M Sc COMPUTER SCIENCE

LOCF SYLLABUS 2023

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 110 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.*

Common Core (CC): *A common core course is a shared educational element encompassing fundamental topics across disciplines within a school. It promotes interdisciplinary comprehension and collaboration among students by providing a foundational understanding of key subjects essential for academic and professional success across diverse fields of study.*

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.*

Generic Elective Courses (EG): *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 generic elective courses offered by other disciplines within the college, enhancing the diversity of their learning experience.*

Ability Enhancement Course (AE): *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 (SE): *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-paced Learning (SP): *This course promotes independent learning habits among students and they have to undergo the course outside the regular class hours within a specified timeframe.*

Comprehensive Examinations (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 five semesters (2 - 6). 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:

23	**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 - Elective

AE - Ability Enhancement Course

SP - Self-paced Learning

EG - Generic Elective

PW - Project and Viva Voce

CE - Comprehensive Examination

OR - Outreach Programme

IS – Internship

EVALUATION PATTERN

Continuous Internal Assessment

Sl No	Component	Marks Alloted
1	Mid Semester Test	30
2	End Semester Test	30
3	*Three Components (15 + 10 + 10)	35
4	Library Referencing (30 hours)	5
	Total	**100**

Passing minimum: 50 marks

* *The first component is a compulsory online test (JosTEL platform) comprising 15 multiple choice questions (10 questions at K1 level and 5 questions at K2 level); The second and the third components are decided by the course in-charge.*

Question Paper Blueprint for Mid and End Semester Tests

<table>
<tr><td colspan="4">Duration: 2 Hours</td><td colspan="3">Maximum Marks: 60</td></tr>
<tr><td colspan="2" rowspan="2">Section</td><td colspan="4">K levels</td><td rowspan="2">Marks</td></tr>
<tr><td>K1</td><td>K2</td><td>K3</td><td>K4</td><td>K5</td><td>K6</td></tr>
<tr><td colspan="2">A (compulsory)</td><td>7</td><td></td><td></td><td></td><td></td><td></td><td>7 × 1 = 7</td></tr>
<tr><td colspan="2">B (compulsory)</td><td></td><td>5</td><td></td><td></td><td></td><td></td><td>5 × 3 = 15</td></tr>
<tr><td colspan="2">C (either…or type)</td><td></td><td></td><td>3</td><td></td><td></td><td></td><td>3 × 6 = 18</td></tr>
<tr><td rowspan="4">D (2 out of 3)</td><td>For courses with K5 as the highest cognitive level, one K4 and one K5 question is compulsory.
(Note: two questions on K4 and one question on K5)</td><td></td><td></td><td></td><td>1</td><td>1*</td><td></td><td rowspan="4">2 × 10 = 20</td></tr>
<tr><td rowspan="3">For courses with K6 as the highest cognitive level: Mid Sem: two questions on K4 and one question on K5; End Sem: two questions on K5 and one question on K6)</td><td></td><td></td><td></td><td colspan="2">Mid Sem</td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td colspan="2">End Sem</td></tr>
<tr><td></td><td></td><td></td><td>1</td><td>1</td><td>1*</td></tr>
<tr><td colspan="6">Total</td><td>60</td></tr>
</table>

***** *Compulsory*

Question Paper Blueprint for Semester Examination

Duration: 3 Hours						**Maximum Marks: 100**
UNIT	**Section A** *(Compulsory)*	**Section B** *(Compulsory)*	**Section C** *(Either…or type)*	**Section D** *(3 out of 5)*		
	K1	**K2**	**K3**	**K4**	**K5**	**K6**
UNIT I	2	2	2	2*	2*	1*
UNIT II	2	2	2			
UNIT III	2	2	2			
UNIT IV	2	2	2			
UNIT V	2	2	2			
Marks	**10 × 1 = 10**	**10 × 3 = 30**	**5 × 6 = 30**	**3 × 10 = 30**		

** For courses with K6 as the highest cognitive level wherein one question each on K4, K5 and K6 is compulsory.*
(Note: two questions each on K4 and K5 and one question on K6)

Evaluation Pattern for One/Two-credit Courses

Title of the Course	CIA	Semester Examination	Total Marks
• Ability Enhancement Course	20 + 10 + 20 = 50	50 *(A member from the Department other than the course instructors)*	100
• Self-paced Learning • Comprehensive Examination	25 + 25 = 50	50 *(CoE)*	100
• Internship	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:

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

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

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 Objectives (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.

PROGRAMME STRUCTURE				
Semester	**Specification**	**Number of Courses**	**Hours**	**Credits**
1 - 4	Core Course	8	45	43
1 - 4	Core Practical	5	21	15
1, 2, 4	Elective	4	20	14
1	Ability Enhancement Course	1	2	1
2	Self-paced Learning	1	-	2
2	Skill Enhancement Course	1	4	3
2, 3	Generic Elective	2	8	6
2 - 4	Extra Credit Course	3	-	(9)
3, 4	Project Work and Viva Voce	2	20	20
4	Comprehensive Examination	1	-	2
2 - 4	Outreach Programme (SHEPHERD)	-	-	4
	Total	**28**	**120**	**110(9)**

M Sc COMPUTER SCIENCE							
Course Details					Scheme of Exams		
Sem	**Course Code**	**Title of the Course**	**Hours**	**Credits**	**CIA**	**SE**	**Final**
1	23PCS1CC01	**Core Course - 1:** Analysis and Design of Algorithms	6	6	100	100	100
	23PCS1CC02	**Core Course - 2:** Object Oriented Analysis and Design and C++	6	6	100	100	100
	23PCS1CP01	**Core Practical - 1:** Algorithm and OOPS	6	4	100	100	100
	23PCS1ES01	**Elective - 1:** Advanced Software Engineering	5	3	100	100	100
	23PCS1ES02	**Elective - 2:** Python Programming	5	3	100	100	100
	23PCS1AE01	**Ability Enhancement Course:** Big Data Analytics	2	1	100	-	100
		Total	**30**	**23**			
2	23PCS2CC03	**Core Course - 3:** Web Development Using ASP.NET	5	5	100	100	100
	23PCS2CC04	**Core Course - 4:** Java Programming	6	6	100	100	100
	23PCS2CP02	**Core Practical - 2:** ASP.NET	3	2	100	100	100
	23PCS2CP03	**Core Practical - 3:** Java Programming	3	2	100	100	100
	23PCS2SP01	**Self-paced Learning:** Computer Networks*	-	2	50	50	50
	23PCS2ES03A	**Elective - 3:** Artificial Intelligence	5	4	100	100	100
	23PCS2ES03B	**Elective - 3:** Data Warehousing and Data Mining					
	23PSS2SE01	**Skill Enhancement Course:** Soft Skills	4	3	100	-	100
	-	**Generic Elective - 1 (WS):** Refer ANNEXURE 1	4	3	100	100	100
	-	Extra Credit Courses (MOOC/Certificate Courses) - 1	-	(3)			
		Total	**30**	**27(3)**			
3	23PCS3CC05	**Core Course - 5:** Full Stack App Development	6	6	100	100	100
	23PCS3CC06	**Core Course - 6:** Advanced Python and MongoDB	6	6	100	100	100
	23PCS3CC07	**Core Course - 7:** Compiler Design	5	4	100	100	100
	23PCS3CP04	**Core Practical - 4:** Full Stack App Development	4	3	100	100	100
	23PCS3CP05	**Core Practical - 5:** Advanced Python and MongoDB	5	4	100	100	100
	-	**Generic Elective - 2 (BS):** Refer ANNEXURE 2	4	3	100	100	100
	23PCS3PW01	Mini Project and Viva Voce	-	2	100	100	100
	-	Extra Credit Courses (MOOC/Certificate Courses) - 2	-	(3)			
		Total	**30**	**28(3)**			
4	23PCS4CC08	**Core Course - 8:** Cloud Computing	5	4	100	100	100
	23PCS4PW02	Major Project Work and Viva Voce	20	18	100	100	100
	23PCS4ES04A	**Elective - 4:** Digital Marketing	5	4	100	100	100
	23PCS4ES04B	**Elective - 4:** Immersive Technologies					
	23PCS4CE01	Comprehensive Examination*	-	2	50	50	50
	-	Extra Credit Courses (MOOC/Certificate Courses) - 3		(3)			
		Total	**30**	**28(3)**			
2 - 4	23PCW4OR01	Outreach Programme (SHEPHERD)		4			
1 - 4		**Total (2 years)**	**120**	**110(9)**			

*- for grade calculation 50 marks are converted into 100 in the mark statements

ANNEXURE 1
Generic Elective - 1 (WS)*

Course Details		
School	**Course Code**	**Title of the Course**
SCS	23PCA2EG01	Applied Statistics Using R
	23PDS2EG01	Discrete Mathematics
	23PMA2EG01A	Mathematical Foundations for Computer Applications
	23PMA2EG01B	Mathematical Foundations for Computer Science

**Offered to students from other Departments within School*

ANNEXURE 2
Generic Elective - 1 (BS)*

Course Details		
School	**Course Code**	**Title of the Course**
SBS	23PBI3EG02	First Aid Management
	23PBT3EG02	Food Technology
	23PBO3EG02	Horticulture and Landscaping
SLAC	23PEN3EG02	English for Effective Communication
SMS	23PCO3EG02	Basics of TallyPrime
	23PCC3EG02	Dynamics of Human Behaviour in Business
	23PCP3EG02	Social Psychology
	23PEC3EG02	Managerial Economics
	23PHR3EG02	Counselling and Guidance
SPS	23PCH3EG02	Health Science
	23PEL3EG02	Computer Hardware and Networks
	23PPH3EG02A	Physics for Competitive Exams
	23PPH3EG02B	Nanoscience

**Offered to students from other Schools*

Semester	Course Code	Title of the Course	Hours/Week	Credits
1	23PCS1CC01	**Core Course - 1:** Analysis and Design of Algorithms	6	6

Course Objectives
Enable the students to learn the Elementary Data Structures Algorithms
Presents an Introduction to the Algorithms, their analysis and design
Discuss various methods like Basic Traversal and Search Techniques, Divide and Conquer method, Dynamic programming, Backtracking
Understood the Various Design And Analysis of the algorithms

UNIT I: Introduction **(18 Hours)**

Introduction: - Algorithm Definition and Specification - Space complexity - Time Complexity Asymptotic Notations - Elementary Data Structure: Stacks and Queues - Binary Tree - Binary Search Tree - Heap - Heap sort- Graph.

