|  |  |  |  |
| --- | --- | --- | --- |
| **Course Title and Code:** Software Engineering**CS1113** | | | |
| Hours per Week | | **L-T-P: 2-1-2** | |
| Credits | | **4** | |
| Students who can take | | B. Tech Sem VI | |
| **Course Objective:** In this course, students will gain a broad understanding of the discipline of software engineering and apply theories, models, and techniques to solve real-world problems. | | | |
| **Course Outcome:**  On successful completion of this course, the students will be able to:   1. Use software development lifecycle models for project development. 2. Design solutions in various application domains using software engineering approaches that integrate ethical and economic concerns. 3. Elicit and evaluate functional and non-functional requirements for a software system. 4. Design, represent and document software requirements specifications according to IEEE standards. 5. Apply UML modeling for software design. 6. Apply coding standards and guidelines. 7. Prepare code checklist and perform code inspections, code reviews and walkthrough. 8. Develop and implement various manual and automated testing procedures. 9. Estimate the cost of the software project. 10. Evaluate software in terms of software quality and quality assurance according to ISO standards. | | | |
| Prerequisites: Programming I & II | | | |
| **Sr. No** | **Specifications** | | **Marks** |
| 01 | Attendance | | **10** |
| 02 | Assignment | | **20** |
| 03 | Class Participation | | NIL |
| 04 | Quiz | | NIL |
| 05 | Theory Exam-I | | NIL |
| 06 | Theory Exam-II | | NIL |
| 07 | Theory Exam-III | | **30** |
| 08 | Report | | NIL |
| 09 | Report-II | | NIL |
| 10 | Report-III | | NIL |
| 11 | Project | | **30** |
| 12 | Project-II | | NIL |
| 13 | Project-III | | NIL |
| 14 | Lab Evaluation-I | | **10(Continuous)** |
| 15 | Lab Evaluation-II | | NIL |
| 16 | Course Portfolio | | NIL |
| 17 | Presentation | | NIL |
| 18 | Viva | | NIL |
|  | **Total (100)** | | 100 |

**Syllabus (Theory)**

**UNIT I: Introduction to Software Engineering**

Software Characteristics, Software Components, Software Engineering Processes. Software Development Life Cycle (SDLC) Models: Waterfall model, Incremental model, Spiral model, Agile model (Scrum, Kanban). Software Process Models: Prototype model, RAD model, V-Model.

Software Project Management: Project planning and scheduling, Project tracking and control, Risk management, Configuration management.

**UNIT II: Requirement Engineering**

Elicitation, Analysis, Feasibility Study, Information Modeling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, Use cases and scenarios, UML diagrams for requirement representation. Requirements Validation and Management: Techniques for validation, Change control and management.

**UNIT III: Software Design**

Basic Concept of Software Design, Architectural Design, Low-Level Design, Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design methods and Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design, User Interface (UI) Design.

**UNIT IV: Coding and Software Testing**

Coding standards, programming style, code inspection, code review and walkthrough; Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Top-down and Bottom-up, Testing Strategies, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products, Automated Testing Tools. Software Quality Assurance: Quality metrics, Process improvement models (CMMI).

**UNIT V: Project Management**

Project Initiation and Planning: Project charter, Work breakdown structure (WBS), Gantt charts and PERT charts. Project Execution and Monitoring: Team building and communication, Monitoring and controlling project variables, Project Closure and Evaluation.

Software Measures, Metrics and Models: Various Size Oriented Measures, Function Point (FP) Based Measures, Control Flow Graphs, Cost estimation models, Constructive Cost Models (COCOMO) etc.; Software Re-engineering, Reverse engineering.

**Reference/Textbooks:**

* R. S. Pressman, “Software Engineering – A practitioner's approach”, Eighth Edition, McGraw Hill International editions, 2019.
* Ian Somerville, “Software Engineering”, Tenth Edition, Pearson Education, 2017.
* Rajib Mall, “Fundamentals of Software Engineering”, Fifth Edition, Prentice-Hall of India Pvt. Ltd., 2018.
* Harold Kerzner, "Project Management: A Systems Approach to Planning, Scheduling, and Controlling", 13th Edition, Wiley Publication, 2022.
* "A Guide to the Project Management Body of Knowledge (PMBOK Guide)" by Project Management Institute (PMI).

