M Sc COMPUTER SCIENCE

LOCF SYLLABUS 2025

Department of Information Technology

School of Computing Sciences

St. Joseph's College (Autonomous)

Tiruchirappalli - 620002, Tamil Nadu, India

SCHOOLS OF EXCELLENCE WITH CHOICE BASED CREDIT SYSTEM (CBCS)
POSTGRADUATE COURSES

St. Joseph's College (Autonomous), an esteemed institution in the realm of higher education in India, has embarked on a journey to uphold and perpetuate academic excellence. One of the pivotal initiatives in this pursuit is the establishment of five Schools of Excellence commencing from the academic year 2014-15. These schools are strategically designed to confront and surpass the challenges of the 21st century.

Each School amalgamates correlated disciplines under a unified umbrella, fostering synergy and coherence. This integrated approach fosters the optimal utilization of both human expertise and infrastructure. Moreover, it facilitates academic fluidity and augments employability by nurturing a dynamic environment conducive to learning and innovation. Importantly, while promoting collaboration and interdisciplinary study, the Schools of Excellence also uphold the individual identity, autonomy, and distinctiveness of every department within.

The overarching objectives of these five schools are as follows:

1. Optimal Resource Utilization: Ensuring the efficient use of both human and material resources to foster academic flexibility and attain excellence across disciplines.

2. Horizontal Mobility for Students: Providing students with the freedom to choose courses aligning with their interests and facilitating credit transfers, thereby enhancing their academic mobility and enriching their learning experience.

3. Credit-Transfer Across Disciplines (CTAD): The existing curricular structure, compliant with regulations from entities such as TANSCHE and other higher educational institutions, facilitates seamless credit transfers across diverse disciplines. This underscores the adaptability and uniqueness of the choice-based credit system.

4. Promotion of Human Excellence: Nurturing excellence in specialized areas through focused attention and resources, thus empowering individuals to excel in their respective fields.

5. Emphasis on Internships and Projects: Encouraging students to engage in internships and projects, serving as stepping stones toward research endeavors, thereby fostering a culture of inquiry and innovation.

6. Addressing Stakeholder Needs: The multi-disciplinary nature of the School System is tailored to meet the requirements of various stakeholders, particularly employers, by equipping students with versatile skills and competencies essential for success in the contemporary professional landscape.

In essence, the Schools of Excellence at St. Joseph's College (Autonomous) epitomize a holistic approach towards education, aiming not only to impart knowledge but also to cultivate critical thinking, creativity, and adaptability – qualities indispensable for thriving in the dynamic global arena of the 21st century.

Credit system

The credit system at St. Joseph's College (Autonomous) assigns weightage to courses based on the hours allocated to each course. Typically, one credit is equivalent to one hour of instruction per week. However, credits are awarded regardless of actual teaching hours to ensure consistency and adherence to guidelines.

The credits and hours allotted to each course within a programme are detailed in the Programme Pattern table. While the table provides a framework, there may be some flexibility due to practical sessions, field visits, tutorials, and the nature of project work.

For postgraduate (PG) courses, students are required to accumulate a minimum of 92 credits, as stipulated in the programme pattern table. The total minimum number of courses offered by the department is outlined in the Programme Structure.

OUTCOME-BASED EDUCATION (OBE)

OBE is an educational approach that revolves around clearly defined goals or outcomes for every aspect of the educational system. The primary aim is for each student to successfully achieve these predetermined outcomes by the culmination of their educational journey. Unlike traditional methods, OBE does not prescribe a singular teaching style or assessment format. Instead, classes, activities, and evaluations are structured to support students in attaining the specified outcomes effectively.

In OBE, the emphasis lies on measurable outcomes, allowing educational institutions to establish their own set of objectives tailored to their unique context and priorities. The overarching objective of OBE is to establish a direct link between education and employability, ensuring that students acquire the necessary skills and competencies sought after by employers.

OBE fosters a student-centric approach to teaching and learning, where the delivery of courses and assessments are meticulously planned to align with the predetermined objectives and outcomes. It places significant emphasis on evaluating student performance at various levels to gauge their progress and proficiency in meeting the desired outcomes.

Here are some key aspects of Outcome-Based Education:

Course: A course refers to a theory, practical, or a combination of both that is done within a semester.

Course Outcomes (COs): These are statements that delineate the significant and essential learning outcomes that learners should have achieved and can reliably demonstrate by the conclusion of a course. Typically, three or more course outcomes are specified for each course, depending on its importance.

Programme: This term pertains to the specialization or discipline of a degree programme.

Programme Outcomes (POs): POs are statements that articulate what students are expected to be capable of by the time they graduate. These outcomes are closely aligned with Graduate Attributes.

Programme Specific Outcomes (PSOs): PSOs outline the specific skills and abilities that students should possess upon graduation within a particular discipline or specialization.

Programme Educational Objectives (PEOs): PEOs encapsulate the expected accomplishments of graduates in their careers, particularly highlighting what they are expected to achieve and perform during the initial years postgraduation.

LEARNING OUTCOME-BASED CURRICULUM FRAMEWORK (LOCF)

The Learning Outcomes-Centric Framework (LOCF) places the learning outcomes at the forefront of curriculum design and execution. It underscores the importance of ensuring that these outcomes are clear, measurable, and relevant. LOCF orchestrates teaching methodologies, evaluations, and activities in direct correlation with these outcomes. Furthermore, LOCF adopts a backward design approach, focusing on defining precise and attainable learning objectives. The goal is to create a cohesive framework where every educational element is in harmony with these outcomes.

Assessment practices within LOCF are intricately linked to the established learning objectives. Evaluations are crafted to gauge students' achievement of these outcomes accurately. Emphasis is often placed on employing authentic assessment methods, allowing students to showcase their learning in real-life scenarios. Additionally, LOCF frameworks emphasize flexibility and adaptability, enabling educators to tailor curriculum and instructional approaches to suit the diverse needs of students while ensuring alignment with the defined learning outcomes.

Some important terminologies

Core Courses (CC): *These are compulsory courses that students must undertake as essential components of their curriculum, providing fundamental knowledge within their primary discipline. Including core courses is essential to maintain a standardized academic programme, ensuring recognition and consistency across institutions.*

Discipline Specific Elective Courses (ES): *Elective courses are offered within the main discipline or subject of study. They allow students to select specialized or advanced options from a range of courses, offering in-depth exposure to their chosen area of study. Typically, ES are more applied in nature and provide a deeper understanding of specific topics.*

Research Methodology (RM)*: It is a two-credit course offered in the third semester as a common program across disciplines within the school. It is designed to cultivate a strong research aptitude among postgraduate students. The course equips learners with essential skills for formulating research problems and pursuing impactful research.*

Open Elective Courses (OE): *These elective courses are chosen from disciplines unrelated to the student's main area of study, aiming to broaden their exposure and knowledge base. As per the Choice Based Credit System (CBCS) policy, students may opt for open elective courses offered by other disciplines within the college, enhancing the diversity of their learning experience.*

Ability Enhancement Course (AEC): *AE is designed to enhance skills and proficiencies related to the student's main discipline. It aims to provide practical training and hands-on experience, contributing to the overall development of students pursuing academic programmes.*

Skill Enhancement Course (SEC): *SE focus on developing specific skills or proficiencies relevant to students' academic pursuits. While it is open to students from any discipline, SE is particularly beneficial for those within the related academic programme.*

Self-Learning (SL): *A two-credit course designed to foster students' ability for independent and self-directed learning. There are* Three Self-Learning Courses:

- 'Global Citizenship Education' *a common online course offered to all PG students in Semester I on JosTEL.*
- *Compulsory MOOC on NPTEL-SWAYAM in Semester I or II*
- *A Department-Specific Self-Learning Course in Semester III on JosTEL*

Comprehensive Examination (CE): *These examinations cover detailed syllabi comprising select units from courses offered throughout the programme. They are designed to assess crucial knowledge and content that may not have been covered extensively in regular coursework.*

Extra Credit Courses: *To support students in acquiring knowledge and skills through online platforms such as Massive Open Online Courses (MOOCs), additional credits are granted upon verification of course completion. These extra credits can be availed across three semesters (1 - 4). In line with UGC guidelines, students are encouraged to enhance their learning by enrolling in MOOCs offered by portals like SWAYAM, NPTEL, and others. Additionally, certificate courses provided by the college are also considered for these extra credits.*

Outreach Programme (OR): *It is a compulsory course to create a sense of social concern among all the students and to inspire them to dedicated service to the needy.*

Course Coding

The following code system (10 alphanumeric characters) is adopted for Postgraduate courses:

25	**UXX**	**0**	**XX**	**00/X**
Year of Revision	PG Department Code	Semester Number	Course Specific Initials	Running Number/with Choice

Course Specific Initials

CC - Core Course
CP - Core Practical
ES - Discipline Specific Elective
AE - Ability Enhancement Course
SL - Self-Learning
OE – Open Elective
PW - Project and Viva Voce
CE - Comprehensive Examination
OR - Outreach Programme
IS – Internship
RM – Research Methodology

EVALUATION PATTERN (PG)

Continuous Internal Assessment

Sl No	Component	Marks Allotted
1	Mid Semester Test	30
2	End Semester Test	30
3	*Two Components (15 + 20)	35
4	Library Referencing	5
	Total	**100**

Passing minimum: 50 marks

* *The first component is a compulsory online test (JosTEL platform) for 15 marks comprising 7 questions (1 mark) at K1 level and 4 questions (2 marks) at K2 level;* The second component is decided by the course in-charge in accordance with the prescribed K levels.

Question Paper Blueprint for Mid and End Semester Tests

Duration: 2 Hours								**Maximum Marks: 60**
Section		**K levels**						**Marks**
		K1	**K2**	**K3**	**K4**	**K5**	**K6**	
A *(compulsory)*		7						7 × 1 = 7
B *(compulsory)*			5					5 × 3 = 15
C *(either…or type)*				3				3 × 6 = 18
D *(2 out of 3)*	Mid Sem				1(2)	1*		2 × 10 = 20
	End Sem					1(2)	1*	
							Total	**60**

***** *Compulsory*

Question Paper Blueprint for Semester Examination

Duration: 3 Hours							**Maximum Marks: 100**
Section	**K levels**						**Marks**
	K1	**K2**	**K3**	**K4**	**K5**	**K6**	
A *(compulsory)*	10						10 × 1 = 10
B *(compulsory)*		10					10 × 3 = 30
C *(either…or type)*			5				5 × 6 = 30
D *(3 out of 5)*				1(2)	1(2)	1*	3 × 10 = 30
						Total	**100**

***** *Compulsory*

Evaluation Pattern for One/Two-credit Courses

Title of the Course	**CIA**	**Semester Examination**	**Final**
• Ability Enhancement Course	20 + 10 + 20 = 50	50 *(Department)*	100
• Self - Learning Course (Dept. Specific) • Comprehensive Examination	25 + 25 = 50	50 *(CoE)*	100
• Internship • Self - Learning Course (Common) • Self - Learning Online Course (NPTEL / SWAYAM)	100	-	100
• Skill Enhancement Course: Soft Skills	100	-	100
• Project Work and Viva Voce	100	100	100

Grading System

The marks obtained in the CIA and semester for each course will be graded as per the scheme provided in Table - 1.

From the second semester onwards, the total performance within a semester and the continuous performance starting from the first semester are indicated by Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA), respectively. These two are calculated by the following formulae:

$$SGPA \text{ and } CGPA = \frac{\sum_{i=1}^{n} C_i Gp_i}{\sum_{i=1}^{n} C_i}$$

$$WAM = \frac{\sum_{i=1}^{n} C_i M_i}{\sum_{i=1}^{n} C_i}$$

Where,

Ci - credit earned for the Course i

Gpi - Grade Point obtained for the Course i

Mi - Marks obtained for the Course i

*n - Number of Courses **passed** in that semester*

WAM - Weighted Average Marks

Table - 1: Grading of the Courses for PG

Mark Range	Grade Point	Corresponding Grade
90 and above	10	O
80 and above and below 90	9	A+
70 and above and below 80	8	A
60 and above and below 70	7	B+
50 and above and below 60	6	B
Below 50	0	RA

Table - 2: Grading of the Final Performance for PG

CGPA	Grade	Performance
9.00 and above	O	Outstanding*
8.00 to 8.99	A+	Excellent*
7.00 to 7.99	A	Very Good
6.00 to 6.99	B+	Good
5.00 to 5.99	B	Above Average
Below 5.00	RA	Re-appear

**The Candidates who have passed in the first appearance and within the prescribed duration of the PG programme are eligible. If the Candidates Grade is O/A+ with more than one attempt, the performance is considered "Very Good".*

Vision

Forming globally competent, committed, compassionate and holistic persons, to be men and women for others, promoting a just society.

Mission

- Fostering learning environment to students of diverse background, developing their inherent skills and competencies through reflection, creation of knowledge and service.
- Nurturing comprehensive learning and best practices through innovative and value- driven pedagogy.
- Contributing significantly to Higher Education through Teaching, Learning, Research and Extension.

Programme Educational Objectives (PEOs)

1. Graduates will be able to accomplish professional standards in the global environment.
2. Graduates will be able to uphold integrity and human values.
3. Graduates will be able to appreciate and promote pluralism and multiculturalism in working environment.

Programme Outcomes (POs)

1. Graduates will be able to apply assimilated knowledge to evolve tangible solution to emerging problems.
2. Graduates will be able to analyze and interpret data to create and design new knowledge.
3. Graduates will be able to engage in innovative and socially relevant research and effectively communicate the findings.
4. Graduates will become ethically committed professional and entrepreneurs upholding human values.
5. Graduates imbibed with ethical values and social concern will be able to understand and appreciate cultural diversity, social harmony and ensure sustainable environment.

Programme Specific Outcomes (PSOs)

1. Acquire fundamental knowledge in problem solving, general computing and comprehensive knowledge in Computer Science.
2. Competence to identify, analyze, design, optimize and implement system solutions using contemporary computing techniques which propels towards employability.
3. Gain fundamental knowledge in computational methods and tools for solving real- time problems and implanting the quest for continual learning of novel and in- demand skills.
4. Demonstrate the ability to act as a leader, or as a part of a team to create multi- functional Software Solutions.
5. Ability to showcase discrete practical experiences by implementing various strategies that utilizes a variety of software techniques that are ethical and would be beneficial to the society.

M. Sc. Computer Science Programme Structure				
Semester	**Specification**	**No. of Courses**	**Hours**	**Credits**
1 – 4	Core Course	10	52	38
1 - 4	Core Practical	6	18	12
1, 3 & 4	Discipline Specific Elective	3	12	9
1 – 2	Open Elective	2	8	4
1	Ability Enhancement Course	1	2	1
1 – 3	Self-Learning	3	-	4
2	Skill Enhancement Course	1	4	2
3	Research Methodology	1	4	2
3	Mini Project	1	-	2
4	Project	1	20	12
4	Comprehensive Examination	1	-	2
2 – 4	Outreach Programme (SHEPHERD)	-	-	4
1 – 4	Extra Credit Course	4	-	12
	Total	**34**	**120**	**92 (12)**

M.Sc. COMPUTER SCIENCE PROGRAMME PATTERN								
			Course Details			Scheme of Exams		
Sem.	**Course Code**	**Course Type**	**Title of the Course**	**Hours**	**Credits**	**CIA**	**SE**	**Final**
1	25PCS1CC01	**CC Major**	**Core Course - 1**: Advanced Python Programming	5	4	100	100	100
	25PCS1CC02		**Core Course- 2:** Advanced Java Programming	5	4	100	100	100
	25PCS1CC03		**Core Course- 3:** Design and Analysis of Algorithms	4	3	100	100	100
	25PCS1CP01		**Core Practical – 1:** Python Programming Lab	3	2	100	100	100
	25PCS1CP02		**Core Practical - 2:** Java Programming Lab	3	2	100	100	100
	25PCS1ES01A	**DSE**	**Discipline Specific Elective – 1:** Cloud Computing	4	3	100	100	100
	25PCS1ES01B		**Discipline Specific Elective – 1:** Internet of Things					
	25PCS1AE01	**AEC**	**Ability Enhancement Course:** Data Analytics using Excel	2	1	100	-	100
	25PCS1OE01	**OE**	**Open Elective - 1 (WS):** Big Data Analytics	4	2	100	100	100
	25PGC1SL01	**SL**	Global Citizenship Education (Online)	0	1	100	-	100
			Extra Credit Course	0	(3)			
			Total	**30**	**22 (3)**			
2	25PCS2CC04	**CC Major**	**Core Course - 4:** PHP with MySQL	6	4	100	100	100
	25PCS2CC05		**Core Course - 5**: Machine Learning	5	4	100	100	100
	25PCS2CC06		**Core Courses - 6:** Advanced Software Engineering (Internship Embedded Course)	5	4	100	100	100
	25PCS2CP03		**Core Practical - 3:** PHP with MySQL Lab	3	2	100	100	100
	25PCS2CP04		**Core Practical - 4:** Machine Learning	3	2	100	100	100
	25PCS2OE02	**OE**	**Open Elective - 2 (BS):** Recent Trends in Computing	4	2	100	100	100
	25PSS2SE01	**SEC**	**Skill Enhancement Course:** Soft Skills	4	2	100	-	100
	25PCS2SL02	**SL**	Online Courses: NPTEL / SWAYAM	0	2	-	100	100
			Extra Credit Course	0	(3)			
			Total	**30**	**22 (3)**			
3	25PCS3CC07	**CC Major**	**Core Course -7:** Web Development using ASP.NET	6	4	100	100	100
	25PCS3CC08		**Core Course - 8:** No SQL using Mongo DB	5	4	100	100	100
	25PCS3CC09		**Core Course - 9**: Smart Devices using Android	5	3	100	100	100
	25PCS3CP05		**Core Practical - 5:** ASP.NET	3	2	100	100	100
	25PCS3CP06		**Core Practical - 6:** Mongo DB	3	2	100	100	100
	25PCS3ES02 A	**DSE**	**Discipline Specific Elective – 2:** Cryptography and Block Chain Technology	4	3	100	100	100
	25PCS3ES02 B		**Discipline Specific Elective – 2:** Compiler Design					
	25SCS3RM01	**RM**	Research Methodology	4	2	100	100	100
	25PCS3SL03	**SL**	**Self - Learning:** Social Media Techniques*	0	1	50	50	50
	25PCS3PW01	**PW**	Mini Project	0	2	100	100	100
			Extra Credit Course	0	(3)	-	-	-
			Total	**30**	**23 (3)**			
4	25PCS4CC10	**CC Major**	**Core Course - 10:** Edge Computing	6	4	100	100	100
	25PCS4ES03A	**DSE**	**Discipline Specific Elective - 3:** Generative AI	4	3	100	100	100
	25PCS4ES03B		**Discipline Specific Elective - 3:** Immersive Technologies					
	25PCS4PW02	**PW**	Major Project Work and Viva Voce	20	12	100	100	100
	25PCS4CE01	**CE**	Comprehensive Examination*	0	2	50	50	100
			Extra Credit Course	0	(3)			
			Total	**30**	**21(3)**			
	25PCW4OR01	**OR**	Outreach Programme	0	4			
1-4			**TOTAL**	**120**	**92 (12)**			