UNIT II: Traversal and Search Techniques **(18 Hours)**

Basic Traversal and Search Techniques: Techniques for Binary Trees - Techniques for Graphs - Divide and Conquer: - General Method - Binary Search - Merge Sort - Quick Sort.

UNIT III: Greedy Method **(18 Hours)**

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

UNIT IV: Dynamic Programming **(18 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 **(18 Hours)**

Backtracking: General Method - 8-QueensProblem - Sum of Subsets - Graph Coloring - Hamiltonian Cycles - Branch And Bound: - The Method - Traveling Sales person.

Teaching Methodology	Videos, PPT, Demonstration and creation of models

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.

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, the students will be able to	**Cognitive Levels (K-Level)**
CO1	demonstrate specific search and sort algorithms using divide and conquer technique	**K1**
CO2	get knowledge about algorithms and determine that time complexity	**K2**
CO3	gain a good understanding of Greedy Method and Its algorithm	**K3**
CO4	describe graphs using dynamic programming techniques	**K4**
CO5	demonstrate the concept of backtracking branch and bound technique	**K5**
CO6	compare different sorting and searching techniques	**K6**

Relationship Matrix											
Semester	**Course Code**		**Title of the Course**							**Hours**	**Credits**
1	**23PCS1CC01**		**Core Course - 1:** Analysis and Design of Algorithms							**6**	**6**
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	3	2	1	3	2	2	1	3	**2.1**
CO2	3	2	2	3	2	1	3	3	2	1	**2.2**
CO3	3	2	3	3	3	3	2	1	3	1	**2.4**
CO4	1	2	1	1	3	2	3	3	1	3	**2.0**
CO5	3	1	2	1	3	2	3	3	3	2	**2.3**
CO6	2	3	3	2	2	1	3	3	1	2	**2.2**
									Mean Overall Score		**2.2 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
1	23PCS1CC02	**Core Course - 2:** Object Oriented Analysis and Design and C++	6	6

Course Objectives
Present The Object model, classes and objects, object orientation, machine view and model management view
Enables the students to learn the basic functions, principles and concepts of objectoriented analysis and design
Enable the students to understand C++ language with respect OOAD

UNIT I: Object Model **(18 Hours)**

The Object Model: The Evolution of the Object Model - Elements of the Object Model - Applying the Object Model. Classes and Objects: The Nature of an Object - Relationship among Objects**.**

UNIT II: Classes and Objects **(18 Hours)**

Classes and Object: Nature of Class - Relationship Among Classes - The Interplay of Classes and Objects. Classification: The importance of Proper Classification - Identifying classes and objects - Key Abstractions and Mechanism.

UNIT III: C++ Introduction **(18 Hours)**

Introduction to C++ - Input and output statements C++ - Declarations - Control Structures - Functions in C++.

UNIT IV: Inheritance and Overloading **(18 Hours)**

Classes and Objects - Constructors and Destructors - Operators Overloading - Type Conversion Inheritance - Pointers and Arrays.

UNIT V: Polymorphism and Files **(18 Hours)**

Memory Management Operators - Polymorphism - Virtual functions - Files - Exception Handling -String Handling - Templates.

Teaching Methodology	Videos, PPT, Demonstration and creation of models

Books for Study

1. Booch, G. (1998). *Object oriented analysis and design with applications.* (2nd Ed.). Pearson Education.
2. Kamthane, A. N. (2003). *Object-oriented programming with ANSI & Turbo C++*. First Indian Print. Pearson Education.

Book for Reference

1. Balagurusamy. (2003). Object oriented programming with C++ (2nd Ed.). TMH.

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, the students will be able to	**Cognitive Levels (K-Level)**
CO1	understand the concept of Object-Oriented development and modeling techniques.	**K1**
CO2	gain knowledge about the various steps performed during object design.	**K2**
CO3	abstract object-based views for generic software systems.	**K3**
CO4	link OOAD with C++ language.	**K4**
CO5	apply the basic concept of OOPs and familiarize to write C++ program.	**K5**
CO6	show the behaviour of exception handily and its streams	**K6**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
1	**23PCS1CC02**			**Core Course - 2:** Object Oriented Analysis and Design and C++						**6**	**6**
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	3	2	1	3	2	2	1	3	**2.1**
CO2	3	2	2	3	2	1	3	3	2	1	**2.2**
CO3	3	2	3	3	3	3	2	1	3	1	**2.4**
CO4	1	2	1	1	3	2	3	3	1	3	**2.0**
CO5	3	1	2	1	3	2	3	3	3	2	**2.3**
CO6	2	3	3	2	1	3	2	2	1	3	**2.1**
Mean Overall Score											**2.1 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
1	23PCS1CP01	**Core Practical - 1**: Algorithm and OOPS	6	4

Course Objectives
This course covers the basic data structures like Stack, Queue, Tree, List
This course enables the students to learn the application of the data structures using various techniques
It also enables the students to understand C++ language with respect to OOAD concepts
Application of OOPS concepts

List of Programs (75 Hours)

1. Write a program to solve the tower of Hanoi using recursion.
2. Write a program to traverse through binary search tree usingtraversals.
3. Write Program to perform various operations on stack using linked list.
4. Write A Program to perform various operations in a circular queue.
5. Write Program to sort an array an element using quicksort.
6. Write a program to solve number of elements in ascending order using heap sort.
7. Write Program to Solve the knapsack problem using greedy method.
8. Write a program to search for an element in a tree using divide & conquer strategy.
9. Write a program to place the 8 queens on an 8X8 matrix so that no two queens attack.
10. Write a C++ program to perform Virtual Function.
11. Write a C++ program to perform Parameterized constructor.
12. Write a C++ program to perform Friend Function.
13. Write a C++ program to perform Function Overloading.
14. Write a C++ program to perform Single Inheritance.
15. Write a C++ program to perform Employee Details Using files.

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, the students will be able to	**Cognitive Levels (K-Level)**
CO1	understand the concepts of object oriented with respect to C++.	**K1**
CO2	understand and implement OOPS concepts	**K2**
CO3	implement data structures like Stack, Queue, Tree, List using C++.	**K3**
CO4	apply data structures for Sorting, Searching using different techniques.	**K4**
CO5	apply and implement major object oriented concepts like function overloading, constructors and inheritance to solve realworld problems.	**K5**
CO6	demonstrate virtual functions and Input/Output Streams.	**K6**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
1	**23PCS1CP01**			**Core Practical - 1:** Algorithm and OOPS Lab						**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	2	2	3	3	3	**2.4**
CO2	3	2	2	3	2	2	2	2	3	2	**2.3**
CO3	3	2	2	3	2	2	2	2	3	2	**2.3**
CO4	2	2	2	3	2	2	2	3	2	2	**2.2**
CO5	2	2	3	2	2	2	3	2	2	3	**2.3**
CO6	2	3	3	2	1	3	2	2	1	3	**2.1**
									Mean Overall Score		**2.2 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
1	23PCS1ES01	**Elective - 1:** Advanced Software Engineering	5	3

Course Objectives
Introduction to Software Engineering, Design, Testing and Maintenance.
Enable the students to learn the concept of Software Engineering.
Learn about Software Project Management, Software Design & Testing.

UNIT I: Introduction **(15 Hours)**

Introduction: 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 - Case study: Student Result Management System. Software Quality Management –Software Quality, Software Quality Management System, ISO 9000, SEI CMM.

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 -Halstead‟s software science -Staffing level estimation -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 - IEEE Recommended Practice for Software Design Description.

UNIT V: Software Testing **(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 - Maintenance Process - Reverse Engineering - Software Re-engineering - Configuration Management Activities.

Teaching Methodology	Videos, PPT, Demonstration and creation of models

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.*

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, the students will be able to	**Cognitive Levels (K-Level)**
CO1	understand Software Engineering Process.	**K1**
CO2	understand Software Project Management Skills, design and quality management.	**K2**
CO3	analyze Software Requirements and Specification.	**K3**
CO4	analyze Software Testing, Maintenance and Software ReEngineering.	**K4**
CO5	design and conduct various types and levels of software quality for software projects.	**K5**
CO6	distinguish Software Testing Strategies.	**K6**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
1	**23PCS1ES01**			**Elective - 1:** Advanced Software Engineering						**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	3	2	2	3	2	3	3	3	**2.6**
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	**2.6**
CO6	2	3	3	2	3	2	2	2	2	3	**2.4**
										Mean Overall Score	**2.4 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
1	23PCS1ES02	**Elective - 2:** Python Programming	5	3

Course Objectives
Present introduction Python, creation web applications, network applications and working in the clouds.
Use functions for structuring Python programs
Understand different Data Structures in Python
Represent compound data using Python lists, tuples and dictionaries

UNIT I: Introduction **(15 Hours)**

Python: Introduction -Numbers -Strings -Variables -Lists -Tuples -Dictionaries -Sets -Comparison.