**Coursera Courses**: 1. Introduction to Software Engineering offered by IBM

2. IBM DevOps and Software Engineering by IBM.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Outcome** | **Correlation with program outcomes** | | | | | | | | | | | | | | | | **Correlation with program specific outcomes** | | |
| **PO 1** | **PO 2a** | **PO 2b** | **PO 2c** | **PO 3a** | **PO 3b** | **PO 3c** | **PO 4a** | **PO 4b** | **PO 4c** | **PO 5a** | **PO 5b** | **PO 6** | **PO 7a** | **PO 7b** | **PSO-1** | | **PSO-2** |
| **CS1113.1** | 2 |  |  |  | 1 | 1 |  |  |  |  |  |  |  |  |  | 1 | | 1 |
| **CS1113.2** | 1 |  |  |  | 1 | 1 |  |  |  |  |  |  |  |  |  | 1 | | 1 |
| **CS1113.3** | 1 |  |  |  | 1 | 1 |  |  |  |  |  |  |  |  |  | 2 | | 1 |
| **CS1113.4** | 1 | 1 | 1 | 1 | 1 | 1 | 2 |  |  |  |  |  |  |  |  | 2 | | 2 |
| **CS1113.5** | 1 |  |  |  | 1 | 1 |  |  |  |  | 1 | 2 | 2 |  |  | 2 | | 2 |
| **CS1113.6** | 1 | 1 | 1 | 1 | 1 | 1 |  |  |  |  | 1 | 2 |  | 1 |  | 2 | | 2 |
| **CS1113.7** | 1 |  |  |  | 1 | 1 |  |  |  |  | 1 | 2 | 2 | 1 |  | 2 | | 2 |
| **CS1113.8** | 1 | 1 | 1 | 1 | 1 | 1 |  |  | 2 |  | 1 | 2 |  | 1 |  | 2 | | 2 |
| **CS1113.9** | 1 | 1 | 1 | 1 | 1 | 1 |  |  | 2 |  |  |  |  | 1 |  | 2 | | 2 |
| **CS1113.10** | 1 | 1 | 1 | 1 | 1 | 1 | 2 |  | 2 |  | 2 | 2 |  | 2 | 2 | 3 | | 3 |

**Course Articulation Matrix: (Mapping of COs with POs):**

**Learning Activities (LA):**

|  |  |  |  |
| --- | --- | --- | --- |
| **S. No.** | **LA** | **Evaluation component used** | **CO** |
| LA.1 | Identify the Requirements and prepare the SRS | Assignment, Quiz and Project | CS1113.1  CS1113.2  CS1113.3 |
| LA.2 | Prepare the Software Design document | Assignment, Quiz and Project | CS1113.2  CS1113.4 |
| LA.3 | Draw the UML diagrams | Assignment, Quiz and Project | CS1113.5 |
| LA.4 | One day Hackathon for Implementation/coding of the project and upload on GitHub | Project | CS1113.6  CS1113.7 |
| LA.5 | Write the test cases | Assignment and Project | CS1113.8 |
| LA.6 | Demonstration of the complete project | Project | CS1113.9  CS1113.10 |

**Learning Activity Articulation Matrix: (Mapping of LAs with COs)**

**Learning Activities (LA):**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | LA.1 | LA.2 | LA.3 | LA.4 | LA.5 | LA.6 |
| CS1113.1 | 2 |  |  |  |  |  |
| CS1113.2 | 2 | 2 |  |  |  |  |
| CS1113.3 | 2 |  |  |  |  |  |
| CS1113.4 |  | 2 |  |  |  |  |
| CS1113.5 |  |  | 3 |  |  |  |
| CS1113.6 |  |  |  | 2 |  |  |
| CS1113.7 |  |  |  | 2 |  |  |
| CS1113.8 |  |  |  |  | 3 |  |
| CS1113.9 |  |  |  |  |  | 2 |
| CS1113.10 |  |  |  |  |  | 2 |

**1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation**