Escuela Técnica Superior
de Ingenieros Informáticos
Universidad Politécnica de Madrid

EMSE
European Master on
Software Engineering

MÁSTER UNIVERSITARIO EN INGENIERÍA DEL SOFTWARE - EUROPEAN MASTER IN SOFTWARE ENGINEERING

Educational Planning Course 2023-24
First and Second Semester

Computer Science and Engineering School
Universidad Politécnica de Madrid

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1 Pre-enrollment Dates

- **First period:** from 23 January to 9 July 2023
- **Second period:** from November 2023 to January 2024 (still to be determined)

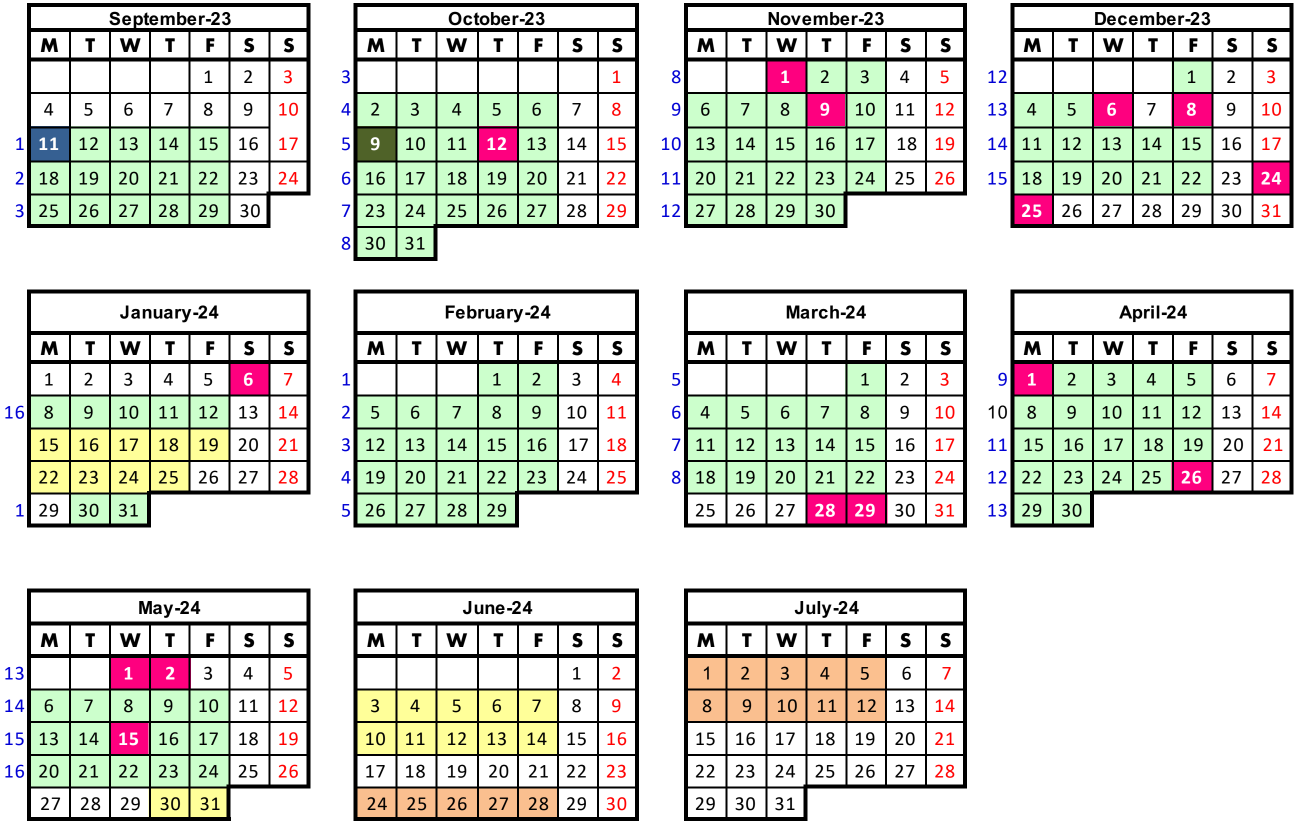
2 Calendar

E.T.S. DE INGENIEROS INFORMÁTICOS
Universidad Politécnica de Madrid

EUROPEAN MASTER IN SOFTWARE ENGINEERING

COURSE 2023-2024

First semester starts on 11 September 2023
Second semester starts on 30 January 2024



September-23

	M	T	W	T	F	S	S
					1	2	3
	4	5	6	7	8	9	10
1	11	12	13	14	15	16	17
2	18	19	20	21	22	23	24
3	25	26	27	28	29	30	

October-23

	M	T	W	T	F	S	S
3							1
4	2	3	4	5	6	7	8
5	9	10	11	12	13	14	15
6	16	17	18	19	20	21	22
7	23	24	25	26	27	28	29
8	30	31					

November-23

	M	T	W	T	F	S	S
8			1	2	3	4	5
9	6	7	8	9	10	11	12
10	13	14	15	16	17	18	19
11	20	21	22	23	24	25	26
12	27	28	29	30			

December-23

	M	T	W	T	F	S	S
12					1	2	3
13	4	5	6	7	8	9	10
14	11	12	13	14	15	16	17
15	18	19	20	21	22	23	24
	25	26	27	28	29	30	31

January-24

	M	T	W	T	F	S	S
	1	2	3	4	5	6	7
16	8	9	10	11	12	13	14
	15	16	17	18	19	20	21
	22	23	24	25	26	27	28
1	29	30	31				

February-24

	M	T	W	T	F	S	S
1				1	2	3	4
2	5	6	7	8	9	10	11
3	12	13	14	15	16	17	18
4	19	20	21	22	23	24	25
5	26	27	28	29			

March-24

	M	T	W	T	F	S	S
5					1	2	3
6	4	5	6	7	8	9	10
7	11	12	13	14	15	16	17
8	18	19	20	21	22	23	24
	25	26	27	28	29	30	31

April-24

	M	T	W	T	F	S	S
9	1	2	3	4	5	6	7
10	8	9	10	11	12	13	14
11	15	16	17	18	19	20	21
12	22	23	24	25	26	27	28
13	29	30					

May-24

	M	T	W	T	F	S	S
13			1	2	3	4	5
14	6	7	8	9	10	11	12
15	13	14	15	16	17	18	19
16	20	21	22	23	24	25	26
	27	28	29	30	31		

June-24

M	T	W	T	F	S	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

July-24

M	T	W	T	F	S	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

Key:

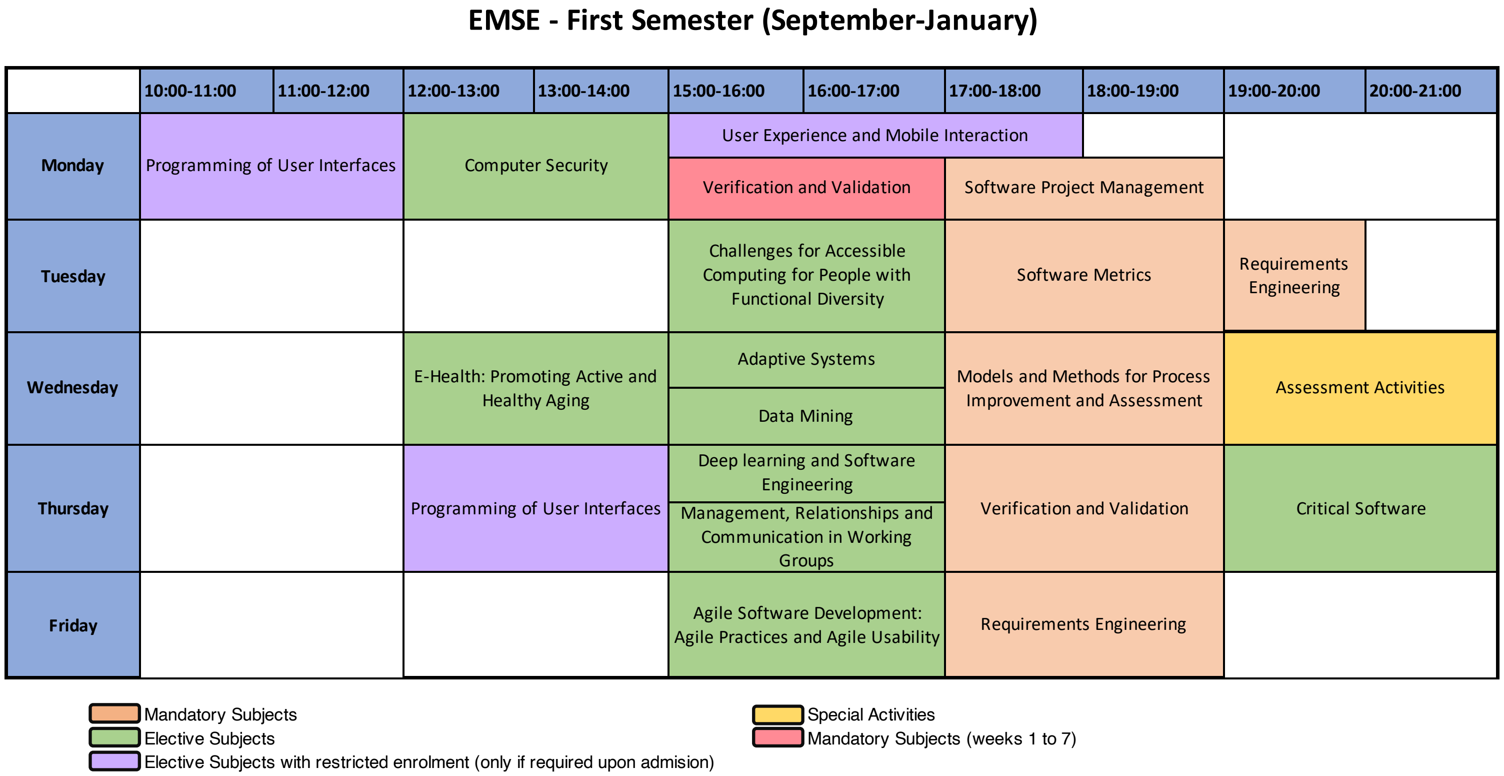
🟦 Welcome meeting for new students
🟩 School day
🟨 Evaluation process
🟥 Holiday
🟧 Extraordinary exams
⬜ Vacation
■ Compensation for holidays, change of schedule

Enrollment dates:

1st and 2nd Semesters enrollment: 14 July-3 August and 4-8 September 2023
Unenrollment for 2nd Semester (max. 12 ECTS): 30 January-5 February 2024
Restricted extension of enrollment: 6-12 February 2024

NOTE: On Monday 9th October 2023, the classes will follow the schedule of a usual Thursday in all courses and subjects, as a compensation for holidays
Compensation for holidays in the Spring semester to be defined when 2024 holidays are established

3 Schedule

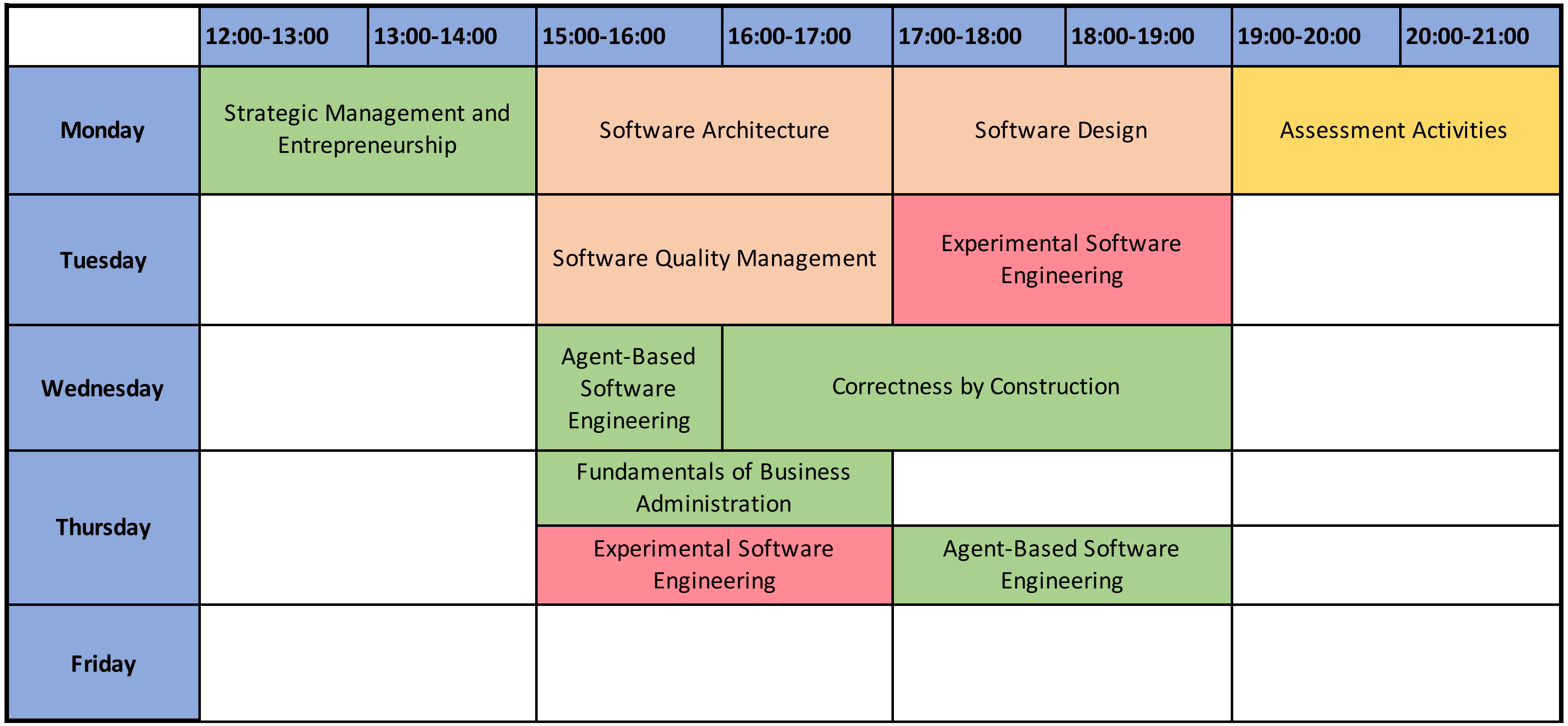


EMSE - First Semester (September-January)

