M.Sc. COMPUTER SCIENCE

LOCF SYLLABUS 2023

Department of Information Technology
School of Computing Sciences
St. Joseph's College (Autonomous)
Tiruchirappalli - 620 002, Tamil Nadu, India

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)

- Graduates will be able to accomplish professional standards in the global environment.
- Graduates will be able to uphold integrity and human values.
- 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

CONTINUOUS INTERNAL ASSESSMENT
Categorizing Outcome Assessment Levels Using Bloom's Taxonomy

Level	Cognitive Domain	Description
K1	Remember	It is the ability to remember the previously learned concepts or ideas.
K2	Understand	The learner explains concepts or ideas.
K3	Apply	The learner uses existing knowledge in new contexts.
K4	Analyse	The learner is expected to draw relations among ideas and to compare and contrast.
K5	Evaluate	The learner makes judgements based on sound analysis.
K6	Create	The learner creates something unique or original.

Question Paper Blueprint for Mid and End Semester Tests

<table>
<tr><td colspan="3">Duration: 2 Hours</td><td colspan="6">Maximum Marks: 60</td></tr>
<tr><td colspan="2" rowspan="2">Section</td><td colspan="6">K level*</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 (no choice)</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 (no choice)</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>Courses with K4 as the highest cognitive level</td><td></td><td></td><td></td><td>2</td><td></td><td></td><td rowspan="4">2 × 10 = 20</td></tr>
<tr><td>Courses with K5 as the highest cognitive level wherein one question each on K4 and K5 is compulsory.
(Note:K4 has two questions whereas, K5 has no choice.)</td><td></td><td></td><td></td><td>1</td><td>1</td><td></td></tr>
<tr><td rowspan="2">Courses with K6 as the highest cognitive level wherein one question each on K5 and K6 is compulsory.
(Note: Mid Sem: K4 has two questions whereas, K5 has no choice; End sem: K5 has two questions whereas, K6 has no choice)</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 colspan="6">Total</td><td>60</td></tr>
</table>

** K4 and K5 levels will be assessed in the Mid semester test whereas K5 and K6 levels will be assessed in the End semester test.*

Question Paper Blueprint for Mid and End Semester Tests *(For quantitative courses only)*

Duration: 2 Hours							**Maximum Marks: 60**
Section	**K level**						**Marks**
	K1	**K2**	**K3**	**K4**	**K5**	**K6**	
A *(no choice)*	5	4					9 × 1 = 9
B *(either… or type)*			2	1			3 × 5 = 15
C *(2 out of 3)*					1	1*	2 × 18 = 36
						Total	**60**

NOTE: *K4 and K5 will be assessed in the Mid semester test whereas K5 and K6 will be assessed in the End semester test.*
** K6 compulsory*

SEMESTER EXAMINATION
Question Paper Blueprint for Semester Examination

Duration: 3 Hours								**Maximum Marks: 100**
Section		**K level**						**Marks**
		K1	**K2**	**K3**	**K4**	**K5**	**K6**	
A *(no choice, two questions from each unit)*		10						10 × 1 = 10
B *(no choice, two questions from each unit)*			10					10 × 3 = 30
C *(either… or type, one question from each unit)*				5				5 × 6 = 30
D *(3 out of 5, one question from each unit)*	*Courses with K4 as the highest cognitive level*				3			3 × 10 = 30
	Courses with K5 as the highest cognitive level wherein two K4 questions and one K5 question are compulsory. (Note: Three questions on K4 and two questions on K5)				2	1		
	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)				1	1	1	
							Total	**100**

Question Paper Blueprint for Semester Examination *(For quantitative courses only)*

Section	Marks	K level
A	10 × 1 = 10	K1
B	5 × 6 = 30 *(either…or)*	K2 *(Q. No. 11 & 12)* K3 *(Q. No. 13, 14 & 15)*
C	4 × 15 = 60 *(4 out of 5)*	K4 *(Q. No. 16 & 17)* K5 *(Q. No. 18 & 19)* K6 *(Q. No. 20 compulsory)*
Total Marks: 100		

Evaluation Pattern for Part IV One/Two Credit Courses

Title of the Course	CIA	Semester Examination	Total Marks
Internship	100		**100**
UG Skill Enhancement Course (Non Major Elective) Foundation Course **PG** Ability Enhancement Course	20 + 10 + 20 = 50	50 *(External member from the Department)*	**100**
Value Education	50	50 *(CoE)*	**100**

M.Sc. COMPUTER SCIENCE							
PROGRAMME PATTERN							
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
	23PCS2EG01	**Generic Elective - 1 (WS):** Mobile Adhoc Networks (MANET)	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
	23PCS3EG02	**Generic Elective - 2 (BS):** Advances in Computer Science	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**			

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

Semester	Course Code	Title of the Course	Hours/ Week	Credits
1	23PCS1CC01	**Core Course - 1:** Analysis and Design of Algorithms	6	5

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**	**Cognitive Levels**
	On completion of this course, students will,	**(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	be able to 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**	**5**
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	5

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 object-oriented 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.

Books for Reference

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

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels**
	On completion of this course, students will	
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 handling and the 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**	**5**
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											
Mean overall Score											**2.1 (Medium)**

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 completion of this course, students will,	**Cognitive Levels** **(K - Level)**
CO1	understand the concepts of object oriented with respect to C++.	**K1**
CO2	be able to 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 real-world 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
Mean overall Score 2.34											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, India.
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.). Published by 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 completion of this course, students will,	**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 Re-Engineering.	**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**	**Cognitive Levels (K - Level)**
	On completion of this course, students will,	
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 (6Hours)

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 data imperatives: Enterprise big data warehouse, BI implementations and analytics*. Apress Media.