UNIT II: Code Structures **(15 Hours)**

Code Structures: if, elseif, and else -Repeat with while -Iterate with for -Comprehensions -Functions -Generators -Decorators -Namespaces and Scope -Handle Errors with try and except -User Exceptions

UNIT III: Modules, Packages, and Programs **(15 Hours)**

Modules, Packages, and Programs: Standalone Programs -Command-Line Arguments -Modules and the import Statement -The Python Standard Library. **Objects and Classes:** Define a Class with class -Inheritance -Override a Method -Add a Method -Get Help from Parent with super -In self Defense –Get and Set Attribute Value with Properties -Name Mangling for Privacy -Method Types -Duck Typing -Special Methods -Composition.

UNIT IV: Data Types **(15 Hours)**

Data Types: Text Strings -Binary Data. **Storing and Retrieving Data:** File Input/Output -Structured Text Files -Structured Binary Files - Relational Databases -NoSQL Data Stores. **Web:** Web Clients -Web Servers -Web Services and Automation.

UNIT V: Systems **(15 Hours)**

Systems: Files -Directories -Programs and Processes -Calendars and Clocks. **Concurrency:** Queues -Processes -Threads -GreenThreads and gevent -twisted-Redis. **Networks:** Patterns -The Publish -Subscribe Model -TCP/IP -Sockets –ZeroMQ -Internet Services -Web Services and APIs -Remote Processing -Big Fat Data and MapReduce -Working in the Clouds.

Teaching Methodology	Videos, PPT, Demonstration and creation of models

Books for Study

1. Lubanovic, B. (2014). *Introducing Python,* (1st Ed.). O'Reilly Inc (Second Release).
2. Lutz, M. (2013). *Learning Python*, (5th Ed.). O'Reilly Inc.

Books for Reference

1. Beazley, D. M. (2009). *Python essential edition*. Addison Wesley.
2. Taneja, S., & Naveen, K. (2017). *Python Programming - A Modular Approach,* (1st Ed.). Pearson India Pearson Publications.

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, the students will be able to	**Cognitive Levels (K-Level)**
CO1	understand the basic concepts of Python Programming.	**K1**
CO2	understand File Operations, Classes and Objects.	**K2**
CO3	acquire Object Oriented Skills in Python.	**K3**
CO4	develop Web applications using Python.	**K4**
CO5	develop Client Server Networking applications.	**K5**
CO6	discover business applications to solve real time problems.	**K6**

Relationship Matrix											
Semester	**Course Code**		**Title of the Course**						**Hours**	**Credits**	
1	**23PCS1ES02**		**Elective - 2:** Python Programming						**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	3	2	2	3	2	3	3	3	**2.6**
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	**2.6**
CO6	3	2	1	3	3	2	3	3	2	3	**2.5**
Mean Overall Score											**2.5 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
1	23PCS1AE01	**Ability Enhancement Course:** Big Data Analytics	2	1

Course Objectives
Introduction to Big data analytics and Careers in Big data
Understand different Methodologies about Hadoop Technology
This course enables the students to learn the HBase and YARN Technologies

UNIT I: Overview of Big Data **(6 Hours)**

What is big data -Structuring Big data -Elements of Big data -Big data analytics- Careers in Big data. EXPLORING THE USE OF BIG DATA IN BUSINESS: Use of big data in social networking -Preventing Fraudulent Activities -Detecting Fraudulent Activities in Insurance Sector -Retail Industry.

UNIT II: Technologies for Handling Big Data **(6 Hours)**

Distributed and parallel computing for Big data -Hadoop -Cloud computing and big data - Understanding Hadoop Ecosystem: Hadoop Ecosystem -Hadoop Distributed File System -Map Reduce.

UNIT III: HBase **(6 Hours)**

HBase Architecture -Storing big data with HBase -Interacting with the Hadoop Ecosystem -Combining HBase and HDFS -Hive -Pig.

UNIT IV: Big Data Technology **(6 Hours)**

Exploring the big data stack -virtualization and big data. Storing Data in Database and Data Warehouse: RDBMS and Big data.

UNIT V: Hadoop Yarn Architecture **(6 Hours)**

YARN Architecture -Working of YARN -YARN Schedulers. Exploring Hive: Hive services.

Teaching Methodology	Videos, PPT, Demonstration and creation of models

Book for Study

1. DT Editorial Services. (2017). *Big data black book*. Dreamtech Press.

Books for Reference

1. Minelli, M., Chambers, M. & Dhiraj, A. (2014). *Big Data*. Big Analytics. Wiley.
2. Sathi, A. (2013). *Big Data Analytics: Disruptive Technologies for Changing the Game*. Elsevier.
3. Mohanty, S., Jagadeesh, M. & Srivatsa, H. (2013). *Big Bata Imperatives: Enterprise Big Data warehouse, BI implementations and Analytics*. Apress Media.

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, the students will be able to	**Cognitive Levels (K-Level)**
CO1	analyze and interpret data using Excel's data analysis tools	**K1**
CO2	evaluate and compare different data analysis techniques and approaches in Excel	**K2**
CO3	design and create comprehensive data visualizations, reports, and dashboards using Excel's advanced charting and visualization features	**K3**

Relationship Matrix											
Semester	**Course Code**		**Title of the Course**						**Hours**	**Credits**	
1	**23PCS1AE01**		**Ability Enhancement Course:** Big Data Analytics						**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	2	3	2	2	2	2	2	3	3	3	**2.4**
CO2	3	2	2	3	2	2	2	2	3	2	**2.3**
CO3	2	2	3	2	3	3	2	2	3	3	**2.5**
										Mean Overall Score	**2.3 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
2	23PCS2CC03	**Core Course - 3:** Web Development Using ASP.NET	5	5

Course Objectives
Understand the concept and architecture of ASP.NET
Create rich GUI web applications using Visual Studio.NET
Learn and implement new features in ASP.NET
Discuss and extend data list and data grid controls
Demonstrate the database connectivity in ASP.NET

UNIT I: Introducing .Net **(15 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 **(15 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 **(15 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. Data Source Controls: The Grid View- Formatting the Grid View- Editing with the Grid View.

UNIT IV: Building Websites **(15 Hours)**

Building Websites using ASP.NET Core Razor Pages: Understanding Web Development - Understanding ASP.NET Core - Exploring Razor Pages - Using Entity Framework Core with ASP.NET Core - Using Razor Class Libraries. Building Websites using the Model View Controller Pattern: Setting Up am ASP.NET Core MVC Website - Exploringan ASP.NET Core MVC Website - Customizingan ASP.NET Core MVC Website.

UNIT V - Querying and Manipulating Data **(15 Hours)**

Querying And Manipulating Data Using Linq: Writing LINQ Queries-Working with Sets and Bags using LINQ Using EF core. Building And Consuming Web Services: Building Web Services using ASP.NET Core Web API - Documenting and Testing Web Services - Consuming Services using HTTP Clients - Implementing Advanced Features.

Teaching Methodology	Chalk and talk, Lectures, Demonstrations, PPT.

Books for Study

1. MacDonald, M. (2007). *Beginning ASP.NET 3.5 in C# 2008.* (2nd Ed.). Apress.
   UNIT - I *Chapter 1, Chapter 2, Chapter 3, Chapter 4.*
   UNIT - II *Chapter 5, Chapter 6, Chapter 7, Chapter 8, Chapter 10.*
   UNIT - III *Chapter 13, Chapter 15, Chapter 16, Chapter 17.*
2. Mark, J.P. (2019). *C# 8.0 and .NET Core 3.0 - Modern Cross-Platform Development,*

(4th Ed.). Packt Publishing Limited.

UNIT - IV *Chapter 15, Chapter 16.*

UNIT - V *Chapter 12, Chapter 18.*

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.). Apress.
3. Adam, F. (2020). *Pro ASP.NET Core 3, (*18th Ed.). Apress.
4. Balagurusamy, E. (2015). *Programming in C#*, (4th Ed.). McGraw-Hill Education Private Limited.

Websites and eLearning Sources

1. http://eng.harran.edu.tr/~msuzer/files/vp/CSharp.pdf
2. https://www.tutorialspoint.com/asp.net/index.htm
3. https://www.w3schools.com/asp/default.asp

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, students will be able to	**Cognitive Levels (K - Level)**
CO1	recollect the fundamental concepts of .NET frame work	**K1**
CO2	understand the use of various web controls and rich controls	**K2**
CO3	make use of data base connectivity in ASP.NET Management	**K3**
CO4	investigate the new features in ASP.NET	**K4**
CO5	observe the web pages using MVC	**K5**
CO6	define the use of LINQ in querying multidimensional tables	**K6**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**					**Hours**	**Credits**	
2	**23PCS2CC03**			**Core Course - 3:** Web Development Using ASP.Net					**5**	**5**	
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	2	2	3	2	2	**2.2**
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	**2.55 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
2	23PCS2CC04	**Core Course - 4:** Java Programming	6	6

Course Objectives
Develop solutions for a range of problems using object-oriented programming
Solve simple problems using the fundamental syntax and semantics of the Java Programming language
Use the Java event-handling model to respond to events arising from the GUI Components.
Acquire knowledge of threads and JDBC programming techniques in Java
Learn to apply networking concepts through Java program

UNIT I: Classes and Objects **(18 Hours)**

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 and Packages **(18 Hours)**

Interfaces-Structure of an Interface - Implementation of an Interface Inheritance. Packages -Placing the Classes in a Package - Package Hierarchy 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: Swings **(18 Hours)**

Applet class - Icons - Jlabel Control - Joption Pane Class - Jtext Field Control JButton Control - JCheck Box Control - Jradio Button Control Menus. Exception Handling: Default Exception Handling - Exception and Error Classes - Catch Block Searching Pattern - Custom Exceptions. I/O Streams: Text and Binary Formats of Data Input Stream and Output Stream Classes - Reader and Writer Classes - Data Output Stream and Data Input Stream Classes.

