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| Course Code: CSE333 | CIE Marks: 60 |
| Course Title: Software Engineering | SEE Marks: 40 |
| Credits: 3.0 | |

Course Syllabus:

Software Engineering is designed helping students to grow up and understanding of how to develop a software system development process and giving them the fundamental principles of system development with object oriented technology using Use Case Model, Object Oriented Model. The course will initiate students to the different software process models, project management, software requirements and design as a problem solving activity, key elements of analysis and design, and the place of the analysis and design phases within the system development life cycle.

Course Description/Rational:

This course aims at introducing to the students about the product that is to be engineered and the process that provides a framework for the engineering technology. The course facilitates the students to analyze risk in software design and quality and to plan, design, develop, and validate the software project.

Course Objectives:

1. To understand the process of designing, building, and maintaining software systems. 2. To acquire the skill of software project management. 3. To understand software evolution, testing approaches and quality assurance to ensure high standard/professional software.

**Course Learning Outcome (CLO): (at the end of the course, student will be able to:)**

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| CO1 | **Explain** a process model for a software project development |
| CO2 | **Infer** the SRS (Software Requirements Specification), Project plan of a given software system. |
| CO3 | **Apply** various UML diagram for project management and requirement analysis to follow the principles of S/W project development. |
| CO4 | **List** test cases using the techniques involved in selecting: (a) White Box testing (b) Block Box testing. |
| CO5 | **Analyze** the cost estimate and problem complexity using various estimation techniques, reviews and inspections are used as a mechanism for software quality assurance and management. |

**Content of the course:**

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| **SL** | **Course Content (as summary)** | **Hrs** | **CLO’s** |
| 1. | Introduction and importance of Software Engineering, Applications, Basic concepts of Software Engineering and System Roadmap to Software Engineering | 3:0 | CO1 |
| 2. | Software Process, Framework activities, Generic process Model, Identifying the task for small, medium and large project, process pattern | 3:0 | CO1 |
| 3. | Software Development Life-Cycle, Models: Waterfall, V-shape, Incremental Model, Spiral Model, Concurrent Model, The Unified Process Model | 3:0 | CO1 |
| 4. | Software Development Life-Cycle: Agile, Extreme Programming (XP), ASD, DSDM, Scrum Models, Problem analysis of different models from real life problem, Comparative Analysis of Software Engineering Models from Traditional to Modern Methodologies | 3:0 | CO1 |
| 5. | Understanding the Requirements, Functional Requirements, Non-Functional Requirements, Building requirements model, Negotiating requirements, negotiating requirements, Project Discussion and execution plan. | 3:0 | CO2, CO3 |
| 6. | System modeling, context models, interaction models, structural models, behavioral models, model-driven engineering, architectural design decisions, architectural views, architectural patterns, application architectures () | 3:0 | CO2 |
| 7. | Software Modelling: Overview of UML; Use Case Modelling; Object Modelling, Dynamic modelling, State diagram, Activity Diagram, Sequence Diagram and Swimlane diagram. | 3:0 | CO1, CO2 |
| 8. | Object-Oriented design, UI Design, Design Case Study and GUI design from user activity. Review discussion | 3:0 | CO1, CO3 |
| 9. | Object Oriented design concept, Modeling, UML diagram types, Class diagram, Object diagram, component level design elements, Practicing exercise on object model diagram from case study | 3:0 | CO3 |
| 10. | Business process modeling(BMP), Notation defining workflows, Some rules for creating BPN, BPM example and practicing, uses of BMP. | 3:0 | CO3 |
| 11. | Integrating Requirements and Business Process Models in BPM Projects, Extracting Business Logic from Business Process Models | 3:0 | CO3 |
| 12. | Software Testing: Testing strategies, Test coverage, developing and recording test cases, Black box, white box, stress & load Testing. | 3:0 | CO4 |
| 13. | Software Maintenance Model, Forward Engineering, Reverse Engineering, Software Engineering vs Reengineering Estimation of approximate maintenance cost | 3:0 | CO4, CO5 |
| 14. | Estimation for software projects, Estimation of development time, Project resources, Estimation of development time, Boehm’s Definition of Software Project Types COCOMO, Basic, Intermediate and Complete COCOMO, Three classes of software: Organic, Semi-detach and Embedded | 3:0 | CO5 |
| 15. | Software quality assurance, Software quality goals, attributes, and metrics, SQA, SQP, SQC, and SQM, Software Quality Management, Reviews and Inspections, Inspection checklist | 3:0 | CO5 |
| 16. | Software evolution, Evolution processes, Program evolution dynamics, Legacy system management (Summer 234-241, 252-259) | 3:0 | CO2 |

