CMR ENGINEERING COLLEGE

UGC AUTONOMOUS

(Approved by AICTE - New Delhi. Affiliated to JNTUH and Accredited by NAAC & NBA)

COURSE INSTRUCTOR NAME: Mrs. Swati Gupta ACADEMIC YEAR:2024-245

SUBJECT NAME: Object Oriented Modeling and Design SECTION: B&D

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SEM START DATE AND END DATE: 8-7-24 TO 9-11-24

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HOD

1. DEPARTMENT VISION & MISSION

Vision:

To produce globally competent and industry ready graduates in Computer Science & Engineering by imparting quality education with a know-how of cutting edge technology and holistic personality.

Mission:

M1. To offer high quality education in Computer Science & Engineering in order to build core competence for the students by laying solid foundation in Applied Mathematics, and program framework with a focus on concept building.

M2. The department promotes excellence in teaching, research, and collaborative activities to prepare students for professional career or higher studies.

M3. Creating intellectual environment for developing logical skills and problem solving strategies, thus to develop, able and proficient computer engineer to compete in the current global scenario.

2. LIST OF PEOs AND POs

2.1 Program Educational Objectives (PEO):

PEO 1: Excel in professional career and higher education by acquiring knowledge of mathematical computing and engineering principles.

PEO 2: To provide an intellectual environment for analyzing and designing computing systems for technical needs.

PEO 3: Exhibit professionalism to adapt current trends using lifelong learning with legal and ethical responsibilities.

PEO 4: To produce responsible graduates with effective communication skills and multidisciplinary practices to serve society and preserve the environment.

2.2 .Program Outcomes (PO):

Engineering Graduates will be able to satisfy these NBA graduate attributes:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
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

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
4. **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
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
6. **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
7. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
8. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
9. **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
10. **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
11. **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

2.3 Program Specific Outcomes (PSOs):

1. **PSO1: Professional Skills and Foundations of Software development:** Ability to analyze, design and develop applications by adopting the dynamic nature of Software developments.
2. **PSO2: Applications of Computing and Research Ability:** Ability to use knowledge in cutting edge technologies in identifying research gaps and to render solutions with innovative ideas.

3. COURSE OUTCOMES

CO's	DESCRIPTIONOFTHEOUTCOMES
CO1	Apply basic concepts of Object Oriented models to design solutions.
CO2	Construct class diagram, use case diagram, sequence diagrams, activity diagrams and Interaction diagrams for designing software systems.
CO3	Analyze class modeling, use case modeling, processes, domain analysis and design patterns to develop simple systems.
CO4	Examine the class modeling, use case modeling, processes, domain analysis, and design patterns to interpret real world problems.
CO5	Evaluate the description of given pattern and design solution to real world problems

4. SYLLABUS COPY

UNIT – I

Introduction, Modeling Concepts and Class Modeling: What is Object orientation? What is Object-Oriented development? Object-Oriented Themes, Evidence for the usefulness of Object-Oriented development, Object-Oriented modeling history. Modeling, abstraction, Object and Class Concept. Link and associations concepts, Generalization and Inheritance. A sample class model Navigation of class models ;Advanced object and class concepts; Association ends; N-ary associations; Aggregation; Abstract classes; Multiple inheritance; Metadata; Reification; Constraints; Derived Data; Packages.

UNIT – II

Use Case Modeling and Detailed Requirements: Overview; Detailed object-oriented Requirements definitions; System Processes-A use case/Scenario view; Identifying Input and outputs-The System sequence diagram; Identifying Object Behavior-The state chart Diagram, Integrated Object-oriented Models.

UNIT – III

Process Overview, System Conception and Domain Analysis: Process Overview: Development stages; Development life Cycle; System Conception: Devising a system concept; elaborating a concept; preparing a problem statement. Domain Analysis: Overview of analysis; Domain Class model: Domain state model; Domain interaction model; Iterating the analysis.

