



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

COMPUTER SCIENCE AND ENGINEERING

COURSE DESCRIPTION FORM

Course Title	:	DESIGN PATTERNS			
Course Code	:	58063			
Course Structure	:	Lectures	Tutorials	Practicals	Credits
		4	-	-	4
Course Coordinator	:	Mr. P Krishna Kishore, Assistant Professor, CSE			
Team of Instructors	:	Ms. A Soujanya, Assistant Professor, CSE Ms. Y Harika Devi, Assistant Professor, CSE			

I. COURSE OVERVIEW:

The course covers a wide range of software development concepts, abilities, and skills, from analyzing a problem to implementing a solution, also discuss the design patterns in Smalltalk MVC architecture, Express representation invariants, understand their impact on efficiency and ease of implementation, and implement them as runtime assertions. Outlines the differences between structural patterns and behavioral patterns of a model. The course explains about common design vocabulary. This course helps to determine how to be recognizing a design and they can reduce the amount of refactoring, helps to use primitive techniques such as objects, inheritance, and polymorphism. Describes problems that occur in a design how to resolve them and how to evaluate them.

II. PREREQUISITES:

Level	Credits	Periods/Week	Prerequisites
UG	4	4	Object Oriented Programming concepts, basic notations of design, and basic data structures such as arrays, hash tables, trees and lists.

III. COURSE ASSESSMENT METHODS:

a) Marks Distribution

Session Marks	University End Exam Marks	Total Marks
There shall be 2 midterm examinations. Each midterm examination consists of subjective type and Objective type tests. The subjective test is for 10 marks, with duration of 1 hour. Subjective test of each semester shall contain 4 questions; the student has to answer 2 questions, each carrying 5 marks. The objective type test is for 10 marks with duration of 20 minutes. It consists of 10 Multiple choice and 10 objective type questions, the student has to answer all the questions and each carries half mark. First midterm examination shall be conducted for	75	1000

the first four units of syllabus and second midterm examination shall be conducted for the remaining four units. Five marks are given for assignments. There shall be two assignments in every theory course. Marks shall be awarded considering the average of two assignments in each course.		
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IV. EVALUATION SCHEME:

S.No	Component	Duration	Marks
1	I Mid Examination	80 Minutes	20
2	I Assignment	-	05
3	II Mid Examination	80 Minutes	20
4	II Assignment	-	05
5	External Examination	3 Hours	75

V. COURSE OBJECTIVES:

1. **Demonstration** of patterns related to object oriented design.
2. **Describe** the design patterns that are common in software applications.
3. **Analyze** a software development problem and express it.
4. **Design** a module structure to solve a problem, and evaluate alternatives;
5. **Implement** a module so that it executes efficiently and correctly;
6. **Appreciate** engineering issues in the development of software, such as the importance of addressing the user's concerns, working with limited resources, maintainability and dependability.
7. **Describes** creational, structural and behavioural patterns.
8. **Demonstrates** the Case Study on designing a document editor.

VI. COURSE OUTCOMES:

Upon completion of this course, students will be able to:

1. Construct a design consisting of a collection of modules.
2. Exploit well-known design patterns (such as Iterator, Observer, Factory and Visitor).
3. Express the appropriate roles of sub typing and inheritance, and use them effectively.
4. Ability to understand and apply common design patterns to incremental/iterative development.
5. Ability to identify appropriate patterns for design of given problem.
6. Applying the software development concepts, abilities, and skills, from analyzing a problem for implementing a solution.

VII. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes		Level	Proficiency assessed by
PO1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	H	Assignment, Exercises
PO2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics,	S	Exercises

	natural sciences, and engineering sciences.		
PO3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	S	Exercises
PO4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	N
PO5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.	H	Design, Exercises
PO6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.	N
PO7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	H	Assignment, Exercises
PO8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.	S	Seminars, Discussions
PO9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	H	Workshop
PO10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	S	Seminars, Paper presentations
PO11	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary	H	Design Exercises, Discussions

	environments.		
PO12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	S	Exams, Discussions

VIII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes		Level	Proficiency assessed by
PSO1	Professional Skills: The ability to research, understand and implement computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient analysis and design of computer-based systems of varying complexity.	H	Lectures, Assignments
PSO2	Software Engineering practices: The ability to apply standard practices and strategies in software service management using open-ended programming environments with agility to deliver a quality service for business success.	H	Projects
PSO3	Successful Career and Entrepreneurship: The ability to employ modern computer languages, environments, and platforms in creating innovative career paths, to be an entrepreneur, and a zest for higher studies.	S	Guest Lectures

N - None S - Supportive H - Highly Related

IX. SYLLABUS:

UNIT – I

Introduction: What is a Design Pattern?, Design Patterns in Smalltalk MVC, Describing Design Patterns, Catalog of Design Patterns, The Catalog of Design Patterns, Organizing the Catalog, How Design Patterns Solve Design Problems, How to Select a Design Pattern, How to Use a Design Pattern.

