A. Course Handout (Version 1.0)

Institute/School Name	Chitkara University Institute of Engineering and Technology		
Department Name	Department of Computer Science & Engineering		
Programme Name	Bachelor of Engineering (B.E.), Computer Science & Engineering		
Course Name	Object Oriented Software Engineering	Session	2024-2025
Course Code	22CS017	Semester/Batch	4th /2023
L-T-P (Per Week)	3-0-0	Course Credits	03
Pre-requisite	Basic knowledge of object-oriented concepts.	NHEQF Level	05
Course Coordinator	Dr. Chetna	SDG Number	1,3,9

CLO01	Define the current theories, models, and techniques that provide a basis for the software lifecycle.
CLO02	Explain the use of techniques and tools necessary for engineering practice in one or moresignificant application domains.
CLO03	Apply the software engineering lifecycle by demonstrating competence in communication, planning, analysis, design, construction, and deployment.
CLO04	Examine the strong communication and interpersonal skills, as well as professional andethical principles when functioning as members and leaders of multi-disciplinary teams.
CLO05	Design software based on requirements analysis, verification, validation and to develop solutions to modern problems such as security, data science, and systems engineering.

1. Objectives of the Course

Software Engineering (SE) comprises the core principles consistent in software construction and maintenance: fundamental software processes and life cycles, mathematical foundations of software engineering, requirements analysis, software engineering methodologies and software quality frameworks and validation, software development, and maintenance environments and tools. In this course, an introduction to object- oriented software development process and design. Topics include iterative development, interpretation of requirements and use case documents into code; application of design notation in UML and use of commonly-used design patterns. The objectives of the course are:

i. to build an understanding of the software process models such as the waterfall and evolutionary models based on the software requirements and the SRS documents.
ii. to inculcate the skill in the application of computing-based solutions to societal and organizational problems.
iii. to develop, implement and manage quality control and how to ensure good quality software.
iv. to demonstrate ethical principles in the application of computing-based solutions to societal and organizational problems.

2. Course Learning Outcomes

After completion of the course, the student should be able to:

	Course Learning Outcome	***POs**	****CL**	*****KC**	**Sessions**
CLO01	Define the current theories, models, and techniques that provide a basis for the software lifecycle.	PO1, PO2, PO3, PO5, PO12	K2	Factual Conceptual	**12**

CLO02	Explain the use of techniques andtools necessary for engineering practice in one or more significant application domains.	PO3, PO4, PO5	K3	Conceptual Procedural	**12**
CLO03	Apply the software engineering lifecycle by demonstrating competence in communication, planning, analysis, design, construction, and deployment.	PO1, PO2, PO3, PO4, PO5, PO7, PO11	K3	Conceptual Procedural	**12**
CLO04	Examine the strong communication and interpersonal skills, as well as professional and ethical principles when functioning as members and leaders of multi-disciplinary teams.	PO3, PO4, PO5	K4	Procedural	**12**
CLO05	Design software based on requirements analysis, verification,validation and to develop solutions tomodern problems such as security, data science, and systems engineering.	PO1, PO2, PO3, PO5, PO6, PO7, PO11	K3	Conceptual Procedural	**12**
Total Contact Hours					**60**

Revised Bloom's Taxonomy Terminology

* PO's available at (shorturl.at/cryzF)

**Cognitive Level =CL

***Knowledge Categories = KC

Course Learning Outcomes	**PO 1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CLO01	H	H	M		M							H
CLO02		H	H	H								
CLO03	H	H	M	M	H		M				H	
CLO04			H	H	M							
CLO05	H	H	H		M	M	M				M	

H=High, M=Medium, L=Low

3. ERISE Grid Mapping

Feature Enablement	**Level (1-5, 5 being highest)**
Entrepreneurship	1
Research	3
Innovation	2
Skills	5
Employability	4

4. Recommended Books

Textbooks:

B01: An Integrated Approach to Software Engineering by Pankaj Jalote, Narosa Publications, New Delhi, 2nd Edition,1997.

B02: Software Engineering - A Practitioner's Approach, Roger S. Pressman, MGH, New Delhi. 5th Edition,2001.
B03: Fundamentals of Software Engineering, Rajib Mall, PHI, New Delhi, 4th Edition, 2014.
B04: Agile Software Development, Torgeir Dingsoyr, Tore Dyba, Nils Brede Moe, Springer, Jan,2010.