UNIT IV: Threads **(18 Hours)**

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

UNIT V: Remote Method Invocation **(18 Hours)**

Remote Interface- Java. Rmi. Server Package The Naming Class - Creating RMI Client And Server Classes. 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

Teaching Methodology	Chalk and talk, Lectures, Demonstrations, PPT.

Book for Study

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

UNIT I - *Chapter 5, Chapter 6*
UNITII - *Chapter 7, Chapter 8*
UNIT III - *Chapter 11, Chapter 14*
UNIT IV - *Chapter 13, Chapter 15, Chapter 18*
UNIT V - *Chapter 19, Chapter 2*0

Books for Reference

1. Schildt, H. (2018). *Java 2: Complete Reference*, (11th Ed.). Tata McGraw-Hill.
2. Balagurusamy, E. (2018). *Programming with JAVA*, (6th Ed.). Tata McGraw-Hill.
3. Lassoff, M. (2017). *Java Programming for Beginners*, (1st Ed.). Packt Publishing.

Course Outcome		
CO No.	**CO- Statements** On successful completion of this course, students will be able to	**Cognitive Levels (K - Level)**
CO1	find solutions for a range of problems using object-oriented programming.	**K1**
CO2	explain the Java Event-Handling model GUI Components.	**K2**
CO3	solve problems using the fundamental syntax and semantics of the Java Programming Language.	**K3**
CO4	examine JDBC programming techniques in Java.	**K4**
CO5	evaluate Remote real-time applications using RMI and Servlet.	**K5**
CO6	build RMI applications	**K6**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
2	**23PCS2CC04**			**Core Course - 4:** Java Programming						**6**	**6**
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		**2.48 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
2	23PCS2CP02	**Core Practical - 2:** ASP.NET	3	2

Course Objectives
Understand the concept and architecture of ASP.NET
Create rich GUI web applications using Visual Studio.NET
Learn and implement new features in ASP.NET
Discuss and extend data list and data grid controls
Demonstrate the database connectivity in ASP.NET

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 (using Session and Application)
6. Data Retrieval, Updating using ADO.NET (using Stored Procedure)
7. Template Creation using Data List and Data Grid
8. Sorting and Paging using Data Grid
9. Build website using RAZOR pages
10. Create a database using entity framework

Teaching Methodology	Chalk and talk, Lectures, Demonstrations, PPT.

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, students will be able to	**Cognitive Levels (K - Level)**
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 Razor pages.	**K5**
CO6	design web pages by integrating web services and ASP.NET	**K6**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
2	**23PCS2CP02**			**Core Practical - 2:** 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	2	2	3	2	**2.4**
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
2	23PCS2CP03	**Core Practical - 3:** Java Programming	3	2

Course Objectives
Demonstrate the basic concepts of OOPS
Demonstrate the behavior of Exception handling and Multithreading
Implement the GUI techniques Event handling, Applet and Swing
Develop programming aspect with files and networking
Apply JDBC methods to establish connection with database

List of Exercises

1. Classes & Objects
2. Packages & Interfaces
3. Inheritance
4. Exception Handling
5. Multithreading
6. Swing
7. Event Handling Mechanisms
8. Streams and Files
9. Networking
10. Servlets

Teaching Methodology	Chalk and talk, Lectures, Demonstrations, PPT.

Course Outcome		
CO No.	**CO- Statements** On successful completion of this course, students will be able to	**Cognitive Levels (K- Level)**
CO1	show the behavior of exception handling and multithreading.	**K1**
CO2	demonstrate the basic concepts of oops.	**K2**
CO3	apply the JDBC methods to establish connection with Database.	**K3**
CO4	examine the GUI techniques such as Event handling, Appletand Swing.	**K4**
CO5	develop programming aspect with files and networking.	**K5**
CO6	build applications using JDBC	**K6**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
2	**23PCS2CP03**			**Core Practical - 3:** Java Programming						**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	**2.46 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
2	23PCS2SP01	**Self-paced Learning:** Computer Networks	-	2

Course Objectives
Understand the services, functions, and inter-relationship of different layers in network models
Describe how modules in different layers inter-operate and analyze their enactment.
Learn various protocols used in communication.
Understand the various networks and switching concept
Understand the concept of Quality of Service

UNIT I Introduction

Introduction: Data Communications - Networks- The Internet - Protocols and Standards-Network Models - Layered Tasks - The OSI Model - Layers in the OSI Model - TCP/IP Protocol Suite-Addressing.

UNIT II PHYSICAL LAYER AND MEDIA

Physical Layer and Media: Analog and Digital - Analog to Digital Conversion - Transmission Modes - Digital to Analog Conversion - Multiplexing - Transmission Media - Guided Media - Unguided Media -Switching - Circuit Switched Networks - Datagram Networks - Virtual Circuit Networks

UNIT III DATA LINK LAYER

Data Link Layer: Error Detection and Correction - Block Coding - Cyclic codes - Check sum - Data Link Control - Framing - Flow and error control - Protocols - Noiseless Channels - Noisy Channels - Point to Point Protocol - Channelization - IEEE 802.11 - Bluetooth - Cellular Telephony - Satellite Networks.

UNIT IV NETWORK LAYER

Network Layer: IPV4 Addresses - IPV6 Addresses - Internetworking - IPV4 - IPV6 - Transition from IPv4 to IPv6 - Address mapping - ICMP - IGMP - Delivery - Forwarding - Unicast Routing Protocols - Multicast Routing Protocols.

UNIT V TRANSPORT LAYER AND APPLICATION LAYER

Transport Layer and Application Layer: Process to Process Delivery - UDP - TCP - SCTP - Data Traffic - Congestion - Congestion Control - Quality of Service. Application Layer: Name Space -Domain Name Space-Remote Logging - Email & amp; File Transfer.

Teaching Methodology	Chalk and talk, Lectures, Demonstrations, PPT.

Book for Study

1. Forouzan, A.B. (2009). *Data Communications and Networking*, (4th Ed.). Tata McGraw-Hill Publishing Company Limited.
   UNIT-I *Chapter 1, Chapter 2*
   UNIT-II *Chapter 3, Chapter 4, Chapter 6, Chapter 7*
   UNIT-III *Chapter 10, Chapter 11, Chapter 16*
   UNIT-IV *Chapter 20, Chapter 21*
   UNIT-V *Chapter 24, Chapter 25 Chapter 26*

Books for Reference

1. Stallings, W. (2018). *Data and Computer Communication*, (9th Ed.). Dorling Kindersley Pvt. Ltd.
2. Tanenbaum, S.A. & Feamster, N. (2019). *Computer Networks*, (5th Ed.). Pearson Education.
3. Kurose, F.J & Ross, K.W. (2017). *Computer Networks*, (7th Ed.). Pearson Education.

Websites and eLearning Sources

1. https://jostel.sjctni.edu:8085/moodle/course/view.php?id=85
2. https://www.javatpoint.com/computer-network-tutorial
3. https://www.geeksforgeeks.org/basics-computer-networking/

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, students will be able to	**Cognitive Levels (K - Level)**
CO1	describe the services, functions, and inter-relationship of different layers in network models	**K1**
CO2	illustrate the concept of physical layer and media	**K2**
CO3	apply various protocols used in communication.	**K3**
CO4	discover the inter-operability of modules in different layers and their enactment.	**K4**
CO5	understand the various networks and switching concept.	**K5**
CO6	estimate the functionality of various Networking Technologies using protocols.	**K6**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
2	**23PCS2SP01**			**Self-paced Learning:** Computer Networks						**-**	**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	1	2	2	2	3	3	2	2	3	**2.3**
CO2	2	3	1	3	2	2	3	2	3	3	**2.4**
CO3	2	2	3	2	2	3	2	3	3	2	**2.4**
CO4	3	3	2	1	3	3	2	3	2	3	**2.5**
CO5	2	2	3	3	2	2	3	2	3	2	**2.4**
CO6	2	3	2	2	2	3	3	2	3	3	**2.5**
										Mean Overall Score	**2.42 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
2	23PCS2ES03A	**Elective - 3:** Artificial Intelligence	5	4

Course Objectives
Apply the fundamentals of Artificial Intelligence (AI) and its foundations for solving AI problems
Solve real life problems using AI techniques like searching and game playing in a state space representation
Propose solutions using knowledge representation, logic and heuristic search for AI problems
Develop applications using Artificial Intelligence techniques and Data Mining Tools
Discuss the concepts of Expert Systems and Machine Learning

UNIT I - Problem solving using AI and Heuristic Search Techniques (15 Hours)

Introduction: Artificial Intelligence and Problem solving: Definition - AI problems - Underlying Assumption - AI Technique. Problems, Problem Spaces and Search: Defining the problem as state space search - Production systems. Heuristic Search Techniques: Generate and Test - Constraint Satisfaction- Means - End Analysis

UNIT II: Knowledge Representation Issues, Using Predicate Logic (15 Hours)

Knowledge Representation Issues: Representations and mappings - Approaches to Knowledge representations. Using Predicate Logic: Representing simple facts in logic - Representing Instance and ISA relationships - Computable functions and predicates - Resolution.

