4:0:0:3

Course objective:

- Impart strong technical understanding of Block chain technologies
- Develop familiarity of current technologies, tools, and implementation strategies
- Introduce application areas, current practices, and research activity.

CO No.	CO Statement	Knowledge Level
CO1	Understand the types, benefits and limitation of block chain.	K1
CO2	Explore the block chain decentralization and cryptography concepts.	K2,K4
CO3	Enumerate the Bit coin features and its alternative options.	K3
CO4	Describe and deploy the smart contracts.	K4
CO5	Summarize the block chain features outside of currencies.	K4

Unit	Contents	No. of Sessions
I	**Introduction to Block chain &Crypto currencies:** Block chain-Public Ledgers, Block chain as Public Ledgers- Bit coin, Blockchain2.0, Smart Contracts, Block in a Block chain, Transactions-Distributed Consensus, The Chain and the Longest Chain-Cryptographic Hash Functions–Hash Pointers and Data Structures – Digital Signatures – Public Keys as Identities – A Simple Crypto currency.	12
II	**How Bit coin Achieves Decentralization:** Centralization vs. Decentralization-Distributed consensus–Consensus without identity using a block chain-Incentives and proof of work.	12
III	**Mechanics of Bit coin:** Bit coin transactions – Bit coin Scripts – Applications of Bit coin scripts–Bit coin blocks– The Bit coin network-Limitations and improvements.	12
IV	**How to Store and Use Bit coins:** Simple Local Storage – Hot and Cold Storage –Splitting and Sharing Keys–Online Wallets and Exchanges–Payment Services–Transaction Fees– Currency Exchange Markets.	12
V	**Community, Politics, and Regulation:** Consensus in Bit coin – Bit coin Core Software – Stakeholders: Who's in Charge? – Roots of Bit coin – Governments Notice Bit coin – Anti Money-Laundering – Regulation – New York's Bit License Proposal**.**	12

Learning Resources	
Text Books	1.Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Gold feder."Bit coin and crypto currency technologies: a comprehensive introduction". Princeton University Press, 2016.
Reference Books	1.Judith Hurwitz, Alan Nugent, Dr. Fern Halper, Marcia Kaufman, "Big Data for Dummies", John Wiley & Sons, Inc., 2013. 2. Tom White, "Hadoop: The Definitive Guide", Reilly Publications, 2011. 3. Kyle Banker, "Mongo DB in Action", Manning Publications Company, 2012. 4. Russell Brad berry, Eric Blow, "Practical Cassandra A developers Approach", Pearson Education, 2014.
Website/Link	1. https://www.webopedia.com/TERM/B/Big_data_analytics.html 2. https://www.simplilearn.com/data-science-vs-big-data-vs-data-analytics-article

Mapping with Programme Outcomes

	PO01	PO02	PO03	PO04
CO1	S	S	S	-
CO2	S	M	M	S
CO3	S	L	L	M
CO4	M	S	M	S
CO5	S	L	S	S

S-Strong , M- Medium , L – Low

Subject Title	Open Source Technologies	Semester	II
Subject Code	24P2CADE06	Specialization	NA
Type	Elective	L:T:P:C	4:0:0:3

Course objective:

- This course is aimed to provide a fundamental understanding of dynamic web site creation.
- PHP is the language used for development of most common web sites.
- Syllabus includes basic and advanced features of PHP which includes detailed introduction of PHP and MYSQL, Arrays, Loops and variables etc.
- It also gives an overview open source framework like JOOMLA, ZEND etc.

