

## Course E-Syllabus

1	<b>Course title</b>	Advanced Software Engineering
2	<b>Course number</b>	1902472
3	<b>Credit hours</b>	٣
	<b>Contact hours (theory, practical)</b>	٣
4	<b>Prerequisites/corequisites</b>	Introduction to Software Engineering
5	<b>Program title</b>	Computer Information Systems
6	<b>Program code</b>	٢
7	<b>Awarding institution</b>	The University of Jordan
8	<b>School</b>	King Abdullah II School for Information Technology
9	<b>Department</b>	Computer Information Systems
10	<b>Level of course</b>	Undergraduate
11	<b>Year of study and semester (s)</b>	2022-2023 (Autumn)
12	<b>Final Qualification</b>	Bachelor of Science in Computer Information Systems
13	<b>Other department (s) involved in teaching the course</b>	None
14	<b>Language of Instruction</b>	English
15	<b>Teaching methodology</b>	<input checked="" type="checkbox"/> Blended <input type="checkbox"/> <b>Online</b>
16	<b>Electronic platform(s)</b>	<input checked="" type="checkbox"/> <b>Moodle</b> <input checked="" type="checkbox"/> <b>Microsoft Teams</b> <input type="checkbox"/> Skype <input type="checkbox"/> Zoom <input checked="" type="checkbox"/> Face to Face <input checked="" type="checkbox"/> Others:JUexams.com
17	<b>Date of production/revision</b>	October, 2022

### 18 Course Coordinator:

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### 19 Other instructors:

None

### ٢٠ Course Description:

This course helps students understand the advanced topics of software engineering, including approaches to development and process improvement: The course begins with a revision of the main methodologies of software engineering including agile methods i.e., XP, and Software Development Life Cycle (SDLC). The course presents Requirements analysis, Software design: architectural design, service oriented architecture, distributed software engineering; Formal specification, software verification and validation, Maintenance; evolution, SW Documentation, SW reuse, Re-engineering and reverse

engineering; The course will be presented by online lectures, recorded lectures, case study from healthcare and industry domains, and assignments. Assignments will include a term project illustrative of professional practice in developing computer information systems.

## Course aims and outcomes:

### Aims

The main objectives of the software engineering course are:

- 1- To produce high-quality software by going through the whole software development life cycle, with cost-effective development of software systems,
- 2- To provide students with software requirements analysis, design and implementation techniques, and testing that result in the development of maintainable and reliable software that meets the customer's needs.

### **Intended Learning Outcomes (ILOs):**

Upon successful completion of this course students will be able to:

#### **A. Knowledge and Understanding:**

- 1- Students should be able to understand what are the phases of the software lifecycle development can be managed using different models of software process.
- 2- Students should be able to understand the goals and deliverables of each phase of the software lifecycle.
- 3- Students should be able to select and apply appropriate techniques to evaluate the achievements of a software.
- 4- Students should be able to understand software architectural design.

#### **B. Intellectual skills:**

- 1- Identify the basic concepts and principles to analyze software architecture.
- 2- Identify the basic concepts to the design of software.
- 3- Students should be able to understand and evaluate the categorize application domains for computer software.
- 4- Identify the basic concepts and principles to the distributed system characteristics.
- 5- Students should be able to understand and evaluate techniques can be used to formally specify the software and impact on project success.
- 6- Identify the basic concepts and principles to the Validation and Evolution activities.

#### **C. Subject Specific skills:**

- 1- Describe how process models can be applied to software development.
- 2- Practice software design and implementation through development processes.
- 3- Select the proper method(s) and techniques(s) to the software testing.
- 4- Practice software formal specification.

#### **D. Transferable Key Skills:**

- 1- Demonstrate how to produce a high quality software and define its characteristics
- 2- Evaluate the role of project testing, architectural pattern, quality control and assurance in the development of computer software.
- 3- Students should be able to identify how change is managed during the development of computer software and after delivery to the customer

### **ABET Students Outcomes (SOs):**

- 1- Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.
- 2- Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.

4- Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.

6- Support the delivery, use, and management of information systems within an information systems environment [IS].

