ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

103000933 - Requirements Engineering

DEGREE PROGRAMME

10AZ - Master Universitario En Innovación Digital

ACADEMIC YEAR & SEMESTER

2024/25 - Semester 1

Index

Learning guide

1. Description

1.1. Subject details

Name of the subject	103000933 - Requirements Engineering
No of credits	6 ECTS
Type	Optional
Academic year ot the programme	First year
Semester of tuition	Semester 1
Tuition period	September-January
Tuition languages	English
Degree programme	10AZ - Master Universitario en Innovación Digital
Centre	10 - Escuela Tecnica Superior De Ingenieros Informaticos
Academic year	2024-25

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Oscar Dieste Tubio (Subject coordinator)	D5106	oscar.dieste@upm.es	Tu - 16:00 - 19:00 W - 17:00 - 19:00 F - 16:00 - 17:00
Natalia Juristo Juzgado	D5104	natalia.juristo@upm.es	Tu - 19:00 - 20:00 W - 13:00 - 17:00 F - 15:00 - 16:00

* The tutoring schedule is indicative and subject to possible changes. Please check tutoring times with the faculty member in charge.

3. Skills and learning outcomes *

3.1. Skills to be learned

CB07 - Que los estudiantes sepan aplicar los conocimientos adquiridos y su capacidad de resolución de problemas en entornos nuevos o poco conocidos dentro de contextos más amplios (o multidisciplinares) relacionados con su área de estudio

CB09 - Que los estudiantes sepan comunicar sus conclusiones y los conocimientos y razones últimas que las sustentan a públicos especializados y no especializados de un modo claro y sin ambigüedades

CE-DM04 - Capacidad para analizar las necesidades que se plantean en un entorno industrial para su trasformación digital

3.2. Learning outcomes

RA129 - The students will be able to elicit and conceptualize customer and user's needs

RA127 - The students will be able to analize, specify and validate software requirements

RA128 - The students will be able to manage and negotiate requirements with project stakeholders

* The Learning Guides should reflect the Skills and Learning Outcomes in the same way as indicated in the Degree Verification Memory. For this reason, they have not been translated into English and appear in Spanish.

4. Brief description of the subject and syllabus

4.1. Brief description of the subject

The requirements engineering course aims to teach or expand students' abilities regarding software requirements: elicitation, analysis, documentation, validation and management. The course will balance lectures and practical activities. Special attention will be paid to tool support. Whenever possible, professional from industry will deliver keynotes about specific requirements engineering topics.

4.2. Syllabus

1. Requirements engineering processes
    1.1. Lifecycle and process models
        1.1.1. IEEE/ISO/IEC 12207-2017 Software life cycle processes
        1.1.2. IEEE/ISO/IEC 29148-2018 Life cycle processes -- Requirements engineering
    1.2. System operational concept
    1.3. Concept of operations
    1.4. Business requirements Specification
    1.5. Stakeholder requirements specification
    1.6. System requirements specification
2. Requirements elicitation
    2.1. Process actors
    2.2. Requirements sources
    2.3. Elicitation techniques
        2.3.1. Interviews
        2.3.2. Scenarios
        2.3.3. Regular techniques: observation, competing analysis, document analysis, focus groups, brainstorming
        2.3.4. Contrived techniques: Laddering, card sorting, protocol analysis
        2.3.5. Elicitation technique selection
3. Requirements analysis
    3.1. Glossaries
    3.2. Weak techniques: analysis checklist, interaction matrix
    3.3. Natural languege processing tools
    3.4. Conceptual modeling
        3.4.1. Goal-oriented models
        3.4.2. Concept models
        3.4.3. Process models

