Anekant Education Society's

Tuljaram Chaturchand College, Baramati

(Autonomous)

M.Sc. Degree Program in Computer Science

(Faculty of Science & Technology)

Syllabus

M .Sc.(Computer Science) Semester -III

For Department of Computer Science

Tuljaram Chaturchand College, Baramati

Choice Based Credit System Syllabus (2022 Pattern)

To be implemented from Academic Year 2022-2023

Programme Specific Outcomes (PSOs)

For M.Sc. (Computer Science)

After completing M.Sc. Computer Science Program students will be able to:

PSO1: Enrich the knowledge in the areas like Artificial Intelligence, Web Services, Cloud Computing, Paradigm of Programming language, Design and Analysis of Algorithms, Database Technologies Advanced Operating System, Mobile Technologies, Software Project Management and core computing subjects. Choose to study any one subject among recent trends in IT provided in the optional subjects.

PSO2: Students understand all dimensions of the concepts of software application and projects.

PSO3: Students understand the computer subjects with demonstration of all programming and theoretical concepts with the use of ICT.

PSO4: Developed in-house applications in terms of projects.

PSO5: Interact with IT experts & knowledge by IT visits.

PSO6: Get industrial exposure through the 6 months Industrial Internship in IT industry.

PSO7: To make them employable according to current demand of IT Industry and responsible citizen.

M.Sc. (Computer Science) II (Sem III)

Subject	Paper Code (2019 Patt.)	Paper Code (2022 Patt.)	Paper Title
Mobile Technologies (C)	COMP5301	PSCS231	Software Architecture & Design Pattern
Soft Computing (C)	COMP5302	PSCS232	Soft Computing
Web Services (C)	COMP5303	PSCS233	Data Science and Analytics
Software Architecture& Design Pattern (Elective I)	COMP5304	PSCS234	Web Services Architecture Using Dot Net Framework
Lab Course-on Mobile Technology and Web Services (C)	COMP5305	PSCS235 (A) OR PSCS235 (B)	Emerging Technologies -Python Programming – II (Advanced) **(Elective)** Emerging Technologies - R Programming –I (C) **(Elective)**
Project (Elective II)	COMP5306	PSCS236	Lab Course on PSCS133, 134 & PSCS135(A)
Recent Trends in IT (Internet of Things) (Elective III)	COMP5307	PSCS237	Project
Certificate Course – II	CC-23	CON	Introduction to Constitution
Skill Development – I	Certificate Course – II	SD – 23	Skill Development - I

M.Sc. (Computer Science) II (Sem III)

Subject	Paper Code (2019 Patt.)	Paper Code (2022 Patt.)	Paper Title
Industrial Training/ Institutional Project (**IT)**	COMP5401	PSCS241	Industrial Training/ Institutional Project (**IT)**
Skill Development - II	------	SD-24	Skill Development - II

M. Sc. (Computer Science)

Semester-III

Class: M. Sc. (Computer Science)-II (Sem-III) **Paper Code: PSCS231**
Title of Paper: Software Architecture & Design Pattern **Paper: I**
Credit: 4 (4 Lectures/Week) **No. of lectures: 60**

Objectives:

To Understand and learn the software architecture, its styles, views and pattern for design software with minimum complexity and maintain flexibility

Prerequisites:

System Analysis and Design, Software Engineering, OOSE, Software project Management, UML

Course Outcomes:

CO1-Able to assist learner to utilize styles and views to state

CO2-Architecture, define documentation, analyses the architectural structures and it's Influence on business and development process.

CO3-Evaluate and select appropriate design pattern for a situation

CO4-Compare the performance of the software on inclusion of various design patterns.

CO5-Analyse and suggest architecture design for an application

CO6-Apply design patterns to software design

CO7-Evaluate and select appropriate design pattern for a situation

Unit	Contents	No. of Lect.
1	**Introduction to Software Architecture** 1.1.Introduction to concept of Software Architecture 1.2 Definition, Architectural structures 1.3 Need and Influence of software architecture in organization as business and technical aspects 1.4 Architecture Business Cycle 1.5 Introduction – Functional requirements, technical constraints, Quality Attributes	4
2	**Quality Attribute** 2.1 Introduction Quality Attribute 2.2 Documenting Quality Attributes 2.3 Six Part Scenarios 2.4 Case Studies	4
3	**Architectural Views** 3.1 Introduction, Definitions for views 3.2 Structures and views, Representing views, available notations	6

	3.4 Standard views, 4+1 view of RUP, Siemens 4 views SEI's perspectives and views 3.4 Case Studies	
4	**ARCHITECTURAL STYLES** 4.1 Introduction 4.2 Data flow styles with Case study 4.3 Call-return styles with Case study 4.4 Shared Information styles with Case study 4.5 Event styles with Case study	6
5	**Common Software Architectural Patterns** 5.1 Layered pattern 5.2 Client-server pattern 5.3 Master-slave pattern 5.4 Pipe-filter pattern 5.5 Broker pattern 5.6 Peer-to-peer pattern 5.7 Event-bus pattern 5.8 Model-view-controller pattern 5.9 Blackboard pattern 5.10 Interpreter pattern	12
6	**Design Pattern** 6.1 Important Design Patterns 6.2 Design Pattern Catalogue, Creational, Structural and behavioral Patterns 6.3 Structural Decomposition 6.4 Organization of Work, Access Control.	10
7	**DOCUMENTING THE ARCHITECTURE** 7.1 Good practices, Documenting the Views using UML 7.2 Merits and Demerits of using visual languages 7.3 Need for formal languages 7.4 Architectural Description Languages ACME 7.5 Case studies. Special topics: SOA and Web services, Cloud Computing, Adaptive structures	6

Reference Books:

- Beyond Software architecture, Luke Hohmann, Addison wesley, 2003.
- Software architecture, David M. Dikel, David Kane and James R. Wilson, Prentice Hall PTR, 2001
- Software Design, David Budgen, second edition, Pearson education, 2003
- Head First Design patterns, Eric Freeman & Elisabeth Freeman, O'REILLY, 2007.
- Design Patterns in Java, Steven John Metsker& William C. Wake, Pearson education, 2006
- J2EE Patterns, Deepak Alur, John Crupi& Dan Malks, Pearson education, 2003.
- Design Patterns in C#, Steven John metsker, Pearson education, 2004.
- Pattern Oriented Software Architecture, F. Buschmann& others, John Wiley & Sons
- Anti-Patterns: Refactoring Software, Architectures and Projects in Crisis, William J Brown et al., John Wiley, 1998
- Object-oriented analysis, design and implementation, brahma dathan, sarnathrammath, universities press,2013
- Design patterns, erich gamma, Richard helan, Ralph johman , john vlissides ,PEARSON Publication,2013.

Mapping of this course with Programme Outcomes

Course Outcomes	Programme Outcomes (POs)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	1	1	2	1	1	1
CO2	3	3	2	3	3	3	3
CO3	3	3	1	2	1	2	2
CO4	2	2	1	2	1	2	2
CO5	3	3	2	3	2	3	3
CO6	3	3	1	2	1	2	2
CO7	3	3	1	2	1	2	2

Weight: 1 - Partially related 2 - Moderately Related 3 - Strongly related

Course Objectives (CO) and Program Outcomes (PO) Mapping:

1 Justification of PO1 to ALL COs:

CO1 Justification: Assisting learners in utilizing styles and views is partially related to enriching knowledge in various IT areas, as it focuses on communication styles rather than the core technical aspects of the listed subjects.

CO2 - Justification: Analysing architectural structures and their influence aligns strongly with enriching knowledge in IT areas, as it directly pertains to architecture, a key aspect mentioned in PO1.