***For Grade Calculation:** Marks obtained out of 50 will be converted into 100 in the mark statements.

Open Elective - 1 (WS): 1st Semester

School	Course Code	Title of the Course
SCS		
Artificial Intelligence	25PAI1OE01	Neural Networks and Fuzzy Logic
Computer Science	25PCA1OE01A	AI Tools & Applications
	25PCA1OE01B	Internet of Things
Information Technology	25PCS1OE01	Big Data Analytics
Data Science	25PDS1OE01	SQL and NoSQL for Data Science
Mathematics	25PMA1OE01	Mathematical Foundations

Open Elective–2 (BS): 2nd Semester
Offered to students from other Schools

School	Course Code	Title of the Course
SBS		
Botany	25PBO2OE02	Sustainable Horticulture and Urban Landscaping
Biochemistry	25PBI2OE02	First Aid Management
Biotechnology	25PBT2OE02	Food Technology
SCS		
Artificial Intelligence and Machine Learning	25PAI2OE02	Cyber Security
Computer Science	25PCA2OE02A	Web Design
	25PCA2OE02B	Cyber Security
Information Technology	25PCS2OE02	Recent Trends in Computing
Data Science	25PDS2OE02	Discrete Mathematics
Mathematics	25PMA2OE02	Operations Research
Visual Communication	25PVC2OE02	Women and Media
SLAC		
English	25PEN2OE02	English for Digital Media
History	25PHS2OE02	Public Administration
Tamil	25PTA2OE02	விளம்பரக்கலை (Art of advertising)
SMS		
Commerce	25PCO2OE02	Basics of Tally Prime
Commerce Computer Application	25PCC2OE02	Behavioural Dynamics and Psychology
Counselling Psychology	25PCP2OE02	Artificial Intelligence in Psychology
Economics	25PEC2OE02	Managerial Economics
Human Resource Management	25PHR2OE02	Counselling and Guidance
SPS		
Chemistry	25PCH2OE02	Chemistry of Health and Nutrition
Electronics	25PEL2OE02	Computer Hardware and Networks
Physics	25PPH2OE02A	Physics for Competitive Exams
	25PPH2OE02B	Nanoscience

Semester	Course Code	Title of the Course	Hours/Week	Credits
1	25PCS1CC01	**Core Course - 1:** Advanced Python Programming	5	4

Course Objectives
To make students understand the concepts of Python programming
To impart knowledge on functions Function Arguments, Python Strings, Modules
To discover the relationship among the numerical data using Numpy for doing statistical analysis.
To build Data Frames using pandas for Business Solutions that require Data Analytics.
To interpret the data through Matplotlib for visualization to give possible solutions

UNIT I: Basics of Python and Function (15 Hours)

Data Types -Operators - Expressions- Python Arrays - Branching statements - Iterative Statements - Jump Statements. Functions: Function Definition - Function Call - Variable Scope and its Life time Return Statement. Function Arguments: Required Arguments, Keyword Arguments, Default Arguments and Variable Length Arguments Recursion.

UNIT II: Modules, Strings and File Handling (15 Hours)

Modules - Packages in Python - Standard Library modules – Globals (), Locals (), and Reload (). Python Strings: String operations- Immutable Strings - Built-in String Methods and Functions - String Comparison. File Handling: Introduction - File Path - Types of Files- Opening and Closing Files - Reading and Writing Files - File Positions - Renaming and Deleting Files - Directory Methods - Methods from the os Module

UNIT III: Lists, Tuples, Dictionaries and NumPy (15 Hours)

Lists: Creating a list - Access values in List-Updating values in Lists - Nested lists Basic list operations List Methods. Tuples: Creating, Accessing, Updating and Deleting Elements in a tuple-Nested tuples Difference between lists and tuples. Dictionaries: Creating, Accessing, Updating and Deleting Elements in a Dictionary-Dictionary Functions and Methods Difference between Lists and Dictionaries. The NumPy Library: The NumPy Installation – Nd array: The Heart of the Library - Basic Operations - Indexing, Slicing, and Iterating - Conditions and Boolean Arrays - Shape Manipulation - Array Manipulation - Structured Arrays - Reading and Writing Array Data on Files.

UNIT IV: Pandas (15 Hours)

Introduction to pandas Data Structures: The Data Frame- Other Functionalities on Indexes- Operations Between Data Structures- Function Application and Mapping - Sorting and Ranking- "Not a Number" Data - Hierarchical Indexing and Leveling- Reading Data in CSV or Text Files- Reading and Writing HTML Files- Reading Data from XML- JSON Data. pandas in Depth: Data Manipulation: Data Preparation- Concatenating- Data Transformation - Discretization and Binning - Permutation - String Manipulation - Data Aggregation - Group Iteration.

UNIT V: Data Visualization and scikit (15 Hours)

Visualization with matplotlib: The matplotlib Library - The matplotlib Architecture - pyplot - The Plotting Window - Adding Elements to the Chart - Bar Charts - Pie Charts - Advanced Charts - The mplot3d Toolkit - Multi-Panel Plots. Machine Learning with scikit-learn: The scikit-learn Library - Machine Learning.

Teaching Methodology	Chalk and talk, PPT, Mathematical models, Graphical representation using software, simulation
Assessment Methods	Snap Test, MCQ, Code Debugging, Project-Based Assessment

Books for Study:

1. Thareja, R. (2017). *Python Programming using problem solving approach*, (1st Ed.). Oxford University Press.
2. Fabio Nelli (2018). *Python Data Analytics with Pandas, NumPy, and Matplotlib*, (2nd Ed.). Apress, UK.

Books for Reference:

1. Bhasin, H. (2018). *Python for Beginners*, (1st Ed.). New Age International Publishers
2. Brown, M.C. (2018). *Python: The Complete Reference*. (4th Ed.). McGraw-Hill.
3. Kurama, V. (2017). *Python Programming: A Modern Approach*. Pearson Education.
4. Downey, A.B. (2016). *Think Python. How to Think Like a Computer Scientist*, (2nd Ed.). O 'Reilly Publishers.

Websites and eLearning Sources:

1. https://realpython.com/
2. https://www.tutorialspoint.com/python/index.htm
3. http://www.geeksforgeeks.org/python-programming-language/
4. https://cfm.ehu.es/ricardo/docs/python/Learning_Python.pdf
5. https://assets.openstax.org/oscms-prodcms/media/documents/Introduction_to_Python_Programming_-_WEB.pdf
6. https://bugs.python.org/file47781/Tutorial_EDIT.pdf

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, students will be able to	
CO1	Recall fundamental Python concepts such as data types, operators, expressions, and control structures.	**K1**
CO2	Describe Python modules in programs, apply string functions for text processing, and perform file operations such as reading and writing.	**K2**
CO3	Implement list operations, tuple handling and dictionary manipulation in Python.	**K3**
CO4	Analyze NumPy's Nd array operations, shape manipulation	**K4**
CO5	Justify the use of pandas for data analysis and evaluate its efficiency in handling various data formats.	**K5**
CO6	Develop interactive visualizations and implement basic machine learning models for data-driven applications.	**K6**

Relationship Matrix											
Semester	**Course Code**		**Title of the Course**							**Hours**	**Credits**
1	**25PCS1CC01**		**Core Course - 1:** Advanced Python Programming							**5**	**4**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	2	2	2	2	2	3	3	3	2	3	**2.4**
CO2	3	3	3	2	2	3	3	3	2	2	**2.6**
CO3	3	3	3	2	2	3	3	2	2	3	**2.6**
CO4	3	3	2	2	2	3	3	3	2	3	**2.6**
CO5	3	3	3	3	3	3	3	3	2	3	**2.9**
CO6	3	2	2	3	2	3	3	3	2	2	**2.5**
										Mean Overall Score	**2.6 (High)**

1	**25PCS1CC02**	**Core Course - 2:** Advanced Java Programming	**5**	**4**

Course Objectives
To equip the students with solutions for problems using object-oriented programming
To extend their ideas to Solve simple problems using constructors and inheritance concepts
To help the students apply Java event-handling model to respond to events and exception handling techniques.
To Acquire knowledge of threads, networking and JDBC programming techniques using Java
To interpret the essence of various techniques in Servlet and Java Beans concepts

UNIT I: Classes and Objects & Inheritance (15 Hours)

Introduction – Object and Classes – Encapsulation – Inheritance -Polymorphism- Control Statements - General Form of a Class - Creation of Objects - Usage of Constructors - 'this' Keyword-Constructor Overloading – Copy Constructors-Static Data Members - Static Methods- Finalize Method. Inheritance and Polymorphism: Inheriting Variables in a Class - Inheriting Methods in a Class - Inheritance and Constructors Abstract Classes-Final Classes.

UNIT II: Interfaces, Packages & Applet (15 Hours)

Interfaces-Structure of an Interface – Implementation of an Interface Inheritance. Packages -Placing the Classes in a Package - Package Hierarchy – import Statements- Access Control Modifiers. Applets: The Life Cycle of an Applet - The Applet Class Development and Execution of a Simple Applet -Syntax of Applet Tag- Methods in the Graphic Class.

UNIT III: Java Swings, Exception Handling & I/O Streams (15 Hours)

Swings: Applet class – Icons – Jlabel Control-Joption Pane Class-Jtext Field ControlJ Button Control-JCheck Box Control - Jradio Button Control Menus. Exception Handling: Default Exception Handling - Exception and Error Classes - Catch Block Searching Pattern – throw Statement - throws Clause - Custom Exceptions. I/O Streams: Text andBinaryFormatsofDataInputStreamandOutputStreamClasses-ReaderandWriterClasses-Data Output Stream and Data Input Stream Classes.

UNIT IV: Threads, Networking & JDBC (15 Hours)

Life Cycle of a Thread - Creating and Running Threads - Method in the Thread Class - Setting the Priority of a Thread–Synchronization-Inter Thread Communication. Networking: TCP Server Socket Class-TCP Socket Class- UDP Approach. Java Database Connectivity: Establishing A Connection-Creation of Data Tables - Entering Data into The Tables-Table Updating.

UNIT V: Servlet & Java Beans (15 Hours)

Servlet: Servlet and Dynamic Webpages Life Cycle of a Servlet- a Simple- Servlet Javax. Servlet Package Retrieving the Values of Parameters. Cookies: Creating a Cookie and Sending it to the Client - Retrieving the Stored Cookies. Java Beans: Procedure for running the juggler Bean – Procedure for Running our Button Bean -Connecting the juggler and our Button Beans.

Teaching Methodology	Chalk and talk, PPT, Group Discussion
Assessment Methods	Seminar, Snap Test, MCQ, Quiz

Books for Study:

1. Muthu, C. (2011). *Programming with JAVA*, (2ndEd.). Vijay Nicole Imprints Private Limited.

Books for Reference:

1. Schildt, H. (2018). *Java2: Complete Reference*, (11thEd.). Tata McGraw-Hill.
2. Balagurusamy, E. (2018). *Programming with JAVA*, (6thEd.). Tata McGraw-Hill.
3. Lass off, M. (2017). *Java Programming for Beginners*, (1stEd.). Packt Publishing.

Websites and eLearning Sources:

1. https://iaccheyyar.com/images/pdf/ematerials/computerscience/2javaprogramming1.pdf
2. https://gacbe.ac.in/pdf/ematerial/18BCS43C-U1.pdf

3. https://mrcet.com/downloads/digital_notes/IT/Java%20Programming.pdf
4. https://www.iitk.ac.in/esc101/share/downloads/javanotes5.pdf
5. https://www.cs.cmu.edu/afs/cs.cmu.edu/user/gchen/www/download/java/LearnJava.pdf
6. https://www.jbiet.edu.in/pdffls/ECM-Coursematerial/OOP-NOTES-final.pdf
7. https://www.greenstechnologys.com/Core-java-material.pdf
8. https://jju.edu.et/docs/javanotes/chapter1.pdf

Course Outcome		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, students will be able to	
CO1	Find the solutions to arrange the problems using object-oriented programming.	**K1**
CO2	Explain the Java Event-Handling model GUI Components.	**K2**
CO3	Solve simple problems using constructor and inheritance concepts using java programming Language.	**K3**
CO4	Examine networking and JDBC programming techniques in Java.	**K4**
CO5	Evaluate Exception handling and I/O Streams	**K5**
CO6	Build Servlet and java beans applications	**K6**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
1	**25PCS1CC02**			**Core Course-2:** Advanced Java Programming						**5**	**4**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Scores of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	2	2	3	2	3	3	3	2	3	3	**2.6**
CO2	2	3	2	2	3	3	3	2	2	3	**2.5**
CO3	1	2	3	2	3	3	2	3	2	2	**2.3**
CO4	2	2	3	2	2	3	3	2	3	3	**2.5**
CO5	2	2	3	3	2	2	3	2	3	3	**2.5**
CO6	2	2	3	2	3	3	3	2	3	3	**2.6**
										Mean Overall Score	**2.5 (High)**

Semester	**Course Code**	**Title of the Course**	**Hours/Week**	**Credits**

1	**25PCS1CC03**	**Core Course - 3:** Design and Analysis of Algorithms	**4**	3

Course Objectives
To enable the students to learn the Elementary Data Structures Algorithms
To understand basics of data structures such as stacks, queues, trees, and graphs
To discuss various methods like Basic Traversal and Search Techniques
To apply divide and conquer, greedy and dynamic programming algorithm in problem.
To enhance problem-solving skills by implementing and analysing different algorithmic approaches

UNIT I: Introduction (12 Hours)

Algorithm Specification – Performance Analysis: Space Complexity - Time Complexity - Asymptotic Notations. Elementary Data Structure: Stacks and Queues - Trees - Binary Trees -Priority Queues: Heap - Heap Sort- Graph - Graph Representations.

UNIT II: Traversal and Search Techniques (12 Hours)

Basic Traversal and Search Techniques: Techniques for Binary Trees - Techniques For Graphs - Divide And Conquer: - General Method – Find Maximum and Minimum - Merge Sort - Quick Sort- Selection Sort.

UNIT III: Greedy Method (12 Hours)

The Greedy Method: General Method - Knapsack Problem -Job Sequencing with Deadlines - Minimum Cost Spanning Tree - Single Source Shortest Path.

UNIT IV: Dynamic Programming (12 Hours)

Dynamic Programming - General Method - Multistage Graphs - All Pair Shortest Path - Optimal Binary Search Trees - 0/1 Knapsacks - Traveling Salesman Problem - Flow Shop Scheduling.

UNIT V: Backtracking (12 Hours)

Backtracking: General Method - 8-Queensproblem - Sum of Subsets - Graph Coloring - Hamiltonian Cycles - Branch and Bound: - The Method -0/1 Knapsack Problem - Traveling Sales Person.

Teaching Methodology	Chalk and talk, PPT, Mathematical models, Graphical representation using software, simulation
Assessment Methods	Seminar, Snap Test, MCQ

Books for Study:

1. Aho, A. V., Hopcroft, J. E. & Ullman, J. D. (2009). *Data Structures and Algorithms*. Addison - Wesley.
2. Horowitz, E. & Sahni, S. (1978). *Fundamentals of Computer Algorithms*. Universities Press.

Books for Reference:

1. Goodrich. (2003). *Data structures & Algorithms in Java*, (3rd Ed.). Wiley.
2. Skiena. (2008). *The Algorithm Design manual*, (2nd Ed.). Springer.
3. Levith, A. (2003). *Introduction to the Design and Analysis of Algorithm*. Pearson Education Asia.

Websites and eLearning Sources:

1. www.khanacademy.org
2. https://youtu.be/LZnRlOA1_2I
3. http://hyperphysics.phy-astr.gsu.edu/hbase/hmat.html#hmath
4. https://www.youtube.com/watch?v=_2jymuM7OUU&list=PLhkiT_RYTEU27vS_SlE D56gNjVJGO2qaZ ++
5. https://archive.nptel.ac.in/courses/115/106/115106086/

Course Outcome

CO No.	CO-Statements On successful completion of this course, students will be able to	Cognitive Levels (K-Level)
CO1	Understand algorithm design, analysis, and fundamental data structures.	**K1**
CO2	Apply traversal and search techniques in trees and graphs	**K2**
CO3	Solve optimization problems using the greedy method.	**K3**
CO4	Implement dynamic programming for complex problem-solving	**K4**
CO5	Develop solutions using backtracking and branch-and-bound techniques.	**K5**
CO6	Analyze and compare algorithmic strategies for efficiency.	**K6**

Relationship Matrix											
Semester	**Course Code**		**Title of the Course**							**Hours**	**Credits**
1	**25PCS1CC03**		**Core Course- 3:** Design and Analysis of Algorithms							**4**	**3**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	2	2	1	3	3	3	2	2	**2.4**
CO2	3	3	3	2	2	3	3	3	2	2	**2.5**
CO3	3	3	3	2	2	3	3	3	2	2	**2.5**
CO4	3	3	2	2	2	3	3	3	2	2	**2.5**
CO5	3	3	3	3	2	3	3	3	2	2	**2.7**
CO6	3	3	2	3	2	3	3	3	2	2	**2.6**
										Mean Overall Score	**2.53 (High)**

1	25PCS1CP01	**Core Practical – 1:** Python Programming Lab	3	2

Course Objectives
Be able to create loops and decision statements in Python.
Demonstrate forms using various Python functions, Arguments, Strings, Modules
Analyze the data using various statistical and mathematical functions for Decision Making
Interpret the data through Matplotlib for visualization to give possible solutions
Build applications using Pandas.

List of Exercises:

1.Operators.
2. Conditional Statements, Loops, Jump Statements and Arrays.
3. Functions and Modules.
4. Strings and File Handling.
5. Lists, Tuples and Dictionaries.
6. Array Function using Numpy
7. Aggregation function using Numpy.
8. Series manipulation using Pandas
9. Data Frame manipulation using Pandas.
10. Reading Data from CSV, Text Files, HTML, XML and JSON using Pandas.
11. Data Visualization using Matplotlib.
12. Advanced Charts using Pandas and Matplotlib.