7.2. Relationship with Verification and Validation

7.3. Relationship with Software Design

7.4. Relationship with Documentation and Training

5. Schedule

5.1. Subject schedule*

Week	Type 1 activities	Type 2 activities	Distant / On-line	Assessment activities
1	**Requirements importance** Duration: 00:10 Lecture **Requirements engineering lifecycles and processes: Introduction** Duration: 00:20 Lecture **Course goals and methodology** Duration: 00:15 Lecture **Software project proposal** Duration: 00:15 Additional activities **Software requirements: Concept and types** Duration: 00:30 Inverted classroom **How to write software requirements** Duration: 01:30 Problem-solving class			**Identify software requirements for an existing software system** Individual work Progressive assessment Not Presential Duration: 01:00 **Lecture 1 self-evaluation** Written test Progressive assessment Not Presential Duration: 01:00
2	**User stories, features, and use cases** Duration: 00:25 Inverted classroom **Software requirements specifications** Duration: 00:15 Inverted classroom **Requirements and specification properties** Duration: 00:20 Lecture **Tool support for requirements specification: Jira or a similar tool** Duration: 00:30 Laboratory assignments **Tool support for requirements specification: DOORS Next Generation** Duration: 01:30 Laboratory assignments			**Creation of a requirements specification using DOORS** Individual work Progressive assessment Not Presential Duration: 02:00 **PROJECT: Software project proposal (the proposal will get improved thorough the course)** Group work Progressive assessment Not Presential Duration: 10:00 **Lecture 2 self-evaluation** Written test Progressive assessment Not Presential Duration: 01:00

3	**Requirements engineering lifecycles and processes (revisited): Early stages** Duration: 00:20 Lecture **Requirements validation** Duration: 00:20 Inverted classroom **Requirements reviews** Duration: 00:20 Lecture **Other validation approaches: requirements testing and user manual development** Duration: 00:20 Problem-solving class **Conduct a requirements review using DOORS** Duration: 01:00 Laboratory assignments **Perform requirements validation using requirements testing and user manual development** Duration: 01:40 Laboratory assignments			**Perform a requirements testability exercise** Individual work Progressive assessment Not Presential Duration: 01:00 **Lecture 3 self-evaluation** Written test Progressive assessment Not Presential Duration: 01:00
4	**Requirements elicitation** Duration: 00:20 Inverted classroom **Interviews: Types, design, and consolidation** Duration: 00:40 Problem-solving class **Interviews: Conduction** Duration: 00:30 Cooperative activities **PROJECT: Perform the first interview** Duration: 01:00 Cooperative activities **Elicitation: Report information using DOORS** Duration: 00:30 Laboratory assignments			**PROJECT: Create a business-oriented specification** Group work Progressive assessment Not Presential Duration: 03:00 **Lecture 4 self-evaluation** Written test Progressive assessment Not Presential Duration: 01:00
	Interviews: Concepts underlying user stories, features, use cases and requirememts Duration: 00:20 Lecture **Interview: How to create new interview scripts** Duration: 00:10 Lecture **Analysis: Overview** Duration: 00:10			**PROJECT: Create a stakeholders-oriented specification** Group work Progressive assessment Not Presential Duration: 04:00

5	Inverted classroom **Analysis: Derivation of requirements** Duration: 00:20 Cooperative activities **PROJECT: Perform the second interview** Duration: 01:00 Cooperative activities **PROJECT: Identify features/use cases/requirements** Duration: 00:30 Cooperative activities **Analysis: Report information using DOORS** Duration: 00:30 Laboratory assignments			
6	**Analysis: Weak techniques** Duration: 00:20 Inverted classroom **Analysis: Conceptual modeling** Duration: 00:10 Inverted classroom **Analysis: Concept models, glossary, and data dictionary** Duration: 00:30 Problem-solving class **Analysis: Process models, data dictionary, and cross-checks** Duration: 00:20 Problem-solving class **Analysis: State/event models and cross-checks** Duration: 00:20 Problem-solving class **Analysis: Report information using DOORS** Duration: 00:20 Laboratory assignments **Analysis: NLP tools** Duration: 01:00 Laboratory assignments			**PROJECT: Add the glossary to DOORS** Group work Progressive assessment Not Presential Duration: 01:00 **Lecture 5 self-evaluation** Written test Progressive assessment Not Presential Duration: 01:00
7	**Prototyping: Concept, types and roadmap** Duration: 00:20 Inverted classroom **Prototyping: Validation using scenarios** Duration: 00:30 Problem-solving class **Prototyping: Fix wrong information** Duration: 00:10 Problem-solving class			**PROJECT: Add prototyping information to DOORS** Group work Progressive assessment Not Presential Duration: 03:00 **Lecture 6 self-evaluation** Written test Progressive assessment Not Presential Duration: 01:00