UNIT – IV

Use case Realization: The Design Discipline within up iterations: Object Oriented Design, The Bridge between Requirements and Implementation; Design Classes and Design within Class

Diagrams, Interaction Diagrams-Realizing Use Case and defining methods; Designing with Communication Diagrams, Updating the Design Class Diagram; Package Diagrams Structuring the Major Components; Implementation Issues for Three-Layer Design.

UNIT – V

Design Patterns: Introduction; what is a design pattern? Describing design patterns, the catalogue of design patterns, Organizing the catalogue, How design patterns solve design problems, how to select a design patterns, how to use a design pattern; Creational patterns: prototype and singleton (only); structural patterns adaptor and proxy (only).

TEXT BOOK:

1. Michael Blaha, James Rumbaugh: Object Oriented Modelling and Design with UML,2nd Edition, Pearson Education,2005

2. Satzinger, Jackson and Burd: Object-Oriented Analysis & Design with the Unified Process, Cengage Learning, 2005.

3. Erich Gamma, Richard Helm, Ralph Johnson and john Vlissides: Design Patterns –Elements of Reusable Object-Oriented Software, Pearson Education,2007.

5. Subject (lesson) Plan

S.NO	Topic Autonomous syllabus)	Sub-Topic	NO. OF LECTURES REQUIRED	Teaching Methods
1		Introduction, What is Object orientation	L1	M4
2		Object-Oriented Themes, Evidence for the usefulness of Object-Oriented development	L2-L3	M4
3		Object-Oriented modeling history	L4	M4
4		Modeling, abstraction	L5-L6	M4

5	**Introduction, modeling Concepts and Class Model**	Object and Class Concept.	**L7**	**M4**
6		Link and associations concepts	**L8**	**M4**
7		Generalization and Inheritance	**L9**	**M4**
8		A sample class model Navigation of class models	**L10**	**M4**
9		Advanced object and class concepts	**L11**	**M4**
10		Association ends; N-ary associations	**L12**	**M4**
11		Abstract classes	**L13**	**M4**
12		Multiple inheritance	**L14**	**M4**
13		Metadata; Reification;	**L15**	**M1**
14		Constraints; Derived Data; Packages	**L16**	**M1**
15	**Use Case Modeling and Detailed Requirements**	Overview	**L17**	**M1**
16		Detailed object-oriented Requirements definitions	**L18**	**M1**
17		System Processes-A use case/Scenario view	**L19**	**M1**
13		Identifying Input and outputs-The System sequence diagram	**L20-L21**	**M1**
14		Identifying Object Behavior-The state chart Diagram	**L22**	**M1**
15		Integrated Object-oriented Models	**L23**	**M1**

16	**Process Overview, System Conception and Domain Analysis**	Process Overview	**L24**	**M1**
17		Development stages	**L25**	**M4**
24		Development life Cycle	**L26**	**M4**
18		System Conception	**L27**	**M1**
19		Devising a system concept	**L28**	**M1**
20		elaborating a concept; preparing a problem statement	**L29**	**M1**
21		Domain Analysis: Overview of analysis	**L30**	**M1**
22		Domain Class model	**L31-L32**	**M4**
23		Domain state model	**L33**	**M4**
24		Domain Interaction model	**L34**	**M4**
25		Iterating the analysis	**L35**	**M1**
26	**Use case Realization**	**Use case Realization**	**L36**	**M1**
27		The Design Discipline within up iterations	**L37**	**M1**
28		Object Oriented Design The Bridge between Requirements and Implementation	**L38**	**M1**
29		Design Classes and Design within Class Diagrams	**L39**	**M1**
30		Interaction Diagrams	**L40**	**M1**