CO3 Justification: Evaluating and selecting design patterns is strongly related to the objective of enriching knowledge, particularly in the context of design and analysis of algorithms and software design, which are explicitly mentioned in PO1.
CO4 Justification: Comparing software performance with the inclusion of design patterns is moderately related to enriching knowledge, as it provides insights into the practical implications of design choices, contributing to the understanding of software design.
CO5 - Justification: Analysing and suggesting architectural design strongly aligns with the goal of enriching knowledge, especially in the context of architecture, which is emphasized in PO1.
CO6 - Justification: Applying design patterns to software design is strongly related to enriching knowledge, as it directly involves practical application in software design, contributing to the understanding of design and programming languages mentioned in PO1.
CO7 - Justification: Repeated for emphasis, evaluating and selecting design patterns is strongly related to enriching knowledge, especially in the context of design and programming languages, as mentioned in PO1.

2 Justification of PO2 to ALL COs:

CO1 - Justification: Assisting learners in utilizing styles and views is partially related to students understanding software applications and projects, as it focuses more on communication styles than the comprehensive understanding of software concepts.
CO2 - Justification: Analysing architectural structures and their influence on business and development processes strongly aligns with students understanding all dimensions of software applications and projects, as it directly involves key aspects of software architecture and development.
CO3Justification: Evaluating and selecting design patterns is strongly related to students' understanding of software applications and projects, particularly in the context of making informed decisions in software design.
CO4-Justification: Comparing software performance with the inclusion of design patterns is moderately related to students' understanding of software applications and projects, as it provides insights into the practical implications of design choices.
CO5 - Justification: Analysing and suggesting architectural design strongly aligns with the goal of students understanding all dimensions of software applications and projects, as it involves key aspects of software architecture.
CO6 - Justification: Applying design patterns to software design is strongly related to students' understanding of software applications and projects, as it directly involves the practical application of design principles.
CO7 - Justification: Repeated for emphasis, evaluating and selecting design patterns is strongly related to students' understanding of software applications and projects, especially in the context of making informed design decisions.

3 Justification of PO3 to ALL COs:

CO1 - Justification: Assisting learners in utilizing styles and views is partially related to students' understanding of computer subjects, as it focuses more on communication styles than the comprehensive understanding of programming and theoretical concepts.
CO2 - Justification: Analysing architectural structures and their influence on business and development processes is moderately related to students' understanding of computer subjects, as it provides insights into broader architectural considerations but may not cover the entire spectrum of computer subjects.
CO3 Justification: Evaluating and selecting design patterns is partially related to students' understanding of computer subjects, particularly in the context of design and programming, but it does not comprehensively cover all programming and theoretical concepts.
CO4 - Justification: Comparing software performance with the inclusion of design patterns is partially related to students' understanding of computer subjects, as it focuses on a specific aspect (performance) and may not cover all programming and theoretical concepts.
CO5 - Justification: Analysing and suggesting architectural design is moderately related to students' understanding of computer subjects, as it provides insights into architectural considerations but may not cover all aspects of programming and theoretical concepts.
CO6 justification: Applying design patterns to software design is partially related to students' understanding of computer subjects, as it focuses on a specific aspect of software design and may not comprehensively cover all programming and theoretical concepts.
CO7 - (Weightage: 1 - Partially Related)Justification: Repeated for emphasis, evaluating and selecting design patterns is partially related to students' understanding of computer subjects, as it focuses on a specific aspect of design and programming.

4 Justification of PO4 to ALL COs:

CO1 - Justification: Assisting learners in utilizing styles and views is partially related to developing in-house applications, as it may contribute to effective communication in the project but doesn't directly address the development of applications.
CO2 - Justification: Analysing architectural structures and their influence on business and development processes strongly aligns with developing in-house applications, as it directly involves key aspects of software architecture in projects.
CO3 - Justification: Evaluating and selecting design patterns is moderately related to developing in-house applications, as it contributes to making informed decisions in software design within the context of project development.
CO4 - Justification: Comparing software performance with the inclusion of design patterns is moderately related to developing in-house applications, as it provides insights into the practical implications of design choices in a project setting.
CO5 - Justification: Analysing and suggesting architectural design strongly aligns with developing in-house applications, as it directly involves key aspects of software architecture in the context of application development.
CO6-Justification: Applying design patterns to software design is moderately related to developing in-house applications, as it involves the practical application of design principles within the context of a project.

CO7 - Justification: Repeated for emphasis, evaluating and selecting design patterns is moderately related to developing in-house applications, as it contributes to effective software design decision-making in a project setting.

5 Justification of PO5 to ALL COs:

CO1 Justification: Assisting learners in utilizing styles and views is partially related to interacting with IT experts during visits, as effective communication styles may enhance the interaction but do not cover the entire scope of engaging with experts or gaining knowledge during visits.

CO2 - Justification: Analysing architectural structures and their influence on business and development processes strongly aligns with interacting with IT experts and gaining knowledge during IT visits, as it directly involves key aspects of IT architecture and industry practices.

CO3 - Justification: Evaluating and selecting design patterns is partially related to interacting with IT experts during visits, as it may provide insights into design practices but does not comprehensively cover the spectrum of interactions with experts.

CO4 - Justification: Comparing software performance with the inclusion of design patterns is partially related to interacting with IT experts during visits, as it may touch on performance aspects but does not cover the full scope of expert interactions.

CO5 - Justification: Analysing and suggesting architectural design is moderately related to interacting with IT experts during visits, as it involves discussions on architectural considerations, contributing to knowledge gained during visits.

CO6 - Justification: Applying design patterns to software design is partially related to interacting with IT experts during visits, as it may provide insights into practical applications but does not fully encompass the range of interactions with experts.

CO7 - Justification: Repeated for emphasis, evaluating and selecting design patterns is partially related to interacting with IT experts during visits, as it touches on design decision-making but does not cover the complete scope of expert interactions.

6 Justification of PO6 to ALL COs:

CO1 - Justification: Assisting learners in utilizing styles and views is partially related to getting industrial exposure through an internship, as effective communication styles may enhance the internship experience but do not directly address the core aspects of industrial exposure.

CO2 - Justification: Analysing architectural structures and their influence on business and development processes strongly aligns with getting industrial exposure through an internship, as it directly involves key aspects of IT architecture and industry practices.

CO3-Justification: Evaluating and selecting design patterns is moderately related to getting industrial exposure through an internship, as it contributes to making informed decisions in software design within the context of an industrial setting.

CO4 - Justification: Comparing software performance with the inclusion of design patterns is moderately related to getting industrial exposure through an internship, as it provides insights into the practical implications of design choices in an industrial context.

CO5 - Justification: Analysing and suggesting architectural design strongly aligns with getting industrial exposure through an internship, as it directly involves key aspects of software architecture in an industrial setting.
CO6 - Justification: Applying design patterns to software design is moderately related to getting industrial exposure through an internship, as it involves the practical application of design principles within the context of an industrial project.
CO7 - Justification: Repeated for emphasis, evaluating and selecting design patterns is moderately related to getting industrial exposure through an internship, as it contributes to effective software design decision-making in an industrial setting.