	10:00-11:00	11:00-12:00	12:00-13:00	13:00-14:00	15:00-16:00	16:00-17:00	17:00-18:00	18:00-19:00	19:00-20:00	20:00-21:00
Monday	Programming of User Interfaces		Computer Security		User Experience and Mobile Interaction Verification and Validation		Software Project Management			
Tuesday					Challenges for Accessible Computing for People with Functional Diversity		Software Metrics		Requirements Engineering	
Wednesday			E-Health: Promoting Active and Healthy Aging		Adaptive Systems Data Mining		Models and Methods for Process Improvement and Assessment		Assessment Activities	
Thursday			Programming of User Interfaces		Deep learning and Software Engineering Management, Relationships and Communication in Working Groups		Verification and Validation		Critical Software	
Friday					Agile Software Development: Agile Practices and Agile Usability		Requirements Engineering			

🟧 Mandatory Subjects
🟩 Elective Subjects
🟪 Elective Subjects with restricted enrolment (only if required upon admision)
🟨 Special Activities
🟥 Mandatory Subjects (weeks 1 to 7)

EMSE - Second Semester (February-May)



	12:00-13:00	13:00-14:00	15:00-16:00	16:00-17:00	17:00-18:00	18:00-19:00	19:00-20:00	20:00-21:00
Monday	Strategic Management and Entrepreneurship		Software Architecture		Software Design		Assessment Activities	
Tuesday			Software Quality Management		Experimental Software Engineering			
Wednesday			Agent-Based Software Engineering	Correctness by Construction				
Thursday			Fundamentals of Business Administration					
			Experimental Software Engineering		Agent-Based Software Engineering			
Friday								

🟧 Mandatory Subjects
🟩 Elective Subjects

🟥 Elective Subjects (weeks 1 to 12)
🟨 Special Activities

1st and 3rd Semester (Fall Term)

JANUARY 2024

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
15	16	17	18	19	20	21
	Programming of User Interfaces 12:00	E-Health: Promoting Active and Healthy Aging 12:00				
Verification and Validation 15:00	Software Metrics 15:00	Challenges for Accessible Computing for People with Functional Diversity 15:00	Software Project Management 15:00	User Experience and Mobile Interaction 15:00		
Adaptive Systems 18:00		Computer Security 18:00	Critical Software 18:00	Agile Software Development: Agile Practices and Agile Usability 18:00		
22	23	24	25	26	27	28
Models and Methods for Process Improvement and Assessment 15:00	Requirements Engineering 15:00	Deep Learning and Software Engineering 15:00	Master Thesis 10:00			
Data Mining 18:00	Management, Relationships and Communication in Working Groups 18:00					

2nd Semester (Spring Term)

MAY-JUNE 2024

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
27	28	29	30	31 Software Architecture 15:00	1	2
3 Software Quality Management 15:00	4 Fundamentals of Business Administration 15:00	5 Software Design 15:00	6 Agent-based Software Engineering 15:00	7 Experimental Software Engineering 15:00	8	9
10	11 Strategic Management and Entrepreneurship 15:00	12 Correctness by Construction 15:00	13	14 Master Thesis 10:00	15	16

Extraordinary period (JUL)

JUNE-JULY 2024

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
17	18	19	20	21	22	23
24	25	26	27	28	29	30
	Programming of User Interfaces 12:00					
Software Design 15:00	Models and Methods for Process Improvement and Assessment 15:00	Verification and Validation 15:00	Agile Software Development: Agile Practices and Agile Usability 15:00	Software Metrics 15:00		
Data Mining 18:00	User Experience and Mobile Interaction 18:00	Adaptive Systems 18:00	Challenges for Accessible Computing for People with Functional Diversity 18:00	Critical Software 18:00		
1	2	3	4	5	6	7
	E-Health: Promoting Active and Healthy Aging 12:00					
Software Architecture 15:00	Requirements Engineering 15:00	Correctness by Construction 15:00	Software Project Management 15:00	Fundamentals of Business Administration 15:00		
Management, Relationships and Communication in Working Groups 18:00	Experimental Software Engineering 18:00	Computer Security 18:00	Agent-based Software Engineering 18:00			

5 Courses Coordinators

Máster Universitario en Ingeniería de Software
European Master in Software Engineering

Subjects for Course 2023/2024

MODULE SOFTWARE DEVELOPMENT				
Course unit name	Coordinator	Type	ECTS	Term
Requirements Engineering	Óscar Dieste	C	6	1, 3
Software Architecture	Jaime Ramírez	C	4	2
Software Design	Nelson Medinilla	C	4	2

MODULE PROJECT MANAGEMENT AND ORGANIZATIONAL PROCESSES				
Course unit name	Coordinator	Type	ECTS	Term
Models and Methods for Process Improvement and Assessment	José A. Calvo-Manzano	C	4	1, 3
Software Project Management	Ana M. Moreno	C	4	1, 3

MODULE SUPPORT PROCESSES				
Course unit name	Coordinator	Type	ECTS	Term
Software Metrics	Tomás San Feliu	C	4	1, 3
Software Quality Management	Angélica de Antonio	C	4	2
Verification and Validation	Sira Vegas	C	6	1, 3

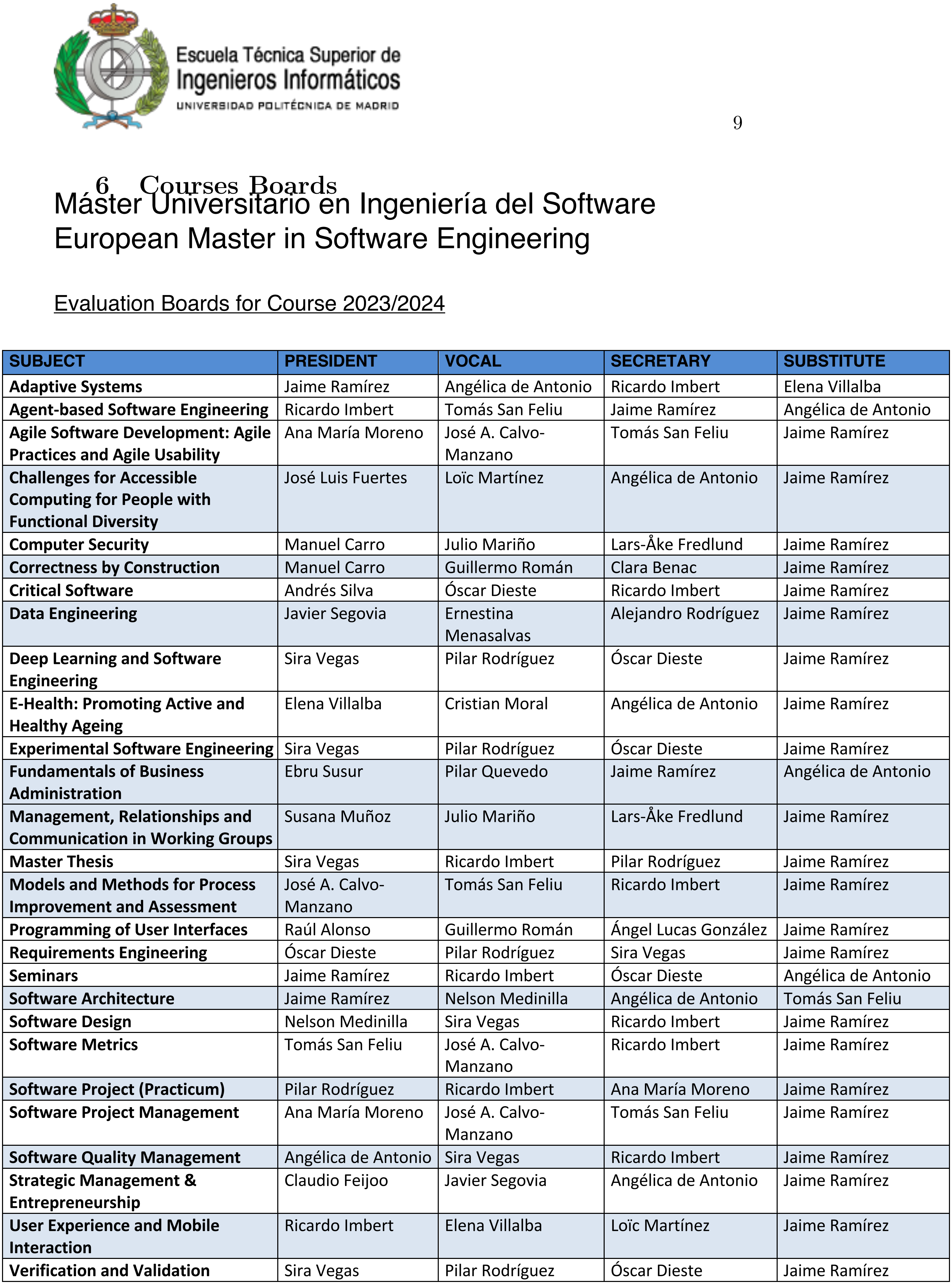
MODULE ADVANCED SOFTWARE ENGINEERING ASPECTS				
Course unit name	Coordinator	Type	ECTS	Term
Adaptive Systems	Jaime Ramírez	E	4	1, 3
Agent-based Software Development	Ricardo Imbert	E	6	2
Agile Software Development: Agile Practices and Agile Usability	Ana M. Moreno	E	4	1, 3
Challenges for Accessible Computing for People with Functional Diversity	José Luis Fuertes	E	4	1, 3
Computer Security	Manuel Carro	E	4	1, 3
Correctness by Construction	Manuel Carro	E	6	2
Critical Software	Andrés Silva	E	4	1, 3
Data Engineering	Javier Segovia	E	4	1, 3
Deep Learning and Software Engineering	Sira Vegas	E	4	1
E-Health: Promoting Active and Healthy Aging	Elena Villalba	E	4	1
Experimental Software Engineering	Sira Vegas	E	6	2
Fundamentals of Business Administration	Ebru Susur	E	4	2
Management, Relationships and Communication in Working Groups	Susana Muñoz	E	4	1, 3
Programming of User Interfaces	Raúl Alonso	E	6	1,3
Strategic Management and Entrepreneurship	Claudio Feijoo	E	4	2
User Experience and Mobile Interaction	Ricardo Imbert	E	6	1,3

PRACTICUM				
Course unit name	Coordinator	Type	ECTS	Term
Software Project	Pilar Rodríguez	C	14	3, 4

FINAL MASTER THESIS				
Course unit name	Coordinator	Type	ECTS	Term
Master Thesis	Sira Vegas	C	30	3, 4

Type: C - Compulsory; E - Elective

6 Courses Boards



Escuela Técnica Superior de Ingenieros Informáticos
UNIVERSIDAD POLITÉCNICA DE MADRID

Máster Universitario en Ingeniería del Software
European Master in Software Engineering

Evaluation Boards for Course 2023/2024

SUBJECT	PRESIDENT	VOCAL	SECRETARY	SUBSTITUTE
Adaptive Systems	Jaime Ramírez	Angélica de Antonio	Ricardo Imbert	Elena Villalba
Agent-based Software Engineering	Ricardo Imbert	Tomás San Feliu	Jaime Ramírez	Angélica de Antonio
Agile Software Development: Agile Practices and Agile Usability	Ana María Moreno	José A. Calvo-Manzano	Tomás San Feliu	Jaime Ramírez
Challenges for Accessible Computing for People with Functional Diversity	José Luis Fuertes	Loïc Martínez	Angélica de Antonio	Jaime Ramírez
Computer Security	Manuel Carro	Julio Mariño	Lars-Åke Fredlund	Jaime Ramírez
Correctness by Construction	Manuel Carro	Guillermo Román	Clara Benac	Jaime Ramírez
Critical Software	Andrés Silva	Óscar Dieste	Ricardo Imbert	Jaime Ramírez
Data Engineering	Javier Segovia	Ernestina Menasalvas	Alejandro Rodríguez	Jaime Ramírez
Deep Learning and Software Engineering	Sira Vegas	Pilar Rodríguez	Óscar Dieste	Jaime Ramírez
E-Health: Promoting Active and Healthy Ageing	Elena Villalba	Cristian Moral	Angélica de Antonio	Jaime Ramírez
Experimental Software Engineering	Sira Vegas	Pilar Rodríguez	Óscar Dieste	Jaime Ramírez
Fundamentals of Business Administration	Ebru Susur	Pilar Quevedo	Jaime Ramírez	Angélica de Antonio
Management, Relationships and Communication in Working Groups	Susana Muñoz	Julio Mariño	Lars-Åke Fredlund	Jaime Ramírez
Master Thesis	Sira Vegas	Ricardo Imbert	Pilar Rodríguez	Jaime Ramírez
Models and Methods for Process Improvement and Assessment	José A. Calvo-Manzano	Tomás San Feliu	Ricardo Imbert	Jaime Ramírez
Programming of User Interfaces	Raúl Alonso	Guillermo Román	Ángel Lucas González	Jaime Ramírez
Requirements Engineering	Óscar Dieste	Pilar Rodríguez	Sira Vegas	Jaime Ramírez
Seminars	Jaime Ramírez	Ricardo Imbert	Óscar Dieste	Angélica de Antonio
Software Architecture	Jaime Ramírez	Nelson Medinilla	Angélica de Antonio	Tomás San Feliu
Software Design	Nelson Medinilla	Sira Vegas	Ricardo Imbert	Jaime Ramírez
Software Metrics	Tomás San Feliu	José A. Calvo-Manzano	Ricardo Imbert	Jaime Ramírez
Software Project (Practicum)	Pilar Rodríguez	Ricardo Imbert	Ana María Moreno	Jaime Ramírez
Software Project Management	Ana María Moreno	José A. Calvo-Manzano	Tomás San Feliu	Jaime Ramírez
Software Quality Management	Angélica de Antonio	Sira Vegas	Ricardo Imbert	Jaime Ramírez
Strategic Management & Entrepreneurship	Claudio Feijoo	Javier Segovia	Angélica de Antonio	Jaime Ramírez
User Experience and Mobile Interaction	Ricardo Imbert	Elena Villalba	Loïc Martínez	Jaime Ramírez
Verification and Validation	Sira Vegas	Pilar Rodríguez	Óscar Dieste	Jaime Ramírez

7 Learning Guides

7.1 Software Development Module

7.1.1 Requirements Engineering

POLITÉCNICA
INTERNATIONAL
CAMPUS OF
EXCELLENCE

COORDINATION PROCESS OF
LEARNING ACTIVITIES
PR/CL/001

E.T.S. de Ingenieros
Informaticos

ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

103000482 - Requirements Engineering

DEGREE PROGRAMME

10AM - Master Universitario En Ingenieria Del Software

ACADEMIC YEAR & SEMESTER

2023/24 - Semester 1

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Learning guide

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1. Description

1.1. Subject details

Name of the subject	103000482 - Requirements Engineering
No of credits	6 ECTS
Type	Compulsory
Academic year ot the programme	First year
Semester of tuition	Semester 1
Tuition period	September-January
Tuition languages	English
Degree programme	10AM - Master Universitario en Ingenieria del Software
Centre	10 - Escuela Tecnica Superior De Ingenieros Informaticos
Academic year	2023-24

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	Sin horario. Please check office hours in the "Course information section" at Moodle.