Teaching Methodology	Hands-on Lab Sessions
Assessment Method	Practical Test, Note Evaluation, Viva-Voce

Course Outcome		
CO No.	**CO-Statements** On successful completion of this course, students will be able to	**Cognitive Levels (K-Level)**
CO1	Identify different conditional statements, loops, and jump statements in Python.	**K1**
CO2	Explain function definitions, scope, arguments, and module usage.	**K2**
CO3	Apply String, list, tuple, and dictionary operations in data handling.	**K3**
CO4	Analyze the impact of basic NumPy array functions and aggregation functions on large datasets.	**K4**
CO5	Evaluate the efficiency of file reading and writing operations for large datasets using Pandas	**K5**
CO6	Design and implement customized advanced visualizations using pandas and matplotlib.	**K6**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
1	**25PCS1CP01**			**Core Practical – 1:** Python Programming Lab						**3**	**2**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	2	2	2	2	2	3	3	3	2	3	**2.4**
CO2	3	3	3	2	2	3	3	2	2	2	**2.5**
CO3	3	3	3	2	2	3	3	2	2	3	**2.6**
CO4	3	3	2	2	2	3	3	3	3	3	**2.7**
CO5	3	3	3	3	3	3	3	3	2	3	**2.9**
CO6	3	2	2	3	3	3	3	3	2	3	**2.7**
										Mean Overall Score	**2.6 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits

1	25PCS1CP02	**Core Practical - 2:** Java Programming Lab	3	2

Course Objectives
To Demonstrate the basic concepts of OOPS
To Demonstrate the behavior of Exception handling and Multithreading
To Implement the GUI techniques Event handling, Applet and Swing
To Develop programming aspect I/O Streams and networking
To Apply JDBC methods for database and demonstrate Servlet and Java Beans

List of Exercises

1. Classes& Objects
2. Constructor and inheritance
3. Interfaces & Packages
4. Applets & Java Swing
5. Event Handling Mechanism
6. Exception Handling
7. I/O Streams.
8. Multithreading
9. Networking
10. JDBC
11. Servlets
12. Java Beans

Teaching Methodology	Hands-on Lab Sessions
Assessment Method	Practical Test, Note Evaluation, Viva-Voce

Course Outcome		
CO No.	**CO-Statements** On successful completion of this course, students will be able to	**Cognitive Levels (K-Level)**
CO1	Demonstrate the basic concepts of oops	**K1**
CO2	Show the behavior of exception handling and multithreading.	**K2**
CO3	Apply the JDBC methods to establish connection with Database.	**K3**
CO4	Examine the GUI techniques such as Event handling, Applet and Swing.	**K4**
CO5	Develop programming aspect with I/O streams and networking.	**K5**
CO6	Build applications using servlet and Java Beans.	**K6**

Relationship Matrix											
Semester	**Course Code**		**Title of the Course**							**Hours**	**Credits**
1	**25PCS1CP02**		**Core Practical-2:** Java Programming Lab							**3**	**2**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Scores of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	1	1	2	3	2	2	2	3	2	3	**2.1**
CO2	1	3	3	3	2	2	3	3	2	3	**2.5**
CO3	2	2	2	3	2	3	3	2	3	3	**2.5**
CO4	3	2	3	3	3	2	2	3	3	2	**2.6**
CO5	2	3	3	3	2	3	3	2	2	3	**2.6**
CO6	1	1	2	3	2	2	2	3	2	3	**2.1**
										Mean Overall Score	**2.4 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits

1	**25PCS1ES01A**	**Discipline Specific Elective - 1:** Cloud Computing	**4**	**3**

Course Objectives
To Identify the technical foundations of cloud systems architectures
To Analyze the problems and solutions to cloud application problems
To Apply principles of best practice in cloud application design and management.
To Understand different various Avenues for Cloud Computing and Virtualization.
To Define technical challenges for cloud applications and assess their importance

UNIT I: Introduction to Cloud Computing (12 Hours)

Cloud Computing at a Glance - Historical Developments - Building Cloud Computing Environments - Computing Platforms and Technologies. Virtualization: Introduction - Characteristics of Virtualized Environments - Taxonomy of Virtualization Techniques - Virtualization and Cloud Computing - Pros and Cons of Virtualization - Technology Examples.

UNIT-II: Cloud Computing Architecture (12 Hours)

Cloud Reference Model - Types of Clouds - Economics of the Cloud. Cloud Platforms in Industry: Amazon Web Services: Compute Services - Storage Services - Communication Services - Additional Services. Google App Engine: Architecture and Core Concepts - Application Life Cycle - Cost Model. Microsoft Azure: Azure core Concepts - SQL Azure.

UNIT III: Data Intensive Computing (12 Hours)

Map-Reduce Programming - Characterizing Data-Intensive Computations - Challenges ahead - Historical Perspective - Technologies for Data - Intensive Computing - Programming Platform. Cloud Applications: Scientific Applications - Healthcare - Biology - Geoscience - Business and Consumer Applications: CRM and ERP - Productivity - Social Networking - Media Applications.

UNIT IV: Advanced Topics in Cloud Computing (12 Hours)

Energy Efficiency in Clouds - Market Based Management of Cloud: Market-Oriented Cloud Computing - A Reference Model for MOCC - Technologies and Initiatives supporting MOCC. Federated Clouds / Inter Cloud: Characterization and Definition - Cloud Federation Stack - Aspects of Interest - Technologies for Cloud Federations.

UNIT V: Secure Distributed Data Storage in Cloud Computing (12 Hours)

Introduction - Cloud Storage: from LANs TO WANs - Technologies for Data Security in Cloud Computing. Data Security in the Cloud: An Introduction to the Idea of Data Security - The Current State of Data Security in the Cloud - Homo Sapiens and Digital Information - Cloud Computing and Data Security Risk Cloud Computing and Identity - The Cloud, Digital Identity, and Data Security - Content Level Security - Pros and Cons.

Teaching Methodology	PPT, e-Content Videos
Assessment Methods	Snap Test, MCQ

Books for Study:

1. Rajkumar, B., Christian, V., Selvi, S.T. (2013). Mastering Cloud Computing. (1st Reprint). McGraw Hill Education Private Limited Publications.
2. Rajkumar, B., James, B. Andrzej, G. (2011). Cloud Computing; Principles and Paradigms. John Wiley& Sons. Inc. Publications.

Books for Reference:

1. Anand, N. (2019). Hand book of Cloud Computing. First Edition. BPB Publication.
2. Surbhi, R. (2021). Cloud Computing Simplified: Explore Application of Cloud, Cloud Deployment Models, Service Models and Mobile Cloud Computing. (1st Ed.). BPB Publications

3. 3. John, R. V. (2020). Cloud Computing Security Foundations and Challenges. (Second

Edition). CRC Press.

Websites and eLearning Sources:

1. https://www.w3schools.in/cloud-computing
2. https://www.guvi.in/blog/websites-to-learn-cloud-computing/
3. https://studytm.wordpress.com/wp-content/uploads/2014/03/hand-book-of-cloud-computing.pdf
4. https://eclass.uoa.gr/modules/document/file.php/D416/CloudComputingTheoryAndPractice.pdf
5. https://www.ibm.com/cloud-computing/files/cloud-for-dummies.pdf

Course Outcome		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, students will be able to	
CO1	Understand the design challenges in the cloud. Understand the design challenges in the cloud. List the importance of protocols and standards in cloud services.	**K1**
CO2	Interpret the models of distributed and cloud computing.	**K2**
CO3	Apply the concepts of Virtualization and its types.	**K3**
CO4	Analyze authentication, confidentiality, and privacy issues in cloud computing.	**K4**
CO5	Formulate and propose the best solution for handling complex ODE problems	**K5**
CO6	Identify the architecture, infrastructure and delivery models of cloud computing	**K6**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
1	**25PCS1ES01A**			**Discipline Specific Elective - 1:** Cloud Computing						**4**	**3**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	3	2	2	3	3	3	2	2	**2.6**
CO2	3	3	3	2	2	3	3	3	2	2	**2.7**
CO3	3	3	3	2	3	3	2	3	2	2	**2.7**
CO4	3	3	3	3	3	3	2	3	2	2	**2.8**
CO5	3	3	2	2	3	3	3	3	2	2	**2.8**
CO6	3	3	3	3	2	3	3	3	2	2	**2.7**
										Mean Overall Score	**2.72 (High)**

1	**25PCS1ES01B**	**Discipline Specific Elective - 1:** Internet of Things	**4**	**3**

Course Objectives
To grasp the core concepts and technologies behind the Internet of Things (IoT) and explore practical applications.
To learn the principles for creating connected devices, focusing on communication technologies and gateway-level data management.
To gain proficiency in communication protocols and web connectivity solutions for connected devices.
To Analyze IP addressing, MAC layer, and application protocols for efficient data handling and processing.
To learn to collect, store, and process data using cloud platforms in IoT applications, leveraging cloud computing paradigms and service models.

UNIT I: Internet of Things: An Overview (12 Hours)

Internet of Things - IoT Conceptual Framework - IoT Architectural View - Technology Behind IoT - Sources of IoT - M2M Communication - Examples of IoT.

UNIT II: Design Principles for Connected Devices (12 Hours)

Introduction - IoT/M2M Systems Layers and Design Standardisation - Communication Technologies - Data Enrichment, Data Consolidation and Device Management at Gateway.

UNIT III: Design Principles for Web Connectivity (12 Hours)

Introduction - Web Communication Protocols for Connected Devices - Message Communication Protocols for Connected Devices - Web Connectivity for Connected Devices Network using Gateway, SOAP, REST, HTTP RESTful and Web Sockets.

UNIT IV: Internet Connectivity Principles (12 Hours)

Introduction - Internet Connectivity - Internet Based Communication - IP Addressing in IoT - Media Access Control - Application Layer Protocols: HTTP, HTTPS, FTP, Telnet and Others. Data Acquiring, Organising, Processing and Analytics: Data Acquiring and Storage - Organising the Data Analytics.

UNIT V: Data Collection, Storage and Computing using Cloud Platforms (12 Hours)

Cloud Computing Paradigm for Data Collection, Storage and Computing - Everything as a Service and Cloud Service Models. Sensor and Wireless Sensor Networks: Sensor Technology - Participatory Sensing, Industry IoT and Automative IoT - Actuator - Sensor Data Communication Protocols - Radio Frequency Identification Technology - Wireless Sensor Networks Technology.

Teaching Methodology	Tutorials, Demonstration & IoT Simulations
Assessment Methods	Snap Test, MCQ

Books for Study:

1. Kamal, R. (2017). *Internet of Things: Architecture and Design Principles,* (1st Ed.). McGraw Hill Education (India) Private Limited.

Books for Reference:

1. Vasudevan, S. K., Nagarajan, A. S., & Sundaran, R. M. D. (2020). *Internet of Things* (2nd Ed.). Wiley Publication.
2. Hanes, D., Salgueiro, G., Grossetete, P., Barton, R., & Henry, J. (2017). *IoT fundamentals: Networking technologies, protocols, and use cases for the Internet of Things.* Cisco Press.
3. Hassan, Q. F. (2018). *Internet of Things A to Z: Technologies and Applications*. Wiley Publication. IEEE Press

Websites and eLearning Sources:

1. https://www.shiksha.com/online-courses/industrial-internet-of-things-iiot-course-courl405
2. https://www.tinkercad.com/
3. https://www.techtarget.com/iotagenda/definition/Internet-of-Things-IoT

4. https://www.oracle.com/in/internet-of-things/what-is-iot/
5. https://www.ibm.com/topics/internet-of-things

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, students will be able to	**Cognitive Levels (K-Level)**
CO1	Recognize key IoT concepts and terminologies to establish a foundational understanding of the Internet of Things.	**K1**
CO2	Apply design principles to create connected devices, demonstrating the practical application of IoT/M2M system layers and communication technologies.	**K2**
CO3	Implement web connectivity solutions for connected devices, utilizing a range of communication protocols and demonstrating proficiency in IoT network design.	**K3**
CO4	Analyze and evaluate internet connectivity principles, including IP addressing, MAC layer, and application protocols, demonstrating critical thinking skills.	**K4**
CO5	Synthesize data acquisition, organization, and processing techniques for IoT applications, showcasing advanced problem-solving abilities.	**K5**
CO6	Evaluate the integration of cloud computing paradigms for efficient data management in IoT applications, demonstrating a comprehensive understanding and the ability to make informed decisions.	**K6**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**					**Hours**		**Credits**
1	**25PCS1ES01 B**			**Discipline Specific Elective - 1:** Internet of Things					**4**		**3**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Scores of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	2	3	3	2	1	3	2	3	2	2	**2.3**
CO2	3	3	3	3	2	3	3	3	2	2	**2.7**
CO3	2	3	2	2	1	3	3	2	2	1	**2.1**
CO4	3	3	3	2	2	3	3	3	3	2	**2.7**
CO5	3	3	3	3	2	3	3	3	3	2	**2.8**
CO6	3	3	2	2	2	2	3	3	2	3	**2.5**
Mean Overall Score											**2.5 (High)**

1	**25PCS1AE01**	**Ability Enhancement Course:** Data Analytics Using Excel	**2**	**1**

Course Objectives
To understand the basic components of Excel, including worksheets, workbooks, tabs, and ribbons
To gain proficiency in worksheet basics, including data entry, formatting, and organization
To apply formulas and functions effectively to perform calculations and analyse data in Excel
To explore data visualization techniques in Excel
To learn how to create pivot tables, add slicers and timelines, and manipulate calculated fields and items

UNIT I: Getting Started with Excel (6 Hours)

Worksheets and Workbooks- Navigation with Keyword- Tabs and Ribbons - File Menu - Quick Access Toolbar -Excel options - Create a new workbook- Understanding Worksheet Basics.

UNIT-II: Protecting, Importing and exporting Data from Excel (6 Hours)

Protect Workbook - Protect sheet and Allow Edit Ranges- Importing data into Excel: Importing from Text - Importing from Web - Importing from Database- Exporting Data from Excel: Export to file- Export to SharePoint List.

UNIT III: Perform Operations with Formulas and Functions (6 Hours)

Understanding formulas - operators in formula - Defined Names - Calculations - functions in formula - Logical functions - Summarizing functions - Text functions - Lookup functions - Date and Time functions - Math functions - Statistical functions.

UNIT IV: Data Visualization with New Chart Types (6 Hours)

Chart types and when to use them - Waterfall Chart- Histogram - Box and Whisker Chart- Tree map Chart - Gantt Chart - Milestone Chart -Macros in Excel: VBA Quick View - Enabling Developer Tab - Create Macro -Record Macro.

UNIT V: Putting Data into Pivots (6 Hours)

Understanding the terminologies - Verify the source - Format Data for Sync - Recommended Pivot Tables - Setting Pivot table default layout - Adding Slicers & Timelines - Adding / Deleting calculated fields from Pivot - Adding / Deleting calculated items from Pivot -Consolidate data from different sources in Pivot.

Teaching Methodology	PPT, Mathematical models, discussions, and problem-solving.
Assessment Methods	Seminar, assignments, MCQ, Test, Chart Creation, Projects

Books for Study:

1. Nigam, M. (2019). *Advanced analytics with Excel,* (2nd Ed.). BPB Publications.
2. Wayne, L. W. (2019). *Microsoft Excel 2019: Data Analysis & Business Model,* (1st Ed.). PHI Learning Pvt. Ltd.

Books for Reference:

1. Zhou, H. (2020). *Learn Data Mining through Excel: A step-by-step approach for understanding Machine Learning Method,* (1st Ed.). Apress.
2. Lalwani, L. (2019). *Excel 2019 all-in-one,* (1st Ed). BPB Publications.
3. Berk, K, N., & Carey, P. (2010). *Data Analysis with Microsoft Excel*. Richard Stratton.

Websites and eLearning Sources:

1. https://www.tutorialspoint.com/excel_data_analysis/excel_data_analysis_tutorial.pdf
2. https://www.depts.ttu.edu/itts/apps/handouts/Excel-DataAnalysis.pdf
3. https://gurucharancollege.ac.in/notice/MSME%20IN%20EXCEL.pdf
4. https://4-h-extension.media.uconn.edu/wp-content/uploads/sites/3389/2021/12/AnalyzingDataUsingExcel.pdf
5. https://repositorio.uci.cu/jspui/bitstream/123456789/9428/1/Data%20Analysis%20with%20Microsoft%20Excel%20%28%20PDFDrive%20%29.pdf

Course Outcomes

CO No.	CO-Statements On successful completion of this course, students will be able to	Cognitive Levels (K-Level)
CO1	Understand the structure of worksheets and workbooks.	**K1**
CO2	Learn secure Excel files and manage data import/export processes for efficient data handling.	**K2**
CO3	Use the formulas and functions to perform calculations and data analysis.	**K3**
CO4	Visualize data effectively using advanced chart types and automate tasks using macros.	**K4**
CO5	Analyze and summarize large data sets using PivotTables and Pivot Charts.	**K5**
CO6	Equipped with the skills to use Excel effectively in professional and academic growth.	**K6**

Relationship Matrix											
Semester	**Course Code**		**Title of the Course**						**Hours**		**Credits**
1	**25PCS1AE01**		**Ability Enhancement Course:** Data Analytics Using Excel						**2**		**1**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	2	2	2	3	2	2	2	3	**2.4**
CO2	3	3	3	3	2	2	3	3	2	3	**2.7**
CO3	2	2	3	2	2	3	3	3	2	3	**2.5**
CO4	3	3	2	2	2	2	2	3	2	2	**2.3**
CO5	2	2	3	3	2	2	3	3	2	2	**2.4**
CO6	3	2	2	3	2	3	2	2	2	3	**2.4**
										Mean Overall Score	**2.45 (High)**

1	**25PCS1OE01**	**Open Elective (WS):** Big Data Analytics	4	2

Course Objectives
To introduce the fundamental concepts of Big Data, its characteristics, challenges.
To familiarize students with the Big Data technology landscape.
To develop hands-on skills in MapReduce programming for distributed data processing
To Provide an in-depth understanding of Cassandra and MongoDB.
To equip students with practical knowledge of Pig and Hive for data analysis and querying in Hadoop environments.

UNIT I: Introduction to Big Data and Analytics (12 Hours)

Classification of Digital Data - Characteristics of Data - Definition of Big Data - Challenges with Big Data - Definitional Traits of Big Data - Traditional Business Intelligence (BI) versus Big Data - Environment Big Data Analytics: Classification of Analytics – Challenges - Big Data Analytics important - Data Science - Data Scientist - Terminologies used in Big Data Environments - Basically Available Soft State Eventual Consistency - Top Analytics Tools.

