Bachelor of Engineering (Computer Science & Engineering)

**Course Code:** CS107 **Course Name:** Object Oriented Software Engineering

**Credits:** 04 **L-T-P:** 3-0-2

**Total Contact Hours:** 60 Hrs.

# Pre-requisite (if any): NA

**Course Coordinator:** Dr. Rani Kumari

**Course Facilitator (s):** Dr. Ashutosh Kumar Dubey, Ms. Ravita Chahar, Dr. Gaurav Garg

# Assessment Components:

|  |  |  |  |
| --- | --- | --- | --- |
| **Evaluation Component** | **Description** | **Syllabus Covered (%)** | **Timeline of Examination** |
| #Component 01\* | Formative Assessment 01 | Session 1-30 (1-50%) | 12th April 2023\*\*\* |
| Formative Assessment 02 | Session 31-60 (51-100%) | 11th May 2023\*\*\* |
| #Component 02\* | Sessional Test 01 | Session 1-24 (1-40%) | 03rd – 07th April 2023\*\*\* |
| Sessional Test 02 | Session 25-50 (41-80%) | 24th -28th April 2023\*\*\* |
| #Component 03\*\* | End Term Examination | Session 1-60 (100%) | 26th May – 09th June 2023\*\*\* |
| **Note:** For Assessment Pattern please refer to Annexure I. | | | |

#Mandatory component.

\*Out of 02 FAs and 02 STs, the system automatically picks the best 01 FA and ST Marks for evaluation of the FAs and STs as final internal marks.

\*\*75% attendance is mandatory to appear in End Term Examination.

\*\*\* Tentative Dates

# Programme Outcomes (POs):

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| At the end of the programme, students will be able to: | |
| PO 1 | **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering  problems. |
| 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. |
| 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. |
| PO 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. |
| 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. |
| PO 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. |
| PO 7 | **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. |
| PO 8 | **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities  and norms of the engineering practice. |
| PO 9 | **Individual and teamwork**: Function effectively as an individual, and as a member or  leader in diverse teams, and in multidisciplinary settings. |
| 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. |
| 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. |
| 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. |

**Course Learning Outcomes (CLOs):**

At the end of the course, students will be able to:

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| CLO1 | Students will able to acquire strong fundamental knowledge in science, mathematics, fundamentals of computer science, software engineering and multidisciplinary engineering to begin in  practice as a software engineer. |
| CLO2 | Students will able to design applicable solutions in one or more application domains using software  engineering approaches that integrate ethical, social, legal and economic concerns. |
| CLO3 | Students will able to deliver quality software products by possessing the leadership skills as an individual or contributing to the team development and demonstrating effective and modern working strategies by applying both communication and negotiation management  skill. |
| CLO4 | Students will able to apply new software models, techniques and technologies to bring out innovative and novelistic solutions for the growth of the society in all aspects and evolving into their  continuous professional development. |
| CLO5 | Students will able to learn and understand various object oriented concepts along with their applicability contexts |

# CLO-POs Mapping:

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Learning Outcomes** | **Program Outcomes** | | | | | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 1 | - | - | M | - | - | - | - | - | - | - | - | - |
| 2 | - | - | - | - | H | - | - | - | - | - | - | - |
| 3 | - | - | - | M | - | - | - | - | - | - | M | - |
| 4 | H | - | - | - | - | - | - | M | - | - | - | H |
| 5 | - | - | M | - | - | - | - | - | - | - | - | - |