	PROJECT: Conduct the evaluation of the project's low-fidelity prototype Duration: 01:30 Cooperative activities **Prototyping: Report information using DOORS** Duration: 00:30 Laboratory assignments			
8	**Midterm exam** Duration: 01:00 Additional activities **Elicitation: Competing product analysis** Duration: 00:10 Problem-solving class **Elicitation: Document analysis** Duration: 00:50 Problem-solving class **Elicitation: Observation** Duration: 00:10 Cooperative activities **Elicitation: Surveys** Duration: 00:30 Problem-solving class **Brainstorming** Duration: 00:10 Cooperative activities **Elicitation: Focus groups** Duration: 00:10 Lecture			**Midterm exam** Written test Progressive assessment Presential Duration: 01:00 **PROJECT: Create the software requirements specification** Group work Progressive assessment Not Presential Duration: 03:00 **Lecture 7 self-evaluation** Written test Progressive assessment Not Presential Duration: 01:00
9	**Elicitation: Technique selection** Duration: 00:30 Cooperative activities **Elicitation: Requirements workshops** Duration: 00:30 Lecture **PROJECT: Perform a requirements workshop** Duration: 02:00 Cooperative activities			**PROJECT: Complete the requirements specification** Group work Progressive assessment Not Presential Duration: 03:00 **Lecture 8 self-evaluation** Written test Progressive assessment Not Presential Duration: 01:00
10	**PROJECT: Perform a requirements review** Duration: 02:00 Cooperative activities **PROJECT: User manual development** Duration: 01:00 Problem-solving class			**PROJECT: Perform a requirements review** Group work Progressive assessment Presential Duration: 00:00 **PROJECT: User manual development** Group work Progressive assessment Presential Duration: 00:00

11	**Requirements management** Duration: 00:30 Inverted classroom **Negotiation** Duration: 00:30 Lecture **Perform a change management process** Duration: 01:00 Problem-solving class **Perform a requirements prioritization exercise** Duration: 01:00 Problem-solving class			**Report the change management process** Group work Progressive assessment Presential Duration: 00:00 **Report the requirements prioritization exercise** Group work Progressive assessment Presential Duration: 00:00 **Lecture 9 self-evaluation** Written test Progressive assessment Not Presential Duration: 01:00
12	**Triage and release planning** Duration: 00:30 Lecture **Early estimation theory and exercises** Duration: 02:30 Problem-solving class			**Report the early estimation** Group work Progressive assessment Presential Duration: 00:00 **Lecture 10 self-evaluation** Written test Progressive assessment Not Presential Duration: 01:00
13	**Perform a negotiation exercise** Duration: 01:00 Cooperative activities **Perform a triage process** Duration: 02:00 Cooperative activities			**Report the triage process** Group work Progressive assessment Presential Duration: 00:00 **Lecture 11 self-evaluation** Written test Progressive assessment Not Presential Duration: 01:00
14	**End-term exam** Duration: 01:00 Additional activities			**End-term exam** Written test Progressive assessment Presential Duration: 01:00 **Development of a simple application using MDA** Individual work Progressive assessment Not Presential Duration: 02:00
15	**Seminar: Model checking** Duration: 03:00 Laboratory assignments			**Develop a simple set of rules to check a specification** Individual work Progressive assessment Not Presential Duration: 02:00

16				**Global examination** Written test Global examination Presential Duration: 04:00
17				

Depending on the programme study plan, total values will be calculated according to the ECTS credit unit as 26/27 hours of student face-to-face contact and independent study time.

6. Activities and assessment criteria

6.1. Assessment activities

6.1.1. Assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
1	Identify software requirements for an existing software system	Individual work	No Presential	01:00	2%	3 / 10	CE-DM04
1	Lecture 1 self-evaluation	Written test	No Presential	01:00	1%	5 / 10	CE-DM04
2	Creation of a requirements specification using DOORS	Individual work	No Presential	02:00	3%	3 / 10	CE-DM04
2	PROJECT: Software project proposal (the proposal will get improved thorough the course)	Group work	No Presential	10:00	10%	3 / 10	CB07 CB09 CE-DM04
2	Lecture 2 self-evaluation	Written test	No Presential	01:00	1%	5 / 10	CE-DM04
3	Perform a requirements testability exercise	Individual work	No Presential	01:00	2%	3 / 10	CE-DM04
3	Lecture 3 self-evaluation	Written test	No Presential	01:00	1%	5 / 10	CE-DM04
4	PROJECT: Create a business-oriented specification	Group work	No Presential	03:00	6%	3 / 10	CB07 CB09 CE-DM04
4	Lecture 4 self-evaluation	Written test	No Presential	01:00	1%	5 / 10	CE-DM04
5	PROJECT: Create a stakeholders-oriented specification	Group work	No Presential	04:00	8%	3 / 10	CB07 CB09 CE-DM04
6	PROJECT: Add the glossary to DOORS	Group work	No Presential	01:00	2%	3 / 10	CB07 CE-DM04
6	Lecture 5 self-evaluation	Written test	No Presential	01:00	1%	5 / 10	CE-DM04
7	PROJECT: Add prototyping information to DOORS	Group work	No Presential	03:00	3%	3 / 10	CB07 CE-DM04
7	Lecture 6 self-evaluation	Written test	No Presential	01:00	1%	5 / 10	CE-DM04
8	Midterm exam	Written test	Face-to-face	01:00	10%	3 / 10	CE-DM04
8	PROJECT: Create the software requirements specification	Group work	No Presential	03:00	6%	5 / 10	CB07 CB09 CE-DM04
8	Lecture 7 self-evaluation	Written test	No Presential	01:00	1%	5 / 10	CE-DM04

