Lahore University of Management Sciences
(CS 564) – Software Development: Tools and Processes

Spring 2024

Subject to Change

Instructor	Dr. Shafay Shamail
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Secretary/TA	Mr. Afaq Butt / Hafsa Zafar
TA Office Hours	To be decided
Course URL (if any)	lms.lums.edu.pk
Lecture Mode	Online

COURSE TEACHING METHODOLOGY

- Teaching Methodology:
  - Face-to-Face synchronous teaching on campus
  - Students will be guided to supplementary reading material also.
- Lecture Details:
  - Since teaching methodology is going to be synchronous, face-to-face on-campus, therefore there will be no pre-recorded lectures.
  - Links to related reference material available online from different sources will also be provided from time to time.
  - All course related resources will be shared via course site on LMS.

COURSE BASICS

Credit Hours	3			
Lecture(s)	Nbr of Lec(s) Per Week	2, Tuesday, Thursday	Duration	8:00 AM – 9:15 AM
Recitation/Lab (per week)	Nbr of Lab(s) Per Week	None	Duration	
Tutorial (per week)	Nbr of Tutorial(s) Per Week	None	Duration	

COURSE DISTRIBUTION

Core	No
Elective	Yes
Open for Student Category	Graduate Students only
Close for Student Category	Undergraduate Students

COURSE DESCRIPTION

Some of the key software engineering activities like, software requirement management, software configuration management, software quality assurance, and software estimation will be discussed in detail. Some of the tools and their importance and use during the software development process will be discussed. Capability Maturity Model Integration (CMMI) framework will be introduced to the students. Structure of CMMI will be discussed and detailed discussion of different process areas will be carried out. Guest speakers will be invited from the industry to discuss their approach for the development of software projects.

COURSE PREREQUISITE(S)

•	A course in software engineering

COURSE OBJECTIVES

1. CO1	1. Introduce the students to software development processes.
2. CO2	2. Develop an appreciation for focusing on the processes during software development.
3. CO3	3. Introduce the students to current software development practices in industry and quality assurance techniques.
4. CO4	4. Provide exposure to some of the tools which can be used to handle the software development process more efficiently and quantitatively.
5. CO5	5. Introduce the students with process framework - Capability Maturity Model Integration (CMMI).
6. CO6	6. Introduce the students to assessment of software processes maturity and improvement in organizational

	processes with respect to CMMI.

COURSE LEARNING OUTCOMES	
	A student will be able to
1. CLO1	1. **Processes**: explain fundamental concepts of software development processes, including software development lifecycle, phases, iterations, and practices
2. CLO2	2. **Process Models and Quality Standards**: explain fundamental concepts of software process models and quality standards, process areas, goals, and practices
3. CLO3	3. **Process Assessment**: Demonstrate the key elements of process assessment models, methods, and improvement techniques
4. CLO4	4. **Tools**: explain the main concepts of development and assessment tools and be able to use their basic features

GRADING BREAKUP	
Component Details and Weightages	
Assignment(s):	-
Homework:	-
Quiz(s):	25% (One quiz will be dropped. No petitions will be accepted. Please refer to student handbook for n-x policy.)
Class Participation:	-
Attendance:	-
Midterm Examination:	-
Project:	50% (No part of the project will be dropped. No petitions will be accepted.)
Final Examination:	25%

Examination Detail	
Midterm Exam	Yes/No: No midterm exam Combine / Separate: Duration: Preferred Date: Exam Specifications:
Final Exam	Yes/No: Yes Combine Separate: Duration: 150 minutes (may vary) Exam Specifications:

COURSE OVERVIEW			
Week/ Module/ Lecture	Topics	Recommended Readings	Objectives/ Application
Module 1	**Introduction** • Introduction to course • Software development life cycle - overview of software development process models - general software engineering concepts • SWEBOK o Review of software engineering concepts,	4 sessions Ch 2, 3, 4 Pressman and Maxim Ch 1, 2 Dennis Ch 6, 8 McConnel Ch 1, 2, Pankaj-1 SWEBOK	**CLO1** **CLO4**

	product, and process quality ○ SW Engineering Process, Tools and Methods		
Module 2	**Introduction to CMMI** • Introduction to quality standards - CMMI framework & models • CMMI Model architecture • Interpreting the CMMI • CMMI Process Areas • Process Area Components • Understanding Levels • Generic Goals and Practices • Specific Goals and Practices	5 sessions Ch 28 Pressman and Maxim CMMI For Development Ch 3-7, 9 Dennis Ch 1-5 Beth Ch 7, 14 McConnel	**CLO2**
Module 3	**Process Assessment** • CMMI appraisals – SCAMPI - Standard CMMI Appraisal Method for Process Improvement	3 sessions	**CLO3** **CLO4**
Module 4	**Key concepts for software development processes** • Software configuration management - example of SCM tool • Software quality assurance - example of quality assurance tool - QA activities • Software Estimation - function points and other methods • Requirement Elicitation and management • Case Study: Rapid development of a software project - mapping of artifacts	6 sessions Ch 22 Pressman and Maxim Ch 2, 6, Pankaj-2 Ch 3, 4 Pankaj-1 Ch 15 Pressman and Maxim Ch 17 Pressman and Maxim Ch 25 Pressman and Maxim Ch 7 Pressman and Maxim If time permits If time permits	**CLO1** **CLO4**
Module 5	**Managing Software Projects** • Problems in managing software projects - defining scope, extracting requirement, requirement creep, people factor • Key success factors in management of Information system projects - Major causes of project failures	3 sessions Ch 24 Pressman and Maxim Ch 7 Flowers If time permits	**CLO1**
Module 6	**Guest Speakers** * • Software development practices in industry • Sessions with guest speakers will be held according to the availability and convenience of the speakers	3 sessions Depending upon the availability of guest speakers	**CLO1**
Module 7	**Project Presentations** • Project Presentations	First session around the mid semester Second sessions before final	**CLO1** **CLO2** **CLO3** **CLO4**