**Session-Wise Plan:**

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| --- | --- | --- | --- | --- | --- | --- |
| **Session** | **Topic** | **Readings and References** | **Pedagogy/ Activity Planned** | **CLO** | **Mode of Delivery** | **Link for Online Resource** |
| 1-2 | Introduction to Software Engineering: The Evolving Role of  Software, Changing nature of software | R1/R3 | Visual Learning and Group Discussion | CLO1 | PPT and Discussion | L1/L2 |
| 3-4 | The Software Process: Software Engineering– Layered Technology,  Process Models: The Waterfall Model | R1/R3 | Case-based pedagogy | CLO1 | Interactive learning,  PPT and Discussion | L1/L3 |
| 5-6 | Evolutionary Process Models: Incremental Models, Spiral Model | R1/R3 | Case-based pedagogy | CLO1, CLO2 | Blackboard demonstrati on, PPT and  Discussion | L1/L4 |
| 7-10 | An Agile View of Process: what is agility, what is an agile process, Agile Process Models: extreme programming (XP), ASD, Scrum | R2/R4 | Visual Learning and Group Discussion | CLO1,CLO3 | Brain Storming Discussion s | L2/L4 |
| 11-12 | Introduction to UML and modelling software | R2/R4 | Visual Learning and Group  Discussion | CLO1 | Hands on learning, PPT | L1/L5 |
| 13-14 | Requirements Engineering: Requirements Engineering Tasks: Initiating Requirement, Engineering Process, Eliciting Requirements | R2/R4 | Visual Learning and Group Discussion | CLO1, CLO3 | Classroom teaching, PPT and Group Discussion | L2//L3 |
| 15-17 | Introduction to Use-case Diagram | R2/R4 | Visual Learning and Group Discussion | CLO1 | Flowchart, PPT and Discussion | L1/L2 |
| 18-19 | Building Analysis Model: Requirement Analysis, Data modelling Concepts,  Flow Oriented Modelling | R2/R4 | Visual Learning and Group Discussion | CLO1 | Diagrams, PPT and Group Discussion | L1/L3 |
| 20-23 | 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 | R2/R4 | Visual Learning | CLO1  , CLO2,CLO4 | PPT and Group Discussion s | L1/L4 |
| 24-26 | Introduction to Class diagram | R2/R4 | Visual Learning | CLO1  , CLO2 | Interactive learning,  PPT and Discussion | L2/L4 |
| 27-28 | Software Testing Strategies and Tactics: A strategic approach for Software Testing,  Software Testing Strategies: Unit Testing | R2/R4 | Case-based pedagogy | CLO1  , CLO2, CLO3 | Blackboard demonstrati on, PPT and Discussion | L1/L2 |
| 29-30 | Integration Testing,  Validation Testing, System Testing, Test strategies for Object Oriented Software- Unit Testing in the OO Context, Integration Testing in the OO Context | R2/R4 | Case-based pedagogy | CLO1  , CLO2, CLO5 | Brain Storming Discussion s | L1/L3 |
| 31-32 | White-Box Testing Techniques: Basis Path Testing, Control  Structure Testing: condition and loop testing | R2/R4 | Software Developm ent Approach | CLO1  , CLO2 | Hands on learning, PPT | L1/L4 |
| 33-34 | Black-Box Testing Techniques: Equivalence Partitioning and  Boundary Value Analysis | R2/R4 | Case-based pedagogy/ Software Developm ent  Approach | CLO1  , CLO2 | Classroom teaching, PPT and Group Discussion | L2/L4 |
| 35-36 | Testing Object Oriented Applications: Testing OOA and OOD model, Object Oriented Testing Strategies, Object  Oriented Testing Methods | R2/R4 | Software Developm ent Approach | CLO5 | Flowchart, PPT and Discussion | L1/L2 |
| 37-39 | Introduction to Interaction diagrams | R2/R4 | Software Developm ent Approach | CLO3 | Diagrams, PPT and Group Discussion | L1/L3 |
| 40-41 | Project Management & Metrics: The  management spectrum, Metrics for process & project, Metrics for Software Quality, Estimation | R2/R4 | Visual Learning | CLO1  , CLO2 | PPT and Discussion | L1/L4 |
| 42-43 | Product Metrics:  Metrics for the requirement model, Metrics for the design model, Metrics for Testing | R2/R4 | Case-based pedagogy/ Software Developm ent  Approach | CLO4 | Interactive learning, PPT and Discussion | L2/L4 |
| 44-46 | Introduction to Activity diagram | R2/R4 | Case-based pedagogy/ Software Developm  ent Approach | CLO2  , CLO3 | Blackboard demonstrati on, PPT and Discussion | L1/L2 |
| 47-49 | Software Project Planning: Objective, Software Scope and Resources, Software Project Estimation and Decomposition  Techniques (LOC, FP) | R2/R4 | Software Developm ent Approach | CLO1  , CLO2 | Brain Storming Discussion s | L1/L3 |
| 50-52 | Empirical Estimation Models: COCOMO Model, Estimation of Object-Oriented  Projects | R2/R4 | Think- pair-Share | CLO3  , CLO4 | Hands on learning, PPT | L1/L4 |
| 53-54 | Project Scheduling: Basic concepts of scheduling, Project  Scheduling, Earned Value Analysis | R2/R4 | Think- pair-Share | CLO2  , CLO5 | Classroom teaching, PPT and Group  Discussion | L2/L4 |
| 55-57 | Risk Management:  Software Risks & Risk Strategies, Risk  Identification, Risk  Projection, Risk Mitigation, Monitoring and Management  (RMMM) plan | R2/R4 | Visual  Learning and Implement ation of Problems | CLO5 | Flowchart,  PPT and Discussion | L1/L2 |
| 58-60 | Overview of Quality Management and Change Management | R1/R3 | Visual Learning and Implement  ation of Problems | CLO1 | Diagrams, PPT and Group Discussion | L1/L3 |