UNIT II: The Big Data Technology Landscape (12 Hours)

The Big Data Technology Landscape: NoSQL (Not Only SQL) - Types of NoSQL databases - SQL versus NoSQL - Introduction to Hadoop - RDBMS versus Hadoop - Distributed Computing Challenges - Hadoop Overview - Hadoop Distributors - HDFS (Hadoop Distributed File System) - Working with HDFS commands - Interacting with Hadoop Ecosystem.

UNIT III: MapReduce Programming (12 Hours)

MapReduce Programming: Processing Data with Hadoop - Mapper - Reducer - Combiner - Partitioner - Searching - Sorting - Compression -Managing Resources and Applications with Hadoop YARN.

UNIT IV: Cassandra and MongoDB (12Hours)

Cassandra: Features of Cassandra - CQL Data Types - Key spaces - CRUD Operations -Collection Types - Table Operations. MongoDB: Features of MongoDB - RDBMS vs MongoDB - Data Types in MongoDB - MongoDB Query Language - CRUD operations -Count - Limit - Sort - and Skip.

UNIT V: PIG (12 Hours)

PIG: The Anatomy of Pig - Pig Philosophy - Pig Latin Overview - Data Types in Pig - Running Pig - Execution Modes of Pig - Relational Operators - Eval Functions - Word Count Using Pig. HIVE: Introduction to Hive - Hive Architecture - Hive Data Types - Hive File Format - Hive Query Language (HQL): DDL - DML - Partitions - Pig versus Hive.

Teaching Methodology	PPT, Data Gathering and Analysis, Data Visualization, Discussions
Assessment Methods	Seminar, Quizzes and Exams, Assignment, Case Study Analysis

Books for Study:

1. Acharya, S., & Subhashini, C. (2019). *Big Data and Analytics*. (2nd Ed.). Wiley India Private Limited, New Delhi.
2. Raj, K., & Preeti, S. (2019). *Big Data Analytics, Introduction to Hadoop, Spark, and Machine Learning.* McGraw Hill Publication.

Books for Reference:

1. Tom, W. (2015). *Hadoop — The Definitive Guide*, (4th Ed). O'Reilly Publications, India.
2. Judith, H., Alan, N., Fern, H., & Marcia, K. (2013) *Big Data for Dummies*, John Wiley & Sons, Inc.
3. Dirk, D., Paul, C. Z., Roman, B. M., Bruce, B., & Rafael, C. (2014). *Hadoop For Dummies*, Wiley Publications.
4. Robert, D. S. (2012). *Hadoop For Dummies*. John Wiley & Sons, Inc. (2012)
5. Paul, Z. (2012). *Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data*, McGraw Hill.

Websites and eLearning Sources:

1. https://mrcet.com/downloads/digital_notes/CSE/IV%20Year/(R17A0528%20)%20Big%20Data%20Analytics%20Digital%20notes.pdf
2. https://www.pvpsiddhartha.ac.in/dep_it/lecture%20notes/FBDA1/FBDA%20UNIT-3.pdf
3. https://pdfcoffee.com/qdownload/big-data-analytics-by-seema-acharya-pdf-9-pdf-free.html
4. https://aitskadapa.ac.in/e-books/AI&DS/BIG%20DATA/Data%20Science%20_%20Big%20Data%20Analytics%20(%20PDFDrive%20).pdf
5. https://bmsce.ac.in/Content/CS/Unit-5.pdf

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, students will be able to	**Cognitive Levels (K-Level)**
CO1	Identify the fundamental concepts of big data analytics.	**K1**
CO2	Understand Hadoop environment and apply HDFS commands on file management tasks	**K2**
CO3	Utilize optimization techniques of MapReduce Programming to process massive amounts of data in parallel.	**K3**
CO4	Make use of NoSQL databases like Mango DB and Cassandra to store log data to be pulled for analysis.	**K4**
CO5	Construct a appropriate modern tools like Pig and Hive for complex data flow and analysis	**K5**
CO6	Evaluate Hadoop Cluster to deploy Map Reduce jobs, PIG, HIVE and Cassendra	**K6**

Relationship Matrix											
Semester	**Course Code**		**Title of the Course**							**Hours**	**Credits**
1	**25PCS1OE01**		**Open Elective (WS):** Big Data Analytics							**4**	**2**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	2	2	2	2	2	3	3	3	3	**2.4**
CO2	3	3	2	2	2	3	3	2	2	3	**2.5**
CO3	2	2	3	2	2	3	2	3	3	2	**2.4**
CO4	2	3	2	3	2	3	3	3	2	3	**2.6**
CO5	2	2	3	2	2	2	2	3	3	3	**2.4**
CO6	3	3	2	2	2	2	3	3	2	2	**2.4**
										Mean Overall Score	**2.46 (High)**

Semester	Course Code	Title of the Course	Hours/ Weeks	Credits
1	25PGC1SL01	**Self-Learning Course:** Global Citizenship Education	Online	1

Course Objectives
To develop an understanding of global governance structures, rights and responsibilities.
To recognize and respect differences, multiple identities and diversity.
To examine beliefs and perceptions about social justice, equality and civic engagement.
To develop attitudes of care and empathy for others and the environment.
To develop global competence and ethical considerations by enhancing communication and collaboration skills across cultures

UNIT I: Introduction to Global Citizenship

01. Historical and Philosophical Foundations of Global Citizenship
02 Rights and Responsibilities of Global Citizenship
03. Key Organizations and Movements Promoting Global Citizenship

UNIT II: Globalization and Its Impact on Society

04. Globalization and Its Key Drivers
05. Positive and Negative Impacts of Globalization
06. Role of Education in Fostering a Global Perspective

UNIT III: Human Rights, Social Justice, Equality and Diversity

07. Key Human Rights Treaties, Frameworks and Declarations
08. Advocacy, Activism, and Movements for Social Justice and Equality
09. Global Challenges to Human Rights, Equality and Diversity

UNIT IV: Sustainable Development and Environmental Responsibility

10. The Sustainable Development Goals and Their Relevance to Global Citizenship
11. Climate Change, Environmental Degradation and Sustainable Development
12. Strategies for Promoting Environmental Responsibility

UNIT V: Building Global Competence and Engagement

13. Effective Communication and Collaboration Across Cultures
14. Volunteering and Community Engagement in Global Initiatives
15. Ethical Considerations in Global Citizenship

Teaching Methodology	Recorded Lectures/Videos, Reading Materials, PPTs, Case Studies, Collaborative Projects, Quizzes and Polls
Assessment Methods	Seminars, Assignments, MCQs, Reflection Essays, Group Project Presentations, Problem-Solving Scenarios

Books for Study:

1. Clapham, A. (2007). *Human rights: A very short introduction.* Oxford University Press.
2. Desai, A. (2018). *Global citizenship and cultural diplomacy: India's role in a changing world*. Routledge India.
3. Gould, J. A. (2012). *The ethics of global citizenship*. Routledge.
4. Held, D., et al. (2022). *Globalization and its impact on the developing world*. Cambridge University Press.
5. Sen, A. (2009). *The idea of justice*. Penguin Books India.

Books for Reference:

1. Ghosh, A. (2007). *The global impact of Indian civilization*. HarperCollins India.
2. Krecker, E. (2008). *The global citizen: A guide to creating an international life and career*. Career Press.
3. Kumar, R. (2017). *Sustainable development and environmental justice in India*. Oxford University Press.

4. Nair, K. G. (2014). *Human rights: A socio-political perspective*. Orient Blackswan.
5. Patel, V. (2015). *Social justice and equality in India: Theories and practices*. Oxford University Press.
6. Pillai, V. (2016). *Globalization and its impact on Indian society*. SAGE Publications India.

Websites and eLearning Sources:

1. https://www.unesco.org/en/global-citizenship-peace-education/need-know
2. TEDxCincinnati: Global Citizenship in the Classroom: Jenny Buccos at TEDxCincinnati https://www.youtube.com/watch?v=6jjLHmyBs7o
3. Social justice -- is it still relevant in the 21st century? | Charles L. Robbins | TEDxSBU https://www.youtube.com/watch?v=Wtroop739uU
4. Are We the Last Generation — or the First Sustainable One? | Hannah Ritchie | TED https://www.youtube.com/watch?v=Kl3VVrggKz4
5. Diversity, Equity & Inclusion. Learning how to get it right | Asif Sadiq | TEDxCroydon https://www.youtube.com/watch?v=HR4wz1b54hw

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, students will be able to	**Cognitive Levels (K-Level)**
CO1	Recall the historical, philosophical and practical foundations of global citizenship.	**K1**
CO2	Explain the key drivers of globalization and the role of education in fostering a global perspective.	**K2**
CO3	Apply human rights frameworks, social justice principles, and advocacy strategies to real-world challenges.	**K3**
CO4	Analyze the relevance of the Sustainable Development Goals in addressing climate change and environmental degradation.	**K4**
CO5	Develop strategies for fostering global competence by enhancing communication and collaboration skills across cultures.	**K5**
CO6	Critically evaluate the effectiveness of current global strategies and policies in addressing social justice and environmental sustainability.	**K6**

Semester	Course Code	Title of the Course	Hours/ Weeks	Credits
2	25PCS2CC04	**Core Courses - 4:** PHP with MySQL	6	4

Course Objectives
To understand the structure of PHP code
To learn about PHP functions and types arrays
To demonstrate the use of forms in PHP
To learn to connect to the database using PHP MyAdmin
To manipulate the data in the database using queries

UNIT I: Introduction to PHP (18 Hours)

Incorporating PHP Within HTML – The Structure of PHP. Expressions and Control Flow in PHP: Expressions – Operators – Conditionals – Looping - Implicit and Explicit Casting - PHP Dynamic Linking - Dynamic Linking in Action.

UNIT-II: Functions and Objects (18 Hours)

PHP Functions -Including and Requiring Files. PHP Objects. PHP Arrays: Basic Access - Numerically Indexed Arrays - Associative Arrays - Assignment Using the array Keyword -The foreach...as Loop - Multidimensional Arrays - Using Array Functions. Practical PHP: Using printf - Date and Time Functions - File Handling.

UNIT III: Form Handling (18 Hours)

Building Forms - Retrieving Submitted Data - An Example Program - HTML5 Enhancements. Cookies, Sessions, and Authentication: Using Cookies in PHP - HTTP Authentication - Using Sessions.

UNIT IV: Introduction to MySQL (18 Hours)

MySQL Basics - Summary of Database Terms - Accessing MySQL via the Command Line – Indexes - MySQL Functions - Accessing MySQL via phpMyAdmin.

UNIT V: Mastering MySQL (18 Hours)

Transaction - Backing Up and Restoring. Accessing MySQL Using PHP: Querying a MySQL Database with PHP - A Practical Example - Practical MySQL - Preventing Hacking Attempts - Using mysqli Procedurally.

Teaching Methodology	Chalk and talk, PPT
Assessment Methods	Test, MCQ, Assignment, Seminar

Books for Study:

1. Robin Nixon (2018). *Learning PHP, MySQL & JavaScript,* (5th Ed.). O'Reilly.

Books for Reference:

1. Gibbs, P. (2020). *PHP Tutorials: Programming with PHP and MySQL: Learn PHP 7 / 8 with MySQL*. (5th Ed.).
2. Prettyman, S. (2020). *Learn PHP 8: Using MySQL, JavaScript, CSS3, and HTML5. A Press.*
3. *Luke Welling Laura Thomson*. (2017). PHP and MySQL® Web Development. (5th Ed.). Pearson Education, Inc.
4. Leon Atkinson. (2000). *Core PHP Programming Using PHP to Build Dynamic Web Sites*, (2nd Ed.,). Publisher: Prentice Hall PTR.

Websites and eLearning Sources:

1. https://www.oreilly.com/library/view/learning-php-mysql/9781491979075/
2. https://freecomputerbooks.com/The-PHP-Programming-Language.html
3. https://assets.ctfassets.net/nkydfjx48olf/5qFMF3mvitLMahX67i7iOb/028229996c13cbc27a0538f055a41b46/php_cookbook.pdf
4. https://hoclaptrinhdanang.com/downloads/pdf/php/Core%20PHP%20Programming%20-%20Using%20PHP%20to%20Build%20Dynamic%20Web%20Sites.pdf
5. https://ptgmedia.pearsoncmg.com/images/9780321833891/samplepages/9780321833891.pdf

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, students will be able to	**Cognitive Levels (K-Level)**
CO1	Recall the conditional statements and looping in PHP	**K1**
CO2	Show the PHP functions and arrays	**K2**
CO3	Model forms using various web controls	**K3**
CO4	Analyze the importance of cookies and sessions	**K4**
CO5	Interpret the basic queries using MySQL	**K5**
CO6	Construct database and querying using MySQL	**K6**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
2	**25PCS2CC04**			**Core Courses - 4:** PHP with MySQL						**6**	**4**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	2	3	2	2	2	3	3	3	2	2	2.4
CO2	3	3	2	2	2	3	3	3	2	2	2.5
CO3	3	2	2	3	2	2	2	3	3	3	2.4
CO4	3	2	2	2	3	3	3	2	3	3	2.5
CO5	3	3	3	2	2	2	2	2	2	3	2.3
CO6	3	2	3	2	3	3	3	2	2	3	2.6
									Mean Overall Score		**2.45 (High)**

Semester	Course Code	Title of the Course	Hours/ Weeks	Credits
2	25PCS2CC05	**Core Course – 5:** Machine Learning	5	4

Course Objectives
To understand data analytics and machine learning fundamentals using Python libraries such as NumPy and Pandas for data manipulation and visualization.
To explore various classification algorithms along with data preprocessing techniques.
To apply dimensionality reduction methods and evaluate machine learning models using cross-validation.
To develop ensemble learning techniques and regression models for predicting continuous target variables and improving model performance.
To implement clustering techniques and deploy machine learning models into web applications.

UNIT I: Machine Learning and Data Analytics (15 Hours)

Introduction to Machine Learning - Building ML Systems - Perceptron Learning Algorithm - Adaptive Linear Neurons. Data Analytics with Pandas and NumPy: NumPy Basics - Matrices and Arrays - Pandas for Data Manipulation - Creating Graphs.

UNIT II: Data Preprocessing and Classification Algorithms (15 Hours)

Preprocessing: Missing data - Categorical data - Partitioning a dataset into separate training and test datasets - Bringing features onto the same scale - Selecting meaningful features. Machine Learning Classifiers using Scikit-Learn: Choosing a classification algorithm - Training a perceptron - Modeling class probabilities via logistic regression - Classification with support vector machines (SVM)- Decision tree learning - K-nearest neighbours

UNIT III: Dimensionality Reduction and Model Evaluation (15 Hours)

Compressing Data via Dimensionality Reduction: Supervised data compression via linear discriminant analysis - Unsupervised dimensionality reduction via principal component analysis- Best Practices for Model Evaluation and Hyperparameter Tuning- Model Performance Evaluation using k-fold cross-validation to assess model performance- Fine-tuning ML models via grid search.

UNIT IV: Ensembles and Regression Analysis (15 Hours)

Combining Different Models for Ensemble Learning: Learning with ensembles - Combining classifiers via majority vote. Bagging and Boosting techniques for Ensemble Learning. Predicting Continuous Target Variables with Regression Analysis: Linear regression - Turning a linear regression model into a curve - polynomial regression.

UNIT V: Clustering and Embedding ML Models (15 Hours)

Working with Unlabeled Data: Grouping objects by similarity using k-means – Identifying high-density regions using DBSCAN. Deploying ML Models in Web Applications: Serializing fitted scikit-learn models - Setting up an SQLite database for data storage - Developing a web application with Flask- Deploying a trained classifier as a web service.

Teaching Methodology	Chart, PPT, chalk and talk
Assessment Methods	Quizzes, Seminar and Exams

Books for Study:

1. Corey Wade et. al., Vahid Mirjalili. (2022). *The Python Workshop*. (2nd ed.). Packs publishing.
2. Raschka, S., & Mirjalili, V. (2019). *Python Machine Learning*. (3rd ed.). Packt publishing.

Books for Reference:

1.Mueller, A.C., & Guido, S. (2016). *Introduction to Machine Learning with Python*. O'Reilly Media.
2. Alpaydin, E. (2010). *Introduction to Machine Learning*. (2nd ed.). MIT Press.
3. McKinney, W. (2018). *Python for Data Analysis*. (2nd ed.). O'Reilly Media.

Websites and eLearning Source:

1. https://data-flair.training/blogs/machine-learning-tutorial/

2. https://www.nrigroupindia.com/ebook/Introduction%20to%20Machine%20Learning%20with%20Python%20(%20PDFDrive.com%20)-min.pdf
3. http://radio.eng.niigata-u.ac.jp/wp/wp-content/uploads/2020/06/python-machine-learning-2nd.pdf
4. https://python-course.eu/books/bernd_klein_python_and_machine_learning_a4.pdf
5. https://www.youtube.com/watch?v=i_LwzRVP7bg

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, the students will be able to	
CO1	Recall the basics of data analytics using NumPy, Pandas, and visualization techniques	**K1**
CO2	Apply machine learning algorithms and preprocessing techniques for classification.	**K2**
CO3	Analyze model performance using dimensionality reduction and hyperparameter tuning	**K3**
CO4	Evaluate predictive accuracy using ensemble learning methods.	**K4**
CO5	Implement clustering techniques like K-Means and DBSCAN	**K5**
CO6	Develop and deploy ML models using Flask and SQLite	**K6**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**					**Hours**		**Credits**
2	**25PCS2CC05**			**Core Course - 5:** Machine Learning					**5**		**4**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	2	3	2	2	3	2	2	3	2	**2.4**
CO2	2	3	2	3	2	3	2	3	2	1	**2.3**
CO3	2	2	3	2	1	3	3	2	3	1	**2.2**
CO4	3	3	2	3	2	3	3	2	3	2	**2.6**
CO5	2	2	3	2	1	3	2	3	2	1	**2.1**
CO6	3	3	2	3	2	3	3	2	3	2	**2.6**
									Mean Overall Score		**2.44 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
2	25PCS2CC06	**Core Course - 6:** Advanced Software Engineering (Internship Embedded Course)	5	4

Course Objectives
To understanding what the users need from the software
To system Design Deciding how the software will be structured and how the components will interact.
To ensuring the software works correctly and meets all requirements.
To concepts in Software Project Management, Software Design, and Quality Management
To ongoing support and updates to fix bugs, improve performance, or adapt to new needs.

UNIT I: Introduction (15 Hours)

The Problem Domain -Software Engineering Challenges - Software Engineering Approach Software Processes: Software Process -Characteristics of a Software Process Software Development Process Models -Other software processes.