Course Outcomes		
CO No.	**CO-Statements**	**Cognitive Levels (K - Level)**
	On completion of this course, students will,	
CO1	perform the fundamentals of various big data analytics techniques.	**K2**
CO2	analyse the HADOOP and Map Reduce technologies associated with Distribution File System	**K5**
CO3	discuss Base Technologies and Hadoop Yarn Architecture	**K6**

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											**2.4 (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**	**Cognitive Levels (K - Level)**
	On successful completion of this course, students will be able to	
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 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**	**Cognitive Levels (K - Level)**
	On successful completion of this course, students will be able to	
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 C*hapter 1(1.1,1.2,1.3), Chapter 2(2.1,2.2) Chapter 3 (3.1, 3.5,3.6)*
   UNIT - II C*hapter 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 DataMining	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
2	23PCS2EG01	**Generic Elective - 1 (WS):** Mobile Adhoc Networks (MANET)	4	3

Course Objectives
Familiarize various generations of mobile communications and the concept of cellular communication, basics of wireless communication
Comprehension of 3G mobile standards and their comparison with 2G technologies.
Understand multicarrier communication systems and differentiate various Wireless LANs.
Understand multicarrier communion systems.
Knowledge of infrastructure and Ad Hoc networks
Familiarize various generations of mobile communications and the concept of cellular communication, basics of wireless communication

UNIT I: Mobile Computing **(12 Hours)**

Mobile Computing: Adaptability - The Key to Mobile Computing - Mechanisms for Adaptation - Development or Incorporation of Adaptations in Applications. Mobility Management: Concept of Mobility Management - Location Management - Principles and Techniques.

UNIT II: Data Dissemination **(12 Hours)**

Data Dissemination: Mobile Data Caching - Mobile Cache Maintenance Schemes - Mobile web Caching. Context Aware Computing: Ubiquitous of Pervasive Computing -Various Definitions and Types of Contexts - Context Aware Computing & Applications - Middle ware Support. Introduction to Mobile Middle ware: Definition of Mobile Middleware - Application - Agents - Service Discovery.

UNIT III: Introduction To Internet Of Things **(12 Hours)**

Physical design of IoT - Logical design of IoT - IoT Enabling Technologies - IoT levels & Deployment technologies. Demystifying The IoT Paradigm: The Emerging IoT flavors - The Industrial Internet of Things - Consumer Internet of Things - Social Internet of things - Semantics for The Interoperable IoT- Cognitive IoT.

UNIT IV: Realization of IoT ecosystem Using Wireless Technologies **(12 Hours)**

Realization of IoT ecosystem using Wireless Technologies: Architecture for IoT Using Mobile Devices -Mobile Technologies for Supporting IoT Ecosystem -Mobile Use Cases for IoT - Low Power Wide Area Networking Topologies - Sigfox- Weightless - Nwave -Ingenu- Lora.

UNIT V: Infrastructure and Service Discovery Protocols **(12 Hours)**

Layered Architecture for IoT - Protocol Architecture of IoT - Infrastructure Protocols -Deviceor Service Discovery for IoT - Protocols for IoT service Discovery. Sensor and actuator networks.

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

Books for Study

1. Adelstein, F., Sandeep K.S., Gupta, Golden, G.R. & Schwibert, L. (2005). *Fundamentals of Mobile and Pervasive Computing*, TMG Ed.Pvt.Ltd.
   UNIT-I *Chapter 1, Chapter 2*
   UNIT-II *Chapter 3 Chapter 4, Chapter 5*
2. Pethuru, R. & Raman, C.A. (2017). *The Internet of Things Enabling Technologies, Platforms, and Use Cases, (*1st Ed.). Taylor & Francis, CRC Press.
   UNIT-III *Chapter 1, Chapter 4, Chapter 5*
   UNIT-IV Chapter 5, Chapter 6, Chapter 7
   UNIT-V Chapter 2, Chapter 3, Chapter 4

Books for Reference

1. Kamal, R. (2019). *Mobile Computing*, (3rd Ed.). Oxford University Press Pvt. Ltd.
2. Osterhage, W. (2018). *Wireless Network Security*, (2nd Ed.). CRC Press.
3. Holler, H. & Tsiatsis, Mulligan, C., Avesand, S., Karnouskos, S., & Boyle D. (2014). *From Machin e-to-Machine to the Internet of Things: Introduction to a New Age ofIntelligence*, (1st Ed.)., Academic Press.

Websites & eLearning Sources

1. www.geeksforgeeks.org/introduction-of-mobile-ad-hoc-network-manet/
2. www.techtarget.com
3. www.nabto.com/guide-iot-protocols-standards

Course Outcomes		
CO No.	**CO-Statements** On successful completion of this course, students will be able to	**Cognitive Levels (K - Level)**
CO1	recall the knowledge of Mobile Adaptability	**K1**
CO2	illustrate the concepts in Context-Aware Computing	**K2**
CO3	understand the Architectural Overview of IoT.	**K3**
CO4	realize the concepts of IoT using Wireless Technologies.	**K4**
CO5	understand the various IoT Protocols.	**K5**
CO6	decide suitable features for developing new service discovery for IoT	**K6**

Relationship Matrix											
Semester	**Course Code**			**Title of the Course**					**Hours**	**Credits**	
2	**23PCS2EG01**			**Generic Elective - 1 (WS):** Mobile Adhoc Networks (MANET)					**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	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	2.5
CO6	3	2	3	3	2	2	3	2	3	2	2.4
										Mean Overall Score	**2.45 (High)**