31		Realizing Use Case and defining methods	**L41**	**M1**
32		Designing with Communication Diagrams;	**L42**	**M1**
33		Updating the Design Class Diagram	**L43**	**M1**
34		Package Diagrams Structuring the Major Components	**L44**	**M1**
35		Implementation Issues for Three- Layer Design.	**L45**	**M1**
36	**Design Patterns**	Introduction; what is a design pattern?	**L46**	**M1**
37		Describing design patterns	**L47**	**M1**
38		the catalog of design patterns and Organizing the catalog	**L48**	**M1**
39		How design patterns solve design problems	**L49**	**M1**
40		how to select a design patterns,	**L50**	**M1**
41		how to use a design pattern	**L51**	**M1**
42		Creational patterns: prototype	**L52**	**M1**
43		singleton (only)	**L53**	**M1**
44		structural patterns adaptor	**L54**	**M1**
45		proxy (only)	**L55**	**M1**

NOTE: 1. Any Subject in a Semester is supposed to be completed in 50 to 56 periods.

2. Each Period is of 50 minutes.
3. Each unit duration & completion should be mentioned in the Remarks Column.
4. List of Suggested books can be marked with Codes like T1. R1, etc.

METHODS OF TEACHING:

M1 : Lecture Method	**M4 : Presentation /PPT**	**M7 : Assignment**
M2 : Demo Method	**M5 : Lab/Practical**	**M8 : Industry Visit**
M3 : Guest Lecture	**M6 : Tutorial**	**M9 : Project Based**

NOTE:

1. Any Subject in a Semester is suppose to be completed in 50 to 60 periods.
2. Each Period is of 50 minutes.
3. Each unit duration & completion should be mentioned in the Remarks Column.
4. List of Suggested books can be marked with Codes like T1, T2, R1, R2 etc.

6.INDIVIDUAL TIME TABLE ()

	I	II	III		IV	V
MON					OOMD-C	
TUE		OOMD-C				
WED			OOMD-C			
THU					OOMD-C	
FRI	OOMD-C					
SAT						

7. Session Execution Log:

S no	Units	Scheduled started date	Completed date	Remarks
1	I	11/7/24	30/07/24	-
2	II	02/08/24	20/8/24	-
3	III	22/8/24	10/09/24	-
4	IV	12/9/24	30/9/24	-
5	V	02/10/24	30/10/24	-

8. Lecture Notes – (hand written)

9. ASSIGNMENT QUESTIONS ALONG SAMPLE ASSIGNMENT SCRIPTS

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Department of Computer Science & Engineering

IV.B.TECH, I SEM - I MID ASSIGNMENT QUESTIONS

Subject: OBJECT ORIENTED MODELING AND DESIGN
BRANCH: CSE -C

Answer the following questions

Q.1. Explain the concept of constraints with the help of an example. (CO1)

Q.2. Elaborate the concept of derived data. (CO1)

Q.3. Demonstrate the concept of Packages with the help of a diagram. (CO2)

Q.4. Explain the concept of state chart diagram. (CO2)

Q.5.Write in detail about integrated Object Oriented Models. (CO2)

10. MID EXAM QUESTION PAPER ALONG SAMPLE ANSWER SCRIPTS

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

IV.B.TECH- I-SEM-I MID EXAMINATION Date: Time: 29/08/2023 10:00-11:30 AM

Subject: OBJECT ORIENTED MODELING AND DESIGN (CS743PE) Branch: Common to CSE Marks: 25 M

Note: Question paper contains two parts, Part - A and Part - B.

Part-A is compulsory which carries 10 marks. Answer all questions in part-A.

Part-B consists of (2 1/2) units. Answer any one full question from each unit. Each question carries 5 marks and may have a, b, c sub questions.

PART-A
5X2=10

1. What is object oriented Modeling?Is Modeling required? (CO1)
2. Define the concept of waterfall model. (CO1)
3. What is an abstract class? (CO2)
4. Explain the concept of Multiple Inheritance. (CO2)
5. Explain the concept of meta data using an example? (CO3)

PART-B
3X5=15

6. Demonstrate the concept of class modeling with the help of a diagram. (CO1)

(OR)

7. Elaborate the concept of abstraction and encapsulation . (CO1)

8. What is the difference between a state and a pseudo state in state chart diagram. (CO2)

(OR)

9. What is the difference between a use case diagram and an activity diagram. (CO2)

10. Elaborate the concept of Development Life Cycle. (CO3)

(OR)