### Mapping ILOs to ABET SOs

ILOs	ABET SOs
B1,B3	1
A4,B2, C2, D1	2
A4, A3,B5, C3, C4	4
A1, A2, B1, B4, B6, B7, C1,C2, D1, D2, D3	6

### Topic Outline and Schedule:

Week	Lecture	Topic	ILOs	Teaching Methods* / Platform	Evaluation Methods	References
Week 1	1.1	Welcome and orientation (review syllabus, objectives, textbook, project and assignments, online material and teaching methods). Introduction to the course	-	Face to Face & Synchronous lecture (MS-Teams)	-	Course Syllabus and Announcements on MOODLE
	1.2	<b>(Revision)</b> Ch1: Professional Software Development	A1, A.2,	Face to Face & Synchronous lecture (MS-Teams)	In-lecture questions <b>Self-reading Assignment</b> (case study in health care information systems)	Text Book - Chapter 1; lecture notes(slides) (MOODLE)
	1.3	<b>(Revision)</b> <b>Ch2: Software process models:</b> Software Development Life Cycle/activities		Face to Face & Synchronous lecture (MS-Teams)	In-lecture questions	Text Book - Chapter 2; lecture notes(sides) (MOODLE)
2.1	<b>Ch2:</b> Software process models;	Face to Face & Synchronous lecture (MS-Teams)		In-lecture questions	Text Book - Chapter 2; lecture notes(slides);	
Week 2	2.2	<b>(Revision)</b> <b>Ch3: Agile methods Plan-driven and agile development</b>	A.1, A.2, B2	Face to Face & Synchronous lecture (MS-Teams)	<b>Project Task 1</b>	Text Book - Chapter 3; lecture notes(slides); recorded presentation; Project (MOODLE)

Week	Lecture	Topic	ILOs	Teaching Methods* / Platform	Evaluation Methods	References
	2.3	<b>(Revision)</b> <b>Ch4: Requirements Engineering:</b> Functional and non-functional requirements		Face to Face & Synchronous lecture (MS-Teams)	In-lecture questions; Project Task1	Text Book - Chapter 4; lecture notes(slides); recorded presentation; Project Task1 (MOODLE)
Week 3	3.1	<b>(Revision)</b> <b>Ch5: Design and Modelling:</b> Context models; Interaction models		Face to Face & Synchronous lecture (MS-Teams)	In-lecture questions	Text Book - Chapter 5; lecture notes(slides); presentation; (MOODLE)
	3.2	<b>(Revision)</b> <b>Ch5: Design and Modelling:</b> Structural models Behavioral models Model driven Engineering	<b>A.1, A.2, B1, B3</b>	Face to Face & Synchronous lecture (MS-Teams)	In-lecture questions	Text Book - Chapter 3; lecture notes(slides); recorded presentation (MOODLE)
	3.3	<b>Discussion on Lectures and Projects progress</b>		Synchronous lecture + <b>(Self-reading)</b>	<b>Task 1</b>	<b>(MOODLE)</b>
Week 4	4.1	<b>Ch6: Architectural design:</b> Architectural design definition, decisions, representation Architectural views,		Face to Face & Synchronous lecture (MS-Teams)	In-lecture questions	Text Book - Chapter 6; lecture notes(slides); recorded presentation; SCRUM material (MOODLE)
	4.2	<b>Ch6 Architectural Design: Architecture and system characteristics;</b>		Face to Face & Synchronous lecture (MS-Teams)	<b>Assignment 1</b>	Text Book - Chapter 6, lecture notes(slides); SRS Example (MOODLE)
	4.3	<b>Ch6 Architectural Design:</b> Architectural style, architectural patterns, and Application architectures	<b>A4, B.1, B2.</b>	Synchronous lecture (MS-Teams)	-	Text Book - Chapter 6; lecture notes(slides); recorded presentation; SRS Example (MOODLE)
Week 5	5.1	<b>How to build architectural design</b>		Face to Face & Synchronous lecture	-	Text Book - Chapter 6; lecture notes(slides); recorded presentation; (MOODLE)
	5.2	<b>Discussion on Lectures</b>		Face to Face & Synchronous	<b>Project Task 2</b>	Example (MOODLE)

