Savitribai Phule Pune University

(Formerly University of Pune)

Two year M.Sc. Degree Program in Computer Science

(Faculty of Science & Technology)

M.Sc.- II (Computer Science)

Choice Based Credit System Syllabus

To be implemented from Academic Year

2020-2021

CSUT231- Software Architecture and Design Patterns   Total Credits - 4

Pre-requisites

- Familiarity with UML and OOPs Concepts
- Programming in Java

Course Objectives:

- To introduce students to the basic concepts and techniques of SADP.
- To write java programs using Design Pattern and Frameworks to create reusable and flexible software systems.
- Use of patterns and architectures for solving practical problems.
- To understand about design pattern.
- To understand about the process of deploying web apps using specific Frameworks.

Course Outcomes:

- Recognize the characteristics of patterns that make it useful to solve real-world problems.
- Process available data using python libraries and predict outcomes using Machine Learning algorithms to solve given problem.
- Able to use specific frameworks as per applications need.
- Design java application using design pattern techniques.

Chapter No.	Topics	# Lectures
1.	**Introduction**	2
1.1	UML The Notation	
1.2	Process Unified Process / Rational Unified Process inception, elaboration, construction, transition	
1.3	How various components fit in the life cycle The artifacts at end of each process / discipline	
2.	**Software Architecture**	4
2.1	What Software Architecture is and what it isn't.	
2.2	Why is architecture important?	
2.3	Architectural structures and views	
	Architectural Styles	

	3.1	Architectural Styles	
	3.2	Pipes and Filters	
	3.3	Data Abstraction and Object – Oriented Organization	
	3.4	Event-Based, Implicit Invocation	
3.	**3.5**	Layered Systems	**6**
	3.6	Repositories	
	3.7	Interpreters	
	3.8	Other familiar Architectures	
	3.9	Heterogeneous Architectures.	

4.   Introduction to Patterns   **4**
    4.1   What is a Pattern & Design Pattern
    4.2   What makes a Pattern (GOF)
    4.3   Describing Design Patterns.
    4.4   Pattern Categories & Relationships between Patterns.
    4.5   Organizing the Catalogue.
    4.6   Patterns and Software Architecture.

5.   Study of Design Patterns   **12**
    5.1   Creational Patterns-singleton, factory method, abstract factory
    5.2   Structural Patterns-adapter, decorator, facade
    5.3   Behavioural Patterns-iterator, observer, strategy, command and state (study of intent, applicability, participants, structure, collaboration , Java Example code , Implementation and consequences)

6.   GRASP(General Responsibility Assignment Software Patterns)   **10**
    6.1   Expert, Creator, High Cohesion, Low Coupling
    6.2   Controller, Polymorphism, Pure Fabrication, Indirection
    6.3   Don't Talk to Strangers

7.   Study of Frameworks   **14**
    7.1   Frameworks as reusable chunks of architecture
    7.2   The framework lifecycle, development using frameworks
    7.3   Spring Core Framework
    7.4   Spring Boot Framework
    7.5   Microservices with Spring
    7.6   Web Architectures: Google Web Tool Kit, Spring , Hibernate etc.
    7.7   Selection of proper framework
    7.8   Comparing Frameworks
    7.9   Advantages of Spring
    7.10   Web based Case Study

8.   Case Study (any one of the web Architecture)   **8**
    8.1   Take a Framework and find Patterns in the Frame work.
    8.2   Benefits of Patterns in the chosen Framework

8.3   How Pattern interact in the selected Framework.

References:
1. Design Patterns – Elements of Reusable Object-oriented Software By E. Gamma, Richard Helm, Ralph Johnson , John Vlissides (GoF)
2. Pattern – Oriented Software Architecture (POSA) Volume 1. By : Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, Michael Stal.
3. Software Architecture in Practice. By Len Bass, Paul Clements, Rick Kazman
4. Applying UML and Patterns By Craig Larman.
5. Software Architecture- Perspectives on an emerging discipline by Mary shaw and David Garlan
6. Head First Design Pattern by Kathy Sierra, Bert Bates, Elisabeth Robson, Eric Freeman Publisher: O'Reilly Media, Inc.
7. Building Microservices-Designing Fine-Grained Systems By Sam Newman Publisher: O'Reilly Media
8. Design patterns in Java by Douglas Schmidt Publisher O'Reilly
9. Professional Java Development with the Spring Framework **1st Edition** by Rod Johnson, Alef Arendsen, Thomas Risberg, Colin Sampaleanu ; WROX publication
10. Mastering Spring 5: An effective guide to build enterprise applications using Java Spring and Spring Boot framework, 2nd Edition by Ranga Rao Karanam ; PACKT publishing