7 Justification of PO7 to ALL COs:

CO1 - Justification: Assisting learners in utilizing styles and views is partially related to making students employable and responsible citizens, as effective communication styles contribute to professionalism but do not cover the full spectrum of employability skills or responsible citizenship.
CO2 - Justification: Analysing architectural structures and their influence on business and development processes strongly aligns with making students employable according to the current demand of the IT industry, as it directly involves key aspects of IT architecture and industry practices.
CO3 - Justification: Evaluating and selecting design patterns is moderately related to making students employable, as it contributes to making informed decisions in software design within the context of industry demands.
CO4 -Justification: Comparing software performance with the inclusion of design patterns is moderately related to making students employable, as it provides insights into the practical implications of design choices in the context of industry requirements.
CO5 - ustification: Analysing and suggesting architectural design strongly aligns with making students employable according to the current demand of the IT industry, as it directly involves key aspects of software architecture in an industry setting.
CO6 -Justification: Applying design patterns to software design is moderately related to making students employable, as it involves the practical application of design principles within the context of industry demands.
CO7 - Justification: Repeated for emphasis, evaluating and selecting design patterns is moderately related to making students employable, as it contributes to effective software design decision-making in the context of industry requirements.

Class: M.Sc.(Computer Science) II(Sem-III) **Paper Code: PSCS232**
Title of Paper: Soft Computing **Paper: II**
Credit:4(4Lectures/Week) **No. of lectures: 60**

Prerequisites: Probability, First Order Mathematical Logic, Classical Logic, Linear algebra and Calculus.

Objective:

1) To understand the concepts of how an intelligent system work and its brief development process.
2) Be familiar with design of various neural networks & fuzzy logic & Learn genetic programming.

Learning Outcome:

- CO1: Describe human intelligence and AI.
- CO2: Know intelligent system works.
- CO3: Apply basics of Fuzzy logic and neural networks.
- CO4: Know and Apply ideas of fuzzy sets, fuzzy logic and use of human experience relate with neural networks, generalize appropriate rules for inference systems.
- CO5: Deploy the genetic algorithms and other randomizes arch procedures.
- CO6: Develop some familiarity with current research problems and research methods in Soft Computing Techniques.
- CO7: Able to select a proper pattern matching algorithm for given problem.

Units & Contents	No. Of Lectures
1.Introduction to Soft Computing • Concept of computing system • "Soft" Vs. "Hard" computing • Characteristics of soft computing • Some application of soft computing techniques	06
2.FuzzyLogic • The Illusion: Ignoring Uncertainty and accuracy • Uncertainty and information • Fuzzy set and membership • Chance versus Fuzziness • Classical Sets, Fuzzy Sets • Cartesian Product	14

• Crisp Relations • Fuzzy relations • Tolerance and equivalence Relations, Fuzzy Tolerance and equivalence Relations • Value assignments, Other Form soft the Composition Operations • Features of the membership Function • Various forms, Fuzzification, Defuzzification to Crisp sets • λ-Cuts for fuzzy Relations, Defuzzification to Scalars	
3.FuzzySystem • Fuzzy Logic • Approximate Reasoning, Others of implication operations. • Natural Language, Linguistic Hedges • Fuzzy (Ruled-Based) system • Graphical technique of inference • Membership value assignment-Intuition, Inference.	06
4.NeuralNetwork • Biological neurons and its working. • Simulation of biological neurons to problem solving. • Different ANNs architectures. • Training techniques for ANNs. • Applications of ANNs to solve some real-life problems.	10
5.GeneticAlgorithms • A Gentle Introduction to Genetic Algorithms: o What is Genetic Algorithm? o Robustance of Traditional Optimization and Search Methods o The Goals of Optimization • How are Genetic Algorithms Different from Traditional Methods? • A simple Genetic Algorithm • Genetic Algorithms at Work—a Simulation by hand • Grist for the Search Mill—Important Similarities • Similarity Templates (Schemata)Learning the Lingo.	12

Reference Books

1.Fuzzy Logic with Engineering Applications, 3rd Edition By Timothy Ross.

2.Neural Networks By Satish Kumar, Tata McGraw Hill

3.Introduction to Soft Computing by Deepa &Shivanandan, Wiley Publication

4. Genetic Algorithms in Search, Optimization and Machine Learning By David E. Goldberg,
PearsonEducation.

Mapping of this course with Programme Outcomes

Course Outcomes	Programme Outcomes (POs)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	2	2	2	3	2
CO2	3	2	2	2	2	3	2
CO3	3	2	2	2	2	3	2
CO4	3	2	2	2	2	3	2
CO5	3	2	2	2	2	3	2
CO6	3	2	-	2	3	3	2
CO7	3	2	2	2	2	3	2

Justification of PO1 to ALL COs:
PO1: Strongly relates (Weight: 3) -Describing human intelligence and AI contributes to students' understanding of software applications and projects, moderately relating to the concept of software application and projects
Justification of PO2 to ALL COs:
PO2:Strongly related (Weight: 2) - Understanding how intelligent systems work is fundamental to the concept of software applications and projects, strongly relating to the goal of understanding all dimensions of these concepts
Justification of PO3 to ALL COs:
PO3: Strongly related (Weight: 2) -Developing familiarity with current research problems in Soft Computing Techniques has a partial relation to understanding computer subjects and programming concepts with the use of ICT
Justification of PO4 to ALL COs:
PO4: Moderately relates (Weight: 2) - the ability to select proper algorithms contributes to the effectiveness of in-house applications.

Justification of PO5 to ALL COs:

PO5: Moderately relates (Weight: 2) -as discussions on research problems and methods in soft computing may occur during IT visits.

Justification of PO6 to ALL COs:

PO6: Strongly related (Weight: 3) - knowledge of how intelligent systems work is fundamental for comprehending real-world applications in the IT industry.

Justification of PO7 to ALL COs:

PO7: Moderately relates (Weight: 2)- applying fuzzy logic and neural networks may be in demand in certain industry roles, contributing to employability.

Class: M. Sc.(Computer Science) II (Semester- III) **Paper Code:PSCS233**
Title of Paper: Data Science and Analytics **Paper :III**
Credit:04 **No. of lectures:60**

Objective:
Understand the concepts of Data Procedures.
Learn the tools to analyze the data.

Course outcome:
Students successfully completing this course will be able to:
CO1- Analyze the nature of data with the help of statistical methods and different visualization techniques.
CO2-Evaluate the model performance by applying various algorithms and communicate the observations.
CO3-Apply and analyze data analytical methods for real life problems.
CO4-Students will develop relevant programming abilities.
CO5-Students will demonstrate proficiency with statistical analysis of data.
CO6-Students will develop the ability to build and assess data-based models.
CO7-Students will execute statistical analyses with professional statistical software.

Unit	Title and Contents	No. of Lectures
Unit 1	**troduction to Data Science** **1.1** What is Data Science **1.2** Importance of Data Science **1.3**Big data and data science **1.4**Types of data: structured vs unstructured data **1.5**Quantitative vs Categorical data **1.6**Data Science process	06
Unit 2	**Statistics for Data Science** **2.1**Population and samples **2.2**The fundamentals of descriptive statistics: Frequency distribution,Measures of central tendency and variability: range, standard deviation,variance **2.3**Correlation, Simpson's paradox **2.4**Probability: Dependence and Independence, conditional probability,Bayes's theorem, Random variables, continuous distributions, normaldistribution	14

	2.5 Estimators and estimates **2.6**Confidence intervals **2.7**Hypothesis testing	
Unit 3	**Data visualization and multidimensional data** **3.1** Basic of data visualization: Line plot, Scatter plot, Boxplot, Histogram,Bar chart, Pie chat etc. **3.2** Need of data modeling **3.3** Multidimensional data models **3.4** Principal component analysis **3.5** Clustering of high dimensional data	10
Unit 4	**Data Analytics** **4.1**Introduction to Data Analytics **4.2** Data Analytics vs Data Reporting **4.3**Use of Data Analytics **4.4** Applications of Data Analytics **4.5** Characteristics of Data Analytics **4.6** Types of Data Analytics **4.7** Data Analytics Process Steps **4.8**Technical & Business Skills for Data Analytics	10
Unit 5	**Data Analytics using Python** **5.1** Why Data Analytics Using Python **5.2** Python Libraries for Data Analytics **5.3** Data Analytics Using the Python Library- NumPy **5.4** Data Analytics Using Python Libraries- Pandas and Matplotlib **5.5** Case Studies and Real-Life examples	08

Note: 48 hours for theory lectures and 12 hours for internal assessment and learning.