* 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

CE5 - Educir, analizar y especificar las necesidades de los clientes, usuarios y otras partes interesadas, teniendo en cuenta los posibles condicionantes que pudieran afectar al sistema a desarrollar

CG1 - 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 (RD)

CG3 - 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 (RD)

3.2. Learning outcomes

RA74 - The students will be able to analize, specify and validate software requirements

RA75 - The students will be able to manage and negotiate requirements with project stakeholders

RA73 - The students will be able to elicit and conceptualize customer and user's needs

* 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

2. Requirements elicitation

3. Requirements analysis

4. Requirements documentation

5. Requirements validation

6. Requirements management/release planning

5. Schedule

5.1. Subject schedule*

Week	Classroom activities	Laboratory activities	Distant / On-line	Assessment activities
1	**Course goals and methodology** Duration: 00:10 Lecture **Requirements engineering process (including agile approaches)** Duration: 00:30 Lecture **Software project proposal** Duration: 00:10 Additional activities **Term paper proposal** Duration: 00:10 Additional activities	**Requirement types** Duration: 02:00 Problem-solving class		**Identifying software requirements for an existing software application** Individual work Continuous assessment Not Presential Duration: 02:00 **Lecture 1 self-evaluation** Written test Continuous assessment Not Presential Duration: 02:00
2	**Software requirements specification** Duration: 00:30 Lecture **Software requirements attributes (and relationship with Management)** Duration: 00:20 Lecture **User stories, features, and use cases** Duration: 00:10 Lecture	**Tool support for requirements specification: Rational Requisite Pro or a similar tool** Duration: 02:00 Laboratory assignments		**Creation a requirement specification using Requisite Pro or a similar tool** Individual work Continuous assessment Not Presential Duration: 03:00 **Lecture 2 self-evaluation** Written test Continuous assessment Not Presential Duration: 02:00
3	**Requirements validation** Duration: 00:40 Lecture **Requirements reviews** Duration: 00:20 Lecture	**Conduct a requirements review** Duration: 00:45 Cooperative activities **Apply validation approaches (user manual, requirements testing)** Duration: 01:15 Problem-solving class		**PROJECT: Software project proposal** Group work Continuous assessment Not Presential Duration: 03:00 **Report the validation exercises** Individual work Continuous assessment Not Presential Duration: 01:00 **Lecture 3 self-evaluation** Written test Continuous assessment Not Presential Duration: 02:00

4	**Requirements elicitation** Duration: 00:30 Lecture **Elicitation with interviews** Duration: 00:30 Lecture	**PROJECT: Conduct the elicitation of a software project using interviews** Duration: 01:00 Cooperative activities **Tool support for requirements projects: IBM Doors Next Generation** Duration: 00:30 Laboratory assignments		**Midterm exam** Written test Continuous assessment Presential Duration: 00:30 **PROJECT: Add elicitation information to DOORS** Group work Continuous assessment Not Presential Duration: 04:00 **Lecture 4 self-evaluation** Written test Continuous assessment Not Presential Duration: 02:00
5	**Analysis: Overview** Duration: 00:10 Lecture **Requirements identification** Duration: 00:20 Lecture **Analysis: Weak techniques** Duration: 00:30 Cooperative activities	**PROJECT: Identify features/use cases/requirements** Duration: 01:15 Cooperative activities **Perform a checklist-based analysis using DOORS** Duration: 00:45 Cooperative activities		**PROJECT: Add features/use cases/requirements to DOORS** Group work Continuous assessment Not Presential Duration: 01:00 **Lecture 5 self-evaluation** Written test Continuous assessment Not Presential Duration: 02:00
6	**Prototyping** Duration: 01:00 Lecture	**PROJECT: Conduct the evaluation of the project's low-fidelity prototype** Duration: 02:00 Cooperative activities		**PROJECT: Add prototyping information to DOORS** Group work Continuous assessment Not Presential Duration: 02:00
7	**Elicitation: Other techniques, e.g., brainstorming, quizzes, etc.** Duration: 01:00 Lecture	**PROJECT: Conduct the elicitation of a software project using interviews** Duration: 02:00 Cooperative activities		**PROJECT: Add elicitation information to DOORS** Group work Continuous assessment Not Presential Duration: 02:00 **Lecture 7 self-evaluation** Written test Continuous assessment Not Presential Duration: 02:00
8	**Analysis: Conceptual models** Duration: 01:00 Cooperative activities	**PROJECT: Create models for the different product perspectives** Duration: 02:00 Cooperative activities		**PROJECT: Add the conceptual models and the cross-checks to DOORS** Group work Continuous assessment Not Presential Duration: 02:00 **Lecture 8 self-evaluation** Written test Continuous assessment Not Presential Duration: 02:00

9	**Elicitation: Requirements workshops** Duration: 01:00 Lecture	**PROJECT: Conduct the elicitation of a software project using a requirements workshop** Duration: 02:00 Cooperative activities		**PROJECT: Add elicitation information to DOORS** Group work Continuous assessment Not Presential Duration: 02:00 **Lecture 9 self-evaluation** Written test Continuous assessment Not Presential Duration: 02:00
10	**Requirements management** Duration: 00:30 Lecture **Requirements prioritization** Duration: 00:30 Lecture	**Perform a change management process** Duration: 01:00 Problem-solving class **Perform a requirements prioritization** Duration: 00:30 Cooperative activities		**Midterm exam** Written test Continuous assessment Presential Duration: 00:30 **Report the change management process** Group work Continuous assessment Not Presential Duration: 01:00 **Lecture 10 self-evaluation** Written test Continuous assessment Not Presential Duration: 02:00
11	**Early estimation** Duration: 03:00 Problem-solving class			**PROJECT: Creation a preliminary requirement specification using DOORS** Group work Continuous assessment Not Presential Duration: 04:00 **Report the early estimation** Group work Continuous assessment Not Presential Duration: 01:00
12	**Negotiation** Duration: 00:30 Lecture **Triage and release planning** Duration: 00:30 Lecture	**Perform a triage process** Duration: 02:00 Problem-solving class		**PROJECT: Perform the peer-evaluation of the software requirements specification** Group work Continuous assessment Not Presential Duration: 05:00 **Report the triage process** Group work Continuous assessment Not Presential Duration: 01:00 **Lecture 11 self-evaluation** Written test Continuous assessment Not Presential Duration: 02:00

13	**Keynote: Practical experiences managing requirements** Duration: 01:00 Additional activities	**Modeling requirements with UML** Duration: 02:00 Problem-solving class		**Term paper submission** Individual work Continuous assessment Not Presential Duration: 15:00 **Develop a simple specification using UML** Individual work Continuous assessment Not Presential Duration: 02:00
14		**Seminar: Model checking** Duration: 03:00 Laboratory assignments		**Term paper presentation submission** Individual presentation Continuous assessment Not Presential Duration: 02:00 **Develop a simple set of rules to check a specification** Individual work Continuous assessment Not Presential Duration: 02:00
15		**Seminar: Model-driven engineering** Duration: 03:00 Laboratory assignments		**Development of a simple application using MDA** Individual work Continuous assessment Not Presential Duration: 04:00
16	**Project: Retrospective** Duration: 00:30 Cooperative activities **Keynote: Artefact-driven Requirements Engineering** Duration: 02:00 Lecture			**Midterm exam** Written test Continuous assessment Presential Duration: 00:30
17				**Term paper evaluation** Individual work Continuous assessment Not Presential Duration: 03:00 **Global examination** Written test Final examination Presential Duration: 03:00

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.

* The schedule is based on an a priori planning of the subject; it might be modified during the academic year, especially considering the COVID19 evolution.

6. Activities and assessment criteria

6.1. Assessment activities

6.1.1. Assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
1	Identifying software requirements for an existing software application	Individual work	No Presential	02:00	3%	3 / 10	CE5
1	Lecture 1 self-evaluation	Written test	No Presential	02:00	1%	5 / 10	CE5
2	Creation a requirement specification using Requisite Pro or a similar tool	Individual work	No Presential	03:00	2%	3 / 10	CE5
2	Lecture 2 self-evaluation	Written test	No Presential	02:00	1%	5 / 10	CE5
3	PROJECT: Software project proposal	Group work	No Presential	03:00	2%	3 / 10	CE5 CG1 CG3
3	Report the validation exercises	Individual work	No Presential	01:00	2%	3 / 10	CE5 CG3
3	Lecture 3 self-evaluation	Written test	No Presential	02:00	1%	5 / 10	CE5
4	Midterm exam	Written test	Face-to-face	00:30	10%	3 / 10	CE5
4	PROJECT: Add elicitation information to DOORS	Group work	No Presential	04:00	3%	3 / 10	CE5
4	Lecture 4 self-evaluation	Written test	No Presential	02:00	1%	5 / 10	CE5
5	PROJECT: Add features/use cases/requirements to DOORS	Group work	No Presential	01:00	2%	3 / 10	CE5
5	Lecture 5 self-evaluation	Written test	No Presential	02:00	1%	5 / 10	CE5
6	PROJECT: Add prototyping information to DOORS	Group work	No Presential	02:00	3%	3 / 10	CE5
7	PROJECT: Add elicitation information to DOORS	Group work	No Presential	02:00	2%	3 / 10	CE5
7	Lecture 7 self-evaluation	Written test	No Presential	02:00	1%	5 / 10	CE5
8	PROJECT: Add the conceptual models and the cross-checks to DOORS	Group work	No Presential	02:00	3%	3 / 10	CE5 CG3
8	Lecture 8 self-evaluation	Written test	No Presential	02:00	1%	5 / 10	CE5
9	PROJECT: Add elicitation information to DOORS	Group work	No Presential	02:00	2%	3 / 10	CE5

9	Lecture 9 self-evaluation	Written test	No Presential	02:00	1%	5 / 10	CE5
10	Midterm exam	Written test	Face-to-face	00:30	10%	5 / 10	CE5
10	Report the change management process	Group work	No Presential	01:00	2%	3 / 10	CE5 CG3
10	Lecture 10 self-evaluation	Written test	No Presential	02:00	1%	5 / 10	CE5
11	PROJECT: Creation a preliminary requirement specification using DOORS	Group work	No Presential	04:00	4%	3 / 10	CE5
11	Report the early estimation	Group work	No Presential	01:00	3%	3 / 10	CE5
12	PROJECT: Perform the peer-evaluation of the software requirements specification	Group work	No Presential	05:00	10%	3 / 10	CE5 CG1 CG3
12	Report the triage process	Group work	No Presential	01:00	2%	3 / 10	CE5 CG3
12	Lecture 11 self-evaluation	Written test	No Presential	02:00	1%	5 / 10	CE5
13	Term paper submission	Individual work	No Presential	15:00	5%	0 / 10	CG3
13	Develop a simple specification using UML	Individual work	No Presential	02:00	2%	3 / 10	CE5
14	Term paper presentation submission	Individual presentation	No Presential	02:00	1%	0 / 10	CG3
14	Develop a simple set of rules to check a specification	Individual work	No Presential	02:00	1%	0 / 10	CE5
15	Development of a simple application using MDA	Individual work	No Presential	04:00	3%	3 / 10	CE5
16	Midterm exam	Written test	Face-to-face	00:30	10%	5 / 10	CE5
17	Term paper evaluation	Individual work	No Presential	03:00	3%	0 / 10	CG1

6.1.2. Global examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
17	Global examination	Written test	Face-to-face	03:00	100%	5 / 10	CE5 CG1 CG3

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	CE5 CG1 CG3

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 labelled "**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 it is not guaranteed that fellow students have other time slots available apart from the ones assigned to the Requirements Engineering course.
- The students cannot retake the term paper. First, this activity does not have a minimum grade, i.e., there is no "fail" grade. Second, the term paper is evaluated using peer review; it implies that the paper should be available at the designated time. Finally, the term paper requires a substantial effort that students cannot likely perform between the submission time and the Global Examination date; these dates correspond to the course evaluation period.

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).
- The project and the term paper cannot be retaken.