11. Explain the concept of software process overview. (CO3)

11. SCHEME OF EVALUATION

COURSE: B.Tech YEAR: IV SEM: I
A-Y: 2024-25

NAME OF SUBJECT: OBJECT ORIENTED MODELING AND DESIGN
MID: II

SET-1

S.No.	Question	Marks	
1.	What is object oriented Modeling? Is Modeling required?	2M	10M
2.	Define the concept of waterfall model	2 M	
3.	What is an abstract class?	2M	
4.	Explain the concept of Multiple Inheritance	2M	
5.	Explain the concept of meta data using an example?	2M	
6	Demonstrate the concept of class modeling with the help of a diagram. OR Elaborate the concept of abstraction and encapsulation .	5M	15 M
7	Elaborate the concept of abstraction and encapsulation OR What is the difference between a state and a pseudo state in state chart diagram	5M	
8	Elaborate the concept of Development Life Cycle.	5M	

	OR Explain the concept of software process overview.		

12. <u>Mapping of COs and Pos with PSOs:</u>

	Program Outcome(PO):											
PEOS		1	2	3	4	5	6	7	8	9	10	11
	I	**X**	**X**	**X**								
	II	**X**	**X**	**X**								
	III		**X**	**X**		**X**						
	IV						**X**		**X**			

13.COs, POs, PSOs Justification

CO 1: Examine the class modeling, use case modeling, processes, domain analysis, and design patterns to interpret real world problems.

	Justification
PO1	**Correlated with PO1 strongly** because the student's able to know the class model and use case modeling. So, overall the correlation of CO1 to PO1 is good.
PO2	**Correlated with PO2 strongly** because Students will able to analyze the domain process. So, overall the correlation of CO2 to PO2 is good.
PO5	**Correlated with PO5 moderately** because Studentswill beable to learnthe design patterns to interpret real world problems. So, overall the correlation of CO3 to PO5 is moderate.
PSO1	**Correlated with PSO1 is moderately** because Students are able to analyze, design and develop the applications by adopting the various python platform execution environments. So, overall the correlation of CO5 to PSO1 is moderate.

CO 2: Demonstrate concept of use-case model, sequence model and state chart model for a given problem.

	Justification
PO3	**Correlated with PO3 moderately** because Students will be ableto know the concept of use-case model.So, overall the correlation of CO2 to PO3 is moderate.

PO5	**Correlated with PO5 moderately** because Students will be able to learn the Sequence model . So, overall the correlation of CO2 to PO5 is moderate.
PO7	**Correlated with PO7 moderately** because Students will be able to do any work on state chart model for a given model. So, overall the correlation of CO2 to PO7 is moderate.
PSO1	**Correlated with PSO1 is moderately** because Students are able to analyze, design and develop the applications by adopting the various modeling concepts. So, overall the correlation of CO5 to PSO1 is moderate.

CO 3: Analyze class modeling, use case modeling, processes, domain analysis, and design patterns to develop simple systems.

	Justification
PO1	**Correlated with PO1 moderately** because Students will be able to apply class modeling for analyzing Lists etc., . So, overall the correlation of CO3 to PO1 is moderate.
PO2	**Correlated with PO2 moderately** because Students will be able to design the patterns to develop simple systems So, overall the correlation of CO3 to PO2 is moderate.
PO3	**Correlated with PO3 strongly** because Students will be able to design the solutions to solve the problems related to. So, overall the correlation of CO3 to PO3 is good.
PO5	**Correlated with PO5 strongly** because Students will be able to use case modeling . So, overall the correlation of CO3 to PO5 is good.
PSO2	**Correlated with PSO2 is Low** Students will be ableto use the domain analysis . So, overall the correlation of CO3 to PSO2 is low.

CO 4:Interpretthe description of given pattern and design solution to real world problem.