UNIT II: Software Requirements (15 Hours)

Software Requirements Analysis and Specification - Requirement engineering -Type of Requirements - Feasibility Studies -Requirements Elicitation -Requirement Analysis Requirement Documentation - Requirement Validation -Requirement Management -SRS Formal System Specification -Axiomatic Specification -Algebraic Specification.

UNIT III: Project Management (15 Hours)

Software Project Management- Responsibilities of a software project manager -Project planning - Metrics for Project size estimation -Project Estimation Techniques -Empirical Estimation Techniques - COCOMO-Scheduling-Organization and Team Structures Staffing -Risk management -Software Configuration Management -Miscellaneous Plan.

UNIT IV: Software Design (15 Hours)

Software Design- Outcome of a Design process -Characteristics of a good software design -Cohesion and coupling - Strategy of Design -Function Oriented Design -Object Oriented Design - Detailed Design.

UNIT V: Quality Management (15 Hours)

Software Testing - A Strategic approach to software testing -Terminologies -Functional Testing-Structural testing -Levels of testing -Validation testing - Regression testing -Art of Debugging -Testing tools - Metrics - Reliability Estimation. Software Maintenance Process.

Teaching Methodology	Videos, PPT, Demonstration and creation of models
Assessment Methods	Class Test, MCQ Test, Seminar

Books for Study:

1. Jalote, P. (2005). *An Integrated Approach to Software Engineering*, (3rd Ed.). Narosa Publishing House Pvt Ltd.
2. Mall, R. (2009). *Fundamentals of Software Engineering*, (3rd Ed.). PHI Publication.

Books for Reference:

1. Aggarwal, K. K., & Singh, Y. (2008). *Software Engineering*, (3rd Ed.). New Age International Publishers.
2. Pressman, R. S. (2004). *Software engineering: A practitioner's approach*, (6th Ed.). McGraw Hill.
3. Ghezzi, C., Jarayeri, M., & Manodrioli, D. (2007). *Fundamentals of Software Engineering*, (7th Ed.). PHI Publication.
4. Mall, R. (2009). *Fundamentals of Software Engineering*. (6th Ed.). PHI Learning Private Ltd., New Delhi, 404-411.

Websites and eLearning Sources:

1. https://www.geeksforgeeks.org/software-engineering-introduction-to-software- engineering/
2. https://www.tpointtech.com/software-engineering
3. https://www.unr.edu/cse/undergraduates/prospective-students/what-is-software-engineering
4. https://www.vssut.ac.in/lecture_notes/lecture1428551142.pdf
5. https://mrcet.com/downloads/digital_notes/CSE/III%20Year/Software%20Engineering.pdf

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, the students will be able to	
CO1	Gain a comprehensive understanding of the software engineering process.	**K1**
CO2	Develop proficiency in software project management, design principles, and quality management.	**K2**
CO3	Analyze software requirements and specifications to establish clear project goals.	**K3**
CO4	Evaluate strategies in software testing, maintenance, and reengineering.	**K4**
CO5	Design and implement quality assurance measures across different levels of software projects.	**K5**
CO6	Differentiate between various software testing strategies.	**K6**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
2	**25PCS2CC06**			**Core Course - 6:** Advanced Software Engineering (Internship Embedded Course)						**5**	**4**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	2	3	2	2	3	2	3	3	3	**2.5**
CO2	3	2	3	2	1	3	3	2	3	2	**2.4**
CO3	3	2	1	3	3	2	3	3	2	3	**2.5**
CO4	2	3	3	2	3	2	2	2	2	3	**2.4**
CO5	3	2	3	1	3	3	3	3	3	2	**2.5**
CO6	2	3	3	2	3	2	2	2	2	3	**2.4**
Mean Overall Score											**2.45 (High)**

Semester	Course Code	Title of the Course	Hours/ Weeks	Credits
2	25PCS2CP03	**Core Practicals - 3:** PHP with MySQL Lab	3	2

Course Objectives
To learn the fundamentals of programming using PHP
To demonstrate use of functions in PHP
To classify the types of arrays in PHP
To design forms using web controls
To connect to database using MySQL

List of Exercises

1. Expressions
2. Operators
3. Conditional statements and looping
4. PHP Functions and Objects
5. Arrays in PHP
6. File handling in PHP
7. Create forms using web controls
8. Retrieving submitting data
9. Cookies
10. Session
11. MySQL Basics and Transactions
12. Querying MySQL database

Teaching Methodology	Hands on Lab Session
Assessment Methods	Lab Test, Note Evaluation, Viva-voice

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, students will be able to	
CO1	Show the use of expressions and operators in PHP programming	**K1**
CO2	Demonstrate purpose of functions and arrays	**K2**
CO3	Make use of files to save the data	**K3**
CO4	Inspect the role of cookies and sessions	**K4**
CO5	Assess the importance of forms in designing web pages	**K5**
CO6	Create a database using MySQL	**K6**

Relationship Matrix											
Semester	**Course Code**		**Title of the Course**							**Hours**	**Credits**
2	**25PCS2CP03**		**Core Practicals - 3:** PHP with MySQL Lab							**3**	**2**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	2	3	2	2	2	3	3	3	2	2	2.4
CO2	3	3	3	3	2	3	2	2	3	2	2.6
CO3	2	3	2	2	3	2	3	2	3	3	2.5
CO4	2	3	2	2	2	3	3	3	2	3	2.5
CO5	2	3	3	3	2	2	3	3	2	3	2.6
CO6	3	3	2	3	2	3	3	3	3	2	2.7
										Mean Overall Score	**2.55 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
2	25PCS2CP04	**Core Practical - 4:** Machine Learning Lab	3	2

Course Objectives
To acquire skills in data manipulation and analysis using NumPy and Pandas
To gain proficiency in data visualization through graph creation and interpretation
To explore dimensionality reduction techniques, encompassing both supervised and unsupervised methods
To develop the ability to construct and apply classification models
To utilize unsupervised learning for data clustering, employing methods such as k-means and DBSCAN

LIST OF EXERCISES

1. Programs using NumPy and Pandas
2. Visualizing datasets using graphs
3. Training a perceptron classifier
4. Classification with Support Vector Machines (SVM)
5. Evaluate Model Performance using k-Fold Cross-Validation
6. Apply Principal Component Analysis (PCA) on a Dataset
7. Implement Ensemble Learning
8. Implementing polynomial regression for nonlinear data
9. Perform K-Means clustering on a dataset
10. Deploy a trained machine learning model using Flask

Teaching Methodology	Hands on Lab Session
Assessment Method	Lab Test, Note Evaluation, Viva-voice

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, the students will be able to	**Cognitive Levels (K-Level)**
CO1	Implement data manipulation and analysis techniques using NumPy and Pandas for efficient data processing.	**K1**
CO2	Visualize data effectively using graphs and plots to interpret patterns and relationships.	**K2**
CO3	Apply supervised and unsupervised dimensionality reduction techniques, including Linear Discriminant Analysis (LDA) and Principal Component Analysis (PCA), for feature selection and data compression.	**K3**
CO4	Develop classification models using algorithms such as Support vector Machines (SVM), Logistic Regression, and Decision Trees for predictive analytics.	**K4**
CO5	Analyze and organize data clusters using k-means and hierarchical clustering methods to group similar objects and uncover hidden patterns.	**K5**
CO6	Deploy machine learning models as web applications using Flask.	**K6**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
2	**25PCS2CP04**			**Core Practical - 4:** Machine Learning Lab						**3**	**2**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	2	3	2	2	3	2	2	3	3	**2.7**
CO2	2	3	2	3	2	3	2	3	2	3	**2.4**
CO3	2	2	3	2	1	3	3	2	3	3	**2.4**
CO4	3	3	2	3	2	3	3	2	3	3	**2.6**
CO5	2	2	3	2	1	3	2	3	2	3	**2.6**
CO6	2	3	2	3	2	3	2	3	2	3	**2.4**
										Mean Overall Score	**2.62 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
2	25PCS2OE02	**Open Elective - 2 (BS):** Recent Trends in Computing	4	2

Course Objectives
To introduce students to emerging technologies and advancements in Computer Science.
To explore modern computing paradigms such as AI, Blockchain, Quantum and Edge Computing.
To provide insights into cybersecurity challenges and solutions in digital infrastructure.
To develop knowledge of recent research trends and their real-world applications.
To analyze & explore the impact of AR and VR on education and healthcare in future trends.

UNIT I: Cloud Computing and IoT (12 Hours)

Overview of cloud computing: Public – Private - Hybrid and Multi-Cloud architectures - Serverless Computing and Function-as-a-Service (FaaS) - Edge Computing: Concepts – advantages and applications - Internet of Things (IoT): Sensors - IoT architecture and security concerns - Applications: Smart cities - Industrial IoT and Connected Healthcare.

UNIT II: Cybersecurity (12 Hours)

Cybersecurity threats and defense mechanisms: Zero Trust Security - AI in cybersecurity - Cryptography: Quantum Cryptography - Homomorphic Encryption - Blockchain Technology: Architecture - consensus mechanisms and smart contracts - Decentralized Finance (DeFi) and Non-Fungible Tokens (NFTs) - Applications: Cybersecurity solutions - blockchain in supply chains - healthcare and finance.

UNIT III: AI and ML (12 Hours)

Evolution of AI and ML: Supervised - Unsupervised and Reinforcement Learning - Deep Learning: Neural networks – CNNs - RNNs and Transformers - Explainable AI (XAI) and ethical concerns in AI Applications: Natural Language Processing (NLP) - Computer Vision, Generative AI - AI-driven automation and its impact on various industries.

UNIT IV: Quantum Computing (12 Hours)

Basics of Quantum Computing: Qubits – Superposition - Entanglement - Quantum algorithms: Shor's Algorithm - Grover's Algorithm - Quantum Machine Learning and its impact on AI - High-Performance Computing (HPC): Parallel computing - GPU and TPU acceleration - Applications: Quantum cryptography - quantum AI - weather prediction and drug discovery.

UNIT V: AR and VR (12 Hours)

Augmented Reality (AR) and Virtual Reality (VR) in education - gaming and healthcare - Metaverse: Digital twins - Web 3.0 and immersive environments - Bioinformatics and Computational Biology in modern healthcare - 5G and Beyond: Evolution of network technologies and their impact - Ethical considerations and future challenges in computing.

Teaching Methodology	Videos, PPT, chalk and talk
Assessment Methods	Quiz, Test, Seminar and Assignment

Books for Study:

1. Rajkumar Buyya et al., (2011). *Cloud Computing: Principles and Paradigms*, Wiley., 1st Edition.
2. William Stallings, (2020). *Cryptography and Network Security*, Pearson, 8th Edition.
3. Stuart Russell & Peter Norvig, (2020), *Artificial Intelligence: A Modern Approach*, Pearson, 4th Edition.
4. Michael Nielsen & Isaac Chuang. (2010), *Quantum Computation and Quantum Information*, Cambridge University Press, 10th Edition.
5. Bernard Marr, (2020). *Tech Trends in Practice: The 25 Technologies That Are Driving the 4th Industrial Revolution*, Wiley, 1st Edition.

Books for Reference:

1. Ian Goodfellow, Yoshua Bengio, & Aaron Courville (2007). *Deep Learning*, MIT Press.

2. Gautam Shroff (2010). *The Intelligent Web: Search, Smart Algorithms, and Big Data*, Oxford University Press.
3. Andreas Antonopoulos (2019). *Mastering Blockchain*, O'Reilly Media.
4. David S. Touretzky (2020). *Introduction to High-Performance Computing for Scientists and Engineers*, CRC Press.
5. Jeremy Kepner & John Gilbert (2017). *Graph Algorithms in the Language of Linear Algebra*, SIAM.

Websites and eLearning Sources:

1. https://api.pageplace.de/preview/DT0400.9781292401171_A41586057/preview-9781292401171_A41586057.pdf
2. https://[PDF] Cloud Computing by Rajkumar Buyya
3. https://BCAD.INFO PDF free online compression - COMPRESS-PDF.BCAD.INFO
4. https://Michael A. Nielsen, Isaac L. Chuang: Free Download, Borrow, and Streaming: Internet Archive
5. https://[PDF] Tech Trends in Practice by Bernard Marr | 9781119646198, 9781119646204

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, students will be able to	**Cognitive Levels (K-Level)**
CO1	Understand and to analyze the fundamentals of AI and ML.	**K1**
CO2	Evaluate cybersecurity threats and blockchain technology.	**K2**
CO3	Explore QC and HPC to understand its algorithms and applications in AI.	**K3**
CO4	Analyze the intersection of quantum computing and machine learning**.**	**K4**
CO5	Investigate emerging technologies and future trends.	**K5**
CO6	Develop a comprehensive educational program incorporating AR/VR for teaching complex subjects such as anatomy or astronomy.	**K6**

Relationship Matrix											
Semester	**Course Code**		**Title of the Course**						**Hours**		**Credits**
2	**25PCS2OE02**		**Open Elective - 2 (BS):** Recent Trends in Computing						**4**		**2**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	2	3	2	2	3	2	2	3	2	2.4
CO2	2	3	2	3	2	3	2	3	2	2	2.4
CO3	2	2	3	2	1	3	3	2	3	2	2.3
CO4	3	3	2	3	2	3	3	2	3	2	2.6
CO5	2	2	3	2	1	3	2	3	2	2	2.2
CO6											
										Mean Overall Score	2.38 (High)

Semester	Course Code	Title of the Course	Hours/ Weeks	Credits
2	25PSS2SE01	**Skill Enhancement Course:** Soft Skills	4	2

Course Objectives
To provide a focused training on soft skills for students in colleges for better job prospects
To communicate effectively and professionally
To help the students take active part in group dynamics
To familiarize students with numeracy skills for quick problem solving
To make the students appraise themselves and assess others

Unit I: Effective Communication & Professional Communication (**12 Hours)**

Definition of communication - Barriers of Communication - Non-verbal Communication. Effective Communication - Conversation Techniques - Good manners and Etiquettes - Speech Preparations & Presentations - Professional Communication.

Unit II: Resume Writing & Interview Skills **(12 Hours)**

Resume Writing: What is a résumé? Types of résumés – Chronological - Functional and Mixed Resume - Purpose and Structure of a Resume - Model Resume.

Interview Skills: Types of Interviews - Preparation for an interview – Attire - Body Language - Common interview questions - Mock interviews & Practicum.

Unit III: Group Discussion & Personal effectiveness **(12 Hours)**

Basics of Group Discussion- Parameters of GD- Topics for Practice - Mock GD & Practicum & Team Building. *Personal Effectiveness*: Self Discovery - Goal Setting with questionnaires & Exercises.

Unit IV: Numerical Ability **(12 Hours)**

Introducing concepts - Average – Percentage - Profit and Loss - Simple Interest - Compound Interest - Time and Work - Pipes and Cisterns.

Unit V: Test of Reasoning **(12 Hours)**

Introducing Verbal Reasoning: Series Completion – Analogy - Data Sufficiency - Assertion and Reasoning and Logical Deduction. *Non-Verbal Reasoning*: Series - and Classification.

Teaching Methodology	Chalk and talk, PPT, Mathematical models, Video presentation

Books for Study:

1. Melchias G., Balaiah, J. & Joy, J. L. (Eds). (2018). Winner in the Making: A Primer on soft Skills. Trichy, India: St. Joseph's College.

Books for Reference:

1. Aggarwal, R. S. (2010). A Modern Approach to Verbal and Non- Verbal Reasoning. S. Chand.
2. Covey, S. (2004). 7 Habits of Highly effective people. Free Press.
3. Gerard, E. (1994). The Skilled Helper (5th Ed.). Brooks/Cole.
4. Khera, S. (2003). You Can Win. Macmillan Books.
5. Murphy, R. (1998). Essential English Grammar, (2nd Ed.). Cambridge University Press.
6. Sankaran, K., & Kumar, M. (2010). Group Discussion and Public Speaking (5th Ed.). M.I. Publications.
7. Trishna, K. S. (2012). How to do well in GDS & Interviews? (3rd Ed.). Pearson Education.
8. Yate, M. (2005). Hiring the Best: A Manager 's Guide to Effective Interviewing and Recruiting

Websites and eLearning Sources:

7. https://www.indeed.com/career-advice/resumes-cover-letters/communication-skills
8. https://www.seek.com.au/career-advice/article/50-communication-skills-for-the-workplace-your-resume
9. https://southeast.iu.edu/career/files/power-phrases.pdf
10. https://dese.ade.arkansas.gov/Files/20201209124449_Professional-Communication.docx

11. https://www.dol.gov/sites/dolgov/files/ETA/publications/00-wes.pdf
12. https://www.tmu.ac.in/other_websites/cdoe.tmu.ac.in.old/study-material/28-08-2024/COMMON/SEMESTER_2/MAIN_SOFT_SKILLS.pdf
13. https://byjus.com/maths/profit-and-loss-questions/
14. https://www.indiabix.com/

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K-Level)**
	On successful completion of this course, students will be able to	
CO1	Recall various soft skill sets	**K1**
CO2	Understand personal effectiveness in any managerial positions	**K2**
CO3	Apply verbal and non-verbal reasoning skills to solve problems	**K3**
CO4	Differentiate problems at work and home; and design solutions to maintain work-life balance	**K4**
CO5	Assess growth and sustainability and infuse creativity in employment that increases professional productivity	**K5**
CO6	Construct plans and strategies to work for better human society	**K6**

Relationship Matrix											
Semester	**Course Code**		**Title of the Course**							**Hours**	**Credits**
2	**25PSS2SE01**		**Skill Enhancement Course:** Soft Skills							**4**	**2**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	3	3	2	3	2	3	2	3	2.7
CO2	3	3	3	2	3	3	3	3	3	3	2.9
CO3	3	2	2	3	3	3	3	3	3	3	2.8
CO4	3	3	2	2	3	3	3	3	3	3	2.8
CO5	3	3	3	2	2	3	3	3	3	3	2.8
CO6	3	3	3	2	2	3	3	3	3	3	2.8
										Mean Overall Score	**2.8 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
3	25PCS3CC07	**Core Courses - 7:** Web Development Using ASP.NET	6	4

Course Objectives
To understand the concept and architecture of ASP.NET
To create rich GUI web applications using Visual Studio.NET
To learn and implement new features in ASP.NET
To demonstrate the database connectivity in ASP.NET
To discuss and extend the CRUD applications

UNIT I: Introducing .Net (18 Hours)

Introducing .NET: The Evolution of Web Development - The .NET Framework - The C# Language: The .NET Language - The .NET Languages - C# Language Basics - Variables and Data Types - Variable Operations - Object-Based Manipulation - Conditional Logic - Loops - Methods. Visual Studio: Designing A Web Page - Writing Code - Visual Studio Debugging.