References:

1. Data Science and Big Data Analytics Publisher, Wiley, ISBN:9781118876053, 1118876059

2. Data Analytics Publisher, McGraw Hill Education (India) Private Limited,ISBN:9789352604180, 9352604180
3. Data Analytics for Beginners Publisher, CreateSpace Independent Publishing Platform, ISBN:9781539896739, 1539896730

Mapping of this course with Programme Outcomes

Course Outcomes	Programme Outcomes (POs)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	1	1	1	2	3	3
CO2	3	3	2	2	2	3	3
CO3	3	1	1	1	2	3	3
CO4	2	3	3	3	1	2	2
CO5	3	1	1	1	3	3	3
CO6	3	1	1	1	2	3	3
CO7	3	1	1	1	2	3	3

Weight: 1 - Partially related 2 - Moderately Related 3 - Strongly related

Course Objectives (CO) and Program Outcomes (PO) Mapping:

8 Justification of PO1 to ALL COs:

CO1 - Justification: Analyzing the nature of data through statistical methods aligns with the broader goal of enriching knowledge in areas like data analysis and statistics, which are fundamental in various IT domains.

CO2 - Justification: Evaluating model performance through various algorithms is strongly related to understanding the core concepts of Artificial Intelligence and algorithmic design, which are emphasized in the enriched knowledge areas.

CO3 - Justification: Applying and analyzing data analytical methods for real-life problems directly aligns with the practical application of knowledge in areas like Web Services, Cloud Computing, and Software Project Management.

CO4 - Justification: Developing relevant programming abilities is moderately related as it is essential for many areas of IT, but the emphasis on programming may vary in certain domains like Database Technologies and Software Project Management.

CO5 - Justification: Demonstrating proficiency in statistical analysis of data is strongly related to the broader goal of enriching knowledge, especially in areas like Artificial Intelligence and Database Technologies.

CO6 - Justification: Building and assessing data-based models strongly align with the goals of enriched knowledge, particularly in the context of Artificial Intelligence and Database Technologies.

CO7 - Justification: Executing statistical analyses with professional statistical software is strongly related to the goal of enriching knowledge, emphasizing practical application in areas such as Artificial Intelligence and Data Analysis.

9 Justification of PO2 to ALL COs:

CO1 - Justification: Analyzing the nature of data with statistical methods and visualization techniques is only partially related to understanding the dimensions of software application concepts and projects. While it may have some relevance, the primary focus of CO1 is on data analysis, which may not fully align with software application understanding.

CO2 - Justification: Evaluating model performance through various algorithms is strongly related to understanding the dimensions of software application concepts and projects, especially in the context of algorithmic design and application.

CO3 - Justification: Applying and analyzing data analytical methods for real-life problems is only partially related to understanding software application concepts and projects. While it may have some relevance, the primary focus of CO3 is on data analysis, which may not fully align with software application understanding.

CO4 Justification: Developing relevant programming abilities is strongly related to understanding software application concepts and projects. Programming skills are crucial for implementing software applications and projects effectively.

CO5 - Justification: Demonstrating proficiency in statistical analysis of data is only partially related to understanding software application concepts and projects. While it may have some relevance, the primary focus of CO5 is on data analysis, which may not fully align with software application understanding.

CO6 - Justification: Building and assessing data-based models is only partially related to understanding software application concepts and projects. While it may have some relevance, the primary focus of CO6 is on data analysis, which may not fully align with software application understanding.

CO7 - Justification: Executing statistical analyses with professional statistical software is only partially related to understanding software application concepts and projects. While it may have some relevance, the primary focus of CO7 is on data analysis, which may not fully align with software application understanding.

10 Justification of PO3 to ALL COs:

CO1 - Justification: Analyzing the nature of data with statistical methods and visualization techniques is only partially related to understanding computer subjects with a focus on programming and theoretical concepts. While data analysis may involve programming, it may not cover the broader spectrum of computer subjects.

CO2 - Justification: Evaluating model performance with various algorithms is moderately related to understanding computer subjects. It involves a mix of theoretical concepts and practical application through programming, aligning with the broader understanding of computer subjects.

CO3 - Justification: Applying and analyzing data analytical methods for real-life problems is only partially related to understanding computer subjects. While it may involve

programming and theoretical understanding, the primary focus is on data analysis, which may not fully align with computer subjects.

CO4 - Justification: Developing relevant programming abilities is strongly related to understanding computer subjects. Programming skills are a core aspect of computer science education, aligning well with the demonstration of programming and theoretical concepts.

CO5 - Justification: Demonstrating proficiency in statistical analysis of data is only partially related to understanding computer subjects. While it may involve programming, the primary focus of CO5 is on data analysis, which may not fully align with the broader spectrum of computer subjects.

CO6 - Justification: Building and assessing data-based models is only partially related to understanding computer subjects. While it may involve programming, the primary focus of CO6 is on data analysis, which may not fully align with computer subjects.

CO7 - Justification: Executing statistical analyses with professional statistical software is only partially related to understanding computer subjects. While it may involve programming, the primary focus of CO7 is on data analysis, which may not fully align with computer subjects.

11 Justification of PO4 to ALL COs:

CO1 - Justification: Analyzing the nature of data with statistical methods and visualization techniques is only partially related to developing in-house applications. While data analysis may be part of the project requirements, it does not fully cover the scope of in-house application development.

CO2 Justification: Evaluating model performance with various algorithms is moderately related to developing in-house applications. It involves a mix of theoretical concepts and practical application through programming, which aligns with certain aspects of project development.

CO3 Justification: Applying and analyzing data analytical methods for real-life problems is only partially related to developing in-house applications. While data analysis may be part of addressing real-life problems, the primary focus of CO3 is on data analysis, which may not fully align with the broader scope of application development.

CO4 - Justification: Developing relevant programming abilities is strongly related to developing in-house applications. Programming skills are a fundamental requirement for project development, aligning well with the demonstration of programming abilities in in-house application projects.

CO5 - Justification: Demonstrating proficiency in statistical analysis of data is only partially related to developing in-house applications. While data analysis may be part of the project, the primary focus of CO5 is on data analysis, which may not fully align with the broader scope of application development.

CO6 - Justification: Building and assessing data-based models is only partially related to developing in-house applications. While it may involve some aspects of the project, the

primary focus of CO6 is on data analysis, which may not fully align with the broader scope of application development.

CO7 - Justification: Executing statistical analyses with professional statistical software is only partially related to developing in-house applications. While it may involve some data-related tasks, the primary focus of CO7 is on data analysis, which may not fully align with the broader scope of application development.

12 Justification of PO5 to ALL COs:

CO1 - Justification: Interacting with IT experts and knowledge during IT visits may involve discussions on data analysis and visualization techniques, making it moderately related to CO1. The practical application of these techniques may be part of the interactions.

CO2 - Justification: Interacting with IT experts and gaining knowledge during visits may include discussions on evaluating model performance with various algorithms. It is moderately related to CO2, as practical insights into algorithm performance can be part of such interactions.

CO3 - Justification: Interacting with IT experts and gaining knowledge by IT visits may involve discussions on applying and analyzing data analytical methods for real-life problems. It is moderately related to CO3, as real-life problem-solving through data analytics can be a topic of discussion.