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 at moodle

7.1.2 Software Architecture

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ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

103000484 - Software Architecture

DEGREE PROGRAMME

10AM - Master Universitario En Ingenieria Del Software

ACADEMIC YEAR & SEMESTER

2023/24 - Semester 2

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Learning guide

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1. Description

1.1. Subject details

Name of the subject	103000484 - Software Architecture
No of credits	4 ECTS
Type	Compulsory
Academic year ot the programme	First year
Semester of tuition	Semester 2
Tuition period	February-June
Tuition languages	English
Degree programme	10AM - Master Universitario en Ingenieria del Software
Centre	10 - Escuela Tecnica Superior De Ingenieros Informaticos
Academic year	2023-24

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	**Office/Room**	**Email**	**Tutoring hours ***
Jaime Ramirez Rodriguez (Subject coordinator)	5112	jaime.ramirez@upm.es	Sin horario. The tutoring timetable is available at: https://docs.google.com/spreadsheets/d/1O2ElQzNBt7pKt-rTGc6JnySNJ-VT5nCz_BPaPMiK2KY/edit#gid=0

Angelica De Antonio Jimenez	5108	angelica.deantonio@upm.es	Sin horario. The tutoring timetable is available at: https://docs.google.com/spreadsheets/d/1O2ElQzNBt7pKt-rTGc6JnySNJ-VT5nCz_BPaPMiK2KY/edit#gid=0

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

3. Prior knowledge recommended to take the subject

3.1. Recommended (passed) subjects

The subject - recommended (passed), are not defined.

3.2. Other recommended learning outcomes

- Object oriented design

4. Skills and learning outcomes *

4.1. Skills to be learned

CE12 - Concebir y realizar el diseño de los sistemas software asegurando atributos relevantes de calidad.

CG1 - 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 (RD)

CG14 - Conocimiento y comprensión de la informática necesaria para la creación de modelos de información, y de los sistemas y procesos complejos

CG18 - Capacidad de trabajar y comunicarse también en contextos internacionales

CG3 - 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 (RD)

4.2. Learning outcomes

RA4 - To design the system according to the requirements, constraints, quality norms and organization goals.

RA6 - Ability to document the software architecture

RA5 - To apply the architectural concepts that are relevant in the architectural design

* 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.

5. Brief description of the subject and syllabus

5.1. Brief description of the subject

The goal of the subject is to teach the basis of the software architectural design. For that purpose, it will be shown how the quality attribute requirements of the system can be satisfied by applying some tactics. In addition, architectural styles will be addressed and their relationship with quality attributes will be explained. Then, some representative architectural patterns will be explained showing how they can be reused to solve some design problems providing well proven solutions without the need of re-inventing the wheel. Throughout the course, application examples will be briefly described to illustrate the concepts.

5.2. Syllabus

1. Previous Concepts on Software Architecture

2. Defining a Software Architecture

    2.1. Quality Attributes related to Software Architecture

    2.2. Achieving Quality Attributes through Tactics

    2.3. Architectural Views

    2.4. Architectural Styles

    2.5. Architectural Patterns

6. Schedule

6.1. Subject schedule*

Week	Classroom activities	Laboratory activities	Distant / On-line	Assessment activities
1	**Presentación** Duration: 01:00 Lecture **Previous concepts on Software Architecture** Duration: 01:00 Lecture			**Classroom participation grade** Other assessment Continuous assessment Presential Duration: 00:00
2	**Quality attributes related to software architecture** Duration: 01:00 Lecture **Practical exercises on topics that are being explained in classroom** Duration: 01:00 Cooperative activities			**Classroom participation grade** Other assessment Continuous assessment Presential Duration: 00:00
3	**Practical exercises on topics that are being explained in classroom** Duration: 01:00 Cooperative activities **Achieving quality attributes through tactics** Duration: 01:00 Lecture			**Practical exercises on topics that are being explained in classroom** Group work Continuous assessment Not Presential Duration: 03:00 **Classroom participation grade** Other assessment Continuous assessment Presential Duration: 00:00
4	**Achieving quality attributes through tactics** Duration: 01:00 Lecture **Practical exercises on topics that are being explained in classroom** Duration: 01:00 Cooperative activities			**Classroom participation grade** Other assessment Continuous assessment Presential Duration: 00:00
5	**Architectural views** Duration: 01:00 Lecture **Practical exercises on topics that are being explained in classroom** Duration: 01:00 Cooperative activities			**Classroom participation grade** Other assessment Continuous assessment Presential Duration: 00:00

6	**Practical exercises on topics that are being explained in classroom** Duration: 01:00 Cooperative activities **Architectural styles** Duration: 01:00 Lecture			**Classroom participation grade** Other assessment Continuous assessment Presential Duration: 00:00
7	**Architectural styles** Duration: 01:00 Lecture **Practical exercises on topics that are being explained in classroom** Duration: 01:00 Cooperative activities			**Practical exercises on topics that are being explained in classroom** Group work Continuous assessment Not Presential Duration: 05:00 **Classroom participation grade** Other assessment Continuous assessment Presential Duration: 00:00
8	**Architectural styles** Duration: 01:00 Lecture **Practical exercises on topics that are being explained in classroom** Duration: 01:00 Cooperative activities			**Classroom participation grade** Other assessment Continuous assessment Presential Duration: 00:00
9	**Practical exercises on topics that are being explained in classroom** Duration: 01:00 Cooperative activities **Architectural patterns** Duration: 01:00 Lecture			**Practical exercises on topics that are being explained in classroom** Group work Continuous assessment Not Presential Duration: 05:00 **Classroom participation grade** Other assessment Continuous assessment Presential Duration: 00:00
10	**Practical exercises on topics that are being explained in classroom** Duration: 01:00 Cooperative activities **Architectural patterns** Duration: 01:00 Lecture			**Classroom participation grade** Other assessment Continuous assessment Presential Duration: 00:00
11	**Presentations of the project proposals** Duration: 01:00 Additional activities **Architectural patterns** Duration: 01:00 Lecture			**Project** Group work Continuous assessment Not Presential Duration: 12:00 **Classroom participation grade** Other assessment Continuous assessment Presential Duration: 00:00

12	**Architectural patterns** Duration: 01:00 Lecture **Practical exercises on topics that are being explained in classroom** Duration: 01:00 Cooperative activities			**Project** Group work Continuous assessment Not Presential Duration: 20:00 **Classroom participation grade** Other assessment Continuous assessment Presential Duration: 00:00
13	**Architectural patterns** Duration: 01:00 Lecture **Practical exercises on topics that are being explained in classroom** Duration: 01:00 Cooperative activities			**Project** Group work Continuous assessment Not Presential Duration: 20:00 **Classroom participation grade** Other assessment Continuous assessment Presential Duration: 00:00
14	**Oral presentations of the projects** Duration: 02:00 Additional activities			**Project** Group work Continuous assessment Not Presential Duration: 09:00 **Classroom participation grade** Other assessment Continuous assessment Presential Duration: 00:00
15				**Exam** Written test Continuous assessment Presential Duration: 02:00 **Classroom participation grade** Other assessment Continuous assessment Presential Duration: 00:00
16				
17				**Final Exam** Written test Final examination Presential Duration: 01:00

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.

* The schedule is based on an a priori planning of the subject; it might be modified during the academic year, especially considering the COVID19 evolution.

7. Activities and assessment criteria

7.1. Assessment activities

7.1.1. Assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
1	Classroom participation grade	Other assessment	Face-to-face	00:00	.33%	0 / 10	CE12 CG14 CG18 CG1 CG3
2	Classroom participation grade	Other assessment	Face-to-face	00:00	.33%	0 / 10	CE12 CG14 CG18 CG1 CG3
3	Practical exercises on topics that are being explained in classroom	Group work	No Presential	03:00	5%	0 / 10	CE12
3	Classroom participation grade	Other assessment	Face-to-face	00:00	.33%	0 / 10	CE12 CG14 CG18 CG1 CG3
4	Classroom participation grade	Other assessment	Face-to-face	00:00	.33%	0 / 10	CE12 CG14 CG18 CG1 CG3
5	Classroom participation grade	Other assessment	Face-to-face	00:00	.33%	0 / 10	CE12 CG14 CG18 CG1 CG3
6	Classroom participation grade	Other assessment	Face-to-face	00:00	.33%	0 / 10	CE12 CG14 CG18 CG1 CG3
7	Practical exercises on topics that are being explained in classroom	Group work	No Presential	05:00	10%	0 / 10	CE12

7	Classroom participation grade	Other assessment	Face-to-face	00:00	.33%	0 / 10	CE12 CG14 CG18 CG1 CG3
8	Classroom participation grade	Other assessment	Face-to-face	00:00	.33%	0 / 10	CE12 CG14 CG18 CG1 CG3
9	Practical exercises on topics that are being explained in classroom	Group work	No Presential	05:00	10%	0 / 10	CE12
9	Classroom participation grade	Other assessment	Face-to-face	00:00	.33%	0 / 10	CE12 CG14 CG18 CG1 CG3
10	Classroom participation grade	Other assessment	Face-to-face	00:00	.33%	0 / 10	CE12 CG14 CG18 CG1 CG3
11	Project	Group work	No Presential	12:00	10%	5 / 10	CE12 CG14 CG18 CG1 CG3
11	Classroom participation grade	Other assessment	Face-to-face	00:00	.33%	0 / 10	CE12 CG14 CG18 CG1 CG3
12	Project	Group work	No Presential	20:00	10%	5 / 10	
12	Classroom participation grade	Other assessment	Face-to-face	00:00	.33%	0 / 10	CE12 CG14 CG18 CG1 CG3
13	Project	Group work	No Presential	20:00	10%	5 / 10	CE12 CG14 CG18 CG1 CG3
13	Classroom participation grade	Other assessment	Face-to-face	00:00	.33%	0 / 10	CE12 CG14 CG18 CG1 CG3

14	Project	Group work	No Presential	09:00	15%	5 / 10	CE12 CG14 CG18 CG1 CG3
14	Classroom participation grade	Other assessment	Face-to-face	00:00	.33%	0 / 10	CE12 CG14 CG18 CG1 CG3
15	Exam	Written test	Face-to-face	02:00	25%	4 / 10	CE12
15	Classroom participation grade	Other assessment	Face-to-face	00:00	.38%	0 / 10	

7.1.2. Global examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
17	Final Exam	Written test	Face-to-face	01:00	25%	5 / 10	CE12 CG14 CG18 CG1 CG3

7.1.3. Referred (re-sit) examination

Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
Project	Individual work	Face-to-face	00:00	75%	5 / 10	CE12 CG14 CG18 CG1 CG3
Final Exam	Individual work	Face-to-face	00:00	25%	5 / 10	CE12 CG14 CG1 CG3

7.2. Assessment criteria

1. Regular Period

1.1. Distributed evaluation

Throughout the semester, in order to pass the course, the student will have to do the following assignments:

- Practical exercises: they will allow the student to apply the concepts, techniques, and principles explained in the classroom.
- Final exam: the student will have to do a final exam where he/she will show that he/she has acquired the basic concepts explained in the classroom.
- Project: the student will have to propose a project and an architectural solution for it. The result of this work will have to be reflected in a document. In addition, before submitting this document, the student will have to do an oral presentation in the classroom where the preliminary results of his/her work will be summarized.

The final grade encompasses the participation of the student in the classes. In this sense, the classroom participation grade stands for the ratio of attendance multiplied by 10. Additionally, **students will have to attend some prefixed classes associated with evaluation activities, which will be reported at least 15 days prior to the day of the evaluation activity.**

The final grade (FG) will be calculated from the grade of the practical assignment (PAG), the exam grade (EG), the classroom participation grade (CPG), and the project grade (PG) by means of the following formula:

FG=0.25*PAG+0.25*EG+0.45*PG+0.05CPG if EG>=4 and PG>=5

FG = 0 otherwise

Where all the grades take values between 0 and 10.

1.2. Global evaluation

If the student fails to pass the final exam of the distributed evaluation, he/she will have a second chance in the global evaluation by doing another exam, which will determine the exam grade (EG) of the regular period.

In the global evaluation, failed practical assignments and the project will not be able to be passed because the solutions of the practical assignments will be solved and discussed in the classrooms during the classes and the deadline of the project will be within the period scheduled for the global evaluation in this master.

2. Extraordinary Period

When failed, in the extraordinary period the final grade will be obtained from the grade of a project (75%) and an exam (25%).

8. Teaching resources

8.1. Teaching resources for the subject

Name	Type	Notes
Moodle site	Web resource	http://moodle.upm.es/titulaciones/oficiales/course/view.php?id=2835
Bass, L. et al. (2013) Software Architecture in Practice. Addison-Wesley, Boston, MA, third edition	Bibliography	
Buschmann, F. et al. (1996) Pattern-Oriented Software Architecture: A System of Patterns, volume 1 de Software Design Patterns. John Wiley & Sons.	Bibliography	
Taylor, R. N. et al. (2009) Software Architecture: Foundations, Theory and Practice. John Wiley & Sons.	Bibliography	
Bachmann, F. et al. (2007) Modificability Tactics. Inf. Téc. CMU/SEI-2007-TR-002, Software Engineering Institute - Carnegie Mellon University, Pittsburg, PA, USA.	Bibliography	
Gorton I. (2006) Essential Software Architecture. Springer-Verlag.	Bibliography	

7.1.3 Software Design

ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

103000483 - Software Design

DEGREE PROGRAMME

10AM - Master Universitario En Ingenieria Del Software

ACADEMIC YEAR & SEMESTER

2023/24 - Semester 2

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1. Description

1.1. Subject details

Name of the subject	103000483 - Software Design
No of credits	4 ECTS
Type	Compulsory
Academic year ot the programme	First year
Semester of tuition	Semester 2
Tuition period	February-June
Tuition languages	English
Degree programme	10AM - Master Universitario en Ingenieria del Software
Centre	10 - Escuela Tecnica Superior De Ingenieros Informaticos
Academic year	2023-24

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Nelson Medinilla Martinez (Subject coordinator)	5109	nelson.medinilla@upm.es	M - 16:00 - 18:00
Natalia Juristo Juzgado	5110	natalia.juristo@upm.es	M - 08:00 - 08:15

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

3. Prior knowledge recommended to take the subject

3.1. Recommended (passed) subjects

The subject - recommended (passed), are not defined.

3.2. Other recommended learning outcomes

- Object Oriented Programming

4. Skills and learning outcomes *

4.1. Skills to be learned

CE12 - Concebir y realizar el diseño de los sistemas software asegurando atributos relevantes de calidad.