UNIT II: Web Controls (18 Hours)

Web Controls: Stepping Up to Web Controls - Web Control Classes - List Controls - Table Controls. State Management: View State - Transferring Information Between Pages - Cookies - Session State - Session State Configuration. Error Handling, Logging, And Tracing: Exception Handling - Handling Exceptions. Validation: Validation Controls. Rich Controls: The Calendar - The AdRotator - Pages with Multiple Views.

UNIT III: ADO.NET Fundamentals (18 Hours)

Styles, Themes, And Master Pages: Styles - Themes - Master Page Basics - Advanced Master Pages. ADO.NET Fundamentals: ADO.NET Basics - Direct Data Access. Data Binding: Single-Value Data Binding - Repeated -Value Data Binding - Data Source Controls. The Data Controls: The Grid View- Formatting the Grid View- Editing with the Grid View.

UNIT IV: ASP.NET Database Systems (18 Hours)

Introduction to ASP.NET Core - Hello World Application - Query String Data - Form Data - ASP.NET Core Fundamentals - Web root - Shared Pages - Layout – Models. Database Systems: SQL Server- SQL Server Management Studio - Structured Query Language: Tables - Views - Stored Procedures-Triggers.

UNIT V: ASP.NET Core Features (18 Hours)

Demo Application: Data from Database - Visual Studio - Connection String. CRUD Applications: Create the Visual Studio Project - Database - Index Page - Models. Additional ASP.NET Core Features: Session Data - Session State in ASP.NET Core - Share Data between Two Web Pages. Charting: Introduction - Google Charts - Google Charts Implementation - Google Charts Examples.

Teaching Methodology	Chalk and talk, Lectures, Demonstrations, PPT.
Assessment Methods	Seminar, Snap Test, MCQ

Books for Study:

1. MacDonald, M. (2008). *Beginning ASP.NET 3.5 in C# 2008.* (2nd Ed.). A press. New York.
2. Hans-Petter Halvorsen (2021). *Web Programming ASP.NET Core*. Microsoft.

Books for Reference:

1. MacDonald, M. (2017). *ASP.NET: The Complete Reference*. Tata McGraw-Hill Ltd.
2. Troelsen, Andrew, Japikse, Philip. (2020). *Pro C# 8 with .NET Core 3 Foundational Principles and Practices in Programming*, (9th Ed.). A press. New York
3. Adam, F. (2020). *Pro ASP.NET Core 3*, (18th Ed.). A press. New York
4. Balagurusamy, E. (2015). *Programming in C#*, (4th Ed.). McGraw-Hill Education Private Limited.
5. Mark, J.P. (2019). *C# 8.0 and .NET Core 3.0 - Modern Cross-Platform Development* (4th Ed.). Packt Publishing Limited.

Websites and eLearning Sources:

1. http://eng.harran.edu.tr/~msuzer/files/vp/CSharp.pdf
2. https://www.profajaypashankar.com/wp-content/uploads/2018/08/beginning_asp.net_4.5_in_C.pdf
3. https://dl.ebooksworld.ir/books/Pro.ASP.NET.Core.6.9th.Edition.Adam.Freeman.Apress.9781484279564.EBooksWorld.ir.pdf
4. https://www.halvorsen.blog/documents/programming/csharp/textbook/aspnet/Web%20Programming%20-%20ASP.NET%20Core.pdf
5. https://eng.harran.edu.tr/~msuzer/files/vp/CSharp.pdf

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K - Level)**
	On successful completion of this course, students will be able to	
CO1	Recollect the fundamental concepts of .NET framework	**K1**
CO2	Understand the use of various web controls and rich controls	**K2**
CO3	Make use of database connectivity in ASP.NET Management	**K3**
CO4	Investigate the new features in ASP.NET	**K4**
CO5	Observe the web pages using SQL Server	**K5**
CO6	Utilize the use of Google Charts in ASP.NET	**K6**

Relationship Matrix											
Semester	**Course Code**		**Title of the Course**							**Hours**	**Credits**
3	**25PCS3CC07**		**Core Course - 4:** Web Development Using ASP.Net							**6**	**4**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Scores of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	2	3	2	2	3	2	3	3	2	2	**2.4**
CO2	2	3	3	3	2	2	3	2	2	3	**2.5**
CO3	3	2	3	3	3	3	2	2	3	2	**2.6**
CO4	3	3	2	2	3	3	3	3	2	3	**2.7**
CO5	2	3	3	3	2	3	2	3	3	3	**2.7**
CO6	3	2	3	2	2	3	3	2	3	3	**2.6**
										Mean Overall Score	**2.6 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
3	25PCS3CC08	**Core Course - 8:** NoSQL using MongoDB	5	4

Course Objectives
To learn the differences between RDBMS and DB, including data mining and data warehouse.
To understand the differences between RDBMS and NoSQL and the structure of document databases.
To learn MongoDB architecture, document operations, indexing, and data manipulation using the MongoDB shell and client.
To understand MongoDB operators, indexing strategies, query optimization, and aggregation pipeline operations.
To learn replication, sharding, MapReduce, and server administration techniques, including security and logging.

UNIT I: Database (15 Hours)

Database Revolutions - System Architecture - Relational Database- Database- Design Data Storage- Transaction Management - Data warehouse and Data Mining- Information Retrieval. Mining- Information Retrieval.

UNIT II: NoSQL and Document Database (15 Hours)

NOSQL DATABASE: RDBMS VS NOSQL - Data Management with Distributed Databases - ACID and BASE - Four types of NOSQL Databases. DOCUMENT DATABASE: Introduction to Document Database: Document managing Multiple Document in collection - Basic Operations on document Database- Normalization- De-normalization.

UNIT III: Introduction to Mongodb (15 Hours)

INTRODUCTION TO MONGODB: Documents - Collections - Subcollections - Databases - Starting MongoDB- MongoDB Shell - MongoDB Client - Basic Operations with the Shell - Data Types - _id and ObjectIds - Inserting and Saving Documents - Removing Documents - Updating Documents - Modifiers - Upserts - updating multiple documents - Returning Updated Documents.

UNIT IV: MongoDB Operators, Aggregation (15 Hours)

MONGODB OPERATORS: Introduction to find - Query Criteria - Type-Specific Queries - $where Queries - Cursors - Introduction to Indexing - Compound Indexes - $-Operators Use Indexes - Using explain () and hint() - Types of Indexes. AGGREGATION: The Aggregation Framework - Pipeline Operations: $match - $project - $group - $unwind - $sort - $limit -$skip.Aggregation Commands - Normalization versus Denormalization - Optimizations for Data Manipulation - Not to Use MongoDB.

UNIT V: Advanced MongoDB, Data and Server Administration (15 Hours)

ADVANCED MONGODB: REPLICATION: Introduction to Replication- Configuring a Replica Set - Changing Your Replica Set Configuration - How to Design a Set - Member Configuration Options- Components of a Replica Set. SHARDING: Introduction to Sharding- Understanding the Components of a Cluster - Starting the Servers - MongoDB Tracks Cluster Data. MAPREDUCE: MongoDB and MapReduce.

Teaching Methodology	Chalk and talk, PPT, Mathematical models, Graphical representation using software, simulation
Assessment Methods	Test, MCQ, Assignment, Seminar

Books for Study:

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan (2011), *Database System Concepts*, (6th Ed.). McGraw Hill.
2. Dan Sullivan, (2015) “NoSQL for Mere Mortals”, Addison-Wesley, USA.
3. Kristina Chodorow, (2019) “MongoDB: The Definitive Guide”, O’Reilly, USA.

Books for Reference:

1. Kyle Banker, PiterBakkum, Shaun Verch (2016), MongoDB in Action, Dream tech Press, New Delhi.
2. David Hows, EelcoPlugge, Peter Membray, Tim Hawkins, (2013), "The Definitive Guide to MongoDB", Apress, UK.
3. Pramod J. Sadalage and Martin Fowler, (2012) "NoSQL Distilled. A Brief Guide to the Emerging World of Polyglot Persistence", Pearson, Chennai.

Websites and eLearning Sources

1. https://www.mongodb.com/docs/manual/introduction/
2. https://www.geeksforgeeks.org/mongodb-an-introduction/
3. https://www.javatpoint.com/mongodb-tutorial.
4. https://people.vts.su.ac.rs/~peti/Baze%20podataka/Literatura/Silberschatz-Database%20System%20Concepts%206th%20ed.pdf

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, students will be able to	**Cognitive Levels (K - Level)**
CO1	Recall the fundamental concepts of relational databases, system architecture, data storage, and transaction management.	**K1**
CO2	Explain the differences between RDBMS and NoSQL databases, including ACID vs. BASE properties and document database operations.	**K2**
CO3	Perform basic CRUD operations, indexing, and data manipulation using MongoDB shell and client.	**K3**
CO4	Analyze the performance of MongoDB queries using indexing, aggregation framework, and query optimization techniques.	**K4**
CO5	Evaluate the replication, sharding, and security mechanisms in MongoDB for efficient data management.	**K5**
CO6	Design and implement a NoSQL-based database system using MongoDB for real-world applications.	**K6**

Relationship Matrix											
Semester	**Course Code**		**Title of the Course**							**Hours**	**Credits**
3	**25PCS3CC08**		**Core Course - 8:** NoSQL using MongoDB							**5**	**4**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	2	2	3	3	3	3	2	2	**2.6**
CO2	3	2	3	2	2	3	3	3	2	3	**2.6**
CO3	2	2	3	3	2	3	3	3	2	2	**2.5**
CO4	3	3	2	2	3	2	3	3	2	3	**2.6**
CO5	3	2	3	3	3	3	3	2	2	2	**2.6**
CO6	3	3	2	3	2	3	3	3	2	3	**2.7**
										Mean Overall Score	**2.6 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
3	25PCS3CC09	**Core Course - 9:** Smart Devices using Android	5	3

Course Objectives
To introduce students to the Android platform, its ecosystem, and the basics of Android application development.
To teach students the MVC design pattern and its application in Android development, along with testing methodologies.
To introduce students to Android Things and its role in IoT development.
To enable students to build practical IoT projects using Android Things.
To understand students to integrate Android Things with cloud platforms and add advanced features like voice control.

UNIT I: Getting to Know Android. (15 Hours)

Getting to Know Android - The Open Handset Alliance - Android Execution Environment - Components of an Android Application - Android Activity Lifecycle - Android Service Lifecycle - Setting Up Your Development Environment - Android and Social Networking.

UNIT II: Model View Controller and Testing (15 Hours)

Model View Controller: The Model View Controller pattern - Applying MVC to Android - MVC code - Testing MVC: Android Testing - Focusing on unit tests - Unit testing an Android Activity - Android Architecture Components: Using the Android Architecture.

UNIT III: Getting Started with Android Things (15 Hours)

Getting Started with Android Things: Internet of Things overview - IoT components - Android Things overview - Things support library - Android Things board compatibility – Install Android Things on Raspberry - Install Android Things using Windows - Creating the first Android Things project - Differences between Android and Android Things- Create your first Android Things app.

UNIT IV: Integrate Android Things with IoT Cloud Platforms (15 Hours)

IoT cloud architecture: Streaming data to the IoT cloud platform - Sending data from the Android Things app - Adding voice capabilities to Android Things - Ambient light control system description - Building the Arduino project - Implementing the Android Things app - Invoking the Arduino services - Remote Weather Station.

UNIT V: Applications Using Android Things (15 Hours)

Creating an Alarm System Using Android Things: Environmental monitoring system project- Handling sensors using the Android sensor framework - Putting it together - Acquiring data.

Teaching Methodology	Chalk and talk, PPT, Demo, Video, Discussion
Assessment Methods	Seminar, MCQ, assignments, Projects

Books for Study:

1. Rick, R., John, L., Zigurd, M., & Blake, M. (2010). *Android Application Development.* O'Reilly Media.
2. Francesco, A. (2017). *Android Things Projects.* Packt Publishing.

Books for Reference:

1. Yun, C., & Aldo, O, D. (2019). *Hadoop — Advanced Android App Architecture*. O'Reilly Publications, India.
2. Reto, M. (2009). *Professional Android Application Development*. Wiley Publishing.
3. Dominique, D. G. & Vlad, M. T. (2016). *Building the Web of Things: With examples in Node.js and Raspberry Pi*. Dreamtech Press.
4. Raul, P. (2018). *Android Things Quick Start Guide: Build your own smart devices using the Android Things platform*. Packt Publishing.

5. Derek, M. (2016). *Exploring Raspberry Pi Interfacing to the Real World with Embedded Linux*. John Wiley & Sons, Inc.

Websites and eLearning Sources:

1. https://mrcet.com/downloads/digital_notes/IT/MOBILE%20APPLICATION%20DEVELOPMENT%20DIGITAL%20NOTES(R18A1207).pdf
2. https://www.tutorialspoint.com/android/android_tutorial.pdf
3. https://unidel.edu.ng/focelibrary/books/Android123uo00es0011.pdf
4. https://developer.android.com/reference/com/google/android/things/AndroidThings
5. https://www.kodeco.com/545672-android-things-tutorial-getting-started

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, students will be able to	**Cognitive Levels (K - Level)**
CO1	Understand Android Fundamentals and Development Environment	**K1**
CO2	Apply Model-View-Controller (MVC) Architecture and execute unit tests for Android components	**K2**
CO3	Develop the architecture of IoT systems and Android Things.	**K3**
CO4	Integrate sensors and acquire data using the Android sensor framework.	**K4**
CO5	Connect IoT devices with cloud platforms for data streaming and remote control.	**K5**
CO6	Build and integrate Arduino projects with Android Things for remote monitoring.	**K6**

Relationship Matrix											
Semester	**Course Code**		**Title of the Course**							**Hours**	**Credits**
3	**25PCS3CC09**		**Core Course - 9:** Smart Devices using Android							**5**	**3**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	2	2	2	2	3	2	2	3	3	2.4
CO2	2	3	2	2	2	3	3	3	2	3	2.5
CO3	2	2	2	2	3	2	3	2	3	2	2.3
CO4	3	2	2	2	2	2	3	2	3	3	2.4
CO5	2	2	2	3	3	3	3	3	2	3	2.6
CO6	3	2	2	2	2	3	2	2	3	3	2.4
										Mean Overall Score	**2.44 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
3	25PCS3CP05	**Core Practicals - 5:** ASP.NET	3	2

Course Objectives
To understand the fundamental concepts of ASP.NET Framework.
To create web applications using Visual Studio.NET.
To learn the use of database in Entity Framework.
To extend data list and data grid controls to build a webpage.
To demonstrate the database using SQL Server.

List of Exercises

1. Form Design Using Various Web Controls
2. Ad Rotator and Calendar Control, Login Control
3. Validation Controls
4. Cookie Manipulation
5. State Management
6. Data Retrieval, Updating using ADO.NET
7. Template Creation using Data List and Data Grid
8. Sorting and Paging using Data Grid
9. Build a website using Structured Query Language
10. Create charts in an ASP.NET Core application.

Teaching Methodology	Hands on Lab Session
Assessment Methods	Lab Test, Note Evaluation, Viva-voice

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K - Level)**
	On successful completion of this course, students will be able to	
CO1	Show dynamic webpages using Web Controls.	**K1**
CO2	Determine rich controls and validation controls to the web page.	**K2**
CO3	Apply cookies**,** session and application state in a web page.	**K3**
CO4	Analyze the data in the database using ADO.NET Queries.	**K4**
CO5	Construct web pages using SQL Server	**K5**
CO6	Design web pages by integrating web services and ASP.NET	**K6**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
3	**25PCS3CP05**			**Core Practicals - 5:** ASP.NET						**3**	**2**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Scores of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	3	2	2	3	2	3	3	3	**2.7**
CO2	2	3	3	2	2	2	3	2	2	3	**2.4**
CO3	3	2	3	2	2	3	3	2	3	2	**2.5**
CO4	3	3	2	2	2	3	3	3	2	3	**2.6**
CO5	3	3	3	2	2	3	3	2	2	3	**2.6**
CO6	2	3	3	3	2	3	3	2	2	3	**2.6**
										Mean Overall Score	**2.6 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
3	25PCS3CP05	**Core Practicals - 6:** Mongo DB Lab	3	2

Course Objectives
To learn the fundamentals of programming using SQL
To demonstrate use of operations on Project
To classify the various types Operations on Match, and Sort
To design forms using Logical operations
To create a filter using Mapreduce Process

List of Exercises:

1. Simple SQL Programs
2. Basic Queries Using Mongodb, Indexes
3. Comparison operations
4. Operations on Project
5. Operations on Group
6. Operations on Match, and Sort
7. Search Text
8. Logical Operations
09. Set Operations
10. Replication
11. Sharding
12. Mapreduce

Teaching Methodology	Hands on Lab Session
Assessment Methods	Lab Test, Note Evaluation, Viva-voice

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, students will be able to	**Cognitive Levels (K - Level)**
CO1	Understand the fundamental design concepts of database using SQL.	**K1**
CO2	Comprehend the regular expression and indexing for solving real time problem.	**K2**
CO3	Apply distributed techniques for querying documents and modification.	**K3**
CO4	Analyze clustering and projecting techniques to interpret the data set.	**K4**
CO5	Estimate the various strategies to Manipulate duplicate data.	**K5**
CO6	Create a data filter technique by using mapreduce.	**K6**

Relationship Matrix											
Semester	**Course Code**		**Title of the Course**							**Hours**	**Credits**
3	**25PCS3CP05**		**Core Practicals - 6:** Mongo DB Lab							**3**	**2**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Scores of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	2	2	2	2	3	3	2	3	2	2	2.3
CO2	3	2	3	3	2	3	3	3	2	3	2.7
CO3	2	2	2	2	3	2	3	2	2	2	2.2
CO4	3	2	2	3	2	3	2	3	3	3	2.5
CO5	2	3	3	2	3	3	3	3	2	2	2.6
CO6	2	2	2	2	3	3	2	3	3	2	2.3
										Mean Overall Score	**2.47 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
3	25PCS3ES02A	**Discipline Specific Elective - 2:** Cryptography and Block Chain Technology	4	3

Course Objectives
To explain cryptographic primitives and their importance in ensuring data confidentiality, integrity, and authenticity
To understand the fundamental concepts of blockchain, including its history, definition, and key characteristics
To study the concept of consensus in blockchain and its significance in achieving trust and decentralization
To analyze blockchain applications in finance, including secure transactions, fraud prevention, and decentralized finance (DeFi)
To learn about Bitcoin addresses, networks, wallets, clients, and the process of making Bitcoin payments

UNIT I: Cryptography (12 Hours)

Introduction – Cryptography primitives – Symmetric Cryptography – Asymmetric Cryptography -Hash functions – Introduction – Hashing – Message Authentication Code – Secure Hash Algorithm **1**(**SHA-1**) - Hashing and data structures.