Week	Lecture	Topic	ILOs	Teaching Methods* / Platform	Evaluation Methods	References
		<b>Building the architecture design of the Project</b>		lecture (MS-Teams)		
	5.3	<b>Architectural diagram</b>	<b>B3</b>	Synchronous lecture (MS-Teams)	<b>Project Task 2</b>	Text Book - Chapter 6, lecture notes(slides); recorded presentation (MOODLE)
<b>Week 6</b>	6.1	<b>Ch7: Design and implementation: Build or buy Context and interaction models Design models</b>	<b>B1, C1, C2, D1</b>	Face to Face & Synchronous lecture	<b>Assignment 2</b>	Text Book - Chapter 7, lecture notes(slides); (MOODLE)
	6.2	<b>Ch7: State diagrams</b> Architectural pattern and its elements		Face to Face & Synchronous lecture (MS-Teams)		
	6.3	<b>Practical Session on Ch7</b>		Face to Face & Synchronous lecture (MS-Teams)		
<b>Week 7</b>	7.1	<b>Projects progress</b>		Face to Face & Synchronous lecture (MS-Teams)		Rational Rose material and examples (MOODLE)
	7.2	<b>Ch7: Design and implementation: Reuse, and reuse levels Implementation issues and Open source development.</b>	-	Face to Face & Synchronous lecture (MS-Teams)	<b>Progress Evaluation</b>	Project Specifications (MOODLE)
	7.3	<b>Ch18: Distributed software engineering: Distributed systems issues, Types of attack</b>	<b>A3, C3</b>	Synchronous lecture (MS-Teams)	In-lecture questions	Text Book - Chapter 17; lecture notes(slides); presentations MOODLE
<b>Week 8</b>	8.1	<b>Ch18: Quality of service Failure management Models of interaction Middleware support</b>	<b>D1, D2</b>	Face to Face & Synchronous lecture	-	Text Book - Chapter 17; lecture notes(slides); recorded presentations

Week	Lecture	Topic	ILOs	Teaching Methods* / Platform	Evaluation Methods	References
						Parts (1 and 2) MOODLE
	8.2	<b>Ch18: Client-server computing Two-tier and Multi-tier client server architectures Distributed component architectures</b>	A3, C3	Face to Face & Synchronous lecture (MS-Teams)	In-lecture questions	Text Book - Chapter 17; lecture notes(slides); recorded presentations Parts (1 and 2) MOODLE Text Book - Chapter 18; lecture notes (slides); recorded presentations Parts 1 and 2 (MOODLE)
	8.3	<b>Ch19: Service-oriented architecture: SOA, Software as a service Services as reusable components Service engineering</b>		Synchronous lecture (MS-Teams)	In-lecture questions	
	9.1	<b>Discuss the exam and Projects progress</b>		Face to Face & Synchronous lecture	-	Project structure (MOODLE)
	9.2	<b>Ch8: Software Testing: Development testing, program testing and test cases, Verification and validation,</b>	A3, D2	Face to Face & Synchronous lecture (MS-Teams)	-	Text Book - Chapter 8; lecture notes(slides); recorded presentations MOODLE)
	10.1	<b>Ch8: Inspections (static testing) Stages of testing Unit testing Automated testing</b>		Face to Face & Synchronous lecture (MS-Teams)	In-lecture questions	Text Book - Chapter 8; lecture notes(slides); (MOODLE)
<b>Week 10</b>	10.2	<b>Ch8: Testing strategies Unit and System testing Interface testing Test-driven development Regression testing, Release testing Performance testing User testing</b>	B6, D2 B3	Face to Face & Synchronous lecture		Text Book - Chapter 8; lecture notes (slides); presentations Parts 1 and 2 (MOODLE)
	10.3	<b>Mid-term exam</b>	-	Juexams.ju.edu. jo (Inside Faculty)	<b>Mid-term exam</b>	Chapters 6,7,8, 17,18
	10.4	<b>Discussion and review project progress</b>		Face to Face & Synchronous lecture	<b>Reviewing and discussing the project</b>	Project structure (MOODLE)