CG1 - 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 (RD)

CG10 - Capacidad de pensamiento creativo con el objetivo de desarrollar enfoques y métodos nuevos y originales

CG11 - Integración del conocimiento a partir de disciplinas diferentes, así como el manejo de la complejidad

CG14 - Conocimiento y comprensión de la informática necesaria para la creación de modelos de información, y de los sistemas y procesos complejos

CG18 - Capacidad de trabajar y comunicarse también en contextos internacionales

CG3 - 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 (RD)

4.2. Learning outcomes

RA16 - The student will be able to evaluate any software system design.

RA14 - The student will be able to design a software system according to requirements, restrictions, quality standards, and developer criteria

RA15 - The student will be able to document each new design.

RA23 - Time organization capability SC13, SC14 K

RA22 - Observing capability SC13, SC14, CG10 C

RA27 - Negotiation skill SC13, SC14, CG18 C

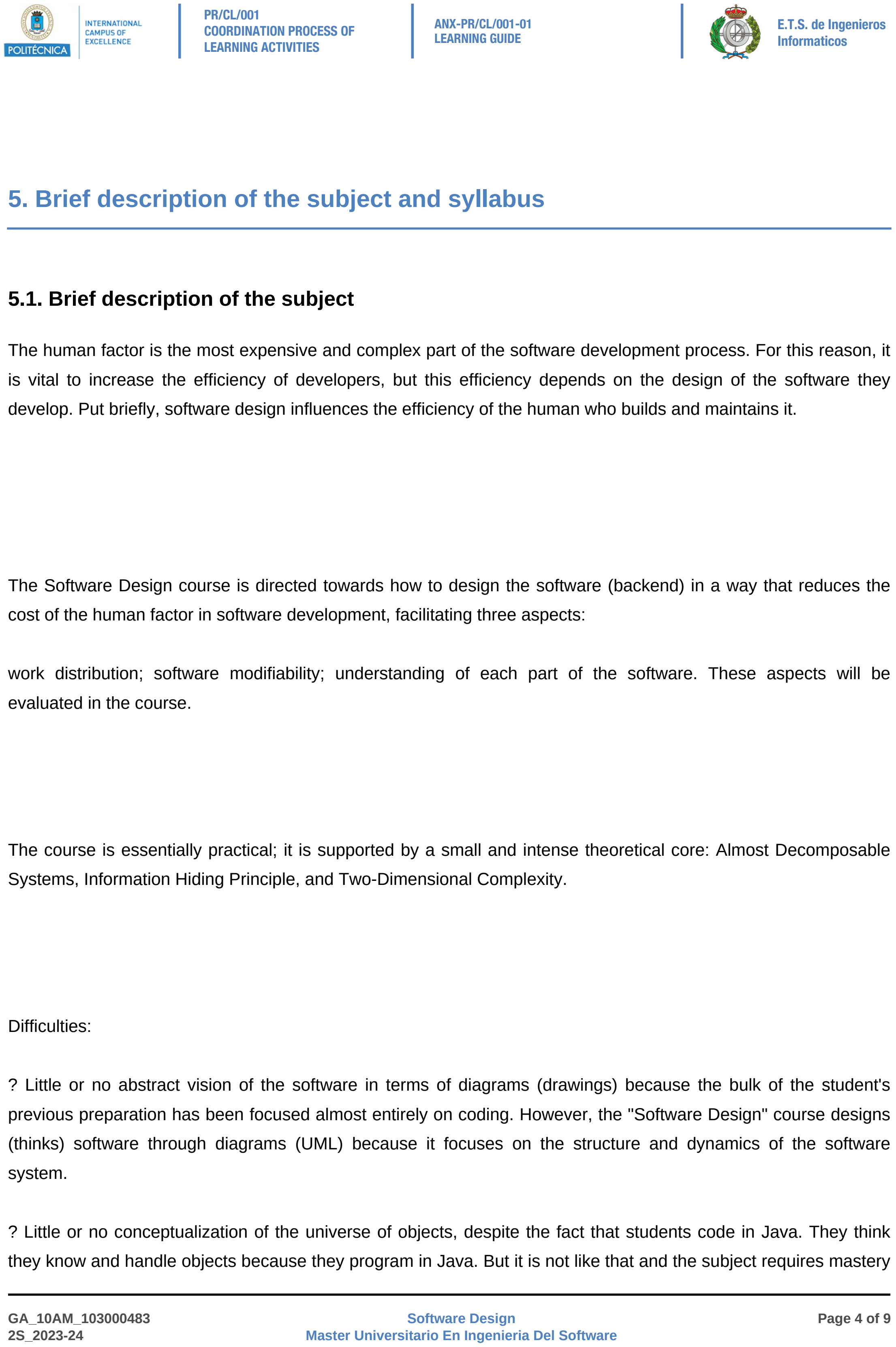
RA25 - Communication skills in public SC13, SC14, CG3, CG18 S

RA24 - Conflict solving capability SC13, SC14, CG18 C

RA21 - Listening capability SC13, SC14, CG10 A

RA26 - Group work skill SC13, SC14, CG17 A

* 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.



5. Brief description of the subject and syllabus

5.1. Brief description of the subject

The human factor is the most expensive and complex part of the software development process. For this reason, it is vital to increase the efficiency of developers, but this efficiency depends on the design of the software they develop. Put briefly, software design influences the efficiency of the human who builds and maintains it.

The Software Design course is directed towards how to design the software (backend) in a way that reduces the cost of the human factor in software development, facilitating three aspects:

work distribution; software modifiability; understanding of each part of the software. These aspects will be evaluated in the course.

The course is essentially practical; it is supported by a small and intense theoretical core: Almost Decomposable Systems, Information Hiding Principle, and Two-Dimensional Complexity.

Difficulties:

? Little or no abstract vision of the software in terms of diagrams (drawings) because the bulk of the student's previous preparation has been focused almost entirely on coding. However, the "Software Design" course designs (thinks) software through diagrams (UML) because it focuses on the structure and dynamics of the software system.

? Little or no conceptualization of the universe of objects, despite the fact that students code in Java. They think they know and handle objects because they program in Java. But it is not like that and the subject requires mastery of the universe of objects.

? Finally, the third type of difficulty is connected to the previous one. Given the poor conceptualization of objects, the structured approach predominates (controls), which conceives software as functions that transform data, far removed from the object approach.

5.2. Syllabus

1. Software Engineering Two-dimensional Complexity
2. System Software Design Features
3. Object Oriented Review
4. Design and Dominion Patterns

6. Schedule

6.1. Subject schedule*

Week	Classroom activities	Laboratory activities	Distant / On-line	Assessment activities
1	**Software Engineering Two-dimensional Complexity** Duration: 02:00 Lecture			
2	**Object Oriented Review** Duration: 02:00 Lecture			
3	**Workshop** Duration: 02:00 Cooperative activities			
4	**System Software Design Features** Duration: 02:00 Lecture			
5	**Workshop** Duration: 02:00 Cooperative activities			
6	**Workshop** Duration: 01:00 Cooperative activities			**Test** Written test Continuous assessment Presential Duration: 01:00
7	**Workshop** Duration: 02:00 Cooperative activities			
8	**Design and Dominion Patterns** Duration: 02:00 Lecture			
9	**Workshop** Duration: 02:00 Cooperative activities			
10	**Workshop** Duration: 02:00 Cooperative activities			
11	**Workshop** Duration: 01:00 Cooperative activities			**Test** Written test Continuous assessment Presential Duration: 01:00
12	**Workshop** Duration: 02:00 Cooperative activities			

13	**Workshop** Duration: 02:00 Cooperative activities			
14	**Workshop** Duration: 02:00 Cooperative activities			
15				**Oral presentation of the final work** Group work Continuous assessment Presential Duration: 02:00
16				**Test recoveries.** Written test Continuous assessment Presential Duration: 02:00
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.

* The schedule is based on an a priori planning of the subject; it might be modified during the academic year, especially considering the COVID19 evolution.

7. Activities and assessment criteria

7.1. Assessment activities

7.1.1. Assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
6	Test	Written test	Face-to-face	01:00	20%	3 / 10	CE12 CG11
11	Test	Written test	Face-to-face	01:00	25%	3 / 10	CE12 CG11
15	Oral presentation of the final work	Group work	Face-to-face	02:00	55%	/ 10	CE12 CG10 CG11 CG14 CG18 CG1 CG3
16	Test recoveries.	Written test	Face-to-face	02:00	%	3 / 10	CE12 CG11

7.1.2. Global examination

No se ha definido la evaluacion sólo por prueba final.

7.1.3. Referred (re-sit) examination

Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
Global test	Individual work	Face-to-face	02:00	100%	5 / 10	CE12 CG10 CG11

7.2. Assessment criteria

The course applies a continuous evaluation through individual evaluation activities (45%) and final work as teamwork (55%).

To pass the course, two conditions are necessary: first, exceed the minimum mark in each test and also obtain 50% (5/10) of the total score (test + teamwork).

In case of not exceeding the minimum required grade, the test may be recovered in the ordinary call. The teamwork is unrecoverable.

8. Teaching resources

8.1. Teaching resources for the subject

Name	Type	Notes
Moodle	Bibliography	It contains or addresses the fundamental literature

7.2 Project Management and Organizational Processes Module

7.2.1 Models and Methods for Process Improvement and Assessment

ANX-PR/CL/001-01
LEARNING GUIDE

SUBJECT

103000486 - Models And Methods For Process Improvement And Assessments

DEGREE PROGRAMME

10AM - Master Universitario En Ingenieria Del Software

ACADEMIC YEAR & SEMESTER

2023/24 - Semester 1

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1. Description

1.1. Subject details

Name of the subject	103000486 - Models And Methods For Process Improvement And Assessments
No of credits	4 ECTS
Type	Compulsory
Academic year ot the programme	First year
Semester of tuition	Semester 1
Tuition period	September-January
Tuition languages	English
Degree programme	10AM - Master Universitario en Ingenieria del Software
Centre	10 - Escuela Tecnica Superior De Ingenieros Informaticos
Academic year	2023-24

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Jose Antonio Calvo-Manzano Villalon (Subject coordinator)	5107	joseantonio.calvomanzano@upm.es	M - 10:30 - 13:30 W - 10:30 - 13:30
Tomas San Feliu Gilabert	5107	tomas.sanfeliu@upm.es	W - 10:00 - 13:00 Th - 10:00 - 13:00

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

3. Prior knowledge recommended to take the subject

3.1. Recommended (passed) subjects

The subject - recommended (passed), are not defined.

3.2. Other recommended learning outcomes

- Knowledge about the software life cycle processes (activities and tasks)

4. Skills and learning outcomes *

4.1. Skills to be learned

CE10 - Evaluar de forma objetiva los procesos y productos frente a los estándares y normas aplicables.

CE9 - Definir, evaluar y mejorar los procesos software de una organización.

CG1 - 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 (RD)

CG17 - Habilidades de gestión y capacidad de liderar un equipo que puede estar integrado por disciplinas y niveles distintos

CG18 - Capacidad de trabajar y comunicarse también en contextos internacionales

CG3 - 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 (RD)

4.2. Learning outcomes

RA37 - Está capacitado para introducir mejoras en la organización

RA35 - Es capaz de definir, evaluar y mejorar los procesos software de una organización

RA36 - Posee dotes para liderar el cambio dentro de la organización

* 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.

5. Brief description of the subject and syllabus

5.1. Brief description of the subject

New technologies are changing our way of life: airplanes, trains, communications, e-commerce, etc, and all of them need software to run. However, software is developed with poor quality; overruns in resources, effort and budget; and delays in delivery. It means that organizations must improve their way of producing software. In this context, it appears software process improvement. It consists of applying consistently the practices that provide good results, and changing those that cause problems.

So, enterprises should know their capacity/maturity level in order to develop software. The reference models are CMMI (Capability Maturity Model Integration with the views of Development, Services and Supplier Management), ISO 15504, and ITIL (Information Technology Infrastructure Library) among others. In order to be involved in a process improvement initiative, organizations should follow a process improvement lifecycle.

In this subject, and independently of the reference model used, a generic process improvement lifecycle oriented to large enterprises as well as small and medium-sized enterprises will be explained. In the main phase (the assessment phase), a method to make an assessment will be described. Students will have to make a plan in order to know the estimated hours and costs, resources and schedule involved in a process improvement initiative.

In the same way, a process improvement initiative in a small enterprise will be presented to students and they will have to analyse if the initiative is going to get benefits.

Later, the generic information related to the most known reference model (i.e., CMMI) will be explained (maturity/capability levels, and institutionalization).

Finally, students will have to choose one of the processes of the ITIL model and make a brief analysis and presentation.