CO No.	CO Statement	Knowledge Level
CO1	Understand the concept and philosophy of open source technology, including its origins, principles, and values.	K1
CO2	Learn control statements to develop programs	K2,K4
CO3	Understand the built in functions and file concepts	K3
CO4	To make use of fundamental concepts of file.	K4
CO5	Write action script for a particular problem.	K4

Unit	Contents	No. of Sessions
I	Introduction to Open Source and PHP programming Introduction to Open Sources Technologies, Introduction to PHP, installation and configuration, Advantages and Disadvantages of PHP, Client Side Scripting, Server Side Scripting, Variables, data types,	12

	various types of function, creating your own function, Strings in PHP, String Functions.	
II	Operator, Loops, Array, Exception and Error Handling Operators, Conditions, Loops, Using for each, Creating and Using Arrays, Multidimensional Array, Associative Array. Error Handling in PHP, Errors and Exceptions, Exception class, try/catch block, throwing an exception, defining your own Exception subclass.	**12**
III	Classes, File system, Passing Information between pages Object oriented programming with Php, Working with Date time, code re-use, require (), include(), and the include path; Understanding PHP file permissions, File reading and writing functions, File system functions, File uploads, Sending mail & use of email server. HTTP, GET arguments, POST arguments, Using Session in PHP, cookies, The setcookie() function, Deleting Cookies and Reading Cookies.	**12**
IV	Working with database HTML Tables and Database tables, Database manipulation (Select, Insert, Update, Delete), validating User Input using Javascript. MYSQL, Introducing MySQL; database design concepts; the Structured Query Language (SQL); communicating with a MySQL backend via the PHP, MySQL API Building Database Applications, Developing PHP scripts for dynamic web page like feedback form, online admission form and online test.	**12**
V	Working with Frameworks Working with Mambo, Working with Joomla, Working with framework. Working with wordpress, Woprking with drupal, Use of Joomla in rapid development of website. Developing of simple website using joomla.	**12**

Learning Resources	
Text Books	1. Beginning PHP, Apache, MySQL Web Development, Michael K. Glass, Yann Le Scouarnec, Elizabeth Naramore, Gary Mailer, Jeremy Stolz, Jason Gerner, published by Wiley, wrox 2. PHP, MySQL and Apache Julie C Meloni Pearson Education ISBN : 81-297-0443-9
Reference Books	1. The Complete Reference PHP, by Steven Holzner, Tata McGraw-Hill Publication 2. Beginning PHP and MYSQL, by W. Jason Gilmore, Apress Publication

Mapping with Programme Outcomes

	PO01	**PO02**	**PO03**	**PO04**
CO1	S	S	S	-
CO2	S	M	M	S

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

S-Strong , M- Medium , L – Low

Subject Title	Natural Language Processing	Semester	III
Subject Code	24P3CADE07	Specialization	NA
Type	Elective	L:T:P:C	4:0:0:3

Course objective:

CO No.	CO Statement	Knowledge Level
CO1	To understand the algorithms available for the processing of linguistic information and computational properties of natural languages.	K1
CO2	To conceive basic knowledge on various morphological, syntactic and semantic NLP tasks.	K1,k2
CO3	To familiarize various NLP software libraries and data sets publicly available.	K2,k3
CO4	To develop systems for various NLP problems with moderate complexity.	K4
CO5	To learn various strategies for NLP system evaluation and error analysis.	K4,k5

Unit	Contents	No. of Hours
I	**Regular Expressions, Text Normalization, Edit Distance:** Regular Expressions, Words, Corpora, Simple Unix Tools for Word Tokenization, Word Tokenization, Word Normalization, Lemmatization and Stemming, Sentence Segmentation, Minimum Edit Distance. **N-gram Language Models:** N-Grams, Evaluating Language Models: Training and Test Sets , Evaluating Language Models: Perplexity, Sampling sentences from a language model, Generalization and Zeros, Smoothing, Huge Language Models and Stupid Backoff .	15
II	**Naive Bayes, Text Classification, and Sentiment:** Naive Bayes Classifiers, Training the Naive Bayes Classifier, Worked example, Optimizing for Sentiment Analysis, Naive Bayes for other text classification tasks ,Naive Bayes as a Language Model, Evaluation: Precision, Recall, F-measure ,Test sets and Cross-validation ,Statistical Significance Testing, Avoiding Harms in Classification.	10

III	**Logistic Regression:** The sigmoid function, Classification with Logistic Regression, Multinomial logistic regression, Learning in Logistic Regression, The cross-entropy loss function, Gradient Descent, Regularization, Learning in Multinomial Logistic Regression, Interpreting models, Advanced: Deriving the Gradient Equation.	**10**
IV	**Vector Semantics and Embeddings:** Lexical Semantics, Vector Semantics ,Words and Vectors , Cosine for measuring similarity, TF-IDF: Weighing terms in the vector , Pointwise Mutual Information (PMI),Applications of the tf-idf or PPMI vector models ,Word2vec, Visualizing Embeddings ,Semantic properties of embeddings, Bias and Embeddings, Evaluating Vector Models.	**12**
V	**Neural Networks and Neural Language Models:** Units, The XOR problem, Feedforward Neural Networks, Feedforward networks for NLP: Classification, Training Neural Nets, Feedforward Neural Language Modeling , Training the neural language model. **Sequence Labeling for Parts of Speech and Named Entities** : English Word Classes ,Part-of-Speech Tagging ,Named Entities and Named Entity Tagging ,HMM Part-of-Speech Tagging , Conditional Random Fields (CRFs) ,Evaluation of Named Entity Recognition	**13**

Learning Resources	
Text Books	1. Daniel Jurafsky and James H. Martin **, Speech and Language Processing:** An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition,3rd Edition, Prentice Hall of India, Copyright 2023.
Reference Books	1. Muskan.Garg, Sandeep Kumar, Abdul Khader Jilani Saudagar Natural Language Processing And Information Retrieval Principles And Applications, CRC Taylor & Francis Group, January 2024. 2. Sowmya Vajjala, Bodhisattwa Majumder, Anuj Gupta , Practical Natural Language Processing: A Comprehensive Guide to Building Real-World NLP Systems (Greyscale Indian Edition),Oreilly, 2020.
Website/Link	1. https://www.slideshare.net/HansiThenuwara/natural-language-processing-64271235 2. http://www.cs.cmu.edu/~arielpro/15381f16/slides/NLP_guest_lecture.pdf

Mapping with Programme Outcomes

	PO01	**PO02**	**PO03**	**PO04**	**PO05**
CO1	M	M	S	S	M
CO2	L	L	S	S	M
CO3	S	S	S	S	L
CO4	S	S	S	M	L
CO5	L	L	S	M	L

S – Strong, M – Medium, L – Low

Subject Title	Sentiment Analysis	Semester	III
Subject Code	24P3CADE08	Specialization	NA
Type	Elective	L:T:P:C	4:0:0:3

Course objective:

1. To introduce to computational study of people's opinions, sentiments, emotions, moods, andattitudes

CO No.	CO Statement	Knowledge Level
CO1	To understand the underlying structure of the problem commonly used to express opinions, sentiments, and emotions	K1
CO2	To understand the underlying structure of the language constructscommonly used to express opinions, sentiments, and emotions	K2,K4
CO3	To understand core areas of sentiment analysis	K3
CO4	To understand sentiment lexicon generation	K4
CO5	To understand the how to analyze the sentiments	K4

Unit	Contents	No. of Sessions
I	Introduction, Sentiment analysis applications, Sentiment analysis research, Sentiment analysis as mini-NLP,The Problem of Sentiment Analysis, Definition of opinion, Definition of opinion summary.	12
II	Different types of opinions, Document Sentiment Classification, Supervised sentiment classification, Unsupervised sentiment classification, Sentiment rating prediction, Cross-Domain Sentiment Classification, Cross-Language Sentiment Classification.	12
III	Sentence Subjectivity and Sentiment Classification, Subjectivity, Sentence Subjectivity Classification, Sentence Sentiment Classification, Aspect Sentiment Classification, Rules of Sentiment composition, Negation and Sentiment, Aspect and Entity Extraction, Frequency based aspect extraction, Exploring syntactic relations, Using supervised learning	12
IV	Sentiment Lexicon Generation, Dictionary based approach, Corpus based approach, Sentiment word embedding, Analysis of Comparative Opinions, Problem definition, Identifying comparative sentences, Identifying the preferred entity set, Special types of comparison	12

