**University of Central Punjab**

**Faculty of Information Technology**



**BSCS**

**PROGRAM (S) TO BE**

**EVALUATED**

**Course Description**

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| **Course Code** | CSSE3113 | | | |
| **Course Title** | Introduction to Software Engineering | | | |
| **Credit Hours** | 3 | | | |
| **Prerequisites by Course(s) and Topics** | Data Structure and Algorithm. | | | |
| **Assessment Instruments with Weights** | Class Participation **05%**  Quiz **15%**  Assignment **10%**  Project **10%**  Mid Term **20%**  Final **40%** | | | |
| **Semester** | FALL 2023 | | | |
| **Course Instructor** |  | | | |
| **Course Instructor Email** |  | | | |
| **Course Coordinator** | Engr. Sajid Saleem | | | |
| **Course Coordinator Email** | [sajid.saleem@ucp.edu.pk](mailto:sajid.saleem@ucp.edu.pk) | | | |
| **Office Hours** |  | | | |
| **Office Location** |  | | | |
| **Plagiarism Policy** | All the parties involved will be awarded Zero in the first instance.  Repeat of the same offense will result in an (F) grade | | | |
| **Tools Used in the Course** | Ms Office, MS Visio, MS Project, Zotero | | | |
| **Course Description** | This is the first course in the field of software engineering given to the students of computer science. It is designed to give an overview to multiple facets of software engineering including SDLC, documentation, design, cost estimation, testing. | | | |
| **Course Objectives** | After successful completion of the course, the students will be able to:   * Differentiate among phases of software development * Describe the relative advantages and disadvantages of well‐ known software development process models. * Select, with justification, a software development process that is most appropriate for the development and maintenance of a diverse range of software products. * Discuss key principles and common methods for software project management (such as scheduling, size estimation, cost estimation and risk analysis). * Perform level design of software * Distinguish between different types and levels of testing (for instance, unit, integration, systems, and acceptance) for medium‐ size software products. * Analyze requirements. | | | |
| **Textbook** | Selected Chapters from:   1. Software Engineering: Theory and Practice by Shari PFleeger and Atlee, 4th Edition 2. Software Engineering: A Practitioner’s Approach by Roger Pressman, 7th Edition 3. Software Engineering by Ian Summerville (reference book) | | | |
| **Reference Material** | Will be provided as per requirement of the lecture | | | |
| **Programming Assignments Done in the Course** | None | | | |
| **Class Time Spent on** (in credit hours) | **Theory** | **Problem Analysis** | **Solution Design** | **Social and Ethical issues** |
| 0.5 | 1 | 1 | 0.5 |
| **Oral and Written Communications** | Yes | | | |

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| **CLO** | **CLO STATEMENT** | **Bloom’s Taxonomy Level** | **PLO** | **Assessed in** |
| 1 | Compare and relate with the theory and concepts related to software engineering | C2 | 1 | Assignments,  quizzes, midterm,  final |
| 2 | Identify with software engineering models, express the requirements based on UML diagrams, and, best design based on design comparison techniques | C4 | 2 | Assignments,  quizzes, midterm,  final |
| 3 | Illustrate defect removal, cost estimation techniques, and, cyclomatic complexity | C3 | 4 | Assignments,  quizzes,  final |