5.2. Syllabus

1. Introduction
    1.1. Maturity Profile
    1.2. State of the practice
    1.3. Process Improvement (PI) concepts & Justifying PI
2. PI life cycles
    2.1. IDEAL, ISO 15504, Action Focus Improvement Model (AFIM)
    2.2. AFIM: Commitment
    2.3. AFIM: Assessment
    2.4. AFIM: Infrastructure&Action Plans, and Implementation
    2.5. A PI initiative in a small company
3. Reference Process Models
    3.1. CMMI Model
    3.2. A process model focused on IT Services

6. Schedule

6.1. Subject schedule*

Week	Classroom activities	Laboratory activities	Distant / On-line	Assessment activities
1	**Chapter 1: Maturity Profile Report** Duration: 00:30 Lecture **Chapter 1: State of the practice. Process Improvement (PI) concepts.** Duration: 01:30 Lecture			**Discussion/Participating in class (NON-RECOVERABLE)** Other assessment Continuous assessment Presential Duration: 01:00
2	**Chapter 1: Justifying PI** Duration: 00:30 Lecture **Chapter 2: Process Improvement life cycles** Duration: 00:30 Lecture **Chapter 2: Process Improvement life cycles: AFIM: Commitment** Duration: 00:30 Lecture **Exercise related to ROI in Commitment** Duration: 00:30 Problem-solving class			**Discussion/Participating in class (NON-RECOVERABLE)** Other assessment Continuous assessment Presential Duration: 01:00
3	**Chapter 2: Process Improvement life cycles: AFIM: Commitment** Duration: 01:00 Lecture **Exercise related to ROI in Commitment** Duration: 01:00 Problem-solving class			**Discussion/Participating in class (NON-RECOVERABLE)** Other assessment Continuous assessment Presential Duration: 01:00
4	**Chapter 2: Process Improvement life cycles: AFIM: Assessment** Duration: 00:30 Lecture **Exercise related to ROI in Assessment** Duration: 00:30 Problem-solving class			**Discussion/Participating in class (NON-RECOVERABLE)** Other assessment Continuous assessment Presential Duration: 01:00 **Exercise related to ROI in Commitment** Other assessment Continuous assessment Presential Duration: 01:00

5	**Chapter 2: Process Improvement life cycles: AFIM: Assessment** Duration: 01:30 Lecture **Exercise related to ROI in Assessment** Duration: 00:30 Problem-solving class			**Discussion/Participating in class (NON-RECOVERABLE)** Other assessment Continuous assessment Presential Duration: 01:00
6	**Chapter 2: Process Improvement life cycles: AFIM: Assessment** Duration: 01:30 Lecture **Exercise related to ROI in Assessment** Duration: 00:30 Problem-solving class			**Discussion/Participating in class (NON-RECOVERABLE)** Other assessment Continuous assessment Presential Duration: 01:00
7	**Chapter 2: Process Improvement life cycles: AFIM: Action Plan and Implementation** Duration: 00:30 Lecture **Exercise related to ROI in Action Plans and Implementation** Duration: 00:30 Problem-solving class			**Discussion/Participating in class (NON-RECOVERABLE)** Other assessment Continuous assessment Presential Duration: 01:00 **Exercise related to ROI in Assessment** Group work Continuous assessment Presential Duration: 01:00
8				
9	**Chapter 2: Process Improvement life cycles: AFIM: Action Plans and Implementation** Duration: 01:00 Lecture **Exercise related to ROI in Action Plans and Implementation** Duration: 00:30 Problem-solving class **Exercise related to ROI in a Small Enterprise (statement)** Duration: 00:30 Problem-solving class			**Discussion/Participating in class (NON-RECOVERABLE)** Other assessment Continuous assessment Presential Duration: 01:00
10				**Exercise related to ROI in Action Plans and Implementation** Group work Continuous assessment Presential Duration: 01:00 **Discussion/Participating in class (NON-RECOVERABLE)** Other assessment Continuous assessment Presential Duration: 01:00 **Exercise related to ROI in Summary** Group work Continuous assessment Presential

				Duration: 01:00
11	**Chapter 3: Process Models oriented to services** Duration: 00:30 Lecture **Exercise related to ITIL (statement)** Duration: 00:30 Problem-solving class			**Discussion/Participating in class (NON-RECOVERABLE)** Other assessment Continuous assessment Presential Duration: 01:00 **Exercise related to ROI in a Small Enterprise** Group work Continuous assessment Presential Duration: 01:00
12	**Chapter 3: CMMI** Duration: 02:00 Lecture			**Discussion/Participating in class (NON-RECOVERABLE** Other assessment Continuous assessment Presential Duration: 01:00
13				
14	**Chapter 3: CMMI** Duration: 02:00 Lecture			**Discussion/Participating in class (NON-RECOVERABLE)** Other assessment Continuous assessment Presential Duration: 01:00
15				**Discussion/Participating in class (NON-RECOVERABLE)** Other assessment Continuous assessment Presential Duration: 01:00 **Presentation related to a selected Service Process** Individual presentation Continuous assessment Presential Duration: 01:00 **Progressive Evaluation** Written test Continuous assessment Presential Duration: 01:00
16				**Discussion/Participating in class (NON-RECOVERABLE)** Other assessment Continuous assessment Presential Duration: 01:00 **Presentation related to a selected Service Process** Individual presentation Continuous assessment Presential Duration: 02:00

17				**Global Evaluation** Written test Final examination Presential Duration: 03:00

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.

* The schedule is based on an a priori planning of the subject; it might be modified during the academic year, especially considering the COVID19 evolution.

7. Activities and assessment criteria

7.1. Assessment activities

7.1.1. Assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
1	Discussion/Participating in class (NON- RECOVERABLE)	Other assessment	Face-to-face	01:00	1%	5 / 10	CG18 CG1
2	Discussion/Participating in class (NON-RECOVERABLE)	Other assessment	Face-to-face	01:00	1%	5 / 10	CG18 CG1
3	Discussion/Participating in class (NON-RECOVERABLE)	Other assessment	Face-to-face	01:00	1%	5 / 10	CE9 CE10 CG18 CG1
4	Discussion/Participating in class (NON-RECOVERABLE)	Other assessment	Face-to-face	01:00	1%	5 / 10	CE9 CE10 CG18 CG1
4	Exercise related to ROI in Commitment	Other assessment	Face-to-face	01:00	10%	5 / 10	CE9 CE10 CG17 CG18 CG1 CG3
5	Discussion/Participating in class (NON-RECOVERABLE)	Other assessment	Face-to-face	01:00	1%	5 / 10	CE9 CE10 CG18 CG1
6	Discussion/Participating in class (NON-RECOVERABLE)	Other assessment	Face-to-face	01:00	1%	5 / 10	CE9 CE10 CG18 CG1
7	Discussion/Participating in class (NON-RECOVERABLE)	Other assessment	Face-to-face	01:00	1%	5 / 10	CE9 CE10 CG18 CG1
7	Exercise related to ROI in Assessment	Group work	Face-to-face	01:00	10%	5 / 10	CE9 CE10 CG17 CG18 CG1 CG3

9	Discussion/Participating in class (NON-RECOVERABLE)	Other assessment	Face-to-face	01:00	1%	5 / 10	CE9 CE10 CG18 CG1
10	Exercise related to ROI in Action Plans and Implementation	Group work	Face-to-face	01:00	10%	5 / 10	CE9 CE10 CG17 CG18 CG1 CG3
10	Discussion/Participating in class (NON-RECOVERABLE)	Other assessment	Face-to-face	01:00	2%	5 / 10	CE9 CE10 CG18 CG1
10	Exercise related to ROI in Summary	Group work	Face-to-face	01:00	5%	5 / 10	CE9 CE10 CG17 CG18 CG1 CG3
11	Discussion/Participating in class (NON-RECOVERABLE)	Other assessment	Face-to-face	01:00	1%	5 / 10	CE10 CG18 CG1 CG3
11	Exercise related to ROI in a Small Enterprise	Group work	Face-to-face	01:00	10%	5 / 10	CE10 CG17 CG18 CG1 CG3
12	Discussion/Participating in class (NON-RECOVERABLE	Other assessment	Face-to-face	01:00	1%	5 / 10	CE10 CG18 CG1 CG3
14	Discussion/Participating in class (NON-RECOVERABLE)	Other assessment	Face-to-face	01:00	1%	5 / 10	CE10 CG18 CG1 CG3
15	Discussion/Participating in class (NON-RECOVERABLE)	Other assessment	Face-to-face	01:00	1%	5 / 10	CE9 CG18 CG1 CG3
15	Presentation related to a selected Service Process	Individual presentation	Face-to-face	01:00	10%	5 / 10	CE9 CG18 CG1 CG3
15	Progressive Evaluation	Written test	Face-to-face	01:00	20%	5 / 10	CE9 CE10 CG1 CG3

16	Discussion/Participating in class (NON-RECOVERABLE)	Other assessment	Face-to-face	01:00	1%	5 / 10	CE9 CG18 CG1 CG3
16	Presentation related to a selected Service Process	Individual presentation	Face-to-face	02:00	10%	5 / 10	CE9 CG18 CG1 CG3

7.1.2. Global examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
17	Global Evaluation	Written test	Face-to-face	03:00	85%	5 / 10	CE9 CE10 CG17 CG18 CG1 CG3

7.1.3. Referred (re-sit) examination

Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
Final Test	Written test	Face-to-face	03:00	100%	5 / 10	CE9 CE10 CG17 CG18 CG1 CG3

7.2. Assessment criteria

The assessment activities are the following:

1. Attendance and Active participation of students during the classes (15%). This is a NON-RECOVERABLE activity because the specific class and its discussion is not going to be repeated.
2. Group Exercises related to Return on Investment (ROI) in Commitment (10%), Assessment (10%), Action Plans and Implementation (10%), and Summary (5%)
3. Group Exercise related to ROI in a Small enterprise (10%).
4. Individual research work based on a service process from ITIL (20%). This activity is divided into two ones. One related to the individual skills in communications (10%) and the other one related to the memory of the work itself (10%).
5. Individual Progressive evaluation exam (20%) related to the main concepts of the subject.

The previous assessment activities can be recovered (except activity 1), if failed, in the Global Evaluation Test (17 week)

Students should have a rating greater or equal than 5.0 (over 10) to pass each activity (except activity 1). If not, the activities can be recovered in the Global Evaluation Test.

In the global evaluation (week 17), the grade of this exam computes the 85% of the final grade. The remaining 15% corresponds to the rating obtained in the previous activity 1.

In the "convocatoria extraordinaria", the same thing happens: the grade of the "final test" computes the 85% of the final grade. The remaining 15% corresponds to the rating obtained in the previous activity 1.

8. Teaching resources

8.1. Teaching resources for the subject

Name	Type	Notes
Subject Moodle Site	Web resource	Students will be able to get the slides and other resources from the Moodle platform.
IDEAL	Bibliography	McFeeley, B.; IDEAL: A User's Guide for Software Process Improvement;<br /> Handbook CMU/SEI-96-HB-001; February 1996
SCAMPI	Bibliography	SCAMPI Upgrade Team; Standard CMMI® Appraisal Method for Process Improvement (SCAMPI) A, Version 1.3: Method Definition Document; Handbook CMU/SEI 2011-HB-?001; March 2011
ITIL	Bibliography	ITIL -Information Technology Infrastructure Library<br /> (Service Strategy, Service Design, Service Transition, Service Operation, Continual Service Improvement)
CMMI Model V2.0	Bibliography	CMMI Institute, CMMI V2.1 Model, December 2018

7.2.2 Software Project Management

POLITÉCNICA
INTERNATIONAL CAMPUS OF EXCELLENCE

COORDINATION PROCESS OF LEARNING ACTIVITIES
PR/CL/001

E.T.S. de Ingenieros Informaticos

ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

103000485 - Software Project Management

DEGREE PROGRAMME

10AM - Master Universitario En Ingenieria Del Software

ACADEMIC YEAR & SEMESTER

2023/24 - Semester 1

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1. Description

1.1. Subject details

Name of the subject	103000485 - Software Project Management
No of credits	4 ECTS
Type	Compulsory
Academic year ot the programme	First year
Semester of tuition	Semester 1
Tuition period	September-January
Tuition languages	English
Degree programme	10AM - Master Universitario en Ingenieria del Software
Centre	10 - Escuela Tecnica Superior De Ingenieros Informaticos
Academic year	2023-24

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Ana Maria Moreno Sanchez-Capuchino (Subject coordinator)	5102	anamaria.moreno@upm.es	M - 15:00 - 21:00
Tomas San Feliu Gilabert	D 5105	tomas.sanfeliu@upm.es	M - 10:00 - 12:00 W - 10:00 - 12:00

* 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

CE1 - Elaborar un plan de proyecto que permita coordinar y priorizar recursos y actividades para obtener los resultados esperados en los plazos, costes y calidad establecidos

CE2 - Llevar a cabo la monitorización de un proyecto software y tomar acciones correctivas si fuera necesario

CE3 - Elaborar una estimación de los parámetros del proyecto software.

CG1 - 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 (RD)

CG14 - Conocimiento y comprensión de la informática necesaria para la creación de modelos de información, y de los sistemas y procesos complejos

CG18 - Capacidad de trabajar y comunicarse también en contextos internacionales

CG2 - Que los estudiantes sean capaces de integrar conocimientos y enfrentarse a la complejidad de formular juicios a partir de una información que, siendo incompleta o limitada, incluya reflexiones sobre las responsabilidades sociales y éticas vinculadas a la aplicación de sus conocimientos y juicios (RD)

CG5 - Organización y planificación

3.2. Learning outcomes

RA25 - Communication skills in public SC13, SC14, CG3, CG18 S

RA61 - Identify the elements of a risk management plan and its rationale

RA2 - Facing a real problem, chooses an appropriate Software Engineering solution, analyzing its viability, what can and cannot be achieved from the current state of development of the selected solution, and what is expected to advance in the future

RA58 - Development of a business case for a software project

RA59 - Development of a project plan using as input estimation data

RA26 - Group work skill SC13, SC14, CG17 A

RA60 - Re-plannification of a software project with monitoring information

* 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

This subject covers the different activities to be performed by a software project manager to successfully drive a software project. For that aim, both workshops and theoretical lecturers will be provided.

4.2. Syllabus

1. Introduction to Software Project Management
   1.1. 1.1 Psychological Model of Software Engineers
   1.2. Leadership versus Management
   1.3. The Basic Functions of Project Management
   1.4. Developing the Business Case
2. Developing and Motivating the Project Team
   2.1. What it Takes for a Team to be Effective
   2.2. The Basics of Personalities
   2.3. Motivating Software Engineers
3. Strategic Approaches to Project Planning
   3.1. The Balanced Scorecard (BSC)
   3.2. Using SWOT to Develop the BSC
   3.3. Tracking Progress
4. Estimating Project Size, Cost, Schedule
5. Project Risk Management
   5.1. What Risk is/is not
   5.2. Strategies for Mitigating Risk
   5.3. Risk Management Methods
6. Tracking the Progress of a Software Project
   6.1. Earned Value Management
   6.2. Time Value

5. Schedule

5.1. Subject schedule*

Week	Classroom activities	Laboratory activities	Distant / On-line	Assessment activities
1	**Chapter 1** Duration: 02:00 Lecture			
2	**Software Project Management Model (Lego)** Duration: 02:00 Cooperative activities			
3	**Chapter 2** Duration: 02:00 Lecture			
4	**Chapter 2. Know your team** Duration: 02:00 Cooperative activities			
5	**Chapter 3** Duration: 02:00 Lecture			
6	**Chapter 4** Duration: 02:00 Lecture			
7	**Chapter 4. Building Blocks** Duration: 02:00 Cooperative activities	**Estimation vs Planning** Duration: 02:00 Cooperative activities		
8	**SPM Complementary Knowledge** Duration: 02:00 Cooperative activities			
9	**Chapter 5** Duration: 02:00 Lecture			
10	**Chapter 5.** Duration: 02:00 Cooperative activities			
11	**Chapter 6** Duration: 02:00 Cooperative activities			
12	**Chapter 6** Duration: 02:00 Cooperative activities			
13	**Chapter 6** Duration: 02:00 Cooperative activities	**Soft Skills Management** Duration: 02:00 Cooperative activities		

14	**Chapter 6** Duration: 02:00 Cooperative activities	**Software Project Management Model (Lego)** Duration: 02:00 Cooperative activities		**Active participation of students** Other assessment Continuous assessment and final examination Not Presential Duration: 00:00
15				**Final Report** Group work Continuous assessment Not Presential Duration: 00:00 **Presentation of Final Report** Group work Continuous assessment Presential Duration: 01:00 **Final Report** Individual presentation Final examination Presential Duration: 02:00
16	**Industrial Seminar** Duration: 02:00 Additional activities			
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.

