INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

DUNDIGAL, HYDERABAD -500 043

COMPUTER SCIENCE AND ENGINEERING

COURSE DESCRIPTION FORM

Course Title	DESIGN PATTERNS			
Course Code	A70530			
Regulation	JNTUH - R15			
Course Structure	Lectures	Tutorials	Practical's	Credits
	4	1	--	4
Course Coordinator	Mr. C. Praveen Kumar, Assistant Professor, CSE			
Team of Instructors	Mr. R.M. Noorullah, Associate Professor, CSE Mr. M. Rakesh, Assistant Professor, CSE Ms. J. Hareesha, 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	5	Java Programming, Data Structures

III. MARKS DISTRIBUTIN:

Sessional Marks	University End Exam marks	Total Marks
There shall be 2 midterm examinations. Each midterm examination consists of subjective test. The subjective test is for 20 marks, with duration of 2 hours. Subjective test of each semester shall contain 5 one mark compulsory questions in part-A and part-B contains 5 questions, the student has to answer3 questions, each carrying 5 marks. First midterm examination shall be conducted for the first two and half units of syllabus and second midterm examination shall be conducted for the remaining position. Five marks are earmarked for assignments. There shall be two assignments in every theory course. Marks shall be awarded considering the average of two assignments in each course. Five marks are earmarked for assignments. There shall be two assignments	75	100

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:

At the end of the course, the students will be able to:

I.   Demonstration of patterns related to object oriented design.

II.   Understand the Design Patterns that are common in software applications.

III.   Analyze a software development problem and express it.

IV.   Understand how the design patterns are related to object oriented design.

V.   Design a module structure to solve a problem, and evaluate alternatives.

VI.   COURSE OUTCOMES:

After completing this course the student must demonstrate the knowledge and ability to:

1.   Describe solutions to programming problems using design patterns.

2.   Develop and maintain programs using common design patterns and frameworks.

3.   Understand how design patterns can be implemented in Object oriented programming.

4.   Applying the software development concepts, abilities, and skills, from analyzing a problem for implementing a solution.

5.   Learns design patterns solutions, and they can solve many problems that can be encountered in the future.

6.   Understand open-closed principle and how to design solutions from the context.

7.   Summarize the advantages and disadvantages of using design pattern variants.

8.   Understands the concept of pattern based analysis and design

9.   Describe various basic design principles in solving real life problems.

10.   An Ability to refractor poorly designed solutions about applying Design Patterns by using the appropriate design pattern.

11.   Understand the architecture, creating it and moving from one to any, different structural patterns.

12.   Learns design patterns solutions, and they can solve many problems that can be encountered in the future.

VII.   HOW PROGRAM OUTCOMES ARE ASSESSED:

	Program Outcomes	Level	Proficiency assessed
PO1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	H	Assignments, Tutorials
PO2	**Problem analysis:** Identify, formulate, review research literature, Analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	H	Assignments
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	Mini Projects
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.	S	Projects
PO5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.	S	Mini Projects
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.	S	Mini Projects
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.	N	--
PO8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.	N	--
PO9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	N	--
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.	H	Mini Projects
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 environments.	S	Mini Projects
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	Projects

N - None   **S - Supportive**   **H - Highly Related**

VIII.   HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

	Program Specific Outcomes	Level	Proficiency
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	**Problem-solving Skills:** The ability to apply standard practices and strategies in software project development open-ended using programming environments to deliver a quality product 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.
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UNIT III:
Structural Patterns Part I: Adapter, Bridge, Composite.
Structural Patterns Part II: Decorator, arcade, 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.
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Text Books:

1. Design Patterns by Erich Gamma, Pearson Education.

References:
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 SrinivasaRao, NarsimhaKarumanchi, 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:

At the end of the course, the students are able to achieve the following course learning outcomes:

Lecture No.	Topics to be covered	Course Learning Outcomes	Reference
1-3	Recognize the importance of design and design patterns	What is a design pattern?, Design patterns in Smalltalk MVC	T1: 2.1
4-8	Listing contents of catalog of design patterns	Describing Design Patterns, The Catalog of Design Patterns, Organizing the Catalog.	T1: 2.3
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: 3.2
13-18	Outlines the problems of Lexis design.	Designing a Document Editor: Design Problems, Document Structure, Formatting, Embellishing the User Interface	T1: 3.4-3.5
19-22	Summarize command class and subclasses	Supporting Multiple Look-and Feel Standards, Supporting Multiple Window Systems	T1: 1.1-1.7
23-27	Describe interactor class and subclasses.,	User Operations Spelling Checking and Hyphenation, Summary.	T1: 2.1-2.5
28-35	Lists out the importance of creational patterns	Abstract Factory, Builder, Factory Method.	T1: 2.6
36-40	Reviews the importance of prototype pattern	Prototype, Singleton, Discussion of Creational Patterns.	T1: 5.3
41-44	Identify the importance of structural patterns	Adapter, Bridge, Composite.	T1: 5.2
45-49	Summarizes the implementation issues when applying the bridge pattern	Decorator, Façade, Flyweight, Proxy.	T1: 5.2
50-52	Outlines the importance of behavioral patterns	Chain of Responsibility, Command, Interpreter, Iterator.	T1: 5.1
53-55	Use of observer, state, strategy in behavioral patterns	Mediator, Memento, Observer, State, Strategy.	T1: 6.1-6.2
56-58	Identify the need of template method	Template Method, Visitor, Discussion of Behavioral Patterns.	T1: 6.3
59	Summarizes the importance of design patterns	What to Expect from Design Patterns, A Brief History.	T1: 6.4
60	Reviews the template of design patterns	The Pattern Community An Invitation, A Parting Thought	T1: 6.9

XI. MAPPING COURSE OBJECTIVES LEADING TO THE ACHIEVEMENTOF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Objectives	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
I	H		H			S						S	H	S	
II	S	H	S	H						S			S	S	
III	H		S	S						H				H	S
IV		S				S							S	S	
V	H	S			S					S					S
VI		S	H		S	H							H	H	

S – Supportive   H - Highly Related

XII. MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

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

S - Supportive   H - Highly Related

Prepared by: Mr.C.Praveen Kumar, Assistant Professor, CSE

HOD, CSE