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| **Week#** | **Topic** | **Reference** | **Instruments** | **CLO Mapping** |
| 1 | **Course Introduction. SE Introduction:** Program, Software, Engineering, Software Engineering (SE), Computer Science (CS), Problem Solving: Analysis, Synthesis. SE Terminology: Method, Tool, Procedure, and Paradigm. Relationship between SE and CS.  **SE Terminology:** Error, Fault, Failure, Relationship between them. Why is SE needed? Benefits of studying SE, A perspective on Quality. Software Process and Product Quality. Participants in software development project | Chap1 (Pfleeger) |  | CLO-1  CLO-1 |
| 2 | **Systems Approach:** Elements of a System like Objects, Activities. Relationship between Objects and Activities. Interrelated Systems, Sub-systems.  **Engineering Approach:** Phases of software engineering, Members of development team, Roles of software development team members.  **Models:**, Process Model, **Introduction of Software Process Models**: Waterfall Model, Waterfall with Prototyping, V Model, Prototyping Model, | Chap1 (Pfleeger)  Chap2 (Pfleeger) |  | CLO-1  CLO-1  CLO-2 |
| 3 | **Introduction of Software Process Models**: Phased Development, Spiral, UP, Agile (Scrum, XP)  **Project Management:** Questions from Customer, Work Breakdown Structure: dividing a project into phases, steps and activities. Project Schedule, Activity Graphs to understand activity dependencies. | Chap2 (Pfleeger)  Chap3 (Pfleeger) | Assignment 01 announced | CLO-2  CLO-2 |
| 4 | Practice to develop WBS and activity graph for a project described in class. Activity graphs to estimate project completion, Critical Path Method to estimate project completion.  Introduction of Gantt Charts, Gantt Chart, (**Additional:** Resource Histogram,) | Chap3 (Pfleeger) | Quiz 01  Assignment 01 due |  |
| 5 | **Gathering, Expressing, Documenting Requirements:** Process of Capturing Requirements, Requirements Elicitation, Gathering and Analysis. Requirements Definition and Specification. Making Requirements Testable.  **Types of Requirements:** Functional and Non-Functional. Requirements prioritization, **Tools to Express Requirements:** (Decision Tables, State Machines) | Chap4 (Pfleeger) | Quiz 02 | CLO-1  CLO-2 |
| 6 | **Tools to Express Requirements:** Dynamic Descriptions of a System: UML State-chart, Fence Diagram  Petrinets, Event Traces (i.e. Message Sequence Diagram). Static Descriptions of a System (Entity-Relationship Diagram) | Chap4 (Pfleeger) | Quiz 03  Assignment 02 announced | CLO-2 |
| 7 | Static Descriptions of a System (Class Diagram). Other types of system descriptions (Dataflow Diagram, Use case Diagram). | Chap4 (Pfleeger) | Assignment 02 due | CLO-2 |
| 8 | 1st Phase Project Submission / Viva / Revision |  |  |  |
|  | **MID TERM EXAM** |  |  |  |
| 9 | Documenting Requirements (SRS), Requirements verification and validation.  Capturing Requirements: Requirements Elicitation Exercise | Chap4 (Pfleeger) |  | CLO-1 |
| 10 | **Product Metrics:** Measures, metrics and Indicators, The challenge of product metrics, attributes of effective software metrics.  **Metrics for the requirements model:** Function based metrics, | Chap23 (Pressman) | Quiz 04  Assignment 03 announced | CLO-1  CLO-2 |
| 11 | **Project and Product Metrics:** Process metrics and s/w process improvement, Project Metrics.  **Software measurements:** Size oriented Metrics, Function Oriented Metrics, Reconciling FP and LOC metrics, Object-oriented Metrics, Use-case oriented metrics, Web app project metrics | Chap25 (Pfleeger) | Assignment 03 due | CLO-1  CLO-1 |
| 12 | **Architecture Styles:** Pipe-and-Filter, Client-Server, Peer-to-Peer, Publish-Subscribe, Repositories, Layering.  **Modularity:** Coupling, Cohesion  **Evaluating multiple designs** for better decision making: Tradeoff Analysis, Cost Benefit Analysis (ROI, ROI %Gain, Payback Period), | Chap5  (Pfleeger)  Chap6 (Pfleeger) |  | CLO-1  CLO-2 |
| 13 | **Metrics for Software Quality:** Measuring quality, Defect removal efficiency  **Estimation for S/w Projects:** Software project estimation, Decomposition techniques (3-point value based estimation) | Chap25 (Pressman)  Chap26 (Pressman) | Quiz 05  Assignment 04 announced | CLO-3  CLO-3 |
| 14 | **Empirical Estimation Models:** The structure of Estimation Models, COCOMO I model (Additional: COCOMO II)  **Unit Testing:** Significance of testing, Elements of a test case, Objectives of testing, Debugging, Types of faults, Levels of testing, Views of Test Objects (Black Box, White Box), Cyclomatic Complexity (CFG and Adjacency matrix method). | Chap26 (Pressman)  Chap8 (Pfleeger) | Assignment 04 due | CLO-3  CLO-3 |
| 15 | **Integration Testing:** Functional Decomposition Based (Big Bang, Top-down, Bottom up, Sandwich). Call Graph Based (Pairwise, Neighborhood based)  2nd Phase Project Submission / Viva | Chap8 (Pfleeger) |  | CLO-1 |
| 16 | Revision |  |  |  |
|  | **FINAL TERM EXAM** |  |  |  |