UNIT II: Basics of Block Chain (12 Hours)

Introduction - Concepts of Block Chain – History - Definition - Fundamentals of Block Chain-characteristics - Consensus in trust building exercise - private, public and hybrid Blockchains - DLT Decentralized applications and databases - Architecture of Block Chain - Decentralized system - Introduction - Distributed Decentralized databases – Decentralized Enterprise.

UNIT III: Consensus and Block Chain components (12 Hours)

Consensus – Introduction – Consensus approach – Block Chain components - Ethereum – History – Ethereum virtual machine – Working of Ethereum – Ethereum clients – Ethereum Key pairs – Ethereum Addresses – Ethereum Wallets – Ethereum Languages – Ethereum Development Tools.

UNIT IV: Smart Contracts (12 Hours)

Introduction – Absolute and immutable – Contractual and Confidentiality – Characteristics – Internet of Things – Utilities: Smart Grid – Proofs of Origin – Supply chain management – Medical sciences – Finance – Media and entertainment – Public Services – Legal services - Darknet.

UNIT V: Bitcoins and Block Chain Allied Technologies (12 Hours)

Introduction – Working of Bitcoin – Merkle Trees – Block structure – Bitcoin Addresses – Bitcoin Networks – Bitcoin Wallet – Bitcoin Clients – Bitcoin payments – Bitcoin Supply – Block Chain and Cloud computing – Block Chain and Artificial Intelligence – Block Chain and IoT – Block Chain and Machine Learning.

Teaching Methodology	Chalk and talk, PPT, Video Lectures
Assessment Methods	Seminar, MCQ, Snap Test

Books for Study:

1. Kumar Saurabh, Ashutosh Saxena (2020). *Block Chain Technology Concepts and applications*, (2nd Ed.). Wiley Publishing India Pvt. Ltd.

Books for Reference:

1. Jogendra Kumar, Dr. (2021). *Block-chain technology and applications***:** BITCOIN (5th Ed.). Notion Press Media Pvt Ltd.
2. Shraddha Saxena, Prof. & Kavita Chourasia, Prof. (2025). *Block Chain Technology the Architecture of The Digital Future* (1st Ed.). Book Rivers.
3. Chandramouli Subramanian, Asha A George, Abhilash, K. A. (2020). *Blockchain technology.* (1st Ed.). Universities Press (India) Pvt. Ltd.

Websites and eLearning Sources:

1. https://www.blockchain-council.org/.
2. https://www.coursera.org/learn/blockchain-basics.
3. https://core.ac.uk/download/pdf/132698353.pdf.
4. https://www.geeksforgeeks.org/blockchain-technology-introduction/
5. https://www.sigc.edu/pdf/BLOCK%20CHAIN%20TECHNOLOGY.pdf

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, students will be able to	**Cognitive Levels (K - Level)**
CO1	Explain the key characteristics and working principles of blockchain	**K1**
CO2	Assess the role of blockchain in supply chain management for enhancing traceability and reducing fraud	**K2**
CO3	Apply blockchain principles to real-world scenarios involving decentralized applications and emerging digital innovations	**K3**
CO4	Analyze different consensus approaches and their impact on blockchain networks	**K4**
CO5	Evaluate the integration of blockchain with the Internet of Things (IoT) and its impact on various industries	**K5**
CO6	Explore Ethereum development tools and programming languages used for building decentralized applications (DApps)	**K6**

Relationship Matrix											
Semester	**Course Code**	**Title of the Course**								**Hours**	**Credits**
3	**25PCS3ES02A**	**Discipline Specific Elective - 2:** Cryptography and Block Chain Technology								**4**	**3**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	2	2	3	1	2	2	3	3	2	**2.3**
CO2	2	2	2	3	3	2	3	2	3	3	**2.5**
CO3	2	3	2	1	3	3	3	2	2	2	**2.3**
CO4	3	1	3	3	2	2	2	3	3	3	**2.5**
CO5	2	2	3	2	2	3	3	3	3	2	**2.5**
CO6	2	3	2	2	2	3	3	2	3	3	**2.5**
										Mean Overall Score	**2.43 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
3	25PCS3ES02B	**Discipline Specific Elective - 2:** Compiler Design	4	3

Course Objectives
To identify the fundamentals of compiler and identify the relationships among different phases of the compiler.
To design and develop a comprehensive Compiler for a given language
To demonstrate intermediate code generation and run-time environment.
To analyze and implement required module, which may include front-end, back-end, and a small set of middle-end optimizations.
To summarize and transform programs to improve their time and memory efficiency

UNIT I: Introduction to compiler (12 Hours)

Definition of compiler- Structure of a compiler - Lexical Analysis - Role of Lexical Analyzer - Input Buffering - Specification of Tokens - Recognition of Tokens – Lex - Finite Automata - Regular Expressions to Automata - Minimizing DFA - pass and phases of translation

UNIT II: Syntax Specification (12 Hours)

Syntax directed definition- Role of Parser – Grammars - Error Handling - Context Free Grammars - Parsers - Derivation and Parse trees - Shift Reduce Parsing - Operator Precedence Parsing - Top-Down Parsing - Predictive Parsers - Introduction to LALR Parser -Error Handling and Recovery in Syntax Analyzer- LR grammars- LR parsers

UNIT III: Intermediate code Generation (12 Hours)

Syntax Directed Definitions - Intermediate Code Generation - Translation - Implementation of Syntax - Directed Translators - Intermediate Code - Postfix Notation - Parse Trees and Syntax Trees - Three Address Codes, Quadruples and Triple -Type Checking- Boolean expressions and flow-of-control statements.

UNIT IV: Symbol Tables (12 Hours)

Contents of a Symbol Table - Data Structures for Symbol Tables - Implementation of a Simple Stack Allocation Scheme - Implementation of Block Structured Languages - Errors - Lexical Phase Error. Run-Time Environment and Code Generation: Storage Organization, Stack Allocation Space - Issues in Code Generation - register allocation and assignment, peephole optimization

UNIT V: Code Optimization (12 Hours)

Principal Sources of Optimization - Peep-hole optimization - DAG- Optimization of Basic Blocks - Global Data Flow Analysis - Efficient Data Flow Algorithm. Elementary Code Optimization technique - Loop Optimization

Teaching Methodology	Chalk and talk, PPT,
Assessment Methods	Seminar, MCQ

Books for Study:

1. Aho A. V, Monica, R. Sethi, J. D. Ullman (2009). *Compilers, Principles, Techniques and Tools*, Second Edition, Pearson Education/Addison Wesley.
2. Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman (2007), *Compilers Principles, Techniques and Tools*,2nd edition, Pearson Education, New Delhi, India.

Books for Reference:

1. Dick Grune, Henri E. Bal, Ceriel J. H. Jacobs, Koen G. Langondeon (2003). *Modern Compiler Design*, Wiley, Singapore.
2. Louden K (2023). *Compiler Construction, Principles and Practice*, Thomson, New Delhi.
3. Alfred V. Aho, Jeffrey D. Ullman (2001). *Principles of compiler design*, Indian student edition, Pearson Education, New Delhi, India.

4. Kenneth C. Louden (1997). *Compiler Construction– Principles and Practice*, (1st Ed), PWS Publishing

Websites and eLearning Sources:

1. https://holub.com/goodies/compiler/compilerDesignInC.pdf
2. https://www.vssut.ac.in/lecture_notes/lecture1422914957.pdf
3. https://www3.nd.edu/~dthain/compilerbook/compilerbook.pdf
4. https://ggnindia.dronacharya.info/Downloads/Sub-info/RelatedBook/6thSem/Compiler-Design-TEXT-book-1.pdf
5. https://www.cet.edu.in/noticefiles/277_CD%20Complete.pdf

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, students will be able to	**Cognitive Levels (K - Level)**
CO1	Define the Loop Optimization and DAG for source code.	**K1**
CO2	Explain the data structures for Block Structured Languages.	**K2**
CO3	Apply various parsing and conversion techniques for the design of a compiler.	**K3**
CO4	Analyze the concept of parsing techniques.	**K4**
CO5	Design and implement a lexical analyzer using finite automata	**K5**
CO6	Evaluate the Code Optimization and code generation techniques.	**K6**

Relationship Matrix											
Semester	**Course Code**		**Title of the Course**							**Hours**	**Credits**
3	**25PCS3ES02B**		**Discipline Specific Elective 2:** Compiler Design							**4**	**3**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	2	3	2	2	3	2	2	3	3	2	2.4
CO2	3	2	2	3	2	2	2	2	3	2	2.3
CO3	3	2	3	2	3	3	3	2	2	3	2.6
CO4	2	3	2	3	2	2	2	3	3	2	2.4
CO5	2	2	3	2	3	2	3	2	2	3	2.4
CO6	3	3	2	3	3	2	3	3	3	2	2.7
										Mean Overall Score	**2.46 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
3	25SCS3RM01	Research Methodology	4	2

Course Objectives
To comprehend the fundamental concepts, objectives, significance, and challenges of research, along with techniques for defining research problems.
To understand the principles of research design, experimental design, and various sampling techniques for effective data collection.
To explore different methods of primary and secondary data collection and develop the ability to select appropriate data-gathering techniques.
To analyze and interpret research data using statistical measures, regression analysis, and correlation techniques.
To gain knowledge of Intellectual Property Rights (IPR), patents, and legal frameworks related to research innovations and their protection.

UNIT I: Basics of Research (12 Hours)

Meaning of Research – Objectives – Motivation – Type of Research – Research Approaches – Significance– Research Methods Versus Methodology – Research and Scientific Method – Importance - Research Process – Criteria of Good Research – Problems Encountered by Researches in India. Defining the Research Problem: Research Problem – Selecting the Problem – Necessity of Defining the Problem – Technique Involved in Defining a Problem.

UNIT-II: Research Design (12 Hours)

Meaning of a Research Design – Need for Research Design – Features of a Good Design – Important Concept Relating to Research Design – Different Research Design – Basic Principles of Experimental Design. Sampling Design: Census and Sample Survey – Implication of a Sample Design – Steps in Sampling Design – Criteria of Selecting a Sampling Procedure – Characteristics of a Good Sample Designs – Different Type of Sample Designs –Select a Random sample – Random Sample from an Infinite Universe – Complex Random Sampling Designs.

UNIT III: Methods and Data Collection (12 Hours)

Collection of Primary Data – Observation Method – Interview Method – Collection of Data Through Questionnaires - Collection of Data Through Schedules – Different Between Questionnaires and Schedules – Some Other Method of Data Collection – Collection of Secondary Data – Selecting of Appropriate Methods for Data Collection.

UNIT IV: Processing and Analysis of Data (12 Hours)

Processing Operations – Some Problems in Processing – Elements Type of Analysis – Statistics in Research – Measures of Central Tendency – Measures of Dispersion - Measures of Asymmetry (Skewness) – Measures of Relationships – Simple Regression Analysis – Multiple Correlation and Regression – Partial Correlation – Association in Case of Attributes – Other Measures.

UNIT V: IPR and Patents (12 Hours)

The need for intellectual property right (IPR) - Kinds of Intellectual Property Rights: Patent, Copyright, Trade Mark, Design, Geographical Indication, Plant Varieties and Layout Design – Genetic Resources and Traditional Knowledge – Trade Secret - IPR in India: Genesis and development – IPR in abroad. Elements of Patentability: Novelty- Non Obviousness (Inventive Steps), Industrial Application - Non-Patentable Subject Matter - Registration Procedure, Rights and Duties of Patentees.

Teaching Methodology	Lectures, Flipped Classes.
Assessment Methods	MCQs, Snap Test.

Books for Study:

1. Kothari C. R. (2004). *Research Methodology – Methods and Techniques*. (2nd Revised Ed.). New Age International Publishers.
   (Unit I- IV - Chapters: 1-4, 6,7.)

2. Nithyananda, K, V. (2019). Intellectual Property Rights: Protection and Management. Cengage Learning publisher.
(Unit V-Chapter: 1, 2.)

Books for Reference:

1. David. Evans, Paul Gruba, Justin Zobel. (1995). *How to write a better thesis*. (3rd Ed.). Springer.
2. Neeraj, P, & Khusdeep, D. (2014). *Intellectual Property Rights. India.* PHI learning.

Websites and eLearning Sources:

1. https://www.scribbr.com/dissertation/thesis/
2. https://kostochk.web.illinois.edu/math412-10/
3. https://vemu.org/uploads/lecture_notes/18_01_2024_914828712.pdf

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, students will be able to	**Cognitive Levels (K - Level)**
CO1	Recall key research concepts, types of research, research methodologies, and intellectual property rights (IPR), including patents and copyrights.	**K1**
CO2	Explain the significance of research design, sampling methods, data collection techniques, and statistical measures used in research.	**K2**
CO3	Demonstrate the ability to formulate research problems, design research studies, and select appropriate data collection methods.	**K3**
CO4	Evaluate different research approaches, sampling techniques, and statistical tools to identify their relevance in solving research problems.	**K4**
CO5	Critically assess research findings, interpret data using statistical methods, and examine the impact of IPR laws on research and innovation.	**K5**

Relationship Matrix											
Semester	**Course Code**		**Title of the Course**							**Hours**	**Credits**
3	**25SCS3RM01**		**Research Methodology**							**4**	**2**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	3	2	1	3	3	2	2	2	**2.4**
CO2	3	3	3	2	2	3	3	3	1	1	**2.4**
CO3	3	3	2	2	1	2	3	2	2	2	**2.2**
CO4	3	3	3	2	2	3	2	3	2	2	**2.5**
CO5	3	3	3	2	2	3	3	3	1	1	**2.4**
CO6	3	3	3	2	1	3	3	3	2	2	**2.5**
										Mean Overall Score	**2.4 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
3	25PCS3SL01	**Self – Learning - 1:** Social Media Techniques	0	1

Course Objectives
To understand social media fundamentals
To apply Instagram marketing strategies
To leverage Facebook Ads, Groups, and Promotions for Brand Success
To enhance profile visibility using SEO Techniques
To analyze YouTube Metrics to improve content strategy

UNIT I: Social Media Introduction

Making the Business case for social media - Defining Social Media Marketing – Making your Social debut - Understanding the benefits of social media – Casting a wide net to catch your target market – Branding – Building relationships – Improving business processes - Understanding the cons of social media – Integrating your social media marketing into your overall marketing effort.

UNIT II: Marketing Strategies

Strategies for Instagram Marketing – Update new posts – Use Images and Videos-Create viable Marketing strategies- Use Social Influencers-Show your Instagram-Provide a rich Bio-Focus on your Profile Design-Use Instagram Stories-Use Instagram Livestream-Create a Mini Video Channel-Facebook: Basic skills for Facebook Marketing.

UNIT III: Business Marketing Apps

Connect to Billions of People-SEO Search Engine Optimization-Competitive advantage-Facebook Page: Settings - Cover Photo-Calls to Action-Feedback Posts-Posting to Page-Additional things to do on Pages-Strategies for your Posts-Emotions-Consistency-Frequency-Business Goals-Converting Profile to Business Page-Merchandize-Rewards-Contests-Events-Facebook Ads-Facebook Groups.

UNIT IV: Profile Creation Strategies

LinkedIn - Custom profile URL - Right information is a Key-Differentiate and capitalize - Search Engine Optimization - Go premium - Support additional languages-Rearrange sections - check your profile on different platforms-Regularly Publish Posts.

UNIT V: Social Media Analytics

Setting up a YouTube Channel- Create account and customize the appearance of your channel-Start uploading your videos-Creating YouTube Videos-Format-Opening-The Meat-End Card-Gear-Editing-Post Production-Strategies for YouTube-Cards and End Screens-Show your brand-Search Magnets - Strategies for Engagement-Channel Trailer-Channel watermark-Software Tools-VidIQ - TubeBuddy-Social Blade-Gleam – Famebit - YouTube Creator Studio-YouTube Analytics - watch Time- Other Metrics to Watch-Calculation of CTR.

Teaching Methodology	Chalk and talk, PPT, Video Lectures
Assessment Methods	Seminar, MCQ, Snap Test

Books for Study:

1. Jan Zimmerman, Deborah Ng, (2015). *Social Media Marketing All-in-one for Dummies* (3rd Ed.). For Dummies.
2. Mark Graham, (2019). *Social Media Marketing*, (2nd Ed.). Vaclav Vrbensky.

Books for Reference:

1. Kavita Kamath, (2024). *Social Media Marketing Essentials You Always Wanted To Know*, (1st Ed.), Vibrant Publishers.
2. Andrew Macarthy. (2018). *500 Social Media Marketing Tips: Essential Advice, Hints and Strategy for Business: Facebook, Twitter, Instagram, Pinterest, LinkedIn, YouTube, Snapchat, and More.* (2nd Ed.). CreateSpace Independent Publishing Platform.
3. Julie Atherton. (2023). *Social Media Strategy: A Practical Guide to Social Media Marketing and Customer Engagement. (*2nd Ed.)., Kogan Page

Websites and eLearning Sources:

1. https://academy.hubspot.com/courses/social-media
2. https://www.coursera.org/specializations/social-media-marketing.
3. https://akdistancelearning.net/resources_files/understanding-social-media.pdf.
4. https://www.slideshare.net/slideshow/linked-in-tutorial-v1-030413/36260842.
5. https://www.scribd.com/document/452348138/LinkedIn-Tutorial-pdf.

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K - Level)**
	On successful completion of this course, students will be able to	
CO1	Successfully create and execute Instagram marketing plans, including posting strategies, content creation with images/videos	**K1**
CO2	Implement Facebook advertising and community engagement strategies	**K2**
CO3	Utilize Search Engine Optimization (SEO) techniques and premium account features	**K3**
CO4	Demonstrate the ability to set up, customize, and optimize a YouTube channel	**K4**
CO5	Develop skills to create and manage YouTube Ads, leverage Fameb it for sponsorships	**K5**
CO6	Create a compelling profile, showcase Instagram content effectively, and create a mini video channel to enhance brand identity	**K6**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
3	**25PCS3SL01**			**Self - Learning - 1:** Social Media Techniques						**0**	**1**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	2	2	3	1	2	2	3	3	2	**2.3**
CO2	2	3	2	3	3	1	3	2	3	3	**2.5**
CO3	2	3	2	2	3	3	3	2	2	1	**2.3**
CO4	3	1	3	3	2	2	2	3	3	3	**2.5**
CO5	2	2	3	1	2	3	3	3	3	2	**2.4**
CO6	2	3	2	2	2	3	3	2	3	3	**2.5**
										Mean Overall Score	**2.41 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
3	25PCS3PW01	Mini Project	-	2

Course Objectives
Learn project planning, scheduling, task allocation, and time management skills essential for successful software development.
Practice gathering and analyzing requirements from stakeholders, translating them into software specifications and functionalities
Apply principles of software design to create robust architectures and design patterns for the project.
Implements the software solution using programming languages, frameworks, and tools learned during the course.
Conducts thorough testing of the software, ensuring functionality, reliability, and identifying and fixing bugs or issues.
Creates comprehensive documentation of the project, including technical specifications, user manuals, and presenting the project outcomes effectively.