V	Analysis of Debates and Comments, Recognizing stances in debates, Modeling debates/Discussions, Modeling comments, Mining Intents, Problem of intent mining, Intent classification, Fine grained mining of intent, Detecting Fake or Deceptive Opinions, Different types of Spam, Supervised fake review detection, Automated discovery of abnormal patterns, Model based behavioral analysis, Group spam detection, Quality of Reviews, Quality prediction as a regression problem	**12**

Learning Resources	
Text Books	Sentiment Analysis: Mining Opinions, Sentiments, and Emotions, by Bing Liu
Reference Books	1. Sentiment Analysis in Social Networks By Federico Pozzi, Elisabetta Fersini, EnzaMessina, Bing Liu · 2016 2. Sentiment Analysis for Social Media, Antonio Moreno, Carlos A. Iglesias, MDPI 2020 3. New Opportunities for Sentiment Analysis and Information Processing, Aakansha Sharaff, G. R. Sinha, Surbhi Bhatia, IGI Global, 2021 4. Sentiment Analysis and Knowledge Discovery in Contemporary Business, Dharmendra Singh Rajput, Ramjeevan Singh Thakur, S. Muzamil Basha, IGI Global, 2018
Website/Link	https://www.analyticsvidhya.com/blog/2021/06/nlp-sentiment-analysis/ https://www.geeksforgeeks.org/what-is-sentiment-analysis/

Mapping with Programme Outcomes

	PO01	**PO02**	**PO03**	**PO04**
CO1	S	S	S	-
CO2	S	M	M	S
CO3	S	L	L	M
CO4	M	S	M	S
CO5	S	L	S	S

S-Strong , M- Medium , L – Low

Subject Title	Microsoft Azure AI Fundamentals – AI 900	Semester	III
Subject Code	24P3CADE09	Specialization	NA
Type	Elective	L:T:P:C	4:0:0:3

Course objective:

- 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	Contents	No. of Sessions
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.	12
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**	12

	Studio - Automated Machine Learning - Azure Machine Learning Designer.	
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.	**12**
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.	**12**
V	**Conversational AI Solutions on Azure** - Features and Uses for Bots- Capabilities of Power Virtual Agents and Azure Bot Service.	**12**

Learning Resources	
Reference Books	Michael Collier and Robin Shahan, "Fundamentals of Azure", 2nd Edition, Microsoft Azure Essential, 2016.
Website/Link	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

Subject Title	BIG DATA ANALYTICS USING R AND HADOOP	Semester	III
Subject Code	24P3CADE10	Specialization	NA
Type	Elective	L:T:P:C	4:0:0:3

Course objective:

- Provide an overview of Apache Hadoop
- Work with user input to create fun and interactive programs
- Create simple games with images, animations, and audio using our custom beginner-friendly programming
- Describe the core syntax and semantics of Python programming language.

CO No.	CO Statement	Knowledge Level
CO1	Understand Big Data and its analytics in the real world	K1
CO2	Analyze the Big Data framework like Hadoop and NOSQL to efficiently store and process Big Data to generate analytics	K2,K4
CO3	Design of Algorithms to solve Data Intensive Problems using Map Reduce Paradigm	K3
CO4	Design and Implementation of Big Data Analytics using pig and spark to solve data intensive problems and to generate analytics.	K4
CO5	Implement Big Data Activities using Hive.	K4

Unit	Contents	No. of Sessions
I	**Ready to Use R and Hadoop:** Installing R- Installing RStudio- Understanding the features of R language- Installing Hadoop- Understanding Hadoop features: Understanding HDFS- Understanding MapReduce.	12
II	**Hadoop Architecture:** Understanding the HDFS architecture- Understanding the MapReduce architecture- Understanding the HDFS and MapReduce architecture by plot- Understanding the Hadoop MapReduce fundamentals-Understanding Hadoop subprojects.	12
III	**Writing Hadoop MapReduce Programs:** Introducing Hadoop MapReduce- Listing Hadoop MapReduce entities- Understanding the Hadoop MapReduce scenario- Understanding the limitations of MapReduce- Understanding Hadoop's ability to solve problems- Writing a Hadoop MapReduce example.	12
V	**Importing and Exporting Data from Various DBs:** Learning about data files as database-Understanding MySQL-Understanding Excel- Summary- Example Hadoop Projects.	12

