INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

INFORMATION TECHNOLOGY

COURSE DESCRIPTOR

Course Title	**OBJECT ORIENTED ANALYSIS AND DESIGN**				
Course Code	**ACS009**				
Programme	**B.Tech**				
Semester	V	IT			
Course Type	Core				
Regulation	IARE - R16				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	3	--	3	3	2
Chief Coordinator	Mr. N Bhaswanth, Assistant Professor				
Course Faculty	Mr. G Chandra sekhar, Assistant Professor				

I. COURSE OVERVIEW:

The Unified Modeling Language is a graphical language for visualizing, specifying, constructing and documenting the artifacts of a software intensive system. The UML gives you a standard way to write systems blueprints covering conceptual things such as business processes and system functions as well as concrete things such as classes written in a specific programming language database schemas and reusable software components. Learn what the UML is what it is not and why the UML is relevant to the process of developing software intensive systems.

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites	Credits
UG	ACS003	III	Object Oriented Programming through JAVA	4
UG	ACS008	V	Software Engineering	4

III. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Data Structures	70 Marks	30 Marks	100

IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

✔	Chalk & Talk	✔	Quiz	✔	Assignments	✘	MOOCs
✔	LCD / PPT	✔	Seminars	✘	Mini Project	✔	Videos
✘	Open Ended Experiments						

V. EVALUATION METHODOLOGY:

The course will be evaluated for a total of 100 marks, with 30 marks for Continuous Internal Assessment (CIA) and 70 marks for Semester End Examination (SEE). Out of 30 marks allotted for CIA during the semester, marks are awarded by taking average of two CIA examinations or the marks scored in the make-up examination.

Semester End Examination (SEE): The SEE is conducted for 70 marks of 3 hours duration. The syllabus for the theory courses is divided into FIVE units and each unit carries equal weightage in terms of marks distribution. The question paper pattern is as follows. Two full questions with "either" or "choice" will be drawn from each unit. Each question carries 14 marks. There could be a maximum of two sub divisions in a question.

The emphasis on the questions is broadly based on the following criteria:

50 %	To test the objectiveness of the concept.
50 %	To test the analytical skill of the concept OR to test the application skill of the concept.

Continuous Internal Assessment (CIA):

CIA is conducted for a total of 30 marks (Table 1), with 20 marks for Continuous Internal Examination (CIE), 05 marks for Quiz and 05 marks for Alternative Assessment Tool (AAT).

Table 1: Assessment pattern for CIA

Component	**Theory**		**Total Marks**
Type of Assessment	CIE Exam	Quiz/AAT	
CIA Marks	25	05	30

Continuous Internal Examination (CIE):

The CIE exam is conducted for 25 marks of 2 hours duration consisting of two parts. Part–A shall have five compulsory questions of one mark each. In part–B, four out of five questions have to be answered where, each question carries 5 marks. Marks are awarded by taking average of marks scored in two CIE exams.

Quiz / Alternative Assessment Tool (AAT):

Two Quiz exams shall be online examination consisting of 20 multiple choice questions and are be answered by choosing the correct answer from a given set of choices (commonly four). Marks shall be awarded considering the average of two quizzes for every course. The AAT may include seminars, assignments, term paper, open ended experiments, micro projects, five minutes video and MOOCs.

VI. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes (POs)		Strength	Proficiency assessed by
PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	3	Assignments/Quiz
PO 2	**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	2	Seminar
PO 3	**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.	2	Seminar
PO 5	**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.	2	Seminar/Videos
PO12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage independent and life-long learning in the broadest context of technological change.	2	Seminar

3 = High; 2 = Medium; 1 = Low

VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes (PSOs)		Strength	Proficiency assessed by
PSO 1	**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.	3	Seminar
PSO 2	**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.	-	-
PSO 3	**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.	1	Seminar/Guest Lecture

3 = High; 2 = Medium; 1 = Low

VIII. COURSE OBJECTIVES :

The course should enable the students to:	
I	Develop the skills to analyze and design object-oriented problems.
II	Create design patterns to solve problems based on object oriented concepts.
III	Understand the various processes and techniques for building object-oriented software systems.
IV	Prepare unified modeling techniques for case studies.