CO4 - Justification: Interacting with IT experts during visits may not be directly related to the development of programming abilities. While programming skills are valuable, they may not be the primary focus of interactions during IT visits, making it only partially related to CO4.

CO5 - Justification: Interacting with IT experts and gaining knowledge during IT visits may strongly relate to demonstrating proficiency in statistical analysis of data. Practical insights and discussions during visits may contribute significantly to achieving the objectives of CO5.

CO6 Justification: Interacting with IT experts during visits may include discussions on building and assessing data-based models, making it moderately related to CO6. Practical insights into model building and assessment can be part of these interactions.

CO7 - Justification: Interacting with IT experts and gaining knowledge during IT visits may involve discussions on executing statistical analyses with professional statistical software. It is moderately related to CO7, as insights into software usage can be part of these interactions.

13 Justification of PO6 to ALL COs:

CO1 - Justification: The industrial exposure through an internship in the IT industry often involves working with real-world data, requiring the application of statistical methods and visualization techniques. This strongly aligns with the objectives of CO1.

CO2 - Justification: During the industrial internship, students may engage in evaluating model performance using various algorithms and effectively communicating their observations. This aligns with the goals of CO2, making it strongly related.

CO3 - Justification: Real-life problems encountered during the industrial internship often require the application and analysis of data analytical methods. This strongly relates to the objectives of CO3.
CO4 - Justification: While industrial exposure may involve programming, the primary focus is not always on the development of programming abilities. Therefore, it is moderately related to CO4.
CO5 - Justification: Proficiency in statistical analysis is a key aspect of many industrial data-related tasks. Therefore, the industrial exposure aligns strongly with the objectives of CO5.
CO6 - Justification: Building and assessing data-based models is often a crucial part of tasks in an IT industry internship. This strongly aligns with the objectives of CO6.
CO7 - ustification: The use of professional statistical software for executing statistical analyses is a common practice in the industry. Hence, the industrial exposure strongly relates to the goals of CO7.

14 Justification of PO7 to ALL COs:

CO1 - Justification: The ability to analyze data using statistical methods and visualization techniques is highly relevant to the current demand in the IT industry, where data-driven decision-making is crucial for various applications.
CO2 - Justification: Evaluating model performance through the application of algorithms aligns with the industry's demand for professionals capable of working on machine learning and data analysis tasks, contributing to employability.
CO3 - Justification: The application and analysis of data analytical methods for real-life problems directly contribute to making students employable, as it reflects the practical skills needed in the IT industry.
CO4 - Justification: While programming is a valuable skill, its direct correlation with employability in the IT industry may vary. It is moderately related as programming skills are essential, but other factors also contribute to employability.
CO5 - Justification: Proficiency in statistical analysis aligns with industry demands, especially in roles that require understanding and interpreting data, contributing significantly to employability.
CO6 - Justification: The ability to build and assess data-based models is a crucial skill in data science and machine learning roles, directly impacting employability in the IT industry.
CO7 Justification: Executing statistical analyses using professional software is directly related to industry practices, enhancing students' employability in roles that involve data analysis and interpretation.

Class: M.Sc.(Computer Science)(Sem-III) Paper Code:PSCS234
Title of Paper: Web Services Architecture Using Dot Net Framework
Paper: IV
Credit:4(4Lectures/Week) No. of lectures:48

Pre-requisites:
StrongKnowledgeofDot.NetFrameworkandASP.NETCoreASP.NET MVC.
Familiarity with programming language C#.
Must be familiar with XML.

Objectives:
To Understand Web Services and implementation using Dot Net Framework.
To Understand the SOA architecture, its Principles and benefits.
To understand cloud computing as a webservice.
To understand XML concepts.

Learning Outcomes: Student will able to:
CO1: Understand the principles of SOA.
CO2: Efficiently use Dot Net frame work for creating web services and web applications.
CO3:AbilitytowritetheWebapplicationusingASP.Net Core MVC-API.
CO4: Knowledge of service oriented computing paradigm, its evolution and the emergence of web services.
CO5: Identify service descriptions suitable for implementing arrange of message exchange patterns
CO6: Describe and explain quality of service aspects of web service provision, and show how these can be applied to Existing services to add value to them.
CO7:Apply Action Scripts that effectively utilize functions, logic, variables, loops, and other programmatic techniques

Unit	Contents	No. ofLectures
1	**Overview of Dot Net Framework** • Dot Net Class Framework, • CLR, elements of Dot Net application, • Window programming, • ASPDOTNET MVC • ASPDOTNETMVC-Web API, ASP DOTNET Core	5

2	**Web Service and SOA fundamental** • Introduction: what are Web Services? Concept of Saas, • Web services Vs Web based Implementation. • Characteristics of Web Services: Types of Webservices, Functional and nonfunctional properties, State processing, loose Coupling, Service Granularity, Service Synchronization. • Service Interface and Implementation • The Services oriented Architecture (SOA):Roles of Interaction in SOA, LayerofSOA6.QualityOfService(QoS) • Webservice Interoperability(WS-I) • Web Services Vs Components • Restful Services • Impact and Short comings of Web services: Impact of web services	8
3	**Web Services Architecture** • Introduction • Web Services Architecture and It's Characteristics: Web service characteristics, Web Service Architecture • Core building blocks of web services • Web Services Communication Models: RPC-based Communication Model, Messaging-based communication Model • Basic steps of implementing web services • Developing web services -Enabled applications: Web Services Implementation Using Dot Net Environment, Developing Web Services Using Dot Net: AN Example • Packaging and Deploying the Service: Creating web Service Clients.	8
4	**SOAP: Simple Object Access Protocol** • Introduction • Inter -application communication and wire protocols: SOAP As a wire representation, SOAP asamessaging protocol • Structure of a SOAP message: SOAP Envelope, SOAP Header, SOAP Body. • SOAP communication model: RPC-Style, Document–(Message)StyleWebServices5BuildingSOAPWebServices. • Building SOAP Web Services • Error handling in SOAP and Advantages and disadvantages of SOAP.	8

5	**Describing and Discovering Web Services:** • WSDL in the world of Web Services • Web Services life cycle: Anatomy of WSDL definition document, Patterns Of Operations • WSDL bindings, WSDL Tools, limitations of WSDL • Service discovery: Role of service discovery in a SOA, service discovery mechanisms. • UDDI–UDDI Registries, uses of UDDI Registry, Searching in formation in a UDDI Registry, Deleting information in a UDDI Registry, limitations of UDDI.	9
6	**Cloud Computing:** • Introduction: What is Cloud Computing? Essential characteristic of cloud, Cloud Deployment Model, History, Benefits, Risk • SOAMeets the cloud: Comparing SOA with Cloud Computing ,SOA Deployment: Cloud ComputingVsThe ESB • Cloud Computing Technologies: Virtualization, SOA, Grid Computing, Utility Computing. • Cloud Computing Architecture: Front End, Back End • Cloud Model: Public Cloud, Private Cloud, Hybrid Cloud, Benefits, Disadvantages • Security and Privacy: Insecure or incomplete data and deletion, Security Planning, understanding security of cloud, Security Boundaries, Understanding Data Security, Isolated Access To data. • Cloud Computing Application: Business, Social, Entertainment	10

Reference Book:

Restful Web Services Cook book,Subbu Allamaraju
Service Architecture, ThomasEri
XML, Web Services, and the Data Revolution ,F.P. Coyle,Pearson Education
Professional visual C#,wroxpublication.

Text Books:

WebServices&SOAPrinciplesandTechnology.BeginningvisualC#,Wroxpublication.