Reference Books:
B05: Testing and Quality Assurance for Component-based Software, by Gao, Tsao and Wu Artech House Publishers,2003
B06: Software Engineering by Ian Summerville, Pearson Education, 5th Edition, New Delhi,2014.
B07: Handbook of Software Quality Assurance, by G. Gordon Schulmeyer, International Thomson Computer Press, 4th Edition, 2016

E-Resources:
https://library.chitkara.edu.in/subscribed-books.php

5. Other readings and relevant websites

Serial No	Link of Journals, Magazines, websites and Research Papers
1.	https://onlinecourses.nptel.ac.in/noc20_cs68/preview
2.	https://archive.nptel.ac.in/courses/106/105/106105182/
3.	https://nptel.ac.in/courses/106101061
4.	https://www.coursera.org/specializations/software-engineering
5.	https://nptel.ac.in/courses/106105087
6.	https://www.coursera.org/learn/software-engineering-software-design-and-project-management
7.	https://onlinecourses.nptel.ac.in/noc22_cs39/preview

6. Recommended Tools and Platforms

1. https://app.smartdraw.com/?nsu=1
2. https://www.figma.com/files/team/1443870582755368449/recents-and-sharing? fuid= 1443870580934668847

7. Course Plan

Lecture Number	Topics	Textbook
1	Detail Discussion of Course Handout (CHO), Introduction to Software Engineering: The Evolving Role ofSoftware, Changing nature of software	B01-Chapter-1
2	The Software Process: Software Engineering–Layered Technology, Process Models: The Waterfall Model	B01-Chapter-2
3-4	Evolutionary Process Models, Incremental Models, SpiralModel	B01-Chapter-2
5-7	An Agile View of Process: what is agility, what is agile process, Agile Process Models: extreme programming (XP),ASD, Scrum, Introduction to UML and modelling software	B01-Chapter-2 B02-Chapter-2 B04-Chapter-1
8-9	Requirements Engineering: Requirements Engineering Tasks: Initiating Requirement, Engineering Process, Eliciting Requirements	B02- Chapter-5
10-12	Introduction to Use-case Diagram, Use-case Diagram of College Information System/Library Management system/ Hospital Management System/ Online shopping system/ Banking System	B02-Chapter-6
13	Building Analysis Model: Requirement Analysis, Datamodelling Concepts, Flow Oriented Modelling	B02-Chapter-5

ST-1(Lecture 1-13)		
14-16	Design Engineering: Design concepts and model, Data design, Architectural design, designing class-based components, User interface analysis and design, Interface analysis and Interface design steps	B01-Chapter-5
17-19	Introduction to Class diagram, Class diagram for College Information System/Library Management system/ HospitalManagement System/ Online shopping system/Banking System	B03-Chapter-7
20	Software Testing Strategies and Tactics: A strategic approach for Software Testing, Software Testing Strategies: Unit Testing	B01-Chapter-9
21-22	Integration Testing, Validation Testing, System Testing, Test strategies for Object Oriented Software- Unit Testing in theOO Context, Integration Testing in the OO Context	B01-Chapter-9
23-24	White-Box Testing Techniques: Basis Path Testing, ControlStructure Testing: condition and loop testing	B01-Chapter-9 B03-Chapter-10
25	Black-Box Testing Techniques: Equivalence Partitioning andBoundary Value Analysis	B01-Chapter-9 B03-Chapter-10
26-27	Testing Object Oriented Applications: Testing OOA and OODmodel, Object Oriented Testing Strategies, Object Oriented Testing Methods	B02-Chapter-19
ST-2 (Lecture 1-27)		
28	Introduction to Interaction diagrams, Draw interactive diagram for college information system/Library Managementsystem/ Hospital Management System/ Online shopping system/Banking System	B03-Chapter-7
29-30	Project Management & Metrics: The management spectrum,Metrics for process & project, Metrics for Software Quality, Estimation.	B01-Chapter-2
31-32	Product Metrics: Metrics for the requirement model, Metrics for the design model, Metrics for testing	B01-Chapter-2 B02-Chapter-23
33-34	Introduction to Activity diagram, Activity diagram for college information system /Library Management system/ Hospital Management System/ Online shopping system/Banking System/Bug Removal	B03-Chapter-7
35	Software Project Planning: Objective, Software Scope and Resources, Software Project Estimation and Decomposition Techniques (LOC, FP)	B03-Chapter-3 B02-Chapter-4
36-38	Empirical Estimation Models: COCOMO Model, Estimation of Object-Oriented Projects	B01-Chapter-4 B02-Chapter-26
39-40	Project Scheduling: Basic concepts of scheduling, Project Scheduling, Earned Value Analysis	B01-Chapter-4 B02-Chapter-27
41-43	Risk Management: Software Risks & Risk Strategies, Risk Identification, Risk Projection, Risk Mitigation, Monitoring and Management (RMMM) plan	B01-Chapter-9 B03-Chapter-3
44-45	Overview of Quality Management and Change Management	B03-Chapter-11
ST-3(Lecture 1-45)		