UNIT III: Representing Knowledge Using Rules, Statistical Reasoning (15 Hours)

Representing Knowledge using Rules: Procedural Vs Declarative knowledge - Logic programming - Backward vs Forward Reasoning. STATISTICAL REASONING: Probability and Baye's Theorem- Bayesian Networks -Dempster-Shafer Theory.

UNIT IV: Knowledge in Learning (15 Hours)

Knowledge in Learning: A Logical formulation of Learning - Knowledge in Learning - Explanation based learning - Learning using Relevance Information

UNIT V: Natural Language Processing (15 Hours)

Natural Language Processing: Introduction - Syntactic Processing - Semantic Analysis - Discourse and Pragmatic Processing - Statistical Natural Language Processing - Spell Checking

Teaching Methodology	Chalk and talk, Lectures, Demonstrations, PPT.

Books for Study

1. Knight, E.R.K. & Shivashankar, B.N. (2017). *Artificial Intelligence,* (3rd Ed.). Tata McGraw-Hill.
   UNIT - I *Chapter 1(1.1,1.2,1.3), Chapter 2(2.1,2.2) Chapter 3 (3.1, 3.5,3.6)*
   UNIT - II *Chapter 4(4.1,4.2), Chapter 5(5.1,5.2,5.3,5.4)*
   UNIT - III *Chapter 6(6.1,6.2,6.3), Chapter 8(8.1,8.3,8.4)*
   UNIT - V *Chapter 15(15.1,15.2,15.3,15.4,15.5,15.6)*
2. Norvig, S.R.P. (2010). *Artificial Intelligence- A Modern Approach,* (3rd Ed.). Pearson Education.
   UNIT - IV *Chapter 19(19.1,19.2,19.3,19.4)*

Books for Reference

1. Seshadri, S. (2017). *A first course in Artificial Intelligence and Agent Technology,* (1st Ed.) LAP LAMBERT Academic Publishing.

2. Wolfgang, E. (2017). *Introduction to Artificial Intelligence*, (2nd Ed.). Springer International PublishingG.
3. Chowdhary, K.R. (2020). *Fundamentals of Artificial Intelligence*, (1st Ed.). Springer Nature IndiaPrivate Limited.

Websites and eLearning Sources

1. https://zoo.cs.yale.edu/classes/cs470/materials/aima2010.pdf.
2. https://www.vssut.ac.in/lecture_notes/lecture1428643004.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 knowledge representation issues and predicate logic usage to real-world problems.	**K1**
CO2	make use of the logical reasoning techniques.	**K2**
CO3	distinguish the Artificial Intelligence with Human Intelligence and Traditional Information Processing.	**K3**
CO4	analyze the logical statements from informal language to propositional logic expressions.	**K4**
CO5	elaborate the role of Natural Language processing in building Intelligent Systems.	**K5**
CO6	show the basic principles, models, and algorithms of Artificial Intelligence.	**K6**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
2	**23PCS2ES03A**			**Elective - 3:** Artificial Intelligence						**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	3	3	3	2	1	3	2	3	2	3	**2.5**
CO2	2	3	3	2	2	2	3	2	1	3	**2.3**
CO3	3	2	3	2	2	3	2	2	2	2	**2.3**
CO4	3	3	2	2	2	3	3	3	2	3	**2.6**
CO5	2	3	3	2	1	3	3	2	2	3	**2.4**
CO6	2	3	3	2	1	3	3	2	2	3	**2.4**
										Mean Overall Score	**2.3 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
2	23PCS2ES03B	**Elective - 3:** Data Warehousing and Data Mining	5	4

Course Objectives
Summarize the basic concepts in data mining and the techniques in knowledge mining
Analyze the fundamentals of Data Preprocessing
Apply the various concepts of Data Warehousing and Online Analytical Processing for forecasting
Analyze the cluster algorithms
Estimate the knowledge of Outlier Detection, Data Mining Trends and Research Frontiers
Summarize the basic concepts in data mining and the techniques in knowledge mining

UNIT I: Data Warehouse, Data Warehouse Schema **(15 Hours)**

Data ware house: The Need for an Operational Data Store (ODS) - Operational Data Store -Data Ware house - Data Marts - Comparative Study of Data Ware house with OLTP and ODS. Data Ware house Schema: Introduction to Data Warehouse Schema - Star Schema - Snow flake Schema - Fact Constellation Schema - Comparison among Star, Snowflake and Fact Constellation Schema

UNIT II: Online Analytical Processing **(15 Hours)**

Online Analytical Processing: Introduction to Online Analytical Processing - Representation of Multi-dimensional Data - Types of OLAP Servers - OLAP Operations. Introduction To Data Mining: Need of Data Mining - Data Mining Do and Not Do - Data Mining Applications - Data Mining Process - Data Mining Techniques - Difference between Data Mining and Machine Learning

UNIT III: Data Preprocessing **(15 Hours)**

Data Preprocessing: Need for Data Preprocessing - Data Preprocessing Methods. Association Mining: Introduction to Association Rule Mining - Defining Association Rule Mining-Representations of Items for Association Mining - The Metrics to Evaluate the Strength of Association Rules. The Apriori Algorithm: About the inventors of Apriori - Working of the Apriori algorithm

UNIT IV: Classification **(15 Hours)**

Classification: Introduction to Classification - Types of Classification - Input and Output Attributes - Working of Classification - Guidelines for Size and Quality of the Training Data set. Introduction to the Decision Tree Classifier: Building decision tree - Concept of information theory - Advantages of the decision tree method - Disadvantages of the decision tree. Understanding Metrics to Assess the Quality of Classifiers: The boy who cried wolf - True positive - True negative - False positive - False negative - Confusion matrix -Precision -Recall-F-Measure.

UNIT V: Cluster Analysis **(15 Hours)**

Cluster Analysis: Introduction to Cluster Analysis- Applications of Cluster Analysis-Desired Features of Clustering - Major Clustering Methods/Algorithms. Distance Metrics: Euclidean distance -Manhattan distance -Chebyshev distance. Partitioning Clustering: k-means clustering.

Teaching Methodology	Chalk and talk, Lectures, Demonstrations, PPT.

Book for Study

1. Parteek, B. (2019). *Data Warehousing and Data Mining*, (1st Ed.). Cambridge University Press.
   UNIT – I *Chapter 12 (Sec 12.1, 12.2, 12.3, 12.4 and 12.5) Chapter13 (Sec13.1,13.2,13,3,13.4 and 13.5)*
   UNIT -II *Chapter 14 (Sec 14.1, 14.2, 14.5 and 14.6) chapter 2 (Sec 2.1, 2.2, 2.3, 2.4, 2.5, 2.6and 2.7)*

UNIT - III *Chapter 4 (Sec 4.1 and 4.2) Chapter 9 (Sec 9.1, 9.2, 9.3, 9.4 and 9.7)*
UNIT - IV *Chapter 5 (Sec 5.1, 5.2, 5.3, 5.4, 5.5, 5.6 and 5.8)*
UNIT – V *Chapter7 (Sec 7.1, 7.2, 7.3, 7.4, 7.5 and 7.6)*

Books for Reference

1. Sreedhar, G. (2017). *Web Data Mining and The Development of Knowledge-Based Decision SupportSystems,* (1st Ed.). IGI Global.
2. Zaki, M.J. & Wagner, M.J.R. (2020). *Data Mining and Machine Learning - Fundamental Concepts and Algorithms,* (2nd Ed.). Cambridge University Press.
3. Raja, R., Nagwanshi, K.K., Kumar, S. & Laxmi, R.K. (2022). *Data Mining and Machine Learning Applications,* (1st Ed.). Scrivener Publishing.

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 data warehouse	**K1**
CO2	summarize the various OLAP operations	**K2**
CO3	make use of association rule mining in data mining	**K3**
CO4	examine decision tree classifier	**K4**
CO5	recommend the metrics to assess classifiers	**K5**
CO6	elaborate the various clustering techniques	**K6**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**					**Hours**		**Credits**
2	**23PCS2ES03B**			**Elective - 3:** Data Warehousing and Data Mining					**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	2	2	3	2	2	3	2	2	**2.2**
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	**2.55 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
2	23PSS2SE01	**Skill Enhancement Course:** Soft Skills	4	3

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, Lectures, Demonstrations, PPT.

Book 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 References

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 & Interview*s? (3rd Ed.). Pearson Education.
8. Yate, M. (2005). *Hiring the Best: A Manager's Guide to Effective Interviewing and Recruiting*

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, students will be able to	**Cognitive Levels (K - Level)**
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	**23PSS2SE01**			**Skill Enhancement Course:** Soft Skills					**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	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	23PCS3CC05	**Core Course - 5:** Full Stack App Development	6	6

Course Objectives
Learn HTML elements for designing a web page
Understand Style sheet rules with HTML elements
Develop dynamic Front End for a web site
Learn Java Script functionality for App Development
Develop server-side and networking applications on the cross-platform runtime environment
Discuss Angular Web Framework for developing scalable web applications

UNIT I Introduction to Web Programming **(18 Hours)**

Introduction to Web Programming: Introduction - Creating a Website - Web page Example - HTML Tags - Structural Elements - title Elements - Meta Element - HTML Attributes - body Elements: hr, p, br, div - Cascading Style sheets preview. Coding Standards, Block Elements, Text Elements and Character References: HTML Coding Conventions - Content Model Categories - Block Element - blockquote Element - Whitespace collapsing - pre Element, Phrasing Elements - Editing Elements - q and cite Elements - dfn, abbr and time Elements - Code-Related Elements - br and wbr Elements - sub, su, s, mark and small Elements - strong, em, b, u and i Elements - span Element - Character References - Web Page with character References and Phrasing Elements.