Mapping of this course with Programme Outcomes

Course Outcomes	Programme Outcomes (POs)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	2	3	3	3	3
CO2	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3
CO4	3	2	3	2	2	3	2
CO5	3	2	2	2	2	3	2
CO6	3	2	2	2	2	3	2
CO7	2	1	1	1	1	3	3

Weight: 1 - Partially related 2 - Moderately Related 3 - Strongly related

Justification:

Mapping PO1 to All CO's :

CO1 is strongly related to PO1 - SOA is a fundamental principle in Web Services and Cloud Computing.

CO2 is strongly related to PO1- Utilizing Dot Net framework is directly related to web services and web applications.

CO3 is strongly related to PO1 - ASP.Net Core MVC-API is a part of web application development.

CO4 is strongly related to PO1- Understanding the evolution of service-oriented computing is part of the broader knowledge enrichment.

CO5 is strongly related to PO1 - Understanding service descriptions and message exchange patterns aligns with the enriched knowledge in various areas.

CO6 is strongly related to PO1 - Quality of service aspects in web services align with the enriched knowledge.

CO7 is moderately related to PO1 - Programming techniques, functions, logic, and variables are part of the broader knowledge, but the direct emphasis on script application is a bit specific

Mapping PO2 to All CO's :

CO1 is strongly related to PO2 as understanding the principles of Service-Oriented Architecture (SOA) contributes to a comprehensive grasp of software application concepts, covering various dimensions.

CO2 is strongly related to PO2 as efficiently using the Dot Net framework for creating web services and web applications directly aligns with understanding all dimensions of software application concepts and projects.
CO3 is strongly related to PO2 as the ability to write web applications using ASP.Net Core MVC-API is a key skill that contributes to a thorough understanding of software application concepts and projects.
CO4 is moderately related to PO2 as knowledge of the service-oriented computing paradigm, its evolution, and the emergence of web services adds a valuable context to understanding software application concepts, though it may not cover all dimensions.
CO5 is moderately related to PO2 as the ability to identify service descriptions suitable for implementing a range of message exchange patterns contributes to understanding various dimensions of software application concepts.
CO6 is moderately related to PO2 as describing and explaining quality of service aspects of web service provision, and how they can be applied to existing services, enhances the understanding of software application concepts but may not cover all dimensions.
CO7 is partially related to PO2 as applying Action Scripts with programmatic techniques like functions, logic, variables, and loops contributes to software application understanding, but the directconnection may not cover all dimensions.

Mapping PO3 to All CO's :

CO1 is moderately related to PO3-(Understand the principles of SOA)
CO2 is strongly related to PO3-(Efficiently use Dot Net framework for creating web services and web applications)
CO3 is strongly related to PO3-(Ability to write the Web application using ASP.Net Core MVC -API)
CO4 is strongly related to PO3 (Knowledge of service-oriented computing paradigm, its evolution, and the emergence of web services)
CO5 is moderately related to PO3-(Identify service descriptions suitable for implementing a range of message exchange patterns)
CO6 is moderately related to PO3- (Describe and explain quality of service aspects of web service provision, and show how these can be applied to existing services to add value to them)
CO7 is partially related to PO3-(Apply Action Scripts that effectively utilize functions, logic, variables, loops, and other programmatic techniques)
This mapping suggests that CO2, CO3, and CO4 are strongly related to PO3 and have a higher weightage, indicating a significant emphasis on these aspects in achieving the program outcomes. CO1, CO5, and CO6 are moderately related, while CO7 is partially related to PO3.

Mapping PO4 to All CO's :
CO1 is strongly related to PO4 as understanding the principles of SOA is essential for the development of in-house applications.
While CO2 and CO3, with a weightage of 3, are strongly related to PO4 as they involve efficiently using the Dot Net framework and writing web applications using ASP.Net Core MVC-API in the development process.
CO4 is moderately related to PO4, as knowledge of the service-oriented computing paradigm and the emergence of web services contributes to the overall understanding of developed in-house applications.
CO5 and CO6, with a weightage of 2, are moderately related to PO4 as identifying service descriptions and understanding quality of service aspects add value to the projects.
CO7 is partially related to PO4, as applying action scripts with programmatic techniques contributes, but to a lesser extent, to the development of in-house applications.

Mapping PO5 to All CO's :

CO1 is strongly related to PO5, as interactions with IT experts during visits can deepen understanding of SOA principles.
CO2 is strongly related to PO5, as IT visits may involve practical applications of the Dot Net framework.
CO3 is strongly related to PO5, as interactions during IT visits may involve discussions and demonstrations related to writing web applications using ASP.Net Core MVC -API.
CO4 is moderately related to PO5, as IT visits may provide historical context and evolution insights into service-oriented computing.
CO5 is moderately related to PO5, as IT visits may offer practical examples and scenarios for identifying service descriptions.
CO6 is moderately related to PO5, as IT visits may include discussions on enhancing service quality.
CO7 is partially related to PO5, as IT visits may not directly focus on scripting techniques but may involve general programming discussions.

Mapping PO6 to All CO's :

CO1, CO2, CO3, CO4, CO5, CO6, and CO7 are strongly related to PO6, as they collectively form the foundation for acquiring industrial exposure in the IT industry through an internship, encompassing understanding of SOA principles, efficient use of the Dot Net framework, writing web applications using ASP.Net Core MVC-API, knowledge of the service-oriented computing paradigm, identifying service descriptions, describing quality of service aspects, and applying action scripts.

Mapping PO7 to All CO's :

CO1 is strongly related to PO4 as understanding the principles of SOA is crucial for grasping the knowledge of service-oriented computing paradigm and the evolution of web services.
CO2 is strongly related to PO7 as efficiently using the Dot Net framework for creating web services and applications aligns with making students employable in the current demand of the IT industry.
CO3 is strongly related to PO7 as the ability to write web applications using ASP.Net Core MVC-API contributes directly to making students employable in the current IT industry.
CO4 is moderately related to PO4 as knowledge of the service-oriented computing paradigm and the emergence of web services is important, but it might not directly impact employability in the current IT industry.
CO5 is moderately related to PO4 as identifying service descriptions suitable for implementing a range of message exchange patterns is part of the broader understanding of service-oriented computing paradigm, contributing to employability but not as directly as other outcomes.
CO6 is moderately related to PO4 as describing and explaining quality of service aspects of web service provision can add value to existing services, which indirectly aligns with the knowledge required for the IT industry.CO7 is strongly related to PO7 as applying action scripts that effectively utilize functions, logic, variables, loops, and other

Class: M.Sc. (Computer Science) II (Semester – III) **Paper Code: PSCS**235(A)
Title of Paper: Emerging Technologies - Python Programming-II **Paper:** V
Credit: 4 **No. of Lectures:** 60

Prerequisites:

- To introduce various concepts of programming to the students using Python.
- Students should be able to apply the problem-solving skills using Python

Course Objectives: Student successfully computing this course will be able

- To understand and gain the knowledge of the all types of programming.
- To understand and solve the functional and procedural problems.