	Justification
PO1	**Correlated with PO1 strongly** because Students will be able to apply patterns concept in the design patterns. So, overall the correlation of CO4 to PO1 is good.
PO2	**Correlated with PO2 strongly** because Students will be able to design the solutions for different problems related to design pattern Concept. So, overall the correlation of CO4 to PO2 is good.
PO3	**Correlated with PO3 moderately** because Students will be able to design the solutions to various problems. So, overall the correlation of CO3 to PO3 is moderate.

PO12	**Correlated with PO12 moderatelybecause**Studentswillbeabletorecognizetheneedforunderstanding the various features of Designing. So, overall the correlation of CO4 to PO12 is moderate.
PSO2	**Correlated with PSO2 is Low** because Students will be able to conduct interpretation of a given pattern and provide proper conclusions. So, overall the correlation of CO4 to PSO2 is low.

CO 5:Implement the concepts involved in Object-Oriented modeling and their benefits.

	Justification
PO1	**Correlated with PO1 is Low** because Students will be able to understand the concept of Oriented models. So, overall the correlation of CO6 to PO1 is low.
PO2	**Correlated with PO2 is Low** because Students will be able to design the solutions for different problems related to designing So, overall the correlation of CO6 to PO2 is low.
PO3	**Correlated with PO3 is Moderately** because Students will be able to generate passwords by applyingthe knowledge modeling techniques So, overall the correlation of CO5 to PO3 is moderate.
PO5	**Correlated with PO5 is Strongly** because students will be able to apply the concept of object-oriented modeling So, overall the correlation of CO5 to PO8 is low.
PSO1	**Correlated with PSO1 Moderate** because Students will able conduct interpretation of given description concept. So, overall the correlation of CO6 to PSO1 is moderate.

14.ATTAINMENT OF CO's, PO's AND PSO's (EXCEL SHEET):

15. University Question Papers or Question Bank.

CodeNo:126EQ **R13**

JAWAHARLALNEHRUTECHNOLOGICALUNIVERSITY HYDERABAD

B.Tech IYear II Semester Examinations, May-2016

OBJECT ORIENTED ANALYSIS AND DESIGN

(Common to CSE,IT)

Time: 3hours **Max.Marks:75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART-A **(25 Marks)**

	What is an artifact?	[2]
b)	What are the adornments in the UML?	[3]
c)	What is navigation?	[2]
d)	Explain the levels of visibility.	[3]
e)	What is use case diagram?	[2]
f)	What are interaction diagrams?	[3]
g)	What is a component?	[2]
h)	What is a deployment diagram?	[3]
i)	What are the common uses of deployment diagrams?	[2]
j)	What are the three kinds of components?	[3]

PART-B **(50 Marks)**

2.a)	What are behavioral things? Explain.	
b)	What is UML? Where can the UML to be used?	[5+5]
	OR	
3.a)	What are the principles of modeling?	
b)	Draw the architecture of a software-intensive system and explain.	[5+5]
4.a)	What are the various kinds of Classifiers? Explain.	

[5+5]

OR

5.a) Explain about generalization with an example.
b) Describe interfaces, types and roles with examples. [5+5]

6.a) Explain about use cases and actors and use cases and flow of events.
b) How to model a flow of control? [5+5]

OR

7.a) Explain sequence diagram with suitable example.
b) How to model the requirements of a system?
[5+5]

8.a) Explain the following:
i) Events.

b) How to model an API? [5+5]

OR

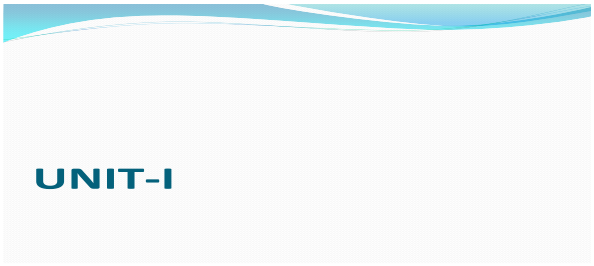
9.a) How to model an embedded system?
b) Differentiate the following:
i) Components and classes
ii) Nodes and components. [4+6]