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PROJECT DETAIL	
Different Types of Projects	
Project Type	**Project Description**
SCAMPI	Do a Maturity Level 2 SCAMPI appraisal of a given software house.
SLR	Do a systematic literature review of a given topic.
Survey/Interview	Do a quantitative/qualitative survey of tools/processes in selected software houses.
Implementation	Implement an independent tool or as a plugin to an IDE to help software developers in executing some of the functionality / feature that is not readily available in their current software development environment.
AI Analysis	Do data analysis of an open-source data by applying AI, machine learning, deep learning techniques.

TEXTBOOK(S)/SUPPLEMENTARY READINGS

Text Books

- Software Engineering: A Practitioner's Approach
  9th Edition
  By Roger Pressman and Bruce Maxim
  ISBN10: 1259872971
  ISBN13: 9781259872976
  Copyright: 2020
  McGraw-Hill
- URL:
  1. https://www.mheducation.com/highered/product/software-engineering-practitioner-s-approach-pressman-maxim/M9781259872976.html
  2. https://www.amazon.com/ISE-SOFTWARE-ENGINEERING-PRACTITIONERS-APPROACH/dp/1260548007/ref=pd_sbs_14_2/130-3452034-1654632?_encoding=UTF8&pd_rd_i=1260548007&pd_rd_r=8fed0bf1-31a5-49d0-999a-7aa8d10a80d1&pd_rd_w=xlrlZ&pd_rd_wg=Pe52H&pf_rd_p=ed1e2146-ecfe-435e-b3b5-d79fa072fd58&pf_rd_r=VQ92BE024W48EMRRY8K1&psc=1&refRID=VQ92BE024W48EMRRY8K1

Recommended Readings:

- Software Engineering Body of Knowledge (SWEBOK)
  http://swebokwiki.org/Wiki_Instructions#Document_Structure
- Skills Framework for the Information Age (SFIA)
  https://sfia-online.org/en/tools-and-resources/bodies-of-knowledge/swebok-the-guide-to-the-software-engineering-body-of-knowledge

- CMMI for Development: Ver 1.2, SEI, Carnegie Mellon, Aug 2006
- CMMI Distilled: A practical Introduction to Integrated Process Improvement
  By Dennis M. Ahern, Aaron Clouse, Richard Turner (Dennis)
- CMMI - Guidelines for Process Integration and Product Improvement
  By Mary Beth Chrissis, Mike Konrad, Sandy Shrum (Beth)

- After the Gold Rush: Creating a True Profession of Software Engineering
  By Steve McConnell, Microsoft Press, 1999 (McConnell)
- An integrated approach to software engineering
  By Pankaj Jalote, Narosa Publishing House, 1997 (Pankaj-1)

- Software Process Improvement: Concepts and Practices
  By Eugene McGuire, Idea Group Publishing, 1999 (Eugene)

- Managing the software process
  By Watts S. Humphrey, Addison-Wesley, 1990 (Humphrey-2)

- Software failure: management failure
  By Stephen Flowers, John Wiley & Sons, 1999 (Flowers)

Reference Readings:

- Software Engineering: A practitioner's Approach, Seventh Edition
  By Roger S Pressman (Pressman)

- CMM in Practice: Processes for Executing Software Projects at Infosys
  By Pankaj Jalote, Addison-Wesley, 2000 (Pankaj-2)

- Elements of Software Process Assessment and Improvement
  By Khaled El Emam and Naxim H. Madhavji, IEEE Computer Society, 1999 (Emam)

- Software Engineering Institute website: www.sei.cmu.edu

Notes:

Notes may be provided for some lectures.

Harassment Policy

SSE, LUMS and particularly this class, is a harassment free zone. There is absolutely zero tolerance for any behavior that is intended or has the expected result of making anyone uncomfortable and negatively impacts the class environment, or any individual's ability to work to the best of their potential.

In case a differently abled student requires accommodations for fully participating in the course, students are advised to contact the instructor so that they can be facilitated accordingly.

If you think that you may be a victim of harassment, or if you have observed any harassment occurring in the purview of this class, please reach out and speak to me. If you are a victim, I strongly encourage you to reach out to the Office of Accessibility and Inclusion at oai@lums.edu.pk or the sexual harassment inquiry committee at shic@lums.edu.pk for any queries, clarifications, or advice. You may choose to file an informal or a formal complaint to put an end of offending behaviour. You can find more details regarding the LUMS sexual harassment policy here.

To file a complaint, please write to harassment@lums.edu.pk.

SSE Council on Equity and Belonging

In addition to LUMS resources, SSE's Council on Belonging and Equity is committed to devising ways to provide a safe, inclusive, and respectful learning environment for students, faculty, and staff. To seek counsel related to any issues, please feel free to approach either a member of the council or email at cbe.sse@lums.edu.pk