Week	Lecture	Topic	ILOs	Teaching Methods* / Platform	Evaluation Methods	References
Week 11	11.1	<b>Ch9: Chapter 9 – Software Evolution: Change processes for software systems Understanding software evolution</b>	<b>D2, C3</b>	Face to Face & Synchronous lecture (MS-Teams)		Text Book - Chapter 9; lecture notes (slides); presentations (MOODLE)
	11.2	<b>Ch9: Chapter 9 – Software Evolution: Software maintenance: Types of maintenance Maintenance prediction</b>		Face to Face & Synchronous lecture (MS-Teams)		Text Book - Chapter 9; lecture notes (slides); presentations (MOODLE)
	11.3	<b>Ch9: Chapter 9 – Software Evolution: System re-engineering ‘Bad smells’ in program code Legacy system management</b>	<b>B7, D2</b>	Synchronous lecture (MS-Teams)		Text Book - Chapter 9; lecture notes (slides); presentations (MOODLE)
Week 12	12.1	<b>Ch12: Dependability and Security Specification: Risk-driven specification, Stages of risk-based analysis</b>	<b>B7, D3</b>	Face to Face & Synchronous lecture (MS-Teams)	In-lecture questions	Text Book - Chapter 12; lecture notes (slides); presentations (MOODLE)
	12.2	<b>Discussion and review project progress</b>		Face to Face & Synchronous lecture	<b>Reviewing and discussing the project</b>	Project structure (MOODLE)
	12.3	<b>Ch12: Dependability and Security Specification: Safety specification System reliability specification AvailabilitySecurity specification</b>	<b>B5, C4</b>	Synchronous lecture (MS-Teams)	In-lecture questions	Text Book - Chapter 12; lecture notes (slides); presentations (MOODLE)
Week 13	13.1	<b>Ch12: Dependability and Security Specification: Formal specification Formal methods</b>	<b>B5, C4</b>	Face to Face & Synchronous lecture (MS-Teams)	In-lecture questions	Text Book - Chapter 12; lecture notes (slides); presentations (MOODLE)

Week	Lecture	Topic	ILOs	Teaching Methods* / Platform	Evaluation Methods	References
	13.2	Review		Face to Face & Synchronous (MS-Teams)	In-lecture questions	
	13.3	Selected Topics on SE: SW Reuse	D3	Synchronous (MS-Teams)		Text Book - Chapter 16; lecture notes (slides);
Week 14	14	Projects discussions	D1, D2, D3.	Face to Face & Synchronous (MS-Teams)	Term Project	Project specifications and evaluation criteria (MOODLE)
Week 15	15	Projects discussions		Face to Face & Synchronous (MS-Teams)	Term Project	Project specifications and evaluation criteria (MOODLE)
Week 16	16	Final Exam		Juexams.ju.edu. jo (Inside Faculty)	Final Exam	Chapters 6,7,8,9,12,17,18

### ५५ Evaluation Methods:

Opportunities to demonstrate achievement of the ILOs are provided through the following assessment methods and requirements:

- Assignments
- Project
- Mid exam
- Final Exam

### ५६ Course Requirements:

- Mobile, Laptop or desktop computers
- Internet connection
- Software design drawing tools (i.e., CASE tools + Rational Rose)
- Account on Microsoft Teams + Moodle.
- Webcam (when needed)

### ५७ Course Policies:

#### A- Attendance policies

Attending online meetings is mandatory. Attendance will be taken for each meeting. Regular attendance is essential for satisfactory completion of this course and university regulations will be applied.

#### B- Absences from exams and handing in assignments on time

- Any student who misses any exam will receive a zero grade. Permission for makeup will be granted only if the student notifies the instructor in due time and presents evidence of an officially excused absence.

- Submitting the assignments will be through the Moodle platform, the time duration for each home assignment will be determined clearly. Late submissions are not allowed; any student exceed this time duration without submitted his/her assignment will take the zero as mark.

### **C- Health and safety procedures**

All students should comply with the university Health and Safety procedures (i.e., COVID-19 procedures).

### **D- Honesty policy regarding cheating, plagiarism, misbehavior**

Assignments are individual or done in learning teams. While students are free to discuss their individual assignments with anybody, including fellow students, individual assignments are expected to show the expertise, creativity and critical faculty of the individual student. Virtually identical individual assignments (in the judgment of the instructor) are not acceptable. Plagiarism is unacceptable and will be punished with an F for the full course. References to all source materials are necessary. For more details on University regulations please visit <http://www.ju.edu.jo/rules/index.htm>

### **E- Grading policy + Weighting (i.e. weight assigned to exams as well as other student work)**

All of the following are important in the evaluation of a student's work.

