INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

INFORMATION TECHNOLOGY

COURSE DESCRIPTION FORM

Course Title	**:**	**DESIGN PATTERNS**			
Course Code	**:**	**A70530**			
Regulations	**:**	**R15 - JNTUH**			
Course Structure	**:**	**Lectures**	**Tutorials**	**Practicals**	**Credits**
		4	**1**	**-**	**4**
Academic Year	**:**	**2018-2019**			
Course Coordinator	**:**	**Ms. B.REKHA, Assistant Professor, IT**			
Course Faculty	**:**	**Ms. B.REKHA, Assistant Professor, IT**			

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 an66 d 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	Object Oriented Programming through java
UG	4	5	Data structures

III. COURSE ASSESSMENT METHODS:

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 the first two and half units of syllabus and second midterm examination shall be conducted for the remaining portion. 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.	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:

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.

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.
7. Evaluate the correctness of a module by careful manual review using the specification, and abstraction function.
8. Describe solutions to programming problems using design patterns
9. Develop and maintain programs using common design patterns and frameworks
10. Identify and implement appropriate solutions to recurring programming problems by consulting technical documentation and specifications, including design pattern catalogs and existing source code
11. Summarize the advantages and disadvantages of using design pattern variants
12. Discuss and implement the Gang of Four (GoF) design patterns.
13. Utilize processes and artifacts to work effectively in a team-oriented development environment
14. Apply various software architectures, including frameworks and design patterns, when developing software projects.
15. Analyze the architecture and build the system from the components.

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, natural sciences, and engineering sciences.	**S**	Exercises
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 environments.	**H**	Design Exercises, Discussions

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

N - None S - Supportive H - Highly Related

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, 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 Pattern Part-I : Adapter, Bridge, Composite.

Structural Pattern Part-II : Decorator, Façade, Flyweight, Proxy.

UNIT-IV

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

Behavioural Patterns Part-II : Mediator, Memento, Observer.

UNIT-V

Behavioural Patterns Part-II (cont'd): State, Strategy, Template Method, Visitor, Discussion of Behavioural 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 Dream Tech.
2. Pattern's in JAVA Vol-II by Mark Grand, Wiley Dream Tech.
3. JAVA Enterprise Design Patterns Vol-III by Mark Grand, Wiley Dream Tech.
4. Design Patterns Explained by Alan Shalloway, Pearson Education.
5. 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	Learning Objectives	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:1-4
4-8	Listing contents of catalog of design patterns.	Describing Design Patterns, The Catalog of Design Patterns, Organizing the Catalog.	T1 pg:6-9
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	PO10	PO11	PO12	PSO1	PSO	PSO3
1									H						S
2			S										H		
3							H			S					
4					H									H	
5	H	S									H				

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	PO10	PO11	PO1	PSO	PSO	PSO3
1								S							
2		S								S		S	H		
3			S				H				H				
4	H								H						S
5					H									H	
6										S					
7		S						S					H		
8			S												
9														H	
10										S					H
11		S											S		
12					H										S
13			S										S		
14	H														S
15			S											H	

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Prepared by: B. Rekha, Assistant Professor, IT

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