IX. COURSE OUTCOMES (COs):

COs	Course Outcome	CLOs	Course Learning Outcome
CO 1	Discuss the overview of object oriented modeling and benefits of each.	CLO 1	Able to show the importance of modeling concept for object oriented development in system.
		CLO 2	Demonstrate the Conceptual model of UML and SDLC.
		CLO 3	Able to understand the role and function of each UML model in software development using object-oriented approach.
		CLO 4	Illustrate the importance of classes and their associated relationships by understanding various common mechanisms.
CO 2	Differentiate advance object-oriented approach from the traditional approach for design and development of System.	CLO 5	Able to differentiate advance object-oriented approach from the traditional approach for design and development of System.
		CLO 6	Analyze the Objects and Classes are required for the development of software system.
		CLO 7	Creation of interaction diagram that model the dynamic aspects of a software system.
CO 3	Understand Unified Modeling Language (UML) for representation of an object-oriented system using different modeling views.	CLO 8	Use case and activity studies to illustrate the analysis and design concepts.
		CLO 9	Identify, analyze, and model behavioral concepts of the system and also know the importance of events and signals and their modeling techniques.
		CLO 10	Analyze and understand the uses of process and threads and time and space to model and development of a system.
CO 4	Apply appropriate design patterns to model or design of the system.	CLO 11	Demonstrate state machines and state chart diagrams and their modeling techniques
		CLO 12	Illustrate the uses of component and deployment diagram and their modeling techniques.
		CLO 13	Understands how to apply the pattern based analysis and design to the software to be developed.
		CLO 14	Describe how design patterns facilitate development and list several of the most popular patterns.
CO5	Apply various software architectures, including frameworks and design patterns, when developing software projects	CLO 15	Identify and describe design patterns and their application in a software design project.
		CLO 16	Ability to refactor poorly designed solutions by using the appropriate design patterns.
		CLO 17	Develop UML models for design patterns using currently available software modeling tools.
		CLO 18	Evaluate and apply design patterns, architectural patterns and enterprise patterns to the development of software systems.
		CLO 19	Assess the use of Design patterns in the design of software systems and the refactoring of existing systems.
		CLO 20	Analyze software components and case studies of system architecture and determine how integration with new and existing systems may be achieved

X. COURSE LEARNING OUTCOMES (CLOs):

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
ACS009.01	CLO 1	Able to show the importance of modeling concept for object oriented development in System.	PO 1, PO 5, PO 12	3
ACS009.02	CLO 2	Demonstrate the Conceptual model of UML and SDLC.	PO 1, PO 3	3

ACS009.03	CLO 3	Able to understand the role and function of each UML model in software development using object-oriented approach.	PO 1, PO 5	3
ACS009.04	CLO 4	Illustrate the importance of classes and their associated relationships by understanding various common mechanisms.	PO 1	3
ACS009.05	CLO 5	Able to differentiate advance object-oriented approach from the traditional approach for design and development of System.	PO 2	3
ACS009.06	CLO 6	Analyze the Objects and Classes are required for the development of software system.	PO 2	3
ACS009.07	CLO 7	Creation of interaction diagram that model the dynamic aspects of a software system.	PO 1	2
ACS009.08	CLO 8	Use case and activity studies to illustrate the analysis and design concepts.	PO 1, PO 2	2
ACS009.09	CLO 9	Identify, analyze, and model behavioral concepts of the system and also know the importance of events and signals and their modeling techniques.	PO 1, PO 2	3
ACS009.10	CLO 10	Analyze and understand the uses of process and threads and time and space to model and development of a system.	PO 2	3
ACS009.11	CLO 11	Demonstrate state machines and state chart diagrams and their modeling techniques	PO 1	3
ACS009.12	CLO 12	Illustrate the uses of component and deployment diagram and their modeling techniques.	PO 1	3
ACS009.13	CLO 13	Understands how to apply the pattern based analysis and design to the software to be developed.	PO 1	3
ACS009.14	CLO 14	Describe how design patterns facilitate development and list several of the most popular patterns.	PO 1, PO 2	3
ACS009.15	CLO 15	Identify and describe design patterns and their application in a software design project.	PO 1	2
ACS009.16	CLO 16	Ability to refactor poorly designed solutions by using the appropriate design patterns.	PO 3	2
ACS009.17	CLO 17	Develop UML models for design patterns using currently available software modeling tools.	PO 1, PO 2	2
ACS009.18	CLO 18	Evaluate and apply design patterns, architectural patterns and enterprise patterns to the development of software systems.	PO 1, PO 2 ,PO 3	2
ACS009.19	CLO 19	Assess the use of Design patterns in the design of software systems and the refactoring of existing systems.	PO 1, PO2	3
ACS009.20	CLO 20	Analyze software components and case studies of system architecture and determine how integration with new and existing systems may be achieved	PO 1, PO 2,PO12	3

