**Course Details**

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| **Program(s)** | **Subject Name** | **Academic Session, Semester** | **Subject Code & Credit** | |
| B.Tech. | Software Engineering | Autumn, 2025  (5th Semester) | CS-31001 | **Cr-4,** **L** – **T** – **P**  **3** –**1** – **0** |

**Note:** **4Credits = 15x4= 60Hours (as per National Credit Framework, 1credit = 15Hours)**

**Course Faculty:**

Prof. (Dr.) Arghya Kundu

Mail-ID: [arghya.kundufcs@kiit.ac.in](mailto:smishrafcs@kiit.ac.in)

**Syllabus**

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| **UNIT I Introduction: (10Hrs)** |

Role of Software Engineer, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Quality Attributes.

**Assessment:** How Software Engineering Changes? Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models, Choosing a social relevant problem, Summary Team Report.

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| **UNIT II Requirement Engineering Process: (16Hrs)** |

Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modeling, Data Flow Diagrams, Entity Relationship Diagrams, Designing the architecture.

**Assessment:** Impact of Requirement Engineering in their problem, Decision Tables, SRS Document, IEEE Standards for SRS, Architectural design, component level design, user interface design, WebApp Design, Submission of SRS Document for Team Project.

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| **UNIT III Quality concepts, Review techniques, Software Quality Assurance (SQA): (8Hrs)** |

Verification and Validation, SQA Plans, Software Quality Frameworks.

**Assessment:** Framing SQA Plan, ISO 9000 Models, SEI-CMM Model and their relevance to project Management, Other emerging models like People CMM.

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| **UNIT IV Testing:**  **(12Hrs)** |

Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top-Down and Bottom-Up Testing, Software Testing Strategies, Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Testing conventional applications, object oriented applications, Web applications, Formal modeling and verification, Software configuration management, Product metrics.

**Assessment:** Team Analysis in Metrics Calculation.

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| **UNIT V:** **Project Management (12Hrs)** |

Project Management Concepts, Process and Project Metrics, Estimation for Software projects, Project Scheduling, Risk Management, Maintenance and Re-engineering.

**Assessment:** Preparation of Risk mitigation plan.

**Text Books**

**Textbooks:**

1. R. S. Pressman, Bruce R Maxim “Software Engineering: A Practitioners Approach”, 9th Edition, McGraw Hill Edition (India) Reprint 2023.
2. Rajib Mall, “Fundamentals of Software Engineering”, Fifth Edition, PHI Learning, Reprint 2023.
3. Pankaj Jalote, “Software Project Management in Practice”, Pearson Education, New Delhi, 2002.

**Course Objectives**

To acquire knowledge and skills for Analysis, Design , Implementation and Management of large and complex Software Systems, fulfilling requirements of quality, budget and schedule software projects.

**Number of Working Days as per Academic Calendar:**

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| --- | --- | --- | --- | --- |
| **Academic Calendar** | **Start Date** | **End Date** | **Number of Holidays** | **Number of Working Days (Excluding Saturdays & Holidays)** |
| Pre-Mid Semester Classes | 11-July-2025 | 6-Sept-2025 | 4 Days  (15 Aug, 27 Aug, 28 Aug, 5 Sept 2025) | 37 Days |
| Mid Semester Examination | 8-Sept-2025 | 13-Sept-2025 | 0 | 6 Days |
| Post Mid Semester Classes | 15-Sept-2025 | 8-Nov-2025 | 12 Days  (29 Sept to 7 Oct) + (20 Oct, 21 Oct, 5 Nov 2025) | 30 Days |
| End Semester Examination | 10-Nov-2025 | 19-Nov-2025 | 0 | 9 Days |