* The schedule is based on an a priori planning of the subject; it might be modified during the academic year, especially considering the COVID19 evolution.

6. Activities and assessment criteria

6.1. Assessment activities

6.1.1. Assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
14	Active participation of students	Other assessment	No Presential	00:00	15%	0 / 10	CG1 CG2
15	Final Report	Group work	No Presential	00:00	70%	5 / 10	CE1 CE2 CE3 CG5 CG14 CG18 CG1 CG2
15	Presentation of Final Report	Group work	Face-to-face	01:00	15%	5 / 10	CE1 CE2 CE3 CG5 CG14 CG18 CG1 CG2

6.1.2. Global examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
14	Active participation of students	Other assessment	No Presential	00:00	15%	0 / 10	CG1 CG2
15	Final Report	Individual presentation	Face-to-face	02:00	85%	5 / 10	CE1 CE2 CE3 CG5 CG14 CG18 CG1 CG2

6.1.3. Referred (re-sit) examination

Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
Content of Final Project Report	Individual work	Face-to-face	00:00	85%	5 / 10	CE1 CE2 CE3 CG5 CG14 CG18 CG1 CG2
Active participation of students	Other assessment	Face-to-face	00:00	15%	0 / 10	CE1 CE2 CE3

6.2. Assessment criteria

During the progressive evaluation, the final grade of students will be calculated according to their performance in the reports to be done and their class participation.

- Active participation of students (15%)
- Content of the reports (70%)
- Presentation of the report (15%)

Students must get a minimum of 5 points (over 10) in the assessment of each report in order to pass the matter.

Students must get a minimum of 5 points (over 10) as final grade in order to pass the matter.

During the global evaluation, the final grade of students will be calculated according to their performance in the report to be done and their class participation. If students have attended to the lecturers during the course, they will be evaluated accordingly in the "Active participation" activity. If not, their grade in the "Active participation" activity will be 0

- Active participation of students (15%)

- Content of the reports (85%)

Students must get a minimum of 5 points (over 10) in the assessment of the report in order to pass the matter.

7. Teaching resources

7.1. Teaching resources for the subject

Name	Type	Notes
Bibliography	Bibliography	Managing Software Projects on the Edge of Chaos: from Antipatterns to Success,? a Kindle eBook, by Lawrence Peters, Software Consultants International Limited, Auburn, Washington, May, 2015. <br />

7.3 Support Processes Module

7.3.1 Software Metrics

ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

103000488 - Software Metrics

DEGREE PROGRAMME

10AM - Master Universitario En Ingenieria Del Software

ACADEMIC YEAR & SEMESTER

2023/24 - Semester 1

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1. Description

1.1. Subject details

Name of the subject	103000488 - Software Metrics
No of credits	4 ECTS
Type	Compulsory
Academic year ot the programme	First year
Semester of tuition	Semester 1
Tuition period	September-January
Tuition languages	English
Degree programme	10AM - Master Universitario en Ingenieria del Software
Centre	10 - Escuela Tecnica Superior De Ingenieros Informaticos
Academic year	2023-24

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Tomas San Feliu Gilabert (Subject coordinator)	5106	tomas.sanfeliu@upm.es	W - 10:00 - 13:00 Th - 10:00 - 13:00
Nelson Medinilla Martinez	5019	nelson.medinilla@upm.es	Tu - 11:00 - 14:00 F - 11:00 - 14:00

* 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

CE10 - Evaluar de forma objetiva los procesos y productos frente a los estándares y normas aplicables.

CG1 - 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 (RD)

CG12 - Comprensión amplia de las técnicas y métodos aplicables en una especialización concreta, así como de sus límites

CG18 - Capacidad de trabajar y comunicarse también en contextos internacionales

CG2 - Que los estudiantes sean capaces de integrar conocimientos y enfrentarse a la complejidad de formular juicios a partir de una información que, siendo incompleta o limitada, incluya reflexiones sobre las responsabilidades sociales y éticas vinculadas a la aplicación de sus conocimientos y juicios (RD)

3.2. Learning outcomes

RA78 - The student will be able to lead and implement measurement plans for the evaluation of processes and products

RA45 - Es capaz de analizar datos para la estimación, planificación y control de calidad en proyectos software

RA79 - The student will be able to analyze data for estimation, planning and quality control in software projects

RA44 - Es capaz de liderar e implantar planes de medida para la evaluación de procesos y productos

RA11 - Understands the interrelation between product quality and process quality

RA16 - The student will be able to evaluate any software system design.

* 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 students will:

- Understand the theoretical aspects of software measurements.
- Demonstrate the knowledge of software metrics.
- Demonstrate the knowledge of using software metrics in software development, software maintenance, and software project management.
- Demonstrate the knowledge of developing and maintaining a measurement program.

4.2. Syllabus

1. Introduction to measurement theory

    1.1. Why measure?

    1.2. Measure elements

2. Measuring Product Attributes

    2.1. Internal Product Attributes

    2.2. External Product Attribtures

3. Measuring Process

4. Designing Metrics Program

    4.1. Goal Question Metrics

5. Frameworks for Software Measurements

    5.1. ISO 15939

    5.2. Practical Software and System Measurement

    5.3. Continuous Iterative Development

6. Visualization and Decision Making with Software Measurements

5. Schedule

5.1. Subject schedule*

Week	Classroom activities	Laboratory activities	Distant / On-line	Assessment activities
1	**Chapter 1.1 Why Measure Chapter 1.2 Measure Elements** Duration: 02:00 Lecture			
2	**Chapter 2.1 Measuring Internal Product Attributes** Duration: 02:00 Lecture			**Quiz 1** Online test Continuous assessment Not Presential Duration: 00:30
3	**Chapter 2.1 Measuring Internal Product Attributes** Duration: 02:00 Lecture			**Reading 1** Individual work Continuous assessment Presential Duration: 02:00
4	**Chapter 2.2 Measuring External Product Attributes** Duration: 02:00 Lecture			
5	**Chapter 3 Measuring Process** Duration: 02:00 Lecture			**Quiz 2** Online test Continuous assessment Not Presential Duration: 00:30
6	**Chapter 4. Designing Metrics Program** Duration: 02:00 Lecture			
7	**Chapter 4. Designing Metrics Program** Duration: 02:00 Lecture			**Reading 2** Individual work Continuous assessment Presential Duration: 02:00
8	**Chapter 4. Designing Metrics Program** Duration: 02:00 Lecture			**Measurement Goal Definition** Group work Continuous assessment Presential Duration: 02:00
9	**Chapter 4. Designing Metrics Program** Duration: 02:00 Lecture			**Quiz 3** Online test Continuous assessment Not Presential Duration: 00:30

10	**Chapter 4. Designing Metrics Program** Duration: 02:00 Lecture			
11	**Chapter 4. Designing Metrics Program** Duration: 02:00 Lecture			
12	**Chapter 5. Frameworks for Software Measurements** Duration: 02:00 Lecture			**Reading 3** Individual work Continuous assessment Presential Duration: 02:00 **Quiz 4** Online test Continuous assessment Not Presential Duration: 00:30
13	**Chapter 5. Frameworks for Software Measurements** Duration: 02:00 Lecture			
14	**Chapter 6 Visualization and Decision Making with Software Measurements** Duration: 02:00 Lecture			
15	**Chapter 6 Visualization and Decision Making with Software Measurements** Duration: 01:00 Lecture			**Final Report** Group work Continuous assessment Presential Duration: 02:00
16				
17				**Final Test** Online test Continuous assessment Not Presential Duration: 02:00 **Final Test** Online test Final examination Presential Duration: 02:00

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.

* The schedule is based on an a priori planning of the subject; it might be modified during the academic year, especially considering the COVID19 evolution.

6. Activities and assessment criteria

6.1. Assessment activities

6.1.1. Assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
2	Quiz 1	Online test	No Presential	00:30	5%	0 / 10	CE10 CG18 CG2
3	Reading 1	Individual work	Face-to-face	02:00	2%	0 / 10	CG18
5	Quiz 2	Online test	No Presential	00:30	5%	4 / 10	CE10
7	Reading 2	Individual work	Face-to-face	02:00	2%	0 / 10	CG18
8	Measurement Goal Definition	Group work	Face-to-face	02:00	20%	4 / 10	CE10 CG12
9	Quiz 3	Online test	No Presential	00:30	5%	4 / 10	CE10 CG18 CG2
12	Reading 3	Individual work	Face-to-face	02:00	2%	0 / 10	CG18
12	Quiz 4	Online test	No Presential	00:30	5%	4 / 10	CE10 CG18 CG2
15	Final Report	Group work	Face-to-face	02:00	25%	4 / 10	CG12 CG18 CG1 CG2
17	Final Test	Online test	No Presential	02:00	29%	5 / 10	CE10 CG18 CG2

6.1.2. Global examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
17	Final Test	Online test	Face-to-face	02:00	100%	5 / 10	CE10 CG12 CG18 CG1 CG2

6.1.3. Referred (re-sit) examination

Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
Final Test	Written test	Face-to-face	00:30	49%	5 / 10	CE10 CG18 CG2

6.2. Assessment criteria

The final evaluation of the students is based on four questionnaires (20%), three reading activities (6%), a definition of initial measurement objectives (20%), a final report (25%) and an individual questionnaire (29 %) .
In case of failure, the tests and exams may be repeated in the ordinary evaluation period, using the new marks together with those obtained in the individual and group exercises and the student's participation in the previous period to calculate the final grade for the subject.

All assessment activities are recoverable.

Finally, in the special evaluation period, there will be a final test to calculate the final grade for the subject.

7. Teaching resources

7.1. Teaching resources for the subject

Name	Type	Notes
Metrics and Models in Software Quality Engineering	Bibliography	Stephen Kan, Metrics and Models in Software Quality<br /> Engineering, Addison Wesley 2003
Measuring the Software Process	Bibliography	Anita Carleton, Measuring the Software Process, Addison Wesley

The big book of Six Sigma training games	Bibliography	Chris Chen and Hadley Roth, The big book of Six Sigma<br /> training games, McGraw-Hill, 2005

7.3.2 Verification and Validation

ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

103000489 - Verification And Validation

DEGREE PROGRAMME

10AM - Master Universitario En Ingenieria Del Software

ACADEMIC YEAR & SEMESTER

2023/24 - Semester 1

Index

Learning guide

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5. Brief description of the subject and syllabus..........3
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7. Activities and assessment criteria..........8
8. Teaching resources..........12

1. Description

1.1. Subject details

Name of the subject	103000489 - Verification And Validation
No of credits	6 ECTS
Type	Compulsory
Academic year ot the programme	First year
Semester of tuition	Semester 1
Tuition period	September-January
Tuition languages	English
Degree programme	10AM - Master Universitario en Ingenieria del Software
Centre	10 - Escuela Tecnica Superior De Ingenieros Informaticos
Academic year	2023-24

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Sira Vegas Hernandez (Subject coordinator)	5105	sira.vegas@upm.es	M - 12:00 - 15:00 Th - 14:00 - 17:00
Natalia Juristo Juzgado	5104	natalia.juristo@upm.es	Sin horario.

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

3. Prior knowledge recommended to take the subject

3.1. Recommended (passed) subjects

The subject - recommended (passed), are not defined.

3.2. Other recommended learning outcomes

- Programming languages C and JAVA

4. Skills and learning outcomes *

4.1. Skills to be learned

CE7 - Elaborar un plan de verificación y validación que permita coordinar y priorizar recursos y actividades para garantizar el nivel de calidad requerido.

CE8 - Aplicar las técnicas de verificación y validación más adecuadas para un proyecto de desarrollo software, enmarcadas en un plan de verificación y validación.

CG1 - 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 (RD)

CG12 - Comprensión amplia de las técnicas y métodos aplicables en una especialización concreta, así como de sus límites

CG18 - Capacidad de trabajar y comunicarse también en contextos internacionales

CG19 - Aproximación sistemática a la gestión de riesgos

CG4 - Que los estudiantes posean las habilidades de aprendizaje que les permitan continuar estudiando de un modo que habrá de ser en gran medida autodirigido o autónomo (RD)

4.2. Learning outcomes

RA12 - Knows and applies product and process quality control techniques

RA8 - Knows and determines the most appropriate verification and validation techniques to be applied in a software development project with the aim of assuring the quality level required

RA39 - Conoce y determina las técnicas de verificación y validación más apropiadas para aplicar en un proyecto de desarrollo de software con el objetivo de garantizar el nivel de calidad requerido

* 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.

5. Brief description of the subject and syllabus

5.1. Brief description of the subject

No hay descripción de la asignatura.