3 = High; 2 = Medium; 1 = Low

XI. MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES

Course Outcomes (COs)	Program Outcomes (POs)					Program Specific Outcomes (PSOs)		
	PO 1	PO 2	PO 3	PO 5	PO 12	PSO1	PSO2	PSO3
CO 1	3	3	2	2		3		
CO 2	3	3	2	2		2		
CO 3	3	3	2	2		2		
CO 4	2	3		2		2		
CO 5	3	3		2	3	3		3

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

CLOs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 1	3				2							1	2		
CLO 2	3		1											3	
CLO 3	3				1								2		1
CLO 4	3													3	
CLO 5		3											2		
CLO 6		3												3	
CLO 7	2												2		1
CLO 8	2	2												3	
CLO 9	2	2											2		
CLO 10		3												3	
CLO 11	3												2		
CLO 12	3													3	
CLO 13	3													3	
CLO 14	2	2											2		1
CLO 15	2				2								2		
CLO 16			2										2		
CLO 17	2	2											2		
CLO18	2	2	2									1	2		

CLO19	3	3											3	
CLO 20	3	3										2		1

3 = High; 2 = Medium; 1 = Low

XIII. ASSESSMENT METHODOLOGIES – DIRECT

CIE Exams	PO1, PO3, PO5, PO 12, PSO1, PSO3	SEE Exams	PO1, PO3, PO5, PO 12, PSO1, PSO3	Assignments	PO 1	Seminars	PO1, PO3, PO5, PO 12, PSO1, PSO3
Laboratory Practices	-	Student Viva	-	Mini Project	-	Certification	-
Term Paper	-						

XIV. ASSESSMENT METHODOLOGIES - INDIRECT

✔	Early Semester Feedback	✔	End Semester OBE Feedback
✘	Assessment of Mini Projects by Experts		

XV. SYLLABUS

UNIT-I	**STRUCTURAL MODELLING**
Introduction to UML: Importance of modeling, principles of modeling, object oriented modeling, conceptual model of the UML, architecture, software development life cycle; Classes, relationships, common mechanisms and diagrams	
UNIT-II	**ADVANCED BEHAVIORAL MODELING**
Advanced classes, advanced relationships, interfaces, types and roles, packages, terms, concepts Modeling techniques for class and object diagrams; Interactions: Interaction diagrams; Use cases: Use case diagrams, activity diagrams.	
UNIT -III	**ARCHITECTURAL MODELING**
Events and signals, state machines, processes and threads, time and space. State chart diagrams, component diagrams, deployment diagrams.	
UNIT -IV	**DESIGN PATTERN**
GRASP: Designing objects with responsibilities, creator, low coupling, high cohesion, design patterns, creational, factory method, structural, behavioral strategy	
UNIT -V	**APPLYING DESIGN PATTENS**
System sequence diagrams, relation between sequence diagrams and use case logical architecture and UML package diagram, logical architecture refinement; Case study: The next gen POS system, inception, use case modeling, relating use cases, include, extend and generalization, domain models, domain model refinement.	
Text Books:	
1. Grady Booch, James Rumbaugh, Ivar Jacobson, "The Unified Modeling Language User Guide", Pearson Education, 2nd Edition, 2004. 2. Craig Larman, "Applying UML and Patterns: An Introduction to Object Oriented Analysis and Design and Iterative Development", Pearson Education, 3rd Edition, 2005. 3. Enrich Gamma, Richard Helm, Ralph Johnson, John Vlissides, "Design Patterns", Pearson Education, 2nd Edition, 2009.	