UNIT II Cascading Style Sheets **(18 Hours)**

Cascading Style Sheets: Introduction - CSS overview - CSS Rules - Example with Type Selectors and the Universal Selector - CSS Syntax and Style - Class Selectors - ID Selectors - span and div Elements - Cascading - style Attribute, style Container - External CSS Files - CSS Properties - Color Properties - Font Properties - line-height Properties - Text Properties - Border Properties - Element Box, padding Property, margin Property. Organizing A Pages Content with Lists, Figures and Various Organizational Elements: Introduction - Unordered Lists - Descendant selectors - Ordered Lists - Figures - Organizational Elements - section, article and aside Elements - nav and a Elements - header and footed Elements - Child Selectors - CSS Inheritance.

UNIT III Introduction to Javascript **(18 Hours)**

Introduction to Javascript: Functions,Dom,Forms and Event Handlers: History of JavaScript - Buttons - Functions - Variables- Identifiers - Assignment Statements andObjects - Document Object Model - form Element - Controls - Text Control - Email AddressGenerator Web page - Accessing a Form's Control values - reset and focus Methods - Commentsand Coding Conventions - Event - Handler Attributes - onchange, onmouseover, onmouseout - Using noscript to Accommodate Disabled JavaScript. Additional Javascript Basics:windowObject -alertand confirm Methods - fi Statement - prompt Method-ifStatement else and else if Clauses - Strings - Arithmetic operators - Math Object Methods - Parsing Numbers - Constraint Validation for Form Controls-Constraint Validation using the Number Control's Attributes - Constraint Validation using CSS Pseudo-Classes - Comparison Operators and Logical Operators-JavaScript for improved Web Page.

UNIT IV Jquery **(18 Hours)**

Jquery: The Basics of jQuery - The Document Object Model - Writing some jQuery. Traversing the DOM: CSS Selectors in jQuery - Traversal Methods - Chaining Methods - Further Filtering. DOM Manipulation with Jquery: Attributes and Properties - text() and html() - Removing Elements from the DOM - Creating New Elements - Inserting into the DOM - Efficient DOM Insertion. Understanding Node.JS: Variables - Functions - Closures - Understanding Node.js Performance - More Node.js internals. Core Node.JS: Node.js File-Based Module System - Important Globals - Core Modules - Reusing Node.js Code in the Browser.

UNIT V Angular Web Framework **(18 Hours)**

Angular Web Framework : Overview - Plunker - Intro to Type Script - Writing first app -String Interpolation-Looping-Property & Event Binding-Domain Model-Nesting Components & Inputs-User

Interaction &Outputs.

Teaching Methodology	Chalk and talk, Lectures, Demonstrations, PPT.

Books for Study

1. Dean, J. (2019). *Web Programming with HTML5, CSS, and JavaScript*. (1st Ed.). Jones & Bartlett Learning, LLC. An Ascend Learning Company.
   UNIT I - *Chapter 1, Chapter 2*
   UNIT II - *Chapter 3, Chapter 4*
   UNIT III - *Chapter8, Chapter 9*
2. Franklin, J., & Ferguson, R. (2017). *Beginning jQuery*. (2nd Ed.). Apress.
   UNIT IV - *Chapter 2, Chapter 3*
3. Syed, B.A. (2014). *BeginningNode.js*. (1st Ed.). Apress.
   UNIT IV - *Chapter 2, Chapter 3*
4. Hussain, A. (2016). *Angular 2 - From Theory To Practice*. Version1.0.1.Daolrevo Ltd.
   UNIT V *Page no 5 -Page no. 56*

Books for Reference

1. Robbins, J.N. (*2012*). *Learning Web Design.* (4th Ed.). *O'Reilly.*
2. York, R. (2015). *Web Development with jQuery*. (1st Ed.). Wrox Publication.
3. Wilke, J. (2018). *Angular in Action*. (1st Ed.). Manning Publications Co.

Websites and eLearning Sources

1. doc-developpement-urable.org/file/Projets-informatiques/cours-&-manuels-informatiques/htmxml ccs/Sams%20Teach%20Yourself%20HTML%20CSS,%20and%20JavaScript%20All%20in%20One.pdf
2. https://www.teamwerx.org/wp-content/uploads/2017/10/Web-Development-with-jQuery.pdf
3. https://assets.digitalocean.com/books/how-to-code-in-nodejs.pdf
4. http://silicart.ru/wp-content/uploads/2017/06/Beginning-Angular-2-with-Typescript.pdf

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, students will be able to	**Cognitive Levels (K - Level)**
CO1	recall HTML elements and their attributes for designing	**K1**
CO2	demonstrate Cascading Style sheet rules with HTML elements	**K2**
CO3	apply Cascading Style Sheets to develop dynamic Front End	**K3**
CO4	examine Java Script functionality in App Development	**K4**
CO5	appreciate Node.JS for developing server-side and networking applications on the cross-platform runtime environment	**K5**
CO6	build Scalable Web applications using Angular Web Framework	**K6**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**					**Hours**		**Credits**
3	**23PCS3CC05**			**Core Course - 5:** Full Stack App Development					**6**		**6**
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	2	2	3	2	3	3	2	3	3	**2.6**
CO2	2	2	3	3	2	2	3	2	2	3	**2.4**
CO3	2	3	3	2	3	2	2	3	3	2	**2.5**
CO4	3	2	2	3	2	3	3	2	3	2	**2.5**
CO5	2	3	3	2	2	3	2	3	2	3	**2.5**
CO6	2	3	3	2	1	3	3	2	2	3	**2.5**
										Mean Overall Score	**2.5 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
3	23PCS3CC06	**Core Course - 6:** Advanced Python and MongoDB	6	6

Course Objectives
Learn the different package in Python
Understand Numpy and perform statistical analysis
Learn to project data in visualization form.
Learn the fundamental concepts of NoSQL
Demonstrate NoSQ Lusing MongoDB.
Discuss various mathematical methods that can be applied for data analysis

UNIT I Python Introduction **(18 Hours)**

Program - Running Python - The First Program - Arithmetic Operators - Values and Types Functions- Function Call - Math Functions - Composition - Adding New Functions - Definitions and Uses - Flow of Execution - Parameters and Arguments - Variable and Parameters. String Operations- String Slices - Strings are immutable - searching - Looping and Counting - String methods - The in operator-string Operation. Lists: A List is a sequence - lists are mutable - traversing a List - List Operations -List slices - List methods- Map, filter and Reduce - Deleting Elements - Lists and strings - Objects and values - Aliasing - List arguments.

UNIT II Strings and Numpy **(18 Hours)**

Dictionaries: A Dictionary is a Mapping - Dictionary as a collection of counters - Looping and Dictionaries - Reverse Lookup - Dictionaries and Lists- Memos- Global Variables. Tuples: Tuples Are Immutable - Tuple Assignment - Tuples as Return Values - Tuples as Return Values - Variable- Length Argument Tuples - Lists and Tuples - Dictionaries and Tuples. Numpy : Numpy a LittleHistory - nd array - The Heart of the library - Basic Operations - Indexing, Slicing and Iterating - Conditional and Boolean Arrays - Shape Manipulation - Array Manipulation - General Concepts - Structured Arrays - Reading and Writing Array Data on Files.

UNIT III The Numpy Library and Matplotlib **(18 Hours)**

PANDAS LIBRARY - An Introduction: Introduction to Pandas Data Structures - Functionalities on Indexes - Operation between Data Structures - Function Application and mapping - Sorting and Ranking -- Not a Number - Hierarchical indexing and Levelling. Matplotlib Library - Architecture-pyplot - The Plotting Window - kwargs - Adding Elements to The Chart - Saving Charts - Handling Date Values - Chart Typology - Line Charts - Histograms - Bar Charts - Pie Charts - Advanced Charts - 3D Toolkit - MultiPanel Plots.

UNIT IV Introduction to MongoDB **(18 Hours)**

Four types of NOSQL Databases. Documents- Collections- Databases- Starting MongoDB- Data Types- Inserting and Saving Documents- Removing Documents- Updating Documents- Introduction to find- Query Criteria- Type-Specific Queries- $where Queries- Introduction to Indexing- Using explain () and hint () - Types of Indexes

UNIT V Advanced MongoDB Function **(18 Hours)**

The Aggregation Framework- Pipeline Operations- MapReduce- Aggregation Commands Normalization versus Denormalization- Optimizations for Data Manipulation- When Not to Use MongoDB. Introduction to Replication- Configuring a Replica Set- Changing Your Replica Set Configuration.

Teaching Methodology	Chalk and talk, Lectures, Demonstrations, PPT.