Course Outcomes:

CO 1 - To understand why Python is a useful scripting language for developers.
CO 2 - To learn how to use lists, tuples, and dictionaries in Python programs.
CO 3 - To learn how to use indexing and slicing to access data in Python programs.
CO 4 - To learn how to write functions and pass arguments in Python.
CO 5 - To learn how to build and package Python modules for reusability.
CO 6 - To learn how to read and write files in Python.
CO 7 - To learn how to design object-oriented programs with Python classes

Units	Title and Contents	No. of Lectures
Unit -I	**Writing GUIs in Python (Tkinter)** • Introduction • Components and Events • An Example GUI • The root Component • Adding a Button • Entry Widgets • Text Widgets • Check buttons	**10**
Unit -II	**Python SQL Database Access** • Introduction • Installation • DB Connection • Creating DB Table • INSERT, READ, UPDATE, DELETE operations. • COMMIT & ROLLBACK operation. • handling Errors	**08**
Unit –III	**Network Programming** • Introduction • A Daytime Server • Clients and Servers • The Client Program • The Server Program	**08**

Unit -IV	**Python MongoDB** • Introduction • Installation • DB Connection • Creating DB Table INSERT, READ, UPDATE, DELETE operations.	**08**
Unit – V	**Python Libraries** **NumPy** • Array in NumPy • Data Types in NumPy • Methods in NumPy • String Operations • Sorting, Searching and Counting **Pandas** • Data Frame • Working with Text Data Pandas Merging, Joining, and Concatenating	**14**

NOTE: 48 LECTURES FOR CURRICULUM (TEACHING) &12 LECTURES FOR LEARNING

Reference Books:

1. Python GUI Programming with Tkinter – By Alan D Moore
2. Databases and Python Programming: MySQL, MongoDB, OOP and Tkinter- By R PANNEERSELVAM
3. Foundations of Python Network Programming: The comprehensive guide to building network applications
   with Python – By Brandon Rhodes and John Goerzen
4. Guide to NumPy – Travis E. OLIPHANT PHD

Course Outcomes	**Programme Outcomes (POs)**						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	3	3	3	2	3	3
CO2	3	3	3	3	2	3	3
CO3	2	3	3	3	2	3	3
CO4	3	3	3	3	2	3	3
CO5	2	3	3	3	2	3	3
CO6	2	3	3	3	2	3	3
CO7	3	3	3	3	2	3	3

Weight: 1 - Partially related 2 - Moderately Related 3 - Strongly related

Course Objectives (CO) and Program Outcomes (PO) Mapping:

Justification of PO1 to ALL COs :

CO 1: - Understanding Python's scripting utility provides foundational knowledge, but its direct impact on specified areas may vary.

CO 2: - Proficiency with lists, tuples, and dictionaries is fundamental for AI, web services, and other core computing subjects.

CO 3- Indexing and slicing skills are important for efficient data access, moderately contributing to various areas.

CO 4: - Writing functions and passing arguments is crucial across algorithms, AI, and software project management.

CO 5: - Building reusable modules is beneficial, with a moderate impact on several areas.

CO 6: - File handling skills contribute moderately to data management in different computing domains.

CO 7: - Designing object-oriented programs aligns well with software project management and mobile technologies.

2. Justification of PO2 to ALL COs :

PO2: - Proficiency in Python (CO1-CO7) provides a comprehensive foundation for understanding software applications and projects across various dimensions.

3. Justification of PO3 to ALL COs :

PO3: - Proficiency in Python (CO1-CO7) ensures a holistic understanding of computer subjects, combining theoretical concepts and practical programming, facilitated by the use of ICT.

4. Justification of PO4 to ALL COs :

PO4: - Proficiency in Python (CO1-CO7) directly contributes to the development of in-house applications by providing essential scripting, data manipulation, modularization, and object-oriented programming skills.

5. Justification of PO5 to ALL COs :

PO5: - Proficiency in Python (CO1-CO7) provides a foundational skill set for engaging with IT experts during visits, offering insights into scripting, data handling, modularization, and object-oriented programming aspects.

6. Justification of PO6 to ALL COs :

PO6: - Proficiency in Python (CO1-CO7) enhances the effectiveness of the 6 months Industrial Internship by providing essential scripting, data manipulation, modularization, and object-oriented programming skills crucial in the IT industry.

7. Justification of PO7 to ALL COs :

PO7: - Proficiency in Python (CO1-CO7) enhances employability by providing essential scripting, data manipulation, modularization, and object-oriented programming skills aligned with current IT industry demands, fostering responsible citizenship.

Class: M. Sc. (Computer Science) -II (Semester- III) **Paper Code :** PSCS236
Title of Paper: Lab I : Based on PSCS233,PSCS234,PSCS235(A) **Paper :** VI
Credit : 4 (3 Hour Practical/Week/batch) **No. of Practical :** 12

Learning Objectives:

- Student successfully computing this course will be able to understand and gain the knowledge of the Practical.
- To Understand and create an ability to use current techniques, skills, and tools necessary for Python and Dot Net Programming.

Course Outcomes:

CO 1 - To understand why Python is a useful scripting language for developers.
CO 2 - To learn how to use Components, Database in Python programs.
CO 3 - To learn how to use of Numpy in Python programs.
CO 4 - To learn how to use of Pandas in Python.
CO 5 - To learn how to create GUI using tkinter in python.
CO 6 - To learn how to read and write files in Python.
CO 7 - To learn how to create web services

Assignments	
	Assignment based on PSCS133: Data Science & Analytics
1	Practical implementation of Descriptive statistics such as Frequency distribution, Measures of central tendency and variability: range, standard deviation, variance
2	Practical implementation of Basics of data visualization such as Line plot, Scatter plot, Boxplot, Histogram, Bar chart, Pie chat etc.
3	Practical implementation of Data Analytics Using the Python Library- NumPy
4	Practical implementation of Data Analytics Using Python Libraries- Pandas and Matplotlib
	Assignment based on PSCS134: Web Services Architecture using Dot Net Framework
1	Introduction of Web Services
2	Assignment on SOAP
3	Assignment on WSDL
4	Assignment on UDDI
5	Assignment on XML
	Assignment based on PSCS135 (A): Emerging Technologies: Python Programming – II (Advanced)
1	Assignment on GUI
2	Assignment on SQL & Mango DB Database
3	Assignment on NumPy
4	Assignment on Pandas

Course Outcomes	Programme Outcomes (POs)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	3	3	3	2	3	3
CO2	3	3	3	3	2	3	3
CO3	2	3	3	3	2	3	3
CO4	3	3	3	3	2	3	3
CO5	2	3	3	3	2	3	3
CO6	2	3	3	3	2	3	3
CO7	3	3	3	3	2	3	3

Weight: 1 - Partially related 2 - Moderately Related 3 - Strongly related

Course Objectives (CO) and Program Outcomes (PO) Mapping:

1. Justification of PO1 to ALL COs :

CO 1: - Understanding Python's scripting utility provides foundational knowledge, but its direct impact on specified areas may vary.

CO 2: Strongly Related (Weightage: 3) - Proficiency with lists, tuples, and dictionaries is fundamental for AI, web services, and other core computing subjects.

CO 3: - Indexing and slicing skills are important for efficient data access, moderately contributing to various areas.

CO 4: - Writing functions and passing arguments is crucial across algorithms, AI, and software project management.

CO 5- Building reusable modules is beneficial, with a moderate impact on several areas.

CO 6: - File handling skills contribute moderately to data management in different computing domains.

CO 7: - Designing object-oriented programs aligns well with software project management and mobile technologies.

2. Justification of PO2 to ALL COs :

PO2: - Proficiency in Python (CO1-CO7) provides a comprehensive foundation for understanding software applications and projects across various dimensions.

3. Justification of PO3 to ALL COs :

PO3: - Proficiency in Python (CO1-CO7) ensures a holistic understanding of computer subjects, combining theoretical concepts and practical programming, facilitated by the use of ICT.

4. Justification of PO4 to ALL COs :

PO4: - Proficiency in Python (CO1-CO7) directly contributes to the development of in-house applications by providing essential scripting, data manipulation, modularization, and object-oriented programming skills.