UNIT – II

A Case Study: Designing a Document Editor: Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look-and-Feel Standards, Supporting Multiple Window Systems, User Operations, Spelling Checking and Hyphenation, Summary.

Creational Patterns: Abstract Factory, Builder, Factory Method, Prototype, Singleton, Discussion of Creational Patterns.

UNIT – III

Structural Patterns Part I: Adapter, Bridge, Composite.

Structural Patterns Part II: Decorator, facade, Flyweight, Proxy.

UNIT – IV

Behavioral Patterns Part I: Chain of Responsibility, Command, Interpreter, Iterator.

Behavioral Patterns Part II: Mediator, Memento, Observer.

UNIT – V

Behavioral Patterns Part III (Cont'd): State, Strategy, Template Method, Visitor, Discussion of Behavioral Patterns.

What to Expect from Design Patterns, A Brief History, The Pattern Community An Invitation, A Parting Thought.

Text books:

1. Design Patterns by Erich Gamma, Pearson Education.

Reference books:

1. Pattern's in JAVA Vol-I by Mark Grand, Wiley DreamTech.
2. Pattern's in JAVA Vol-II by Mark Grand, Wiley DreamTech.
3. JAVA Enterprise Design Patterns Vol-III by Mark Grand, Wiley DreamTech.
4. Head First Design Patterns by Eric Freeman-Oreilly-spd.
5. Peeling Design Patterns, Prof. Meda Srinivasa Rao, Narsimha Karumanchi, CareerMonk Publications.
6. Design Patterns Explained by Alan Shalloway, Pearson Education.
7. Pattern Oriented Software Architecture, F. Buschmann & Others, John Wiley & Sons.

X. COURSE PLAN:

The course plan is meant as a guideline. There may probably be changes.

Lecture No	Course Learning Outcomes	Topics to be covered	References
1-3	Recognize the importance of design and design patterns.	What is a design pattern?, Design patterns in Smalltalk MVC.	T1 pg:1-6
4-8	Listing contents of catalog of design patterns.	Describing Design Patterns, The Catalog of Design Patterns, Organizing the Catalog.	T1 pg:6-11
9-12	Determine object granularity and specify object interfaces.	How Design Patterns Solve Design Problems, How to Select a Design Pattern, How to use a Design Pattern.	T1 pg:11-29
13-18	Outlines the problems of Lexi's design.	Designing a Document Editor: Design Problems, Document Structure, Formatting, Embellishing the User Interface.	T1 pg:33-43
19-22	Summarize command class and subclasses.	Supporting Multiple Look-and Feel Standards, Supporting Multiple Window Systems.	T1 pg:47-51
23-27	Describe interactor class and subclasses.	User Operations Spelling Checking and Hyphenation, Summary.	T1 pg:58-76
28-35	Lists out the importance of creational patterns.	Abstract Factory, Builder, Factory Method.	T1 pg:87-107
36-40	Reviews the importance of prototype pattern.	Prototype, Singleton, Discussion of Creational Patterns.	T1 pg:117-135
41-44	Identify the importance of structural patterns.	Adapter, Bridge, Composite.	T1 pg:139-163
45-49	Summarizes the implementation issues when applying the bridge pattern.	Decorator, Façade, Flyweight, Proxy.	T1 pg:175-207
50-52	Outlines the importance of behavioral patterns.	Chain of Responsibility, Command, Interpreter, Iterator.	T1 pg:223-257
53-55	Use of observer, state, strategy in behavioral patterns.	Mediator, Memento, Observer, State, Strategy.	T1 pg:273-315
56-58	Identify the need of template method.	Template Method, Visitor, Discussion of Behavioral Patterns.	T1 pg:325-345
59	Summarizes the importance of design patterns.	What to Expect from Design Patterns, A Brief History.	T1 pg:351-355
60	Reviews the template of design patterns.	The Pattern Community An Invitation, A Parting Thought.	T1 pg:356-358

XI MAPPING COURSE OBJECTIVES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES:

Course Objectives	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
1						S			H					S		S
2			S											H		
3							S				S				S	
4															H	
5	H	S										S		S		
6		H														
7				H							S			S		S
8			S						H				S			

S= Supportive

H = Highly Related

XII MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES:

Course Outcomes	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1							S									
2		S								S		H		S		
3			H							H	S					
4	H							S								S
5								S						S		
6										S						

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