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**SECOND SEMESTER 2023-2024**

# Course Handout Part II

Date: 09-01-2024

In addition to part-I (General Handout for all courses appended to the timetable) this portion gives further specific details regarding the course.

*Course No.* : **IS F341**

## Course Title : **Software Engineering**

Instructor-in-Charge : **Prof. Narasimha Bolloju**

**Scope:**

Type of Software, Application of Software, Software Life Cycle Model, Agile Modeling, Requirement Engineering, Object Oriented Analysis and Design (using UML), Introduction of Web Engineering, Software Integration and Testing, Support Processes and Software Quality, Software change Management, Software Product and Process Metrics Measurement, Software Project Management, Scheduling, Staff Measurement, Risk Management, Component based Software Engineering, Quality and Reliability Model, Maturity Models, Deployment Models, Ethics of Software Engineering (ACM/IEEE code of Ethics).

**Objectives:**

This course provides the knowledge and skills necessary to effectively participate and contribute to project teams in software development following a suitable methodology. Specifically, the course has the following objectives:

* to offer widely used software development methodologies so that the students will be able to select an appropriate software process model and architecture for a given type of development project,
* to elaborate the relationship of software development to overall software product engineering, estimate time and costs,
* to explain the rationale behind various activities related to planning and management of software development in teams, and
* to make students build a software system in small teams adhering to a widely used agile methodology by practicing relevant techniques pertaining to activities such as requirements elicitation and analysis, requirements modeling and specification, software development, testing and project management.

**Text book:**

T1 - Software Engineering (10th edition) by Ian Sommerville, Pearson Education, 2017.

**Reference books:**

R1 - The work system method: connecting people, processes, and IT for business results by Alter S., Work System Press, 2006.

R2 - Essential Scrum – A practical guide to the most popular agile process by Rubin, K. Addison-Wesley, 2013

R3 - UX Design and Usability Mentor Book: With Best Practice Business Analysis and User Interface Design Tips and Techniques by Yayici, E., UX Services, 2014.

R4 - NoSQL distilled: a brief guide to the emerging world of polyglot persistence by Sadalage PJ, and Fowler M. Pearson Education; 2013.

**Course Plan:**

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| **Lecture Nos.** | **Learning objectives** | **Topics to be covered** | **Reference** |
| 1-6 | Explain challenges in software development  Explain typical characteristics of agile methods  Prepare system scope and top level system requirements | Introduction software engineering (SE); Challenges associated with SE; Types of software systems; Plan-based vs. agile development; Agile project management and Scrum; Work systems (Socio-technical systems); Requirements engineering overview; functional and non-functional requirements; Business rules; Requirements specification with user stories | T1-Chapters 1, 3, and 4;  R1 – Chapter 3 |
| 7-12 | Practice requirements modeling skills using UML through a UI/UX design methodology | Introduction to a UI/UX design methodology and UML; Identifying user profiles; Developing personas; Defining requirements in terms of user stories and use case diagrams;  Interaction design with Use case descriptions and Activity diagrams; Information architecture; Mind maps and card sorting for UI design; Low fidelity prototyping with wireframes | T1-Chapters 4 and 5;  R3 |
| 13-18 | Understand and apply object modeling skills  Develop object models | Domain/object modelling; Attributes and different types of relationships in object models; Different types of operations/methods; NoSQL; schema-less databases; CAP theorem; Document modelling | T1-Chapter 5;  R4 – Chapters 1 and 2 |
| 19-21 | Understand basic software testing concepts  Learn and practice effort estimation techniques | Introduction to software testing; Acceptance tests; Test planning; Validation vs. verification; Estimating effort in plan-driven methods; Estimating effort in agile methods | T1-Chapter 8 |
| 22-27 | Explain and compare different architectural and design choices  Apply patterns for effective and efficient object modeling | Software architectures; Architecture principles; Design principles; Component diagrams; Cohesion and coupling*;* Object modeling with transaction pattern | T1-Chapter 6 |
| 28-30 | Explain various software testing concepts and their role in software engineering | Usability testing; A/B testing; Software testing concepts (validation/verification; types of testing); Test cases and test data; Unit testing; Integration testing; Interface testing, Acceptance testing; Regression testing | T1 - Chapter 8 |
| 31-36 | Understand and compare different types of process models  Explain effort estimation techniques | Software development life cycle; Process models for software development; Component based development; Suitability of process models to a given project; Kanban and Scrumban methodologies; Agile methods for large distributed teams | T1-Chapters 2, 3, and 23 |
| 37-39 | Understand planning and management of development processes | Project planning; Quality management; Risk management; Configuration change management; Process improvement | T1-Chapters 23 to 25 |
| 40-42 | Explain design patterns and their application  Appreciate ethical issues in software engineering | Design patterns and applications of popular design patterns; Ethics for software engineers | T1-Chapters 1, 7 |

Many of the lecture sessions willinclude group work to facilitate collaborative learningand preparatory material, if any, will be provided at least 24 hours prior to the scheduled lecture sessions.

**Evaluation Scheme:**

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| **Component** | **Duration** | **Weightage (%)** | **Date & Time** | **Nature of Component** |
| Mid Term Test | 90 minutes | 25% | 15/03 - 11.00 - 12.30PM | Closed book |
| Class activities  (5% pre mid sem grading) | - | 10% | Spread throughout the semester | Exercises during lecture sessions |
| Lab exercises  (5% pre mid sem grading) | - | 10% | Spread throughout the semester | Exercises during lab sessions |
| Project work and presentation  (5% pre mid sem grading) | - | 20% | Spread throughout the semester | Group project |
| Comprehensive | 3 hours | 35% | 16/05 AN | Closed book |

As part of the group project, students will work on a software development project following Scrum - a popular agile method - in small groups and submit associated reports. Each group will also make a presentation including the demonstration of the developed software product at the end of first or second sprint. After the third and final sprint, a demo video will be submitted by each team for viewing and for soliciting inputs from other students of this course.

Group project work requires full stack development with currently used tools/environments (e.g., React JS, Node.js, MongoDB). In addition to the development tools groups are required to use project management tools (e.g., GitHub), cloud-based modeling environments for UML and UI/UX design (e.g., diagrams.net, Lucidchart), and other supporting tools for testing and test data generation (e.g., Jest and Mockaroo).

**Chamber/Online Consultation Hours:** To be announced on Google Classroom

**Notices:** All notices pertaining to this course will be posted on Google Classroom.

**Make-up Policy:** Make-up will be granted strictly based on prior permissions and on justifiable grounds only. There is no make up for the Assignments/Presentation component.

**Academic Honesty and Integrity Policy**: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

**INSTRUCTOR-IN-CHARGE**