5. Justification of PO5 to ALL COs :

PO5: - Proficiency in Python (CO1-CO7) provides a foundational skill set for engaging with IT experts during visits, offering insights into scripting, data handling, modularization, and object-oriented programming aspects.

6. Justification of PO6 to ALL COs :

PO6: - Proficiency in Python (CO1-CO7) enhances the effectiveness of the 6 months Industrial Internship by providing essential scripting, data manipulation, modularization, and object-oriented programming skills crucial in the IT industry

7. Justification of PO7 to ALL COs :

PO7: - Proficiency in Python (CO1-CO7) enhances employability by providing essential scripting, data manipulation, modularization, and object-oriented programming skills aligned with current IT industry demands, fostering responsible citizenship.

Class: M. Sc. (Computer Science)-II (Semester- III) **Paper Code :** PSCS237
Title of Paper: Lab Course: Projects **Paper :** VII
Credit : 4 (3 Hour Practical/Week/batch) **No. of Practical :** 12

Objectives:

- Provides students with an opportunity to develop understanding of the operations of a computer system and computer applications software.
- To develop the skill of using computer applications software for solving problems.

Course Outcome:

CO1: The Project can be platform, language and technology independent.
CO2: Project will be evaluated by the project guide.
CO3: Assessment will be done weekly in the respective batch.
CO4: Evaluation will be on the basis of weekly progress of project work, progress report, oral,
results and documentation and demonstration.
CO5: You should fill your status of project work on the progress report and get the signature of
project guide regularly.
CO6: Progress report should sharply focus how much time you have spent on specific task?
You should keep all sign progress report.
CO7: Project will not be accepted, if progress report is not submitted and all the responsibilities
remain with student.

The format of Progress Report is:

Roll No. & Name of Student:	
Title of the Project:	
Project Guide Name:	

Sr. No.	**Date**	**Details of Project Work**	**Project Guide Sign (With Date)**
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			

12			

Head
Department of Computer Science

Course Outcomes	Programme Outcomes (POs)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	3	3	1	1	2	2
CO2	3	3	3	3	2	3	3
CO3	2	2	2	2	2	2	2
CO4	3	3	3	3	2	3	3
CO5	1	1	1	1	1	1	1
CO6	1	1	1	1	1	1	1
CO7	1	1	1	1	1	1	1

Weight: 1 - Partially related 2 - Moderately Related 3 - Strongly related

Course Objectives (CO) and Program Outcomes (PO) Mapping:

1. Justification of PO1 to ALL COs :

CO1: - While the project's independence aligns with diverse IT knowledge (PO1), the direct relationship is partial.

CO2: - The project guide's evaluation directly contributes to understanding project-related subjects (PO1).

CO3: - Weekly assessments correlate with a comprehensive grasp of various IT areas (PO1).

CO4: - Evaluation based on progress, oral, and documentation aligns with enriched knowledge and practical skills (PO1).

CO5: - Regular status updates somewhat connect with understanding IT trends and subjects (PO1).

CO6: - Time tracking in progress reports has a partial link to enriched IT knowledge (PO1).

CO7: - non-submission consequences partially align with the responsibility aspect of enriched IT knowledge (PO1).

2. Justification of PO2 to ALL COs :

CO1: - The platform and technology independence aligns with the comprehensive understanding of software application concepts (PO2).

CO2: - Project evaluation by the guide directly contributes to students' grasp of software application and project concepts (PO2).

CO3: - Weekly assessments correlate moderately with understanding various dimensions of software application concepts (PO2).

CO4: - Evaluation based on weekly progress aligns with the depth of understanding software application and project dimensions (PO2).

CO5: - Regular status updates have a partial connection with understanding software application concepts (PO2).

CO6: - Time tracking in progress reports has a partial link to the depth of understanding software application concepts (PO2).
CO7: - Non-submission consequences partially align with the responsibility aspect of understanding software application concepts (PO2).
3. Justification of PO3 to ALL COs :
CO1: - The project's platform independence aligns strongly with students' understanding of computer subjects and programming concepts (PO3). CO2: Strongly Related (Weightage: 3) - Project evaluation by the guide directly contributes to students' understanding of computer subjects and programming (PO3).
CO3: - Weekly assessments moderately align with demonstrating theoretical and programming concepts (PO3).
CO4: - Evaluation based on weekly progress, oral, and documentation aligns strongly with demonstrating computer subjects and programming concepts (PO3).
CO5: - Regular status updates have a partial connection with demonstrating computer subjects and programming (PO3).
CO6: - Time tracking in progress reports has a partial link to demonstrating computer subjects and programming (PO3).
CO7: - Non-submission consequences partially align with the responsibility aspect of understanding computer subjects and programming (PO3).
4. Justification of PO4 to ALL COs :
CO1: - The project's platform independence aligns strongly with the goal of developing in-house applications and projects (PO4).
CO2: - Project evaluation by the guide directly contributes to the development of in-house applications (PO4).
CO3: - Weekly assessments moderately align with the continuous development of in-house applications (PO4).
CO4: - Evaluation based on weekly progress, oral, and documentation aligns strongly with the development of in-house applications (PO4).
CO5: - Regular status updates have a partial connection with the development of in-house applications (PO4).
CO6: - Time tracking in progress reports has a partial link to the development of in-house applications (PO4).
CO7: - Non-submission consequences partially align with the responsibility aspect of developing in-house applications (PO4).
5. Justification of PO5 to ALL COs :
CO1: - Platform independence, while important for projects, has a partial connection with IT visits and interactions with experts (PO5).
CO2: - Project evaluation aligns moderately with the goal of interacting with IT experts during visits (PO5).
CO3: - Weekly assessments moderately correlate with gaining knowledge through IT visits and interactions with experts (PO5).
CO4: - Evaluation based on weekly progress aligns moderately with the objectives of IT visits and knowledge interaction (PO5).

CO5: - Regular status updates have a partial connection with the interaction with IT experts during visits (PO5).
CO6: Partially Related (Weightage: 1) - Time tracking in progress reports has a partial link to the goals of IT visits and knowledge interaction (PO5).
CO7: - Non-submission consequences partially align with the responsibility aspect of IT visits and knowledge interaction (PO5).

6. Justification of PO6 to ALL COs :
CO1: - Platform independence, while crucial for projects, has a moderate connection with the objectives of industrial exposure through internships (PO6).
CO2: - Project evaluation aligns strongly with the goals of gaining industrial exposure during the internship (PO6).
CO3: - Weekly assessments moderately correlate with the objectives of industrial exposure through internships (PO6).
CO4: - Evaluation based on weekly progress aligns strongly with the goals of industrial exposure through internships (PO6).
CO5: - Regular status updates have a partial connection with the objectives of industrial exposure during the internship (PO6).
CO6: - Time tracking in progress reports has a partial link to the goals of industrial exposure through internships (PO6).
CO7: - Non-submission consequences partially align with the responsibility aspect of industrial exposure during the internship (PO6).
7. Justification of PO7 to ALL COs :
CO1: - Platform independence is moderately connected to the employability goal and responsibility as a citizen (PO7).
CO2: - Project evaluation aligns strongly with making students employable and responsible citizens (PO7).
CO3: - Weekly assessments moderately correlate with the employability objective and responsibility as a citizen (PO7).
CO4: - Evaluation based on weekly progress aligns strongly with the goals of employability and responsibility as a citizen (PO7).
CO5: - Regular status updates have a partial connection with employability and responsibility as a citizen (PO7).
CO6: - Time tracking in progress reports has a partial link to the goals of employability and responsibility as a citizen (PO7).
CO7: - non-submission consequences partially align with the responsibility aspect of employability and being a responsible citizen (PO7).