10. Explain the following:
a) Patterns and architecture
b) Modeling an executable release. [5+5]

OR

11. Draw the following diagrams for the unified library application:
a) Class diagrams
b) Interaction diagrams. [5+5]

16. PPTs AND PRESENTATION:



NEW PARADIGMS

- **Object –oriented mean:-**
  - ✓ Organize s/w as a collection of discret objects that incorporate both data structure & behavior
  - ✓ An object is a concept, abstraction, or thing with sharp boundaries and meaning for an application
  - ✓ **object is something that has:**

-State -Behavior - Identity

- **characteristic of object:-**

1. Identity:-
   - ✓ Data is quantize into discrete ,distinguishable entity called object
   - ✓ Ex:- window, car
2. Classification :-

What is *CLASS*?

- ✓ a collection of objects that share common properties, attributes, behavior and semantics, in general.
- ✓ A collection of objects with the same data structure (attributes, state variables) and behavior (function/code/operations) in the solution space.

- ✓ A blueprint or definition of objects.
- ✓ A factory for instantiating objects.
- ✓ The description of a collection of related components.
- ✓ Classification
  - – Grouping of common objects into a class Ex:- fruit

- **Polymorphism:-**
  - ✓ The ability to hide many different implementations behind a single interface
  - ✓ Same operation may behave differently on different classes
  - ✓ Operation is an action or transfer that an object perform
  - ✓ Specific implementation of an operation by a certain class is called method
- **Inheritance :-**
  - ✓ Automatic duplication of super class attribute and behavior definitions in subclass.
  - ✓ Sharing of attribute & operation among classes based on hierarchical relationship

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- **Iterative Development Phases:**

Inception: Understand what to build
- Vision, high-level requirements, business case
- Not detailed requirements

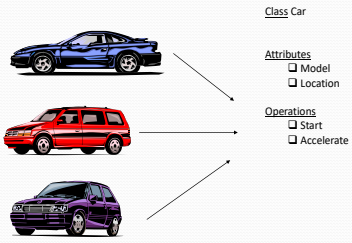
Elaboration: Understand how to build it
- Baseline architecture, most requirements detailed
- Not detailed design

Construction: Build the product
- Working product, system test complete

Transition: Validate solution
- Stakeholder acceptance

What is Object-Orientation

- Example of Abstraction and Encapsulation



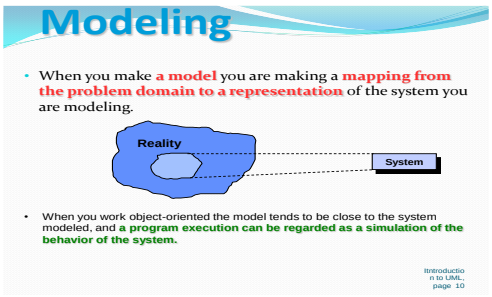
Object –oriented thinking and rethinking

- ✓ Identification & organization of application domain concept rather than their final representation in a programming language

1. modeling concept only ,not implementation
   - Most focus on programming language implementation issues rather than analysis and design object
   - OO is not a programming technique
   - Express concept clearly & communicate between developer and customer
2. object – oriented methodology:-
   - Methodology consist building a model of an application domain & then adding implementation detail to it during design of a system ,it's known as object – modeling technique (OMT)
   - Steps:-

1. Analysis:-

-build a model of real-world situation sowing it's important properties
- Understand the problem statement
- Object in model is application domain concept ,not computer implementation



17. Innovative Teaching method if any(Attached Innovative Assignment)

QUESTIONS

1. Demonstrate the concept of reverse engineering with the help of an example.

2.What is scrum?

18. Websites or URLs e- Resources

1) Types of Models in Object Oriented Modeling and Design - GeeksforGeeks
2)OOMD UNIT2.pdf
3)Object Oriented Analysis & Design Tutorial
4)OOAD - Object Oriented Analysis
5)Software Engineering | Object Oriented Design - javatpoint
6)Object-oriented modeling and design.pdf