Books for Study

1 Allen, B. D. (2015). *Think Python.* (2nd Ed.). O'Reilly Media Inc.
UNIT I *Chapter 1, 3, 8, 10*

UNIT II*Chapter11,12*

2. Fabio, N. (2018). *Python Data Analytics with Pandas, NumPy and Matplotlib*. (2nd Ed.). Apress.
   UNIT II *Chapter 3,4*
   UNIT III *Chapter 5,7*
3. Dan, S. (2015). *NoSQL for Mere Mortals*. Addison-Wesley.
   UNIT IV *Chapter 2*
4. Kristina, C. (2013). *MongoDB: The Definitive Guide*. O'Reilly.
   UNIT IV *Chapter 2, Chapter3, Chapter 4, Chapter 5*
   UNIT V *Chapter 7, Chapter 9*

Books for Reference

1. Michael, M., & Michele, C., & Ambiga, D. *Big Data Analytics - Emerging Business Intelligence and Analytic Trends for Today's Business.* Wiley CIO Series.
2. Jake, V. P. *Python Data Science Handbook*. O'Reilly Media Publishers.
3. Kyle, B., Piter, B., & Shaun, V. *MongoDB in Action*. Dream tech Press.
4. David, H., Plugge, E., Membray,E., & Hawkins, T. *The Definitive Guide to MongoDB*. Apress.

Course Outcome		
CONo.	**CO-Statements** On successful completion of this course, students will be able to	**Cognitive Levels (K - Level)**
CO1	explain the various programming paradigms in Python	**K1**
CO2	discover the relationship among the numerical data using Numpy for doing statistical analysis	**K2**
CO3	interpret the data through Matplotlib for visualization to give possible solutions.	**K3**
CO4	show the fundamental concepts of NoSQL	**K4**
CO5	comprehend the structure of NoSQL to implement MongoDB.	**K5**
CO6	analyze the different concept of aggregation to implement and retrieve the data using mathematical methods	**K6**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**					**Hours**		**Credits**
3	**23PCS3CC06**			**Core Course - 6:** Advanced Python and MongoDB					**6**		**6**
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	2	3	2	2	3	2	3	3	3	**2.6**
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	**2.6**
CO6	3	2	1	3	3	2	3	3	2	3	**2.5**
										Mean Overall Score	**2.5 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
3	23PCS3CC07	**Core Course - 6:** Compiler Design	5	4

Course Objectives
Understand the concepts and different phases of compilation with compile time error handling.
Generate intermediate code for statements in high level language.
Design syntax directed translation schemes for a given context free grammar.
Understand the target machine's run time environment, its instruction set for code generation and techniques used for code optimization.
Apply optimization techniques to intermediate code and generate machine code for high level language program.

UNIT I Introduction **(15 Hours)**

Introduction: 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**.**

UNIT II Syntax Specification **(15 Hours)**

Syntax Specification: 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

UNIT III Intermediate Code Generation **(15 Hours)**

Intermediate Code Generation: 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.

UNIT IV Symbol Tables **(15 Hours)**

Symbol Tables: 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

UNIT V Code Optimization **(15 Hours)**

Code Optimization: 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, Lectures, Demonstrations, PPT.

Book for Study

1. Aho, A. V, Monica, R. S., J., & Ullman, J.D. (2009). *Compilers, Principles, Techniques and Tools*. (2nd Edition). Pearson Education/Addison Wesley.
   UNIT I *Chapter 1 (Section 1.1, 1.2, 1.3, 1.4 And 1.6)*
   UNIT II *Chapter 2 (Section 2.1, 2.2, 2.3 and 2.4)*
   UNIT III *Chapter 4 (Section 4.1, 4.2, 4.3), Chapter 5 (Section 5.4),Chapter 6 (Section 6.1,6.2)*
   UNIT IV, V *Chapter 7 (Section 7.1 and 7.2), Chapter 8 (Section 8.1 and 8.3)*

Books for Reference

1. Dick, G., Henri, E.B., Ceriel, J .H. J., & Langondeon, K.G.. (2003). *Modern Compiler Design*.Wiley.
2. Louden, K. (2003). *Compiler Construction, Principles and Practice*. Thomson.
3. Tremblay, J. P., & Sorrenson, P.G. (1985). *The Theory and Practice of Compiler Writing*. McGraw Hill.

Websites and eLearning Sources

1. https://holub.com/goodies/compiler/compilerDesignInC.pdf
2. https://www.vssut.ac.in/lecture_notes/lecture1422914957.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	adopt Code Optimization and code generation techniques	**K5**
CO6	apply optimization techniques to intermediate code and generate machine code for high level language program.	**K6**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
3	**23PCS3CC07**			**Core Course - 6:** Compiler Design						**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	2	3	1	2	2	1	3	2	**2.1**
CO2	3	1	2	3	3	1	3	2	3	3	**2.3**
CO3	3	3	2	1	3	3	3	2	2	1	**2.2**
CO4	2	1	3	3	2	2	2	3	3	3	**2.5**
CO5	2	2	3	1	2	3	3	1	3	2	**2.2**
CO6	3	3	2	2	2	3	3	2	3	3	**2.5**
										Mean Overall Score	**2.46 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
3	23PCS3CP04	**Core Practical - 4:** Full Stack App Development	4	3

Course Objectives
Learn to create apps and websites
Learn to create dynamic and responsive web applications.
Understands the functionality of Java Script
Acquire the fundamentals of jQuery.
Recognized the need for Node.js
Design dynamic web pages using Angular Web Framework

LIST OF EXERCISES

1. HTML elements, tags, and attributes
2. HTML block elements with the different types of CSS rules
3. HTML editing elements, phrasing elements in different places with CSS rules
4. Lists, Figures, and Section-oriented elements, with descendent and child selectors
5. JavaScript web pages using functions, DOM and event handlers.
6. Input Validation using JavaScript.
7. Web page manipulation with jQuery
8. Making external http calls with Node.js
9. Parsing the given URL using Node.js

Angular Web Framework

10. Displaying a Message to the user
11. Using Arrays in TypeScript for displaying list of messages.
12. Input property binding and output event binding

Teaching Methodology	Chalk and talk, Lectures, Demonstrations, PPT.

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, students will be able to	**Cognitive Levels (K - Level)**
CO1	show attractive web pages using Cascading Style Sheet	**K1**
CO2	demonstrate dynamic web forms using HTML and CSS	**K2**
CO3	apply Java Script functionality in App development	**K3**
CO4	simplify the design of the smart web sites using jQuery	**K4**
CO5	construct server-side and networking applications using Node.js	**K5**
CO6	design fast responsive web pages with rich user experiences for real-time problems using Angular Web Framework	**K6**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**						**Hours**	**Credits**
3	**23PCS3CP04**			**Core Practical - 4:** Full Stack App Development						**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	3	3	**2.7**
CO2	2	3	3	2	2	2	3	2	2	3	**2.4**
CO3	3	2	3	2	2	3	2	2	3	2	**2.4**
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	23PCS3CP05	**Core Practical - 5:** Advanced Python and MongoDB	5	4

Course Objectives
Learn various Python functions
Understand various statistical and mathematical functions for Decision Making.
Learn Pandas and matplotlib for data analysis and visualization
Acquire the basic concepts of MongoDB.
Realize the regular expression and indexing for data processing
Acquire knowledge for data manipulation

List of Exercises

1. Strings and Functions.
2. Dictionaries, Lists and Tuples.
3. Multidimensional Data.
4. Aggregation function using Numpy
5. Pandas - Series
6. Pandas - Data Frame
7. Data Visualization -Matplotlib
8. Basic Queries and Indexes Using MongoDB
9. Project
10. Group and Match
11. Sort, Search Text
12. Set Operations Replication

Teaching Methodology	Chalk and talk, Lectures, Demonstrations, PPT.

Course Outcome		
CO No.	**CO-Statements** On successful completion of this course, students will be able to	**Cognitive Levels (K - Level)**
CO1	demonstrate forms using various Python functions	**K1**
CO2	analyze the data using various statistical and mathematical functions for Decision Making.	**K2**
CO3	build applications using Pandas and interpret the data through Matplotlib for visualization to give possible solutions.	**K3**
CO4	understand the fundamental design concepts of database using MongoDB.	**K4**
CO5	comprehend the regular expression and indexing for solving real time problem	**K5**
CO6	estimate the various strategies to Manipulate data.	**K6**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**					**Hours**		**Credits**
3	**23PCS3CP05**			**Core Practical - 5:** Advanced Python and MongoDB					**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	2	3	3	3	2	3	**2.5**
CO2	2	3	2	2	2	3	3	3	3	3	**2.6**
CO3	3	3	3	2	2	3	3	2	3	3	**2.7**
CO4	3	3	3	2	2	3	3	3	1	3	**2.6**
CO5	3	3	3	2	2	3	3	3	1	3	**2.6**
CO6	3	3	3	2	2	3	3	3	3	3	**2.7**
										Mean Overall Score	**2.61 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
3	23PCS3PW01	Mini Project 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 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	23PCS3PW01			Mini Project 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	23PCS4CC08	**Core Course 8:** Cloud Computing	5	4

Course Objectives
Understands the core concepts, principles, and components of cloud computing.
Explores the architecture and different cloud platforms
Acquires various cloud service providers such as Azure, Google Cloud and their respective technologies
Appreciates Cloud Federation Stack
Understands data storage, retrieval, and analytics services available in the cloud
Explores the security challenges, access control, compliance, and risk management specific to cloud environments

UNIT I Introduction **(15 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 **(15 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 AppEngine: Architecture and Core Concepts - Application Life Cycle - Cost Model. Microsoft Azure: Azure core Concepts - SQL Azure..

UNIT III Data Intensive Computing **(15 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 **(15 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 **(15 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 DigitalInformation - 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	Chalk and talk, Lectures, Demonstrations, PPT.

