MOOC APPROVAL REQUEST

As per KTU B.Tech Regulations 2024, Section 17

KTU Course Code: HNCST509

KTU Course Name: Object Oriented Design Using UML

NPTEL Course Name:

Instructor: Prof. Rajib Mall

Institution: IIT Kharagpur

Duration: 12 Weeks

Course ID: noc26-cs46

Semester: Jan-Apr 2026

Date: December 02, 2025

This document contains:
1. KTU Course Syllabus (Complete)
2. NPTEL Course Details
3. Syllabus Comparison for 70% Match Verification

Submitted for approval as per R 17.5 of KTU B.Tech Regulations 2024.

SECTION A
KTU COURSE SYLLABUS

SEMESTER 5

Object Oriented Design Using UML

Course Code	HNCST509	CIE Marks	40
Teaching Hours/Week (L:T:P)	3:1:0	ESE Marks	60
Credits	4	Exam Hours	2 Hrs. 30 Min.
Prerequisites (if any)		Course Type	Theory

Course Objectives:

1. To master the fundamental principles of object-oriented methodology—including abstraction, encapsulation, and inheritance—and apply analysis techniques to model the static and dynamic behavior of software systems.
2. To implement rigorous system and object design strategies and utilize the Unified Modeling Language (UML) along with standard design patterns to construct robust, scalable software architectures.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	Introduction: Object Oriented Development - Modeling Concepts– Object Oriented Methodology. Object Oriented Themes - Abstraction - Encapsulation - Combining Data and Behavior - Sharing - Emphasis on Object Structure. Object Oriented Models. Object modeling: Objects and Classes, Links and Associations, Advanced links and Association Concepts, Generalization and Inheritance, Grouping Constructs, A Sample Object Model.	11
2	Dynamic modeling: Events and States, Operations, Nested state diagrams, Concurrency, Advanced Dynamic Modeling Concepts, A sample Dynamic Model, Relationship of Object and Dynamic models. Functional modeling: Functional models, Data Flow Diagrams, Specifying Operations, Constraints, A sample Functional Model. Analysis: Object Modeling - Identifying Object Classes - Preparing a Data Dictionary - Identifying Associations. Dynamic Modeling - Preparing a Scenario - Interface Format - Identifying Event - Building a State Diagram. Functional Modeling - Identifying input and Output Values - Building Data Flow Diagram-Describing Functions.	11

3	System Design: Breaking System into Subsystems, Identifying Concurrency, Allocating Subsystems to Processors and Tasks, Managing Data Stores, Handling of Global Resources, Common Architectural Framework. Object Design: Overview of Object design, Combining the three models, Designing algorithms, Design optimization, Implementation of control, Adjustment of inheritance, Design of association, Object representation, Physical packaging. Documenting design decisions - Comparison of methodologies.	11
4	Unified Modeling Language (UML)-UML introduction & benefits- Different types of UML diagrams- Behavioral. Diagrams-Activity Diagram - Use Case Diagram - State Machine Diagram - Sequence Diagram , structural diagrams.- Class Diagram-Object Diagram-Component Diagram-Composite Structure Diagram-Deployment Diagram-Package Diagram. UML tools and their needs. Design Patterns-Creational - Structural – Behavioral.	11

Course Assessment Method
(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	15	10	10	40

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
• 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks **(8x3 =24marks)**	• Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 sub divisions. **(4x9 = 36 marks)**	**60**

Course Outcomes (COs)

At the end of the course students should be able to:

	Course Outcome	Bloom's Knowledge Level (KL)
CO1	Develop object models that represent the static structure of a real-world system by utilizing concepts such as classes, associations, generalization, and inheritance.	Apply
CO2	Develop dynamic and functional models using state transition diagrams and data flow diagrams to capture system events, concurrency, and operational requirements.	Apply
CO3	Translate analysis models into detailed system and object designs by defining subsystems, optimizing algorithms, and managing data storage strategies.	Apply
CO4	Solve real time problems using various Modeling concepts for managing projects in multidisciplinary environments	Apply

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO-PO Mapping Table:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	3								3
CO2	3	3	3	3							3
CO3	3	3	3	3							3
CO4	3	3	3	3							3

Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Object Oriented Modeling and Design	James Rumbaugh	Prentice Hall India	1/e
2	Object Oriented Analysis and Design with Applications	Grady Booch	Pearson Education Asia References	3/e
3	UML Distilled: A Brief Guide to the Standard Object Modeling Language	Martin Fowler	Addison-Wesley Professional	3/e

Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Object Oriented Software Engineering	Ivan Jacobson	Pearson Education Asia.	3/e
2	Object Oriented Software	Berno Bruegge, Allen H.	Pearson Education	3/e

	Engineering	Dutoit	Asia.	
3	Object Oriented Analysis and Design using UML	H. Srimathi, H. Sriram, A. Krishnamoorthy	Scitech Publications.	1/e
4	UML and C++ practical guide to Object Oriented development	Richard C.Lee& William	Prentice Hall India	2/e.

SECTION B
NPTEL COURSE DETAILS

OBJECT ORIENTED SYSTEM DEVELOPMENT USING UML, JAVA AND PATTERNS

PROF. RAJIB MALL

Department of Computer Science and Engineering

IIT Kharagpur

PRE-REQUISITES : Programming Using Java, Software Engineering

INTENDED AUDIENCE : CSE, IT

COURSE OUTLINE :
Object-oriented software development has become very popular. Also, UML has been accepted as the standard design language. We discuss use of UML to arrive at a design solution. Skeletal java code generation from UML diagrams will be discussed. Design patterns are reusable solutions. These are good solutions to typical programming problems, that can be understood and applied in a specific design situation to improve the overall design and reduce design iterations.

ABOUT INSTRUCTOR :
Prof. Rajib Mall is Professor, Department of Computer Science and Engineering, Indian Institute of Technology Kharagpur, West Bengal. He has more than a two decades of teaching experience in the areas of real-time systems, program analysis and testing. He has written five text books and over 150 refereed research papers.

COURSE PLAN :

 Week 1**:** Introduction

 Week 2**:** Life Cycle Models for OO Development

 Week 3**:** Use Case Diagram

 Week 4**:** Class Diagram I

 Week 5**:** Class Diagram II

 Week 6**:** Sequence Diagram

 Week 7**:** State chart diagram

 Week 8**:** Design process

 Week 9**:** Introduction to design patterns

 Week 10**:** GRASP patterns

 Week 11**:** GoF pattern I
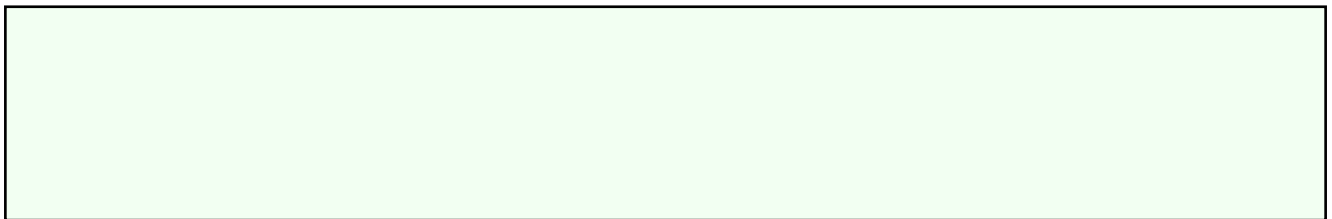
 Week 12**:** GoF Pattern II

SECTION C
SYLLABUS COMPARISON

SYLLABUS COMPARISON REPORT

KTU: HNCST509 - Object Oriented Design Using UML

NPTEL: Object Oriented System Development using UML, Java and Patterns

KTU Topics	NPTEL Topics	Match
Module 1	Week 1-2	? Matched
Module 2	Week 3-4	? Matched
Module 3	Week 5-6	? Matched
Module 4	Week 7-8	? Matched
Module 5	Week 9-10	? Matched

RECOMMENDATION

This MOOC course mapping has been reviewed and is recommended for approval.

The proposed NPTEL course meets all the requirements specified in:
? R 17.1 - Approved MOOC Agency (NPTEL/SWAYAM)
? R 17.2 - Minimum 8 weeks duration
? R 17.3 - Online mode with proctored examination
? R 17.4 - At least 70% content overlap with KTU syllabus

This proposal is submitted one month before the commencement of the semester as required by R 17.5.

Verified by:

_____   _____
   HoD (Department)   IQAC Coordinator

_____
   Principal