8. Delivery/Instructional Resources

Lecture No.	Topics	Web References	Audio-Video
1	Detail Discussion of Course Handout (CHO), Introduction to Software Engineering: The Evolving Role of Software, Changing nature of software	https://www.geeksforgeeks.org/software- engineering/#int	https://youtu.be/AN5I6fFxyfs
2	The Software Process: Software Engineering–Layered Technology, Process Models: The Waterfall Model	https://www.geeksforgeeks.org/software- engineering/#sdl	https://www.youtube.com/watch?v=uJpQlyT_CK4&list=PLxCzCOWd7aiEed7SKZBnC6ypFDWYLRvB2
3-4	Evolutionary Process Models, Incremental Models, Spiral Model	https://www.geeksforgeeks.org/software- engineering/#sdl	https://www.youtube.com/watch?v=uJpQlyT_CK4&list=PLxCzCOWd7aiEed7SKZBnC6ypFDWYLRvB2
5-7	An Agile View of Process: what is agility, what is agile process, Agile Process Models: extreme programming (XP), ASD, Scrum, Introduction to UML and modelling software	https://www.geeksforgeeks.org/software-engineering-agile-development-models/	https://www.youtube.com/watch?v=Xs6E-MAJbfE
8-9	Requirements Engineering: Requirements Engineering Tasks: Initiating Requirement, Engineering Process, Eliciting Requirements	https://www.geeksforgeeks.org/software- engineering/#sr	https://youtu.be/wEr6mwquPLY
10-12	Introduction to Use-case Diagram, Use-case Diagram of College Information System/Library Management system/ Hospital Management System/ Online shopping system/Banking System	https://www.geeksforgeeks.org/use-case-diagram/	https://www.youtube.com/watch?v=Hj6Lkoi_VoM
13	Building Analysis Model: Requirement Analysis, Data modelling Concepts, Flow Oriented Modelling	https://www.geeksforgeeks.org/analysis-modelling-in-software-engineering/	https://www.youtube.com/watch?v=EhmHFtwFoQ0
14-16	Design Engineering: Design concepts and model, Data design, Architectural design, designing class-based components, User interface analysis and design, Interface analysis and Interface	https://www.sciencebuddies.org/science-fair-projects/engineering-design-process/engineering-design-process-steps	https://www.youtube.com/watch?v=H8jqZ09tVD0
17-19	Introduction to Class diagram, Class diagram for College Information System/Library Management system/ Hospital Management System/ Online shopping system/Banking System	https://ecomputernotes.com/software- engineering/data-design	https://www.youtube.com/watch?v=9nT7rvAbwzQ
20	Software Testing Strategies and Tactics: A strategic approach for Software Testing, Software Testing Strategies: Unit Testing	https://www.geeksforgeeks.org/software- engineering/#std	https://youtu.be/Q50ZyydS7 pl