Learning Resources	
Text Books	1. **Vignesh Prajapati**, "Big Data Analytics with R and Hadoop", ISBN 978-1-78216-328-2.
Reference Books	1. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, "Professional Hadoop Solutions", 1 st Edition, Wrox, 2013. 2. 2. Chris Eaton, Dirk Deroos et. al., "Understanding Big data", Indian Edition, McGraw Hill, 2015. 3. 3. Tom White, "HADOOP: The definitive Guide", 3 rd Edition, O Reilly, 2012.
Website/Link	1. https://www.slideserve.com/Learntek1/analytics-using-r-programming#google_vignette 2. https://www.slideshare.net/slideshow/big-data-analytics-with-r/34392622 3. https://www.slideshare.net/UmairShafique2/big-data-analytics-using-r-254115065

Mapping with Programme Outcomes

	PO01	PO02	PO03	PO04
CO1	S	S	S	-
CO2	S	M	M	S
CO3	S	L	L	M
CO4	M	S	M	S
CO5	S	L	S	S

S-Strong , M- Medium , L – Low

Subject Title	Data Analytics using Power BI	Semester	III
Subject Code	24P3CADE11	Specialization	NA
Type	Elective	L:T:P:C	4:0:0:3

Course objective:

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

CO No.	CO Statement	Knowledge Level
CO1	Analyze the key issues in data science and its associated applications in intelligent business and scientific computing	K1
CO2	Comprehend and apply the methods	K2,K4
CO3	Comprehend the Fundamentals of data analytics	K3
CO4	Analyze privacy issues on Business Intelligence	K4
CO5	Build Interactive Dashboard for Business	K4

Unit	Contents	No. of Sessions
I	**Wholeness of Data Analytics:** Business Intelligence, Pattern Recognition, Data Processing Chain, Business Intelligence Concepts and Applications	12
II	**Data Warehousing,Data Mining&Data Visualization**: Data Warehousing, Data Mining, Data Visualization.	12
III	**DECISION TREE&REGRESSION:** Decision Trees, Decision Tree problem, Decision Tree Construction, Decision Tree Algorithms, Regression, **Correlations and Relationships, Logistic Regression :** Artificial Neural Network, Business Applications of ANN, Design Principles of an Artificial Neural Network,	12
IV	**ARTIFICIAL NEURAL NETWORK AND CLUSTER ANALYSIS:** Artificial Neural Network, Business Applications of ANN, Design Principles of an Artificial Neural Network, Cluster Analysis, Applications of Cluster Analysis	12

V	**TEXT MINING:** Text Mining, Text Mining Applications, Text Mining Process, Term Document Matrix, Mining the TDM, Comparing Text Mining and Data Mining, Text Mining Best Practice	**12**

Learning Resources	
Text Books	1. Data Analytics Made Accessible
Reference Books	1. Damian Ryan, Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation Paperback – Import, Kogan Page, Fourth Edition 2. Greg Deckler Learn Power BI - A beginner's guide to developing interactive businessintelligence solutions using Microsoft Power BI, Packt Publishing, 2019
Website/Link	https://powerbi.microsoft.com/en-us/learning/ https://www.simplilearn.com/power-bi-certification-training-course

Mapping with Programme Outcomes

	PO01	**PO02**	**PO03**	**PO04**
CO1	S	S	S	-
CO2	S	M	M	S
CO3	S	L	L	M
CO4	M	S	M	S
CO5	S	L	S	S

S-Strong , M- Medium , L – Low

Subject Title	DEEP LEARNING AND NEURAL NETWORKS	Semester	III
Subject Code	24P3CADE12	Specialization	NA
Type	Elective	L:T:P:C	4:0:0:3