**LESSON PLAN**

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| **Module, Hrs** | **Topics/Coverage** | **Maximum Hours**  (Including Tutorials & ABL) | **Suggested Reference Book(s) Chapters** |
| **UNIT-I**  **Introduction:** | Role of Software Engineer, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Quality Attributes.  ***Additional: Software and its characteristics, application. Software engineering, Emergence of Software Engineering*** | 10 Hrs | Chapter-1, 2 |
| **Assessment:** How Software Engineering Changes? Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models, Choosing a social relevant problem, Summary Team Report.  ***Additional: Iterative Waterfall Model, RAD Model, Essential Idea behind Agile Models, Agile models: Extreme programming and Scrum, Agile versus Other Models*** |  | T1-2.5.1, 2.5.2,2.5.3  T2-1.1.3, 1.4, 2.2.5, |
| **Activity-1**  **(CO-1)** | *Do the Assessment satisfying the CO-1*  ***CO-1: Student will be able to distinguish different software process models and use a suitable model for solving a socially relevant problem.*** | | |
| **UNIT II Requirement Engineering Process:** | Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modeling, Data Flow Diagrams, Entity Relationship Diagrams, Designing the Architecture.  ***Additional: Information Modeling: Scenario Based Modeling, Class Based Modeling, Functional Modeling, Behavioral Modeling (Pressman Ch-8)***  ***DFD, Structure Chart (Software Architecture) (Rajib Mall, Ch-6, 7)*** | 16 Hrs | T1-Ch.7, 8, 9  T2-Ch. 6, 7 |
| **Assessment:** Impact of Requirement Engineering in their problem, Decision Tables, SRS Document, IEEE Standards for SRS, Architectural Design, Component Level Design, User Interface Design, WebApp Design, Submission of SRS Document for Team Project. |  | T1- Ch.10, 11, 12, 13(13.5)  T2- Ch. 4 (4.2.11) |
| **Activity-2 & 3**  **(CO-2&CO-3)** | *Do the Assessment satisfying the CO-2 & C0-3*  ***CO-2: Student will be able create SRS document from a given problem description.***  ***CO-3: Student will be able to do software design from problem description.*** | | |
| **UNIT III**  **Quality concepts, Review technique, Software Quality Assurance (SQA)** | Verification and Validation, SQA Plans, Software Quality Frameworks. | 8 Hrs | T1- 17.4.1, 17.9  T2- Pg: 435, |
| **Assessment:** Framing SQA Plan, ISO 9000 Models, SEI-CMM Model and their relevance to project Management, Other emerging models like People CMM. |  | T2: 11.3,11.4, 1.5, 11.6 |
| **Activity-4**  **(CO-4)** | ***CO-4 Student will be able to understand the relevance of quality models and metrics in software development process.*** | | |
|  | **MID SEMESTER EXAMINATION**  **(8-13September2025)** |  |  |
| **UNIT IV**  **Testing** | Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top-Down and Bottom-Up Testing, Software Testing Strategies, Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Testing conventional applications, object oriented applications, Web applications, Formal modeling and verification, Software configuration management, Product metrics.  **Additional: Coding & Code Review** | 12 Hrs | T1- Ch-19,20,21, 22, 23 (23.3)  T2- Ch-10, 3.14 |
| **Assessment:** Team Analysis in Metrics Calculation. |  |  |
| **Activity-5**  **(CO-5)** | ***CO-5: Student will be able to distinguish and apply different testing methodologies and metrics.*** | | |
| **UNIT V**  **Project Management** | Project Management Concepts, Process and Project Metrics, Estimation for Software projects, Project Scheduling, Risk Management, Maintenance and Re-Engineering. | 12 Hrs | T1 – Ch. 24,25,26  T2 – Ch.3 (except 3.11.3.12, 3.14), Ch.13 |
| **Assessment:** Preparation of Risk Mitigation Plan. |  |  |
| **Activity-6**  **(CO-6)** | ***CO-6: Student will be able to apply basic project management practices in real life project.*** | | |
|  |  | 58 Hrs |  |
|  | **END SEMESTER EXAMINATION**  **(10-19 November 2025)** |  |  |

**Evaluation Scheme:**

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| **Evaluations** | | **Marks** |
| **End** Semester Examination | | 50 |
| **Internal** | Mid Semester Examination | 20 |
| Activity (Continuous Evaluation) | 30 |
| Total | | 100 |

**ACTIVITY**

There will be 6 Activity Components mapping with 6 Outcomes with 5 marks to each activity component. The activity evaluation will be based on the following 6 different types of evaluations pattern (minimum 3 types):

1. Problem Solving (Individual)
2. Critical Thinking (Individual/Group)
3. Creation (Info-graphic, Written summary, Physical model/ mathematical model, soft model)
4. Interactivity Focus (Group based evaluation)
5. Quiz
6. Reflection (Self-Assessment, Reflection on learning )

**LMS**

The Moodle/ Google ClassRoom will be used for uploading class materials, different activities and the evaluation results for 30 Marks Component of Activities.

**Course Outcomes**

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

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|  | **Course Outcomes** | **Module** | **Expected Cognitive Level of Learning** |
| **CO-1** | Distinguish different Software Process Models and Use a suitable model for solving a Social Relevant Problem. | Software Process Models | 3. Apply,  4. Analyse |
| **CO-2** | Create SRS document from a given problem description. | Requirement Engineering Process | 6. Create |
| **CO-3** | Create software design from problem description. | Requirement Engineering Process | 6. Create |
| **CO-4** | Analyse the Relevance of Quality Models and Metrics in Software Development Process. | Quality concepts, Review techniques, Software Quality Assurance (SQA) | 4. Analyse |
| **CO-5** | Distinguish and Apply Different Testing Methodologies and Metrics. | Testing | 4. Analyse |
| **CO-6** | Apply Basic Project Management Practices in Real Life Project. | Project Management | 5. Evaluate |