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| **Sample List of Problems** | |
| 1 | Use-case Diagram of College Information System |
| 2 | Library Management system |
| 3 | Use-case Diagram of Hospital Management System |
| 4 | Use-case Diagram of Online shopping system/Banking System |
| 5 | Class diagram for College Information System |
| 6 | Class diagram for Library Management system/ Hospital Management System/ Online  shopping system/Banking System |
| 7 | Class diagram for Online shopping system/Banking System |
| 8 | Draw interactive diagram for college information system |
| 9 | Draw interactive diagram for Library Management system/ Hospital Management  System |
| 10 | Draw interactive diagram for Online shopping system / Banking System |
| 11 | Activity diagram for college information system /Library Management system |
| 12 | Activity diagram for Hospital Management System/ Online shopping system/ Banking  System/Bug Removal |

**Reference Books:**

**R1:** Software Engineering, A practitioner’s Approach by Roger S. Pressman.

**R2:** Software Engineering by Ian Sommerville, Sixth Edition, Adison-Wesley Pub. Co.

**R3:** An Integrated Approach to Software Engineering by Pankaj Jalote, Third Edition.

**R4:** Fundamentals of Software Engineering by Rajib Mall, 5th Edition, PHI Learning

# Link of Online Resources:

**L1:** https://onlinecourses.swayam2.ac.in/cec21\_cs21/preview

**L2**: https://onlinecourses.nptel.ac.in/noc20\_cs84/preview

**L3:** https:/[/www.uml.org/r](http://www.uml.org/resource-hub.htm)e[source-hub.htm](http://www.uml.org/resource-hub.htm)

**L4:** <https://in.coursera.org/courses?query=software%20engineering>

**L5:** https://archive.nptel.ac.in/courses/106/101/106101061/

**L6:** https://nptel.ac.in/courses/106105224

# Assessment Scheme:

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| --- | --- | --- | --- | --- | --- |
| **Sr.**  **No.** | **Assessment Instrument** | **Formative/**  **Summative** | **Frequency** | **Weightage**  **(%)** | **CLO** |
| 1. | Formative Assessment | Formative | 02 | 10 | CLO1 – CLO4 |
| 2. | Sessional Tests | Formative | 02 | 30 | CLO1 – CLO4 |
| 3. | End Term Examination | Summative | 01 | 60 | CLO1 – CLO4 |
| **Total** | | | | 100 | |

**Proposed Course Evaluation Scheme:**

Questions for internal and ETE will be designed to evaluate cognitive skills the various educational levels (Bloom’s taxonomy) such as:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sr. No.** | **Bloom’s category** | **ST1** | **ST2** | **ETE** |
| 1. | Remember | 10 | 5 | 5 |
| 2. | Understand | 10 | 5 | 10 |
| 3. | Apply | 10 | 10 | 10 |
| 4. | Analyze | 10 | 10 | 10 |
| 5. | Evaluate | 0 | 10 | 10 |
| 6. | Create | 0 | 0 | 15 |

# Concept Map:

Equips you with Design Techniques

Equips you with Project Management

5.1 Software project planning

5.2. Risk

Management

4.1 Project management metrics

* 1. Design engineering
  2. Testing techniques

2.1 Various UML diagrams

* 1. Software process
  2. SDLC
  3. Agile view of process

Helps in Planning

Equips you with UML

Explains process

Object Oriented Software Engineering

**Annexure I: Assessment Pattern**

|  |  |  |  |
| --- | --- | --- | --- |
| **Assessment Component** | **Description** | **Assessment Pattern** | **Duration of Examination** |
| Component 01 | Formative Assessment 01 | 20 MCQs: 1 Mark each | 60 Minutes |
| Formative Assessment 02 | 1 Assignment: 10 Marks  Viva: 10 Marks | 60 Minutes |
| Component 02 | Sessional Test 01 | 1. mark- 5 MCQ 2. marks- 5 questions   5 marks- 3 questions  10 marks- 1 question | 90 Minutes |
| Sessional Test 02 | 1. mark- 5 MCQ 2. marks- 5 questions   5 marks- 3 questions  10 marks- 1 question | 90 Minutes |
| Component 03 | End Term Examination | 1. mark- 5 MCQ 2. marks- 5 questions   5 marks- 5 questions  10 marks- 2 questions | 180 Minutes |

**Approved by:**

|  |  |  |
| --- | --- | --- |
| **Designation** | **Name** | **Signature** |
| **Course Coordinator** | Dr. Rani Kumari |  |
| **Program Incharge** | Dr. Ashutosh Kumar Dubey/ Ms. Ravita Chahar |  |
| **Head of the Department** | Dr. Kuldeep Sharma |  |
| **Date** |  | |