Course Outcomes		
CO No.	CO-Statements On successful completion of this course, students will be able to	Cognitive Levels (K - Level)
CO1	Identify the real-world problems on the project domain	K1
CO2	Comprehend the state-of-the-art requirements of the industry.	K2
CO3	Apply critical thinking, reasoning and creative thinking for software design in an industry as an individual or as a part of a team.	K3
CO4	Analyze the problem and provide solution by decision making.	K4
CO5	Develop interpersonal, communication and presentation skills	K5
CO6	Build the modules for a specific problem	K6

Relationship Matrix											
Semester	Course Code			Title of the Course					Hours		Credits
3	25PCS3PW01			Mini Project					-		2
Course Outcomes	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	2	3	1	2	3	3	3	2	2	3	2.4
CO2	2	1	2	3	2	2	3	2	3	3	2.3
CO3	2	2	3	2	2	2	3	2	2	3	2.3
CO4	2	2	2	3	2	3	2	3	2	3	2.4
CO5	3	3	3	2	3	2	3	2	2	3	2.6
CO6	2	3	3	2	2	2	2	2	3	3	2.4
Mean Overall Score											2.4 (High)

Semester	Course Code	Title of the Course	Hours/Week	Credits
4	25PCS4CC10	**Core Course - 10:** Edge Computing	6	4

Course Objectives
To understand the fundamentals and architecture of edge computing.
To extend their manipulative skills to apply in data analytics and its applications.
To help students to implement edge data storage security and blockchain integration.
To apply edge computing solutions for Industrial IoT applications and 5G network.
To interpret and evaluate real-world applications of edge Computing.
To design edge base AI applications in real-world scenario.

UNIT I: Introduction to Computing (18 Hours)

Impacts of computing - distributed computing - cluster computing - grid computing - cloud computing. Edge computing: Introduction - edge computing architecture - background essentials: IoT Devices - networking architecture - Edge Computing State-of-the-Art interfaces and devices - Edge computing simulators

UNIT II: Edge Analytics (18 Hours)

Types of data – Data analytics - Goals of and domains data analytics - Real-time applications of data analytics – Phases of data analytics – Types of data analytics - Edge data analytics - Architecture of edge analytics.

UNIT III: Edge Data Storage Security (18 Hours)

Edge data security - Data confidentiality – Authentication – Privacy - Preserving schemes – Edge based attack detection and prevention. Edge computing systems and block chain**:** Block chain - Block chain architecture and fundamentals - Block chain platform – Edge computing block chain.

UNIT IV: Edge Computing using IOT (18 Hours)

Edge computing using IIOT – Edge with 5G network- Edge artificial intelligence: A comprehensive Guide - Edge AI in the real world - Evaluating, Deploying, and Supporting edge AI applications.

UNIT V: Applications of Edge Computing (18 Hours)

Edge computing in autonomous vehicles - Smart cities - Industrial automation - Network functions – gaming - Financial sector – Augmented reality - Healthcare sector.

Teaching Methodology	Chart, PPT, chalk and talk
Assessment Methods	Seminar, Snap Test, MCQ

Books for Study:

1. Anitha Kumari. K, Sudha Sadasivam. G, Dharani. D, and Niranjana Murthy. M, (2022), *Edge computing Fundamentals advances and Applications*, CRC Taylor Francis group.
2. Daniel Situnayake & Jenny Plunkett Foreword by Pete Warden, (2023), *AI at the Edge Solving Real World Problems with Embedded Machine Learning*, OREILLY**.**
3. Ajit Singh, (2022), *edge computing***,** 3rd Edition Kindle Edition, Computing, Internet & Digital Media.

Books for Reference:

1. Charles Nehme, (2024), *Edge Computing: Revolutionizing Data Processing in the IoT Era*, Kindle Edition.
2. Javid Taheri, Javid Shuiguang Deng, (*2020), Edge Computing: Models, technologies and applications,* IET**.**

Websites and eLearning Sources:

1. api.pageplace.de/preview/DT0400.9781000483598_A42044171/preview-9781000483598_A42044171.pdf
2. www.oreilly.com/library/view/ai-at-the/9781098120191/ch01.html

3. prace-ri.eu/wp-content/uploads/Edge-Computing-An-Overview-of-Framework-and-Applications.pdf
4. www.slideshare.net/RemoMarconzini1/edge-computingpdf#14
5. www.youtube.com/watch?v=Xm8frqTZRVI
6. www.youtube.com/watch?v=8I8TuQ1evKk
7. www.youtube.com/watch?v=awXyXq21sdQ

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K - Level)**
	On successful completion of this course, students will be able to	
CO1	Describe the architecture of edge computing, including the roles of IoT devices, networking infrastructure, and edge servers.	**K1**
CO2	Classify different types of data and apply various data analytics techniques.	**K2**
CO3	Understand the fundamentals of blockchain technology, its architecture, and its integration with edge computing systems.	**K3**
CO4	Evaluate the applications of edge computing in various domains, including autonomous vehicles, smart cities, industrial automation, gaming, healthcare, and finance.	**K4**
CO5	Design and implement edge computing solutions for industrial IoT applications.	**K5**
CO6	Evaluate, deploy, and support edge AI applications in real-world scenarios.	**K6**

Relationship Matrix											
Semester	**Course Code**		**Title of the Course**							**Hours**	**Credits**
4	**25PCS4CC10**		**Core Course - 10:** Edge Computing							**6**	**4**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	2	2	3	2	2	3	2	3	3	2	**2.4**
CO2	3	2	3	2	3	3	2	3	2	3	**2.6**
CO3	3	2	3	3	3	2	3	3	3	2	**2.7**
CO4	2	3	3	3	2	3	2	3	2	3	**2.6**
CO5	2	2	3	3	2	3	2	3	3	2	**2.5**
CO6	3	3	2	3	2	3	3	3	2	2	**2.6**
										Mean Overall Score	**2.56 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
4	25PCS4ES03 A	**Discipline Specific Elective - 3:** Generative AI	4	3

Course Objectives
To introduce students to the fundamental concepts of Generative AI.
To familiarize students with Large Language Models (LLMs).
To develop an understanding of Prompt Engineering and AI Model.
To equip students with knowledge of data pre-processing techniques and training generative AI models.
To explore real-world applications of Generative AI across various domains.

UNIT I: Introduction to Generative AI (12 Hours)

Introduction – Overview of AI & ML - Natural Language Processing (NLP) in AI – Key areas and use cases - AI **sys**tems, tools, and frameworks - AI Layers: Supervised Learning – Semi Supervised Learning – Reinforcement Learning. Comparison of Generative AI with Traditional AI.

UNIT II: Large Language Models & Deep Learning (12 Hours)

Different Large Language Models - Components of an LLM -Building an LLM application -LLMs use cases - Limitations of LLMs - LLM hallucination mitigation strategies- Vector Databases & Vector Embeddings - Developing a Large Language Model - Adversarial attacks and security concerns in LLMs

UNIT III: Prompt Engineering (12 Hours)

Prompt Engineering: Key aspects of prompt engineering - Benefits of prompt engineering - Examples of prompt engineering applications - Comparing different prompt engineering techniques - Challenges of prompt engineering - Generative AI Developer Stack.

UNIT IV: Generative AI Applications (12 Hours)

Data Preprocessing**:** Probability and Statistics - Data Preprocessing Techniques - Model Training Techniques - Generative AI Applications: Art and Creativity - Image and Video Generation - Text Generation - Music Composition – Healthcare – Finance - Real-world use cases and challenges in deploying generative AI models

UNIT V: GPT Models and Applications (12 Hours)

GPT Models**:** Study of GPT architecture and variants - Applications of GPT models in text generation and dialogue systems – Case study-based implementation of GPT-based tasks - GPT-based Chatbot enhances E-Shop's customer support service.

Teaching Methodology	Chalk and talk, PPT.
Assessment Methods	Seminar, MCQ, Snap Test.

Books for Study:

1. Altaf Rehmani (2023), "*Generative AI for Everyone*: *Understanding the Essentials and Applications of This Breakthrough Technology*", Independently Published.
2. Numa Dhamani (2024), *"Introduction to Generative AI*", Kindle Edition.

Books for Reference:

1. Goodfellow, I., Bengio, Y., & Courville, A. (2016). *Deep Learning*. MIT Press.
2. Russell, S., & Norvig, P. (2021). *Artificial Intelligence: A Modern Approach* (4th Ed.). Pearson.
3. Patrick McCauley (2024), "*Generative AI for Everyone: A Practical Guidebook*", Independently Published.
4. Mark Reed (2023), "Practical Generative AI: Applying Large Language Models and Deep Learning", O'Reilly Media.
5. John D. Kelleher (2019), *"Deep Learning*", MIT Press.

Websites and eLearning Sources:

1. Coursera – "Generative AI Fundamentals" https://www.coursera.org/
2. https://www.edx.org/
3. https://www.udacity.com/course/

4. DeepLearning.AI – "Generative AI with Large Language Models"
5. Udacity – "Intro to Generative AI"

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K - Level)**
	On successful completion of this course, students will be able to	
CO1	Understand the fundamentals of Generative AI, including its key concepts and components.	**K1**
CO2	Explain the working principles of Large Language Models and their applications.	**K2**
CO3	Apply prompt engineering techniques to enhance AI model responses.	**K3**
CO4	Analyze data preprocessing techniques and their impact on Generative AI model performance.	**K4**
CO5	Evaluate the effectiveness of Generative AI applications in various real-world scenarios.	**K5**
CO6	Design and implement GPT-based AI solutions for specific tasks.	**K6**

Relationship Matrix											
Semester	**Course Code**		**Title of the Course**							**Hours**	**Credits**
4	**25PCS4ES03**		**Discipline Specific Elective - 3:** Generative AI							**4**	**3**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	2	3	2	3	2	3	3	3	2	2	**2.5**
CO2	3	3	3	2	3	3	3	3	1	2	**2.6**
CO3	3	3	2	2	2	2	1	3	3	2	**2.3**
CO4	3	3	1	2	2	3	3	3	3	2	**2.5**
CO5	3	2	3	2	2	3	3	3	2	2	**2.5**
CO6	2	3	2	3	2	2	3	3	3	1	**2.6**
									Mean Overall Score		**2.46 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
4	25PCS4ES03B	**Discipline Specific Elective - 3:** Immersive Technologies	4	3

Course Objectives
Get to Know about the concepts, principles, and technologies behind VR, AR, and MR
Understand the different development tools, software frameworks, and hardware required to create immersive experiences
Explore design principles specific to immersive technologies, emphasizing user experience and interaction design
Understands user behavior and psychology in immersive environments
Explore techniques for building applications across multiple platforms
Demonstrate immersive technologies application across industries such as entertainment, healthcare, and Sports.

UNIT I Human Computer Interaction (12 Hours)

Human Computer Interaction: Introduction - New Modalities - Current Controllers for Immersive Computing Systems - Hand Tracking and Hand Pose Recognition. Mixed Reality: Introduction - History - Concept. Virtual Reality: Definition - Virtuality - Virtual ObjectImage- Types of VR

UNIT II Virtual Reality (12 Hours)

Virtual Reality: Current VR Technologies - Hardware - Software - Benefits - Disadvantages - Examples and Case Study

UNIT III Augmented Reality (12 Hours)

Augmented Reality: Definition - Types of AR - Current AR Technologies - Hardware - Software - Benefits of AR - Disadvantages - Examples.

UNIT IV Cross Platform Theory (12 Hours)

Cross Platform Theory: The Role of Game Engines - Understanding 3d Graphics - Video Game Design - Controller Input. Virtual Reality Toolkit - VRTK - Future - Success - History - Unity. Best Practices: Handling Locomotion - Effective Use of Audio - Common Interaction Paradigms.

UNIT V Use Cases in Embodied Reality (12 Hours)

Use Cases In Embodied Reality: Health and Technology Ecosystem - Sports Extended Reality (XR) - Enterprise Training

Teaching Methodology	Chalk and talk, Lectures, Demonstrations, PPT.
Assessment Methods	Seminar, MCQ, Snap Test.

Books for Study:

1. Tacgin, Z. (2020). *Virtual and Augmented Reality: An Educational Handbook.* Cambridge Scholars Publishing, UK.
2. Pangilinan, E., Lukas, S., & Mohan, V. (2019). *Creating Augmented and Virtual Realities Theory and Practice for Next-Generation Spatial Computing*. O'Reilly Media, Inc., USA.

Books for Reference:

1. Doerner, R., Broll, W., Grimm, P., & Jung, B. (2022). *Virtual and Augmented Reality (VR / AR) Foundations and Methods of Extended Realities (XR).* Springer Link, USA.
2. Peddie, J. (2017). *Augmented Reality - Where We Will All Live*. Springer Publications, USA.
3. Schmalstieg, D., Höllerer, T. (2016). *Augmented Reality Principles and Practice*. Addison Wesley.

Websites and eLearning Sources:

1. http://vr-ar-book.org/
2. https://unity.com/unity/features/ar
3. https://learn.microsoft.com/en-us/windows/mixed-reality/discover/mixed-reality
4. https://quill.art/features.html

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, students will be able to	**Cognitive Levels (K - Level)**
CO1	Understand the background of Mixed Realities	**K1**
CO2	Differentiate the factors that determine the usability of supporting software and hardware for Immersive Technologies (AR/VR/MR/XR).	**K2**
CO3	Demonstrate an understanding of the theory, concepts and methods pertaining to immersive technologies	**K3**
CO4	Comprehend to act in variable and unfamiliar learning contexts with a fast-evolving technology	**K4**
CO5	Analyze the technical feasibility of XR applications and identify the challenges.	**K5**
CO6	Design and develop XR components and prototypes that can benefit the society at large	**K6**

Relationship Matrix											
Semester	**Course Code**	**Title of the Course**							**Hours**		**Credits**
4	**25PCS4ES03B**	**Discipline Specific Elective - 3:** Immersive Technologies							**4**		**3**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Scores of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	3	2	2	3	2	3	2	3	**2.6**
CO2	2	2	3	2	2	2	3	2	2	3	**2.3**
CO3	2	2	2	2	2	2	2	2	2	2	**2.0**
CO4	3	3	2	2	2	3	3	3	2	3	**2.6**
CO5	2	3	3	2	2	3	3	2	2	3	**2.5**
CO6	2	3	3	2	2	3	3	2	2	2	**2.4**
										Mean Overall Score	**2.4 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
4	**25PCS4PW02**	Major Project Work and Viva Voce	**-**	**2**

Course Objectives
Learn project planning, scheduling, task allocation, and time management skills essential for successful software development.
Practice gathering and analyzing requirements from stakeholders, translating them into software specifications and functionalities
Apply principles of software design to create robust architectures and design patterns for the project.
Implements the software solution using programming languages, frameworks, and tools learned during the course.
Conducts thorough testing of the software, ensuring functionality, reliability, and identifying and fixing bugs or issues.
Creates comprehensive documentation of the project, including technical specifications, user manuals, and presenting the project outcomes effectively.

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K - Level)**
	On successful completion of this course, students will be able to	
CO1	Identify the real-world problems on the project domain	**K1**
CO2	Comprehend the state-of-the-art requirements of the industry.	**K2**
CO3	Apply critical thinking, reasoning and creative thinking for software design in an industry as an individual or as a part of a team.	**K3**
CO4	Analyze the problem and provide solution by decision making.	**K4**
CO5	Develop interpersonal, communication and presentation skills	**K5**
CO6	Build the modules for a specific problem	**K6**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**					**Hours**		**Credits**
4	**25PCS4PW02**			Major Project Work and Viva Voce					**-**		**2**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Scores of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	2	3	1	2	3	3	3	2	2	3	**2.4**
CO2	2	1	2	3	2	2	3	2	3	3	**2.3**
CO3	2	2	3	2	2	2	3	2	2	3	**2.3**
CO4	2	2	2	3	2	3	2	3	2	3	**2.4**
CO5	3	3	3	2	3	2	3	2	2	3	**2.6**
CO6	2	3	3	2	2	2	2	2	3	3	**2.4**
										Mean Overall Score	**2.4 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
4	25PCS4CE01	Comprehensive Examination	0	2

Course Objectives
Learn the fundamental ideas, methods, and applications in Computer Science.
Explore how different areas of Computer Science are connected.
Develop critical thinking, logical reasoning, and problem-solving skills for complex tasks.
Improve coding skills and gain knowledge of multiple programming languages.
Understand advanced techniques for analyzing and interpreting data.

UNIT I:
Advanced Python Programming, Java Programming

UNIT-II:
Web Development using ASP.NET, Machine Learning

UNIT III:
Advanced PHP, No SQL using Mongo DB.

Teaching Methodology	Materials
Assessment Methods	MCQ

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, students will be able to	**Cognitive Levels (K - Level)**
CO1	Comprehend the basic functionalities of Python and Java Programming	**K1**
CO2	Describe the programming concepts	**K2**
CO3	Apply Machine Learning programming to real life problems	**K3**
CO4	Demonstrate the use of development tools in the ASP.NET	**K4**
CO5	Evaluate the functionality of PHP	**K5**
CO6	Design the database using Mongo DB	**K6**

Relationship Matrix											
Semester	**Course Code**		**Title of the Course**							**Hours**	**Credits**
4	**25PCS4CE01**		**Comprehensive Examination**							**0**	**2**
Course Outcomes	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	2	2	2	2	2	3	3	3	2	3	**2.4**
CO2	3	3	3	2	2	3	3	3	2	2	**2.6**
CO3	3	3	3	2	2	3	3	2	2	3	**2.6**
CO4	3	3	2	2	2	3	3	3	2	3	**2.6**
CO5	3	3	3	3	3	3	3	3	2	3	**2.9**
CO6	3	2	2	3	2	3	3	3	2	2	**2.5**
										Mean Overall Score	**2.6 (High)**