9	PROJECT: Complete the requirements specification	Group work	No Presential	03:00	3%	3 / 10	CB07 CB09 CE-DM04
9	Lecture 8 self-evaluation	Written test	No Presential	01:00	1%	5 / 10	CE-DM04
10	PROJECT: Perform a requirements review	Group work	Face-to-face	00:00	6%	3 / 10	CB07 CB09 CE-DM04
10	PROJECT: User manual development	Group work	Face-to-face	00:00	3%	3 / 10	CB07 CB09 CE-DM04
11	Report the change management process	Group work	Face-to-face	00:00	2%	3 / 10	CE-DM04
11	Report the requirements prioritization exercise	Group work	Face-to-face	00:00	2%	3 / 10	CE-DM04
11	Lecture 9 self-evaluation	Written test	No Presential	01:00	1%	5 / 10	CE-DM04
12	Report the early estimation	Group work	Face-to-face	00:00	3%	3 / 10	CE-DM04
12	Lecture 10 self-evaluation	Written test	No Presential	01:00	1%	5 / 10	CE-DM04
13	Report the triage process	Group work	Face-to-face	00:00	2%	3 / 10	CE-DM04
13	Lecture 11 self-evaluation	Written test	No Presential	01:00	1%	5 / 10	CE-DM04
14	End-term exam	Written test	Face-to-face	01:00	10%	3 / 10	CE-DM04
14	Development of a simple application using MDA	Individual work	No Presential	02:00	3%	0 / 10	CE-DM04
15	Develop a simple set of rules to check a specification	Individual work	No Presential	02:00	3%	0 / 10	CE-DM04

6.1.2. Global examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
16	Global examination	Written test	Face-to-face	04:00	100%	5 / 10	CB07 CB09 CE-DM04

6.1.3. Referred (re-sit) examination

Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
Final exam (extraordinary session)	Written test	Face-to-face	04:00	100%	5 / 10	CB07 CB09 CE-DM04

6.2. Assessment criteria

Progressive evaluation

- The assessment of assignments will depend on (1) the quality of the submissions, e.g., presentation, cleanliness, etc., and (2) the correctness of the results.
- The final grade will be calculated using a weighted average, as described before.
- The laboratory cooperative activities labeled "**PROJECT:**" are compulsory. Skipping these activities without due reason implies failing the project.
- The course project-related activities are labeled "**PROJECT:**". The students cannot retake the course project in the global evaluation. The project requires the cooperation of groups of students and has a pre-specified calendar, including face-to-face sessions. These activities cannot be scheduled at different times because fellow students are not guaranteed to have other time slots available besides those assigned to the Requirements Engineering course.

Global evaluation (January)

- All assignments can be re-submitted and regraded. When the instructors provide the feedback, they will specify a deadline for the resubmission.
- The students can resit the midterm exams in January (on the date/time specified by the administration).

Global evaluation (July)

- Students will take a single exam. This exam includes all topics (theoretical and practical) covered in the course. Preparatory materials will be available at Moodle.

7. Teaching resources

7.1. Teaching resources for the subject

Name	Type	Notes
Course material	Web resource	All required materials will be available on Moodle
Textbook	Bibliography	Wiegers, Karl, and Beatty, Joy. Software Requirements. United States, Pearson Education, 2013. https://learning.oreilly.com/library/view/software-requirements-3rd/9780735679658/