Course objective:

1. To acquire the knowledge on Deep Learning Concepts
2. To learn various types of Artificial Neural Networks
3. To gain knowledge to apply optimization strategies .
4. To use an efficient algorithm for Deep Models

CO No.	CO Statement	Knowledge Level
CO1	Recognize the characteristics of deep learning models that are useful to solve real-world problems.	K1
CO2	Understand different methodologies to create application using deep nets.	K2,K4
CO3	Ability to select the Learning Networks in modeling real world systems	K3
CO4	Ability to understand the concepts of Neural Network	K4
CO5	Ability to apply optimization strategies for large scale application	K4

Unit	Contents	No. of Sessions
I	Introduction: What is Neural Network? - Human Brain - Models of a Neuron - Neural Networks viewed as Directed Graphs - Network Architectures - Knowledge Representations - Artificial Intelligence and Neural Networks.	12
II	Learning Processes : Introduction - Error - Correction Learning - Memory - Based Learning- Hebbian Learning- Competitive Learning	12
III	Deep Learning Introduction : Artificial intelligence,Machine Learning , and Deep Learning -Research Domains and Industry Applications - Healthcare - Manufacturing -Retail -Virtual Assistants - Self -driving cars. Getting a Perspective of Deep Learning.	12
IV	Representation Learning : Introduction - Few Scenarios of Representation Learning - Classification - Semi - Supervised, less Labelled Data - Transfer Learning - Traditional Representation	12

	Learning :Principal Component Analysis - Principal Component Analysis Visualization .	
V	Deep learning Architecture - Encoder -Decoder Architectures- Attention Mechanism- Transformer Architecture : Multi headed Attention -.Transformer Modes - Outline of Popular Transformer Architectures.	**12**

Learning Resources	
Text Books	1. Simon Haykin ,"Neural Networks "- A Comprehensive Foundation - Pearson Education - Second Edition. (Unit I,II) 2. Amit Kumar Das ,Saptarsi Goswami,Pabitra Mitra , Amlan Chakrabarti, "Deep Learning – Pearson Education 2021. (Unit III,IV & V) Chapter 1 ,7 ,9.
Reference Books	1. Giancarlo Zaccone, Md. RezaulKarim, Ahmed Menshawy "Deep Learning with TensorFlow:Explore neural networks", Packt Publisher, 2017. 2. Antonio Gulli, Sujit Pal "Deep Learning with Keras", Packt Publishers, 2017. 3. Neural Networks and Deep Learning by Michael Nielsen.
Website/Link	1https://www.ibm.com/topics/neural-networks 2https://towardsdatascience.com/simple-introduction-to-neural-networks-ac1d7c3d7a2c

Mapping with Programme Outcomes

	PO01	**PO02**	**PO03**	**PO04**
CO1	S	S	S	-
CO2	S	M	M	S
CO3	S	L	L	M
CO4	M	S	M	S
CO5	S	L	S	S

S-Strong , M- Medium , L – Low

Subject Title	RESEARCH METHODOLOGY	Semester	I
Subject Code	24P1CAS01	Specialization	NA
Type	Soft Skill	L:T:P:C	2:0:0:2

Course objective:

- 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

CO No.	CO Statement	Knowledge Level
CO1	Understand research problem formulation	K1
CO2	Analyze research-related information	K2
CO3	Understand and follow research ethics	K3
CO4	Understand that IPR protection provides an incentive to inventors for further	K4
CO5	Research work and investment in R & D, for economic growth and social benefits	K4,k5

Unit	Contents	No. of Hours
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.	6
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.	6
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,	6
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.	6

V	Ethics in Research - Plagiarism - Definition, different forms, consequences, unintentional plagiarism, copyright infringement, collaborative work. Qualities of good Researcher.	**6**