**Mapping of Course Learning Outcomes to Program Learning Outcomes [attainment level used for**

**CLO’s from 1(weak)-3(strong) correlation]**

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|  | **PLO-1** | **PLO-2** | **PLO-3** | **PLO-4** | **PLO-5** | **PLO-6** | **PLO-7** | **PLO-8** | **PLO-9** | **PLO-10** | **PLO-11** | **PLO-12** |
| **CLO-1** | √ |  |  |  |  |  |  |  |  |  |  |  |
| **CLO-2** |  | √ |  |  |  |  |  |  |  |  |  |  |
| **CLO-3** |  |  | √ |  |  |  |  |  |  |  |  |  |
| **CLO-4** |  |  |  | √ |  |  |  |  |  |  |  |  |
| **CLO-5** |  |  |  |  | √ |  |  |  |  |  |  |  |

**Mapping Course Learning Outcome (CLOs) with the Teaching-Learning and Assessment Strategy:**

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| **CLO’s** | **Teaching Learning Strategy** | **Assessment Strategy** | **Corresponding**  **PO number** | **Domain**  **Level/Learning**  **Taxonomy** |
| CLO1 | Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion | Class Test/Assignment/ Midterm examination | PO1 | L2 |
| CLO2 | Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion | Class Test/Assignment/ Midterm examination | PO2 | L2 |
| CLO3 | Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion | Class Test/Assignment/ Midterm examination | PO3 | L3 |
| CLO4 | Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion | Class Test/Assignment/ Midterm examination | PO4 | L4 |
| CLO5 | Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion | Class Test/Assignment/ Midterm examination | PO5 | L4 |