- Written Reports:
  - Organization, clarity and continuity.
  - Quality, completeness and soundness of the analysis
  - Quality of presentation.
- Oral Presentation:
  - Organization and continuity.
  - Selection and support of recommendations.
  - Time, style and clarity.
  - Professionalism.
- Assessment Weights:
  - Assignments + project + participations: 20%
  - Mid exam: 30%
  - Final exam: 50%
- Satisfactory completion of this subject requires a 50% pass in the end-of-semester
- Suggested Grading Scale:

0-44	F	45-49	D-	50-54	D	55-59	D+	60-63	C-	64-68	C
69-72	C+	73-76	B-	77-80	B	81-84	B+	85-89	A-	90-100	A

### **F- Available university services that support achievement in the course:**

elearning.ju.edu.jo

lmsystem.ju.edu.jo

### **G- Statement on Students with disabilities**

Students with Disabilities: Students with disabilities who need special accommodations for this class (online meetings) are encouraged to contact the instructor and/or their academic advisor as soon as possible. In order to receive accommodations for academic work in this course, students must inform the course instructor and/or their academic advisor, preferably in a written format, about their needs no later than the 2<sup>nd</sup> week of classes.

## References:

### A- Required book (s), assigned reading and audio-visuals:

1. **Ian Sommerville. Software Engineering (10th Edition). Addison Wesley, 2015. (Latest Edition)**
2. <http://iansommerville.com/software-engineering-book/>

### B- Recommended books, materials, and media:

1. Roger S. Pressman. Software Engineering A practitioner's Approach, 10th Edition. McGraw-Hill, 2010.
2. Douglas C. Schmidt, Michael Stal, Hans Rohnert, Frank Buschman. Pattern-Oriented Software Architecture, Patterns for Concurrent and Networked Objects (Wiley Software Patterns Series) 1st Edition, Wiley, 1996
3. Shari Lawrence Pfleeger, Software Engineering: Theory and Practice, 2nd Ed., Prentice-Hall, 2001.
4. J. Rumbaugh, I. Jacobson, and G. Booch. The Unified Modeling Language Reference Manual. Addison-Wesley, Longman, Mass, USA, 1999.
5. Power Designer: <http://www.sybase.com/products/modelingmetadata/powerdesigner>
6. Unified Modeling Language (UML): <http://WWW.UML.ORG>
7. Microsoft Visio: <http://WWW.MICROSOFT.COM>
8. Rational Software: <http://WWW.RATIONAL.COM>
9. Data flow diagram tutorial: <http://www.getaheaddirect.com/gwbadfd.htm>
10. Microsoft Project: <http://www.brighthub.com/office/projectmanagement/articles/71235.aspx>
11. 16. Healthcare Information and Management Systems Society: <http://www.himss.org/>
12. Journal of Medical Systems: <https://link.springer.com/journal/10916>
13. Healthcare IT News: <http://www.healthcareitnews.com/>
14. University of Jordan E-library: <http://e-library/>
15. <http://www.software-engin.com>

### C- Educational Platforms:

1. [Elearning.ju.edu.jo](http://Elearning.ju.edu.jo)
2. [lmsystem.ju.edu.jo](http://lmsystem.ju.edu.jo)
3. <http://teams.office.com/>

## Additional information:

- Students are encouraged to make heavy use of the library, E-LIBRARY. <http://ezlibrary.ju.edu.jo/login> or from within the university using (<http://e-library>).
- The instructor can make changes to this syllabus when necessary.
- University regulations will be preserved at all times.
- Office hour: Every Tuesday and Thursday at 9:45-11 am (only by chatting on a MS-Teams platform)

Name of Course Coordinator: Prof. Amjad Hudaib

Signature: *Amjad Hudaib*

Date: 16/10/2022

Head of Curriculum Committee/Department: -----Signature: -----

Head of Department: -----Signature: -----

Head of Curriculum Committee/Faculty: -----Signature: -----

Dean: -----Signature: -----