Learning Resources	
Text Books	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 3. Prentice Hall 4. Michael V. P Research Methodology. 5. Fred N. Kerlinger : Foundations of Behavioral Research.
Website/Link	1. https://www.slideshare.net/slideshow/research-methods-methodology/237970380 2. https://www.slideshare.net/slideshow/research-methodology-3101947/23101947

Mappingwith ProgrammeOutcomes

	PO01	**PO02**	**PO03**	**PO04**	**PO05**
CO1	M	S	M	S	M
CO2	M	M	S	M	S
CO3	M	S	L	L	M
CO4	M	S	S	S	S
CO5	S	L	M	S	L

S–Strong, M–Medium,L–Low

Subject Title	COMMUNICATION SKILLS FOR SOFTWARE ENGINEERS	Semester	II
Subject Code	24P2CASO2	Specialization	NA
Type	Soft Skill	L:T:P:C	2:0:0:2

Course objective:

- Knowledge of English Language plays an important role in career development.
- This subject aims at introducing basic concepts of communication besides laying emphasis on developing listening, speaking, reading and writing skills as parts of Communication Skill

CO No.	CO Statement	Knowledge Level
CO1	Frame correct sentences with illustrations	K1
CO2	Comprehend the language correctly and Interpret the language correctly	K2
CO3	Use given material in new situations.	K3
CO4	Correspond effectively using various types of writings like letters, memos etc.	K4
CO5	Communicate effectively in English with appropriate body language making use of correct and appropriate vocabulary and grammar in an organised set up and social context	K4,k5

Unit	Contents	No. of Hours
I	**Functional Grammar** 1Prepositions 2Framing Questions 3Conjunctions 4Tenses	6
II	**Reading** Unseen Passage for Comprehension (Vocabulary enhancement - Prefixes, Suffixes, one word substitution, Synonym and Antonym) based upon the passage should be covered under this topic	6
III	**Writing Skill** Correspondence a) Business Letters- Floating Quotations, Placing Orders, Complaint Letters. b) Official Letters- Letters to Government and other Offices 3.1. Memos, Circular, Office Orders 3.2. Agenda & Minutes of Meeting 3.3. Report Writing	6

IV	LIST OF PRACTICALS Note: Teaching Learning Process should be focused on the use of the language in writing reports and making presentations. Topics such as Effective listening, effective note taking, group discussions and regular presentations by the students need to be taught in a project oriented manner where the learning happens as a by product	**6**
V	**Speaking and Listening Skills** 1. Debate 2. Telephonic Conversation: general etiquette for making and receiving calls 3. Offering- Responding to offers. 4. Requesting – Responding to requests 5. Congratulating 6. Exploring sympathy and condolences 7. Asking Questions- Polite Responses 8. Apologizing, forgiving 9. Complaining 10. Warning 11. Asking and giving information 12. Getting and giving permission 13. Asking for and giving opinions • Students should be encouraged to participate in role play and other student-centered activities in class rooms 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	**6**

Learning Resources	
Text Books	1. Communicating Effectively in English, Book-I by RevathiSrinivas; Abhishek Publications, Chandigarh. 2. Communication Techniques and Skills by R. K. Chadha; Dhanpat Rai Publications, New Delhi.
Reference Books	1. High School English Grammar and Composition by Wren & Martin; S. Chand & Company Ltd., Delhi. 2. e-books/e-tools/relevant software to be used as recommended by AICTE/NITTTR, Chandigarh
Website/Link	• http://www.mindtools.com • http://www.letstalk.com.in

	• http://www.englishlearning.com • http://learnenglish.britishcouncil.org/en/ • http://swayam.gov.in

Mappingwith ProgrammeOutcomes

	PO01	PO02	PO03	PO04	PO05
CO1	M	S	M	S	M
CO2	M	M	S	M	S
CO3	M	S	L	L	M
CO4	M	S	S	S	S
CO5	S	L	M	S	L

S–Strong, M–Medium,L–Low

Subject Title	SELF DEVELOPMENT AND INTER PERSONAL SKILLS	Semester	II
Subject Code	24P3CAS03	Specialization	NA
Type	Soft Skill	L:T:P:C	2:0:0:2