**Course Delivery Plan/Lesson Delivery Plan:**

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| **Week/Lesson**  **(hour)** | **Discussion Topic and Book Reference** | **Student Activities during Online and Onsite and TLA** | **Mapping with CLO and PLO** | **Assessment Plan** |
| **Week-1**  Lesson 1 & 2 [3 Hours] | **Lesson 1:**  Introduction and importance of Software Engineering, Applications [Pressman, Chapter-1, Page (1-14)]  **Lesson 2:**  Basic concepts of Software Engineering and System Roadmap to Software Engineering [Pressman, Chapter-1, Page (15-25)] | Lesson 1, 2: Online/ Onsite discussion; Review Feedback online; Using Interactive content e.g.  Voice over PPT, PPT, Video, H5P; TLA1, TLA2 | CLO 1,  PLO-1 |  |
| **Week-2**  Lesson 3 & 4 [3 Hours] | **Lesson 3**  Software Process, Framework activities, Generic process Model, Identifying the task for small, medium and large project [Pressman, Chapter-2, Page ()]  **Lesson 4:**  Process pattern, Software Development Life-Cycle  Models [Pressman, Chapter-2, Page ()] | Lesson 3, 4: Online/Onsite discussion; Review Feedback online; Using Interactive content  e.g. Voice over PPT, PPT, Video, H5P; TLA1, TLA2 | CLO 1, PLO-1 | **Class Test** |
| **Week-3**  Lesson 5 & 6 [3 Hours] | **Lesson 5:**  SDLC models: Waterfall, V-shape, Incremental Model, Spiral Model [Pressman, Chapter-2, Page ()]  **Lesson 6:**  SDLC models: Concurrent Model, The Unified Process Model [Pressman, Chapter-2, Page ()] | Lesson 5, 6: Online/Onsite discussion; Review Feedback online; Using Interactive content  e.g. Voice over PPT, PPT, Video, H5P; TLA2, TLA3 | CLO 1,  PLO-1 |  |
| **Week-4**  Lesson 7 & 8 [3 Hours] | **Lesson 7:**  Software Development Life-Cycle: Agile, Extreme Programming (XP), ASD, DSDM, Scrum Models, Problem analysis of different models from real life problem. [Pressman, Chapter-3, Page(),Sommerville: Ch. 3, Page()]  **Lesson 8:**  Comparative Analysis of Software Engineering Models from Traditional to  Modern Methodologies [(Online Materials: Research Paper)] | Lesson 7, 8: Online/Onsite discussion; Review Feedback online; Using Interactive content  e.g. Voice over PPT, PPT, Video, H5P; TLA1, TLA2, TLA3 | CLO 1,  PLO-1 | **Assignment** |
| **Week-5**  Lesson 9 & 10 [3 Hours] | **Lesson 9:**  Understanding the Requirements, Functional Requirements, Non-Functional Requirements, Use Case, Use Case description [Pressman, Chapter-5, Page(),Sommerville: Ch. 4, Page()]  **Lesson 10:**  Building requirements model, Negotiating requirements, negotiating requirements, Project Discussion and execution plan. [Pressman, Chapter-5, Page(),Sommerville: Ch. 4, Page()] | Lesson 9 & 10: Online/Onsite discussion; Review Feedback online; Using Interactive content e.g. Voice over PPT, PPT, Video, H5P; TLA1, TLA2, TLA3 | CLO 2, 3  PLO-2, 3 |  |
| **Week-6**  Lesson 11 & 12 [3 Hours] | **Lesson 11:**  System modeling, context models, interaction models, structural models, behavioral models, model-driven engineering, [Sommerville: Ch. 5, Page()]  **Lesson 12:**  Architectural design decisions, architectural views, architectural patterns, application architectures [Sommerville: Ch. 6, Page()] | Lesson 11 & 12: Online/Onsite discussion; Review Feedback online; Using Interactive content  e.g. Voice over PPT, PPT, Video, H5P; TLA2, TLA3 | CLO 2  PLO-2 | **Presentation** |
| **Week-7**  Lesson 13 & 14 [3 Hours] | **Lesson 13:**  Software Modelling: Overview of UML; Use Case Modelling; Object Modelling, Dynamic modelling, [Pressman, Chapter-6, Page()]  **Lesson 14:**  State diagram, Activity Diagram, Sequence Diagram and Swimlane diagram [Pressman, Chapter-6, Page()] | Lesson 13, 14: Online/Onsite discussion; Review Feedback online; Using Interactive content  e.g. Voice over PPT, PPT, Video, H5P; TLA2, TLA3 | CLO 1, 2  PLO-1, 2 |  |
| **Week-8**  Lesson 15 & 16 [3 Hours] | **Lesson 15:**  Object-Oriented design, UI Design, [Pressman, Chapter-11, 22, Page()]  **Lesson 16:**  Design Case Study and GUI design from user activity. Review discussion [Pressman, Chapter-15, Page()] | Lesson 15, 16: Online/Onsite discussion; Review Feedback online; Using Interactive content  e.g. Voice over PPT, PPT, Video, H5P; TLA1, TLA3 | CLO 1, 3  PLO-1, 3 |  |
| **Week-9**  Lesson 17 & 18 [3 Hours] | **Lesson 17:**  Object Oriented design concept, Modeling, UML diagram types, Class diagram, Object diagram, component level design elements [Pressman, Chapter-8, Page(),Sommerville: Ch. 5, Page()]  **Lesson 18:**  Practicing exercise on object model diagram from case study [Pressman, Chapter-8, Page(),Sommerville: Ch. 5, Page()] | Lesson 17, 18: Online/Onsite discussion; Review Feedback online; Using Interactive content  e.g. Voice over PPT, PPT, Video, H5P; TLA1, TLA3 | CLO 3  PLO-3 | **Midterm Exam** |
| **Week-10**  Lesson 19 & 20 [3 Hours] | **Lesson 19:**  Business process modeling(BMP), Notation defining workflows, Some rules for creating BPN [Sommerville: Ch. 19, Page()]  **Lesson 20:**  BPM example and practicing, uses of BMP [Sommerville: Ch. 19, Page()] | Lesson 19, 20: Online/Onsite discussion; Review Feedback online; Using Interactive content  e.g. Voice over PPT, PPT, Video, H5P; TLA1, TLA4 | CLO 3  PLO- 3 |  |
| **Week-11**  Lesson 21 & 22 [3 Hours] | **Lesson 21:**  Integrating Requirements and Business Process Models in BPM Projects [(Online Materials: Research Paper)]  **Lesson 22:**  Extracting Business Logic from Business Process Models [(Online Materials: Research Paper)] | Lesson 21, 22: Online/Onsite discussion; Review Feedback online; Using Interactive content  e.g. Voice over PPT, PPT, Video, H5P; TLA1, TLA3 | CLO 3  PLO- 3 | **Class Test** |
| **Week-12**  Lesson 23 & 24 [3 Hours] | **Lesson 21:**  Software Testing: Testing strategies, Test coverage, developing and recording test cases [Sommerville: Ch. 8, Page()]  **Lesson 22:**  Black box, white box, stress & load Testing [Pressman, Chapter-18, Page() | Lesson 23, 24: Online/Onsite discussion; Review Feedback online; Using Interactive content  e.g. Voice over PPT, PPT, Video, H5P; TLA1, TLA4 | CLO 4  PLO-4 |  |
| **Week-13**  Lesson 25 & 26 [3 Hours] | **Lesson 25:**  Software Maintenance Model, Forward Engineering, Reverse Engineering [Sommerville: Ch. 24, Page()]  **Lesson 26:**  Software Engineering vs Reengineering Estimation of approximate maintenance cost [Pressman, Chapter-30, Page(),Sommerville: Ch. 26, Page()] | Lesson 25, 26: Online/Onsite discussion; Review Feedback online; Using Interactive content  e.g. Voice over PPT, PPT, Video, H5P; TLA1, TLA4 | CLO 4, 5  PLO-4, 5 | **Class Test** |
| **Week-14**  Lesson 27 & 28[3 Hours] | **Lesson 27:**  Estimation for software projects, Estimation of development time, Project resources, Estimation of development time [Pressman, Chapter-26, Page(),Sommerville: Ch. 23, Page()]  **Lesson 28:**  Boehm’s Definition of Software Project Types COCOMO, Basic, Intermediate and Complete COCOMO, Three classes of software: Organic, Semi-detach and Embedded [Pressman, Chapter-26, Page(),Sommerville: Ch. 23, Page()] | Lesson 27, 28: Online/Onsite discussion; Review Feedback online; Using Interactive content  e.g. Voice over PPT, PPT, Video, H5P; TLA3 | CLO 5  PLO-5 |  |
| **Week-15**  Lesson 29 & 30[3 Hours] | **Lesson 29:**  Software quality assurance, Software quality goals, attributes, and metrics, SQA, SQP, SQC, and SQM [Pressman, Chapter-16, Page()]  **Lesson 30:**  Software Quality Management, Reviews and Inspections, Inspection checklist [Sommerville: Ch. 24, Page()] | Lesson 29, 30: Online/Onsite discussion; Review Feedback online; Using Interactive content  e.g. Voice over PPT, PPT, Video, H5P; TLA3 | CLO 5  PLO-5 |  |
| **Week-16**  Lesson 31 & 32[3 Hours] | **Lesson 31:**  Software evolution, Evolution processes [Sommerville: Ch. 9, Page()]  **Lesson 32:**  Program evolution dynamics, Legacy system management [Sommerville: Ch. 9, Page()] | Lesson 31, 32: Online/Onsite discussion; Review Feedback online; Using Interactive content  e.g. Voice over PPT, PPT, Video, H5P; TLA3 | CLO 5  PLO-5 | **Final Exam** |