Book for Study

1. Buyya, R., Vecchiola, C., & Selvi, S.T. (2013). *Mastering Cloud Computing.* McGraw Hill Education (India) Private Limited Publications.
   Unit-I *Chapter1(Sec1.1,1.2,1.3,1.4), Chapter3(Sec3.1,3.2,3.3,3.4,3.5,3.6)*
   Unit-II *Chapter4 (Sec 4.1, 4.2,4.3) Chapter9(Sec9.1,9 .2,9.3)*
   Unit-III *Chapter8(Sec 8.1, 8.2), Chapter10(Sec10.1,10.2)*
   Unit-IV *Chapter11(Sec11.1,11.2,11.3)*
2. Buyya, R., Broberg, J., & Goscinski, A. (2011). *Cloud Computing - Principles and Paradigms*, John Wiley & Sons, Inc. Publications, New Jersey.
   Unit-V: *Chapter 8 (Sec8.1,8.2,8.3) Chapter 23(23.1,23.2,23.3,23.4,23.5, 23.6, 23.7)*

Books for Reference

1. Anand, N. (2019). *Handbook of Cloud Computing*, (1st Ed.). BPB Publication, India.
2. Surbhi, R. (2021). *Cloud Computing Simplified: Explore Application of Cloud, Cloud Deployment Models, Service Models and Mobile Cloud Computing*, (1st Ed.). BPB Publications, India, 2021
3. Vacca, J.R. (2020). *Cloud Computing Security Foundations and Challenges*, (2st Ed.). CRC Press, New York, 2020

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, students will be able to	**Cognitive Levels (K - Level)**
CO1	lists the importance of protocols and standards in cloud services.	**K1**
CO2	Comprehends the different Cloud Platforms	**K2**
CO3	interpret the models of distributed and cloud computing.	**K3**
CO4	identify the comparative advantages and disadvantages of Virtualization technology.	**K4**
CO5	analyzes authentication, confidentiality and privacy issues in cloud computing.	**K5**
CO6	discover the knowledge of bigdata analytics in Enterprises.	**K6**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**					**Hours**		**Credits**
4	**23PCS4CC08**			**Core Course 8:** Cloud Computing					**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	3	3	3	2	2	3	3	3	2	2	**2.6**
CO2	3	3	3	2	2	3	3	3	2	3	**2.7**
CO3	3	3	3	2	3	3	2	3	3	2	**2.7**
CO4	3	3	2	3	3	3	2	3	3	3	**2.8**
CO5	3	3	3	2	3	3	3	2	3	3	**2.8**
CO6	3	2	3	2	2	3	3	2	3	3	**2.6**
										Mean Overall Score	**2.7 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
4	23PCS4PW02	Major Project Work & Viva Voce	20	18

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
4	23PCS4PW02			Major Project Work & Viva Voce						20	18
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	23PCS4ES04A	**Elective - 4:** Digital Marketing	5	4

Course Objectives
Understand the concept of digital marketing and its real-world iterations
Articulate innovative insights of digital marketing enabling a competitive edge
Understand how to create and run digital media-based campaigns
Identify and utilize various tools such as Twitter, Instagram and Snapchat
Discuss the benefits of Marketing Tools
Examine the concept of Marketing Web Analytics

UNIT I Digital Marketing **(15 Hours)**

Introduction to Digital Marketing: Internet Users - Digital Marketing Strategies - Skills Required in Digital Marketing - Digital Marketing Plan. Display Advertising: Introduction - Concept of Display Advertising - Types of Display Ads - Buying Models - Display Plan - Targeting - Make a Good Ad.

UNIT II Advanced Display Advertising **(15 Hours)**

Programmatic Digital Advertising - Analytics Tools - YouTube Advertising. Search Engine Advertising: Introduction - Pay for Search Advertising - Understanding Ad Placement - Understanding Ad Ranks. Social Media Marketing: Introduction - To build a Successful Strategy.

UNIT III Facebook Marketing **(15 Hours)**

Introduction - Facebook for Business- Anatomy of an Ad Campaign - Adverts - Other Marketing Tools - Other Essentials. Twitter Marketing: Introduction - Getting Started with Twitter - Building a Context Strategy - Twitter Usage - Twitter Ads - Twitter Analytics - Twitter Tools and Tips for Marketers. Instagram and Snapchat: Introduction- Instagram- snapchat

UNIT IV Search Engine Optimisation **(15 Hours)**

Introduction - Search Engine - Concept of Search Engine Optimisation- SEO Phases - On page optimisation- Off page Optimisation- Social Media Reach - Maintenance..

UNIT V Web Analytics **(15 Hours)**

Introduction - Data Collection - Key Metrics - Marketing Web Analytics Actionable - Types of Tracking codes - Mobile Analytics.

Teaching Methodology	Chalk and talk, Lectures, Demonstrations, PPT.

Book for Study

1. Gupta, S. (2017). *Digital Marketing*, (1st Ed.). Mc-Graw Hill, New Delhi.
   Unit I *Chapter 1, Chapter 2(pg.26-51)*
   Unit II *Chapter 2 (pg.52- 66), Chapter 3 (pg.73- 83), Chapter 4 (pg.108- 132)*
   Unit III Chapter 5(pg.139- 183), Chapter 7 (pg.221 - 254), Chapter 8 (pg.259-268)
   Unit IV *Chapter 10*
   Unit V *Chapter 11(353-382)*

Books for Reference

1. Dodson, I. (2018). *The Art of Digital Marketing*. Wiley, New Jersey, USA.
2. Kamat, N.C., & Kamat, N.C. (2018). Digital Social Media Marketing, Himalaya Publishing House Pvt. Ltd.
3. Deiss, R., & Henneberry, R. (2020). *Digital Marketing for Dummies*, (2nd Ed.). John Wiley& Sons, Inc.

Websites and eLearning Sources

1. https://www.webmarketingacademy.in/wp-content/uploads/2018/10/A-Beginners-Guide-to-Digital-Marketing.pdf
2. https://www.eway-crm.com/eWay-Book/eWay-Book%20-%20Online%20Marketing%20EN.pdf

3. https://www.americansforthearts.org/sites/default/files/Netmarks-2016-Guide-to-Digital-Marketing.pdf

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, students will be able to	**Cognitive Levels (K - Level)**
CO1	show the acquaintance of the concepts of Digital Marketing and Display Advertising.	**K1**
CO2	comprehend the Anatomy of an Ad Campaign	**K2**
CO3	identify the concepts of Search Engine Advertising.	**K3**
CO4	classify the knowledge of Facebook Marketing and Twitter Marketing.	**K4**
CO5	distinguish various applications of Search Engine Optimization and social media.	**K5**
CO6	elaborate various techniques of Web Analytics.	**K6**

Relationship Matrix											
Semester	**Course code**		**Title of the Course**						**Hours**		**Credits**
4	**23PCS3CC07**		**Core Course 7:** Digital Marketing						**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	3	2	2	3	1	2	2	1	3	2	**2.1**
CO2	2	1	2	3	3	1	3	2	3	3	**2.3**
CO3	2	3	2	1	3	3	3	2	2	1	**2.2**
CO4	3	1	3	3	2	2	2	3	3	3	**2.5**
CO5	2	2	3	1	2	3	3	1	3	2	**2.2**
CO6	2	3	2	2	2	3	3	2	3	3	**2.5**
										Mean Overall Score	**2.3 (High)**

Semester	Course Code	Title of the Course	Hours/Week	Credits
4	23PCS4ES04B	**Elective - 4:** Immersive Technologies	5	4

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 **(15 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 **(15 Hours)**

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

UNIT III Augmented Reality **(15 Hours)**

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

UNIT IV Cross Platform Theory **(15 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 **(15 Hours)**

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

Teaching Methodology	Chalk and talk, Lectures, Demonstrations, PPT.

Books for Study

1. Tacgin, Z. (2020). *Virtual and Augmented Reality: An Educational Handbook.* Cambridge Scholars Publishing, UK.
   Unit I *Chapter 1 (Sec 1), Chapter 2 (Sec 2.1 and 2.2)*
   Unit II *Chapter 2 (Sec 2.3, 2.4, 2.5 and 2.6)*
   Unit III *Chapter 3 (Sec 3.1, 3.2, 3.3, 3.4 and 3.5)*
   Unit V Part VI (Sec 11, 12 and 13)
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.
   Unit I *Part I (Sec 1)*
   Unit IV *Part IV (Sec 6, 7 and 8)*

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	**23PCS4ES04B**		**Elective - 4:** Immersive Technologies						**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	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	23PCS4CE01	Comprehensive Examination	-	2

Course Objectives
Understand the core concepts, theories, methodologies, and practices in Computer Science field
Demonstrate connections between different disciplines in Computer Science
Gain problem-solving skills, logical reasoning, and analytical abilities to solve complex computational problems
Expands the programming skills and knowledge of various programming languages
Understand the advance data analytics
Propose innovative solutions or improvements for real-life problems

UNIT I

Programming in JAVA, MongoDB

UNIT II

Web Development using ASP. NET, Python

UNITIII

Cloud Computing, Full Stack App Development.

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 PHP and MongoDB	**K1**
CO2	describe the programming concepts	**K2**
CO3	apply Python programming to real life problems	**K3**
CO4	demonstrate the use of development tools in the Full Stack App Development environment	**K4**
CO5	explain the rich GUI web applications using Visual Studio .NET	**K5**
CO6	develop Solutions for a range of problems using object-oriented programming	**K6**

Relationship Matrix											
Semester	**Course Code**		**Title of the Course**						**Hours**		**Credits**
4	**23PCS4CE01**		Comprehensive Examination						-		**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	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**
											2.46 (High)