Course objective:

- 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**.**

CO No.	CO Statement	Knowledge Level
CO1	The student will be able to understand, analyse develop and exhibit accurate sense of self.	K1
CO2	Think critically	K2
CO3	Demonstrate knowledge of personal beliefs and values and a commitment to continuing personal reflection and reassessment	K3
CO4	Learn to balance confidence with humility and overcome problems associated with personality	K4
CO5	Self-awareness, life skills, soft skills, need for personal development	K4,k5

Unit	Contents	No. of Hours
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-	6

	Bosses or-Asserters-Mediators or Peacemakers - Personality Tests - Example of a Personality Test: Jung Typology Test - Personality Assessment	
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.	**6**
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.	**6**
IV	Strategy III: The Resume Should Show to the Employer the Benefits 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 Resume by an Experienced Professional -Example of a Well-written Resume of 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 Resume Formats	**6**
V	**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-verbal Communicatio - 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	**6**

Learning Resources	
Text Books	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
Website/Link	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

Mappingwith ProgrammeOutcomes

	PO01	PO02	PO03	PO04	PO05
CO1	*L*	*L*	*M*	*S*	*M*
CO2	*S*	*M*	*L*	*M*	*L*
CO3	*M*	*S*	*S*	*L*	*M*
CO4	*S*	*L*	*S*	*M*	*S*
CO5	*S*	*M*	*L*	*S*	*L*

S–Strong, M–Medium,L–Low-+

Subject Title	DOCUMENT PREPARATION AND INTERVIEW SKILLS	Semester	III
Subject Code	24P3CAS04	Specialization	NA
Type	Soft2Skill	L:T:P:C	2:0:0:2

Course objective:

- 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.

CO No.	CO Statement	Knowledge Level
CO1	Understand the purpose of interviews	K1
CO2	Be aware of the processes involved in different types of interviews	K2
CO3	Know how to prepare for interview	K3
CO4	Be clear about the importance of self presentation	K4
CO5	Guidance for Proper Writing	K4,k5

Unit	Contents	No. of Hours
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	8

	or Video Interview - **A Mock** **Interview:** Why did the Interview Team Select Vikram? - Why did the Interview Team not Select Chandra and Amit?	
II	**<u>Body Language: Reveals Your Inner Self and Personality</u>** 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	**6**
III	**<u>Enhance Your Writing Skill to Create an Impression</u>** 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	**6**
IV	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	**5**
V	**<u>Fog Index: Provides Guidance for Proper Writing</u>** 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	**5**

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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
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Mappingwith ProgrammeOutcomes

	PO01	PO02	PO03	PO04	PO05
CO1	*L*	*L*	*M*	*S*	*M*
CO2	*S*	*M*	*L*	*M*	*L*
CO3	*M*	*S*	*S*	*L*	*M*
CO4	*S*	*L*	*S*	*M*	*S*
CO5	*S*	*M*	*L*	*S*	*L*

S–Strong, M–Medium,L–Low-+

Subject Title	TEAM PROJECT	Semester	III
Subject Code	24P3CAS05	Specialization	NA
Type	Soft Skill	L:T:P:C	2:0:0:2

Course objective:

- 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.

CO No.	CO Statement	Knowledge Level
CO1	Demonstrate the ability to locate and use technical information from multiple sources	K1
CO2	Demonstrate the ability to communicate effectively in speech and writing	K2
CO3	To demonstrate a depth of knowledge of modern technology	K3
CO4	To do the Project Scheduling, tracking, Risk analysis, Quality management and Project Costestimation using different techniques	K4
CO5	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	K4,k5

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 allthe 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) willdecide the further process.

Mapping with Programme Outcomes

	PO01	PO02	PO03	PO04	PO05
CO1	M	S	M	S	M
CO2	M	M	S	M	S
CO3	M	S	L	L	M
CO4	M	S	S	S	S
CO5	S	L	M	S	L

S–Strong, M–Medium,L–Low