21-22	Integration Testing, Validation Testing, System Testing, Test strategies for Object Oriented Software- Unit Testing in the OO Context, Integration Testing in the OO Context	https://www.geeksforgeeks.org/software-engineering-white-box-testing/	https://youtu.be/Q50ZyydS7 pI
23-24	White-Box Testing Techniques: Basis Path Testing, Control Structure Testing: condition and loop testing	https://www.geeksforgeeks.org/software-engineering-white-box-testing/	https://youtu.be/Q50ZyydS7 pI
25	Black-Box Testing Techniques: Equivalence Partitioning and Boundary Value Analysis	https://www.geeksforgeeks.org/software-engineering-black-box-testing/	https://youtu.be/PXYqu- OcBoY
26-27	Testing Object Oriented Applications: Testing OOA and OOD model, Object Oriented Testing Strategies, Object Oriented Testing Methods	https://www.geeksforgeeks.org/software-engineering-black-box-testing/	https://youtu.be/PXYqu- OcBoY
28	Introduction to Interaction diagrams, Draw interactive diagram for college information system/Library Management system/ Hospital Management System/ Online shopping system/Banking System	https://www.tutorialspoint.com/uml/uml_interaction_diagram.htm	https://www.youtube.com/watch?v=Ba7SyM78cUM
29-30	Project Management & Metrics: The management spectrum, Metrics for process & project, Metrics for Software Quality, Estimation.	https://www.geeksforgeeks.org/software-engineering/#spm	https://youtu.be/UEEWbe1FoKI https://youtu.be/KqDlDubS-OU
31-32	Product Metrics: Metrics for the requirement model, Metrics for the design model, Metrics for testing	https://www.geeksforgeeks.org/software-engineering/#spm	https://www.youtube.com/watch?v=LYw-Aa7srZU
33-34	Introduction to Activity diagram, Activity diagram for college information system /Library Management system/ Hospital Management System/ Online shopping system/Banking System/Bug Removal	https://www.geeksforgeeks.org/software-engineering/#spm	https://youtu.be/UEEWbe1FoKI
35	Software Project Planning: Objective, Software Scope and Resources, Software Project Estimation and Decomposition Techniques (LOC, FP)	https://www.geeksforgeeks.org/software-engineering-role-and-responsibilities-of- a-software-project- manager/	https://youtu.be/5pwc2DYlKQU
36-38	Empirical Estimation Models: COCOMO Model, Estimation of Object-Oriented Projects	https://www.geeksforgeeks.org/software-engineering-cocomo-model/	https://youtu.be/D04uxZpgp6M
39-40	Project Scheduling: Basic concepts of scheduling, Project Scheduling, Earned Value Analysis	https://www.geeksforgeeks.org/software-engineering-capability-maturity-model-cmm/	https://youtu.be/NGmPTl6Ado0

41-43	Risk Management: Software Risks & Risk Strategies, Risk Identification, Risk Projection, Risk Mitigation, Monitoring and Management (RMMM) plan	https://www.geeksforgeeks.org/integrating-risk-management-in-sdlc-set-1/	https://youtu.be/IBL9MqvpPlM
44-45	Overview of Quality Management and Change Management	https://www.tutorialspoint.com/software_testing_dictionary/quality_management.htm	https://youtu.be/3MgEkS8_jz o

9. Action plan for different types of learners

Slow Learners	Average Learners	Fast Learners
• Remedial Classes on Saturdays • Encouragement for improvement using PeerTutoring • Use of Audio and VisualMaterials • Use of Real-Life Examples	• Workshops • Formative Exercises used to highlight concepts andnotions • E-notes and E-exercises toread ahead of the pedagogic material.	• Engaging students to hold hands of slow learners by creating a Peer Tutoring Group • Design solutions for complex problems • Design solutions for complex problems • Presentation on topics beyond those covered in CHO

10. Evaluation Scheme & Components

Evaluation Component	Type of Component	No. of Assessments	Weightage of Component	Mode of Assessment
Component 2	Sessional Test	03*	40%	Online
Component 3	End Term Examinations	01**	60%	Online
Total		**100%**		

* Students will have to appear in all Sessional Tests.
*Makeup Examination will compensate for either ST-1 or ST-2 (Only for genuine cases, based on the Dean's approval).
**As per Academic Guidelines, a minimum of 75% attendance is required to become eligible to appear in the End Semester Examination.

Syllabus of the Course:

S.No.	Topic (s)	No. of Sessions	Weightage %
1	Introduction to Software Engineering: The Evolving Role of Software, Changing nature of software The Software Process: Software Engineering–Layered Technology, Process Models: The Waterfall Model Evolutionary Process Models, Incremental Models, Spiral Model An Agile View of Process: what is agility, what is agile process, Agile Process Models: extreme programming (XP), ASD, Scrum, Introduction to UML and modelling software	**13**	**28%**