**Assessment Pattern:**

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| **Assessment Task** | **CO’s** | | | | | **Mark (Total=100)** |
| **CO1** | **CO2** | **CO3** | **CO4** | **CO5** |
| Attendance | -- | -- | -- | -- | -- | 7 |
| Class Test (CT1,CT2,  CT3) | -- | -- | -- | -- | -- | 15 |
| Assignment | -- | -- | -- | -- | -- | 5 |
| Presentation | -- | -- | -- | -- | -- | 8 |
| Midterm  Examination |  | 5 | 15 | 5 |  | 25 |
| Semester Final  Examination | - | - | 20 | 10 | 10 | 40 |
| Total Mark |  | 5 | 35 | 15 | 10 | 100 |

**CIE – Breakup (Theory) [60 marks]**

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| Bloom’s Criteria | Attendance (07) | Class Test (15) | Assignment (05) | Presentation (08) | Mid Exam (25) |
| Remember |  |  |  |  |  |
| Understand |  | 5 | 2 | 3 | 9 |
| Apply |  | 5 | 3 | 5 | 16 |
| Analyze |  | 5 |  |  |  |
| Evaluate |  |  |  |  |  |
| Create |  |  |  |  |  |

**SEE – Semester End Examination [40 marks] {Theory}**

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| --- | --- |
| **Bloom Criteria** | **Score for the Test** |
| Remember |  |
| Understand |  |
| Apply | 20 |
| Analyze | 10 |
| Evaluate | 10 |
| Create |  |

**Learning Materials:**

**Textbook/Recommended Readings:**

1. Software Engineering A Practitioner’s Approach, Roger S. Pressman

**Reference Books/Supplementary Readings:**

1. Software Engineering, Ian Sommerville, 10th edition
2. Software Engineering, Ivan Marsic
3. A Concise Introduction to Software Engineering, Pankaj Jalote, Springer,2008