Reference Books:
1. Simon Bennett, Steve Mc Robb and Ray Farmer, "Object Oriented Systems Analysis and Design Using UML", McGraw-Hill Education, 4th Edition, 2010. 2. Pascal Roques, "Modeling Software Systems Using UML2", WILEY- Dreamtech India Pvt. Ltd, 2nd Edition, 2007

XVI. COURSE PLAN:

The course plan is meant as a guideline. Probably there may be changes.

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
1-2	Importance of modeling, principles of modeling, object oriented modeling,	CLO 1	T1:1.1
3-4	Conceptual model of the UML	CLO 2	T1:2.3
5-9	Classes	CLO 4	T1:4.1
10-11	Relationships	CLO 4	T1:5.1
12-13	Common mechanisms	CLO 4	T1:6.1 R 3.2
14-15	Diagrams	CLO 2	T1:7.1.1
16-17	Interfaces, types and roles,	CLO 4	T1:11.4
18	Packages, terms, concepts,	CLO 4	T1:12.5
19-20	Modeling techniques for class and object diagrams;	CLO 6	T1:14.3
21	Interactions: Interaction diagrams;	CLO 7	T1:15.1
22-23	Use cases: Use case diagrams, activity diagrams.	CLO 8	T1:16.4 R 4.5
24-25	Events and signals	CLO 9	T1:20.5
26-27	State machines, processes and threads	CLO 10	T1:21.4
28	Time and space	CLO 10	T1:23.6
29-30	State chart diagrams	CLO 11	T1:23.1
31-32	Component diagrams	CLO 12	T1:29.3
33-34	Deployment diagrams.	CLO 12	T1:30.7
35	GRASP: Designing objects with responsibilities	CLO 13	T2:1.1
36-37	creator, information expert	CLO 13	T2:3.6
38-39	low coupling, high cohesion	CLO 14	T2:27.12
40	Design patterns	CLO 13	T2:27.12
41-42	Creational, factory method	CLO 15	T2:27.12
43-44	Structural, bridge	CLO 18	T2:4.2
45	Adaptor	CLO 16	T2:4.1
46	Behavioral, strategy	CLO 19	T2:5.1 R5.7
47	System sequence diagrams	CLO 7	T2:27.17
48-50	Relation between sequence diagrams and use cases logical architecture and UML package diagram	CLO 7	T2:27.18
51-54	Case study: The next gen POS system	CLO 17	T2:27.19
55	Inception, use case modeling	CLO 8	T1:17.3
56-57	Relating use cases	CLO 8	T1:16.4
58	Include, extend and generalization	CLO 20	T1:10.3
59-60	Domain models	CLO 20	T3:31.1
61-62	Domain model refinement	CLO 20	T3:31.2

XVII. GAPS IN THE SYLLABUS - TO MEET INDUSTRY / PROFESSION REQUIREMENTS:

S. No	Description	Proposed actions	Relevance with POs	Relevance with PSOs
1	Usage of software tools to build right product	Seminars / NPTEL	PO 5	PSO 2
2	Real time Online Transform System	Seminars / Guest / Lectures	PO 3	PSO 2
3	Case study of next gen POS system and other applications	Seminars / Laboratory Practices	PO 12	PSO 1

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