	Requirements Engineering: Requirements Engineering Tasks: Initiating Requirement, Engineering Process, Eliciting Requirements Introduction to Use-case Diagram, Use-case Diagram of College Information System/Library Management system/ Hospital Management System/ Online shopping system/ Banking System Building Analysis Model: Requirement Analysis, Data modelling Concepts, Flow Oriented Modelling		
Sessional Test-1			
2	Introduction to Software Engineering: The Evolving Role of Software, Changing nature of software The Software Process: Software Engineering–Layered Technology, Process Models: The Waterfall Model Evolutionary Process Models, Incremental Models, Spiral Model An Agile View of Process: what is agility, what is agile process, Agile Process Models: extreme programming (XP), ASD, Scrum, Introduction to UML and modelling software Requirements Engineering: Requirements Engineering Tasks: Initiating Requirement, Engineering Process, Eliciting Requirements Introduction to Use-case Diagram, Use-case Diagram of College Information System/Library Management system/ Hospital Management System/ Online shopping system/ Banking System Building Analysis Model: Requirement Analysis, Data modelling Concepts, Flow Oriented Modelling Design Engineering: Design concepts and model, Data design, Architectural design, designing class-based components, User interface analysis and design, Interface analysis and Interface design steps Introduction to Class diagram, Class diagram for College Information System/Library Management system/ Hospital Management System/ Online shopping system/Banking System Software Testing Strategies and Tactics: A strategic approach for Software Testing, Software Testing Strategies: Unit Testing Integration Testing, Validation Testing, System Testing, Test strategies for Object Oriented Software- Unit Testing in the OO Context, Integration Testing in the OO Context White-Box Testing Techniques: Basis Path Testing, Control Structure Testing: condition and loop testing Black-Box Testing Techniques: Equivalence Partitioning and Boundary Value Analysis Testing Object Oriented Applications: Testing OOA and OOD model, Object Oriented Testing Strategies, Object Oriented Testing Methods	**27**	**60%**
Sessional Test -2 (ST1 syllabus also included)			
	Introduction to Software Engineering: The Evolving Role of Software, Changing nature of software The Software Process: Software Engineering–Layered Technology, Process Models: The Waterfall Model	45	**100%**

3	Evolutionary Process Models, Incremental Models, Spiral Model An Agile View of Process: what is agility, what is agile process, Agile Process Models: extreme programming (XP), ASD, Scrum, Introduction to UML and modelling software Requirements Engineering: Requirements Engineering Tasks: Initiating Requirement, Engineering Process, Eliciting Requirements Introduction to Use-case Diagram, Use-case Diagram of College Information System/Library Management system/ Hospital Management System/ Online shopping system/ Banking System Building Analysis Model: Requirement Analysis, Data modelling Concepts, Flow Oriented Modelling Design Engineering: Design concepts and model, Data design, Architectural design, designing class-based components, User interface analysis and design, Interface analysis and Interface design steps Introduction to Class diagram, Class diagram for College Information System/Library Management system/ Hospital Management System/ Online shopping system/Banking System Software Testing Strategies and Tactics: A strategic approach for Software Testing, Software Testing Strategies: Unit Testing Integration Testing, Validation Testing, System Testing, Test strategies for Object Oriented Software- Unit Testing in the OO Context, Integration Testing in the OO Context White-Box Testing Techniques: Basis Path Testing, Control Structure Testing: condition and loop testing Black-Box Testing Techniques: Equivalence Partitioning and Boundary Value Analysis Testing Object Oriented Applications: Testing OOA and OOD model, Object Oriented Testing Strategies, Object Oriented Testing Methods Introduction to Interaction diagrams, Draw interactive diagram for college information system/Library Management system/ Hospital Management System/ Online shopping system/Banking System Project Management & Metrics: The management spectrum, Metrics for process & project, Metrics for Software Quality, Estimation. Product Metrics: Metrics for the requirement model, Metrics for the design model, Metrics for testing Introduction to Activity diagram, Activity diagram for college information system /Library Management system/ Hospital Management System/ Online shopping system/Banking System/Bug Removal Software Project Planning: Objective, Software Scope and Resources, Software Project Estimation and Decomposition Techniques (LOC, FP) Empirical Estimation Models: COCOMO Model, Estimation of Object-Oriented Projects		

	Project Scheduling: Basic concepts of scheduling, Project Scheduling, Earned Value Analysis Risk Management: Software Risks & Risk Strategies, Risk Identification, Risk Projection, Risk Mitigation, Monitoring and Management (RMMM) plan Overview of Quality Management and Change Management		
Sessional Test-3 (ST1 & ST2 syllabus also included)			
End Term Examination (ETE-Complete Syllabus)			

This Document is approved by:

Designation	**Name**	**Signature**
Course Coordinator	Dr. Chetna	
Head-Academic Delivery	Dr. Mrinal Paliwal	
Dean	Dr. Rishu Chhabra	
Date	28.11.2024	