5.2. Syllabus

1. Introduction
    1.1. Introduction to V&V
    1.2. V&V and the software development process
    1.3. V&V and the software development products
2. Static evaluation
    2.1. Introduction to static evaluation
    2.2. Static evaluation techniques
    2.3. Reading techniques
3. Dynamic evaluation: Software testing
    3.1. Introduction to software testing

3.2. Testing levels

3.3. The testing process

3.4. Software verification and validation plan

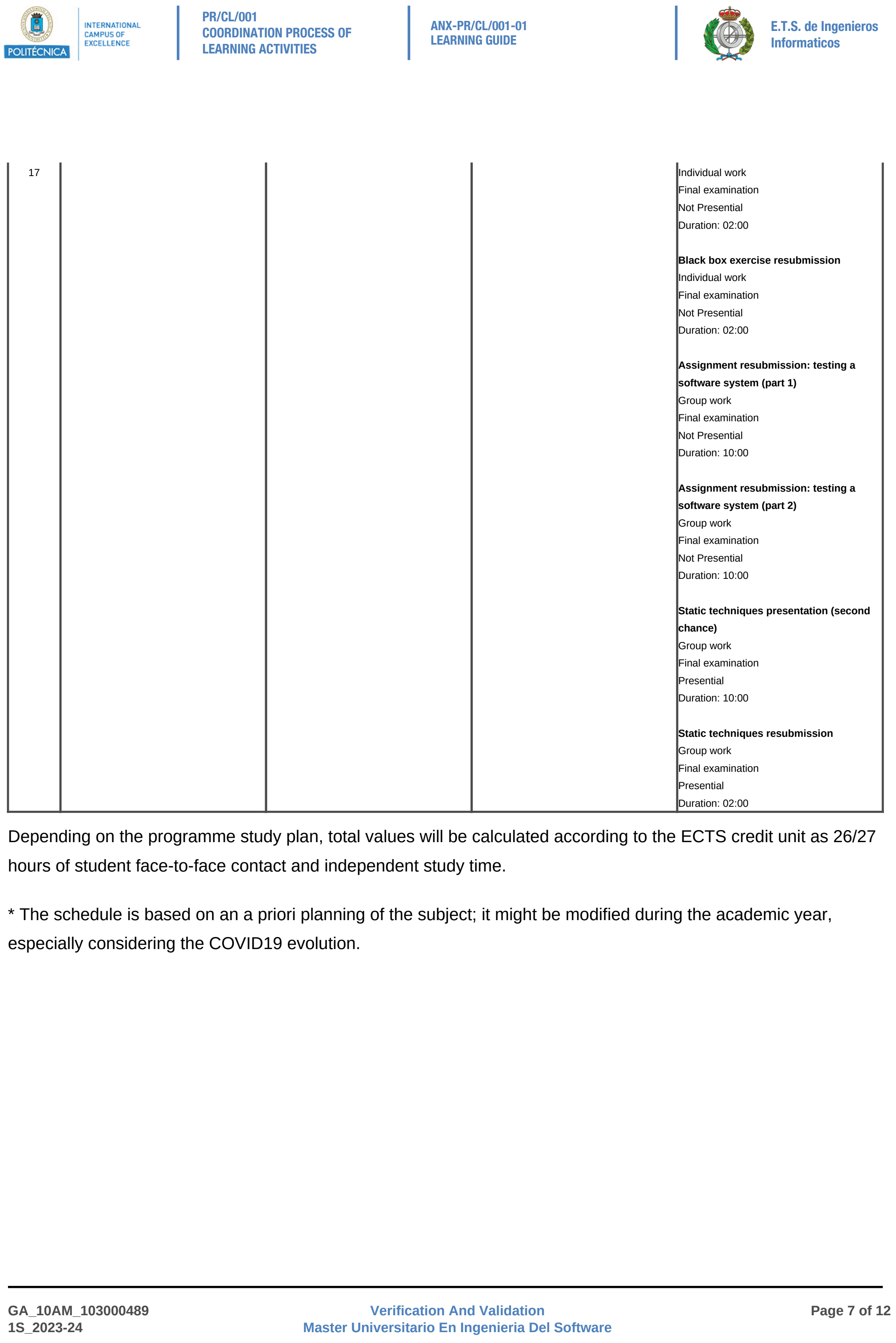
3.5. Testing tools

6. Schedule

6.1. Subject schedule*

Week	Classroom activities	Laboratory activities	Distant / On-line	Assessment activities
1	**Course introduction** Duration: 01:00 Lecture **Static evaluation** Duration: 01:00 Lecture **Introduction to software testing** Duration: 02:00 Lecture			
2	**Static evaluation** Duration: 02:00 Lecture **Testing** Duration: 02:00 Lecture			
3	**Testing** Duration: 02:00 Lecture			**Static techniques exercise** Individual work Continuous assessment Not Presential Duration: 02:00
4	**Static evaluation** Duration: 01:00 Lecture **Static evaluation** Duration: 01:00 Problem-solving class **Testing** Duration: 02:00 Problem-solving class			
5	**Static evaluation** Duration: 01:00 Lecture **Static evaluation** Duration: 01:00 Problem-solving class			**White box exercise** Individual work Continuous assessment Not Presential Duration: 02:00
6	**Static evaluation** Duration: 01:00 Lecture **Static evaluation** Duration: 01:00 Problem-solving class **Testing**			

	Duration: 02:00 Lecture			
7	**Testing** Duration: 02:00 Problem-solving class **Static evaluation** Duration: 02:00 Problem-solving class			
8				**Black box exercise** Individual work Continuous assessment Not Presential Duration: 02:00
9	**Testing** Duration: 02:00 Lecture			
10	**Testing** Duration: 02:00 Problem-solving class			
11				**Assignment: testing a software system (part 1)** Group work Continuous assessment Not Presential Duration: 10:00
12	**Testing: follow-up of assignment** Duration: 02:00 Cooperative activities			
13	**Testing: follow-up of assignment** Duration: 02:00 Cooperative activities			
14				**Assignment: testing a software system (part 2)** Group work Continuous assessment Not Presential Duration: 10:00
15	**Static evaluation: follow-up of assignment** Duration: 02:00 Cooperative activities			**Static techniques submission** Group work Continuous assessment Not Presential Duration: 10:00
16				**Static techniques presentation** Group work Continuous assessment Presential Duration: 02:00
				Attendance Other assessment Continuous assessment Presential Duration: 00:00 **Static techniques exercise resubmission** Individual work Final examination Not Presential Duration: 02:00 **White box exercise resubmission**



17				Individual work Final examination Not Presential Duration: 02:00 **Black box exercise resubmission** Individual work Final examination Not Presential Duration: 02:00 **Assignment resubmission: testing a software system (part 1)** Group work Final examination Not Presential Duration: 10:00 **Assignment resubmission: testing a software system (part 2)** Group work Final examination Not Presential Duration: 10:00 **Static techniques presentation (second chance)** Group work Final examination Presential Duration: 10:00 **Static techniques resubmission** Group work Final examination Presential Duration: 02:00

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.

* The schedule is based on an a priori planning of the subject; it might be modified during the academic year, especially considering the COVID19 evolution.

7. Activities and assessment criteria

7.1. Assessment activities

7.1.1. Assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
3	Static techniques exercise	Individual work	No Presential	02:00	10%	2 / 10	CE8 CE7 CG12
5	White box exercise	Individual work	No Presential	02:00	10%	2 / 10	CG12 CE8 CE7
8	Black box exercise	Individual work	No Presential	02:00	10%	2 / 10	CE8 CE7 CG12
11	Assignment: testing a software system (part 1)	Group work	No Presential	10:00	20%	3 / 10	CE8 CE7 CG4 CG18 CG1 CG19
14	Assignment: testing a software system (part 2)	Group work	No Presential	10:00	20%	3 / 10	CE8 CE7 CG4 CG18 CG1 CG19
15	Static techniques submission	Group work	No Presential	10:00	15%	3 / 10	CE8 CE7 CG4 CG1 CG19
16	Static techniques presentation	Group work	Face-to-face	02:00	5%	5 / 10	CG12 CG18
17	Attendance	Other assessment	Face-to-face	00:00	10%	8 / 10	CE7 CE8

7.1.2. Global examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
17	Static techniques exercise resubmission	Individual work	No Presential	02:00	10%	5 / 10	CE8 CE7 CG12
17	White box exercise resubmission	Individual work	No Presential	02:00	10%	5 / 10	CE8 CE7 CG12
17	Black box exercise resubmission	Individual work	No Presential	02:00	10%	5 / 10	CE8 CE7 CG12
17	Assignment resubmission: testing a software system (part 1)	Group work	No Presential	10:00	20%	5 / 10	CE8 CE7 CG4 CG1 CG19
17	Assignment resubmission: testing a software system (part 2)	Group work	No Presential	10:00	20%	5 / 10	CE8 CE7 CG4 CG1 CG19
17	Static techniques presentation (second chance)	Group work	Face-to-face	10:00	5%	5 / 10	CG12 CG18
17	Static techniques resubmission	Group work	Face-to-face	02:00	15%	5 / 10	CE8 CE7 CG4 CG1 CG19

7.1.3. Referred (re-sit) examination

Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
White box exercise (second resubmission)	Individual work	Face-to-face	02:00	10%	5 / 10	
Static techniques exercise (second resubmission)	Individual work	Face-to-face	02:00	10%	5 / 10	CG12 CE8 CE7
Black box exercise (second resubmission)	Individual work	Face-to-face	02:00	10%	5 / 10	
Assignment second resubmission: testing a software system (part 1)	Group work	Face-to-face	10:00	20%	5 / 10	

Assignment second resubmission: testing a software system (part 2)	Group work	Face-to-face	10:00	20%	5 / 10	
Static techniques presentation (third chance)	Group work	Face-to-face	10:00	20%	5 / 10	
Static techniques second resubmission	Group work	Face-to-face	02:00	20%	5 / 10	

7.2. Assessment criteria

Progressive evaluation period:

The score of the course is calculated regarding the performance of the student in the different tasks that (s)he has been assigned. A minimum overall score of 5 is needed to pass the course:

- Exercises (10% of the score each one):

- Applying a white box technique to a program.
- Applying a black box technique to a program.

- Applying a static technique to a program.

- Assignment performing testing on a software system (40% of the score). This assignment is divided into two parts, submitted separately. Each part counts 20% of the score:

- Testing a software system using a white box technique.
- Testing a software system using a black box technique.

- Assignment about static analysis (20% of the score). This assignment is divided into two parts:

- Doing the task proposed in the assignment (15% of the score).
- Its presentation (5% of the score).

It will also be taken into consideration for the score of the course attendance to the lectures (10% of the score). A minimum of 80% of attendance is required to pass this evaluation criterion. **This task is unrecoverable**. Students that have a justification for not being able to fulfill this criterion (e.g. conciliation issues, health problems, etc.) will be offered an alternative to pass this criterion.

Global evaluation:

When the overall score obtained by the student in the progressive evaluation period is smaller than 5, the student will have to re-submit:

- All exercises/assignments that do not reach the minimum score required.
- From those exercises/assignments that do reach the minimum required, but have a score smaller than 5, the student will choose which ones (s)he wants to re-submit.
- In any case exercises/assignments that have a score equal or greater than 5 will be re-submitted.
- The score for the attendance criterion will be taken from the score obtained during the progressive evaluation period. In case the student has not reached the minimum score to pass this criterion during the progressive evaluation period, the global evaluation will be scored out of 9 instead of 10.

Note that during global evaluation, the student can re-submit those exercises/assignments that have been submitted during the progressive evaluation period. It is not possible to submit exercises/assignments for which there is not a submission in the progressive evaluation period.

A minimum score of 5 is needed to pass the course.

Extraordinary evaluation:

When the overall score obtained by the student in the global evaluation period is smaller than 5, the student will have to re-submit (or submit in case (s)he has not done it before):

- All exercises/assignments that do not reach the minimum score required.
- From those exercises/assignments that do reach the minimum required, but have a score smaller than 5, the student will choose which ones (s)he wants to re-submit.
- In any case exercises/assignments that have a score equal or greater than 5 will be re-submitted.
- The score for the attendance criterion will be taken from the score obtained during the progressive evaluation period. In case the student has not reached the minimum score to pass this criterion during the progressive evaluation period, the global evaluation will be scored out of 9 instead of 10.

A minimum score of 5 is needed to pass the course.

8. Teaching resources

8.1. Teaching resources for the subject

Name	Type	Notes
B. Beizer. "Software Testing Techniques" 2ª Edición. 1990	Bibliography	
G. J. Myers. "The Art of Software Testing" 2ª Edición. Wiley. 2004.	Bibliography	
P.C. Jorgensen. Software Testing. A Craftsman?s Approach. CRC Press, 1995.	Bibliography	
C. Kaner, J. Falk, H.Q. Nguyen. Testing Computer Software. Wiley, 1999.	Bibliography	
W.E. Perry. Effective methods for software testing. Tercera edición. Wiley. 2006	Bibliography	
S.L. Pfleeger. Ingeniería de software: teoría y práctica. Segunda edición. Prentice Hall. 2002	Bibliography	
IEEE V&V standards	Bibliography	
Moodle site of the course	Web resource	

7.3.3 Software Quality Management

ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

103000487 - Software Quality Management

DEGREE PROGRAMME

10AM - Master Universitario En Ingenieria Del Software

ACADEMIC YEAR & SEMESTER

2023/24 - Semester 2

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6. Activities and assessment criteria....9
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1. Description

1.1. Subject details

Name of the subject	103000487 - Software Quality Management
No of credits	4 ECTS
Type	Compulsory
Academic year ot the programme	First year
Semester of tuition	Semester 2
Tuition period	February-June
Tuition languages	English
Degree programme	10AM - Master Universitario en Ingenieria del Software
Centre	10 - Escuela Tecnica Superior De Ingenieros Informaticos
Academic year	2023-24

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	**Office/Room**	**Email**	**Tutoring hours ***
Angelica De Antonio Jimenez (Subject coordinator)	5108	angelica.deantonio@upm.es	M - 10:30 - 12:00 Tu - 17:00 - 18:30 Th - 09:30 - 10:00 Th - 12:00 - 14:30 Previous appointment should be requested at angelica.deantonio@upm.es Check tutoring hours at: https://doc

			s.google.com/spreadsheets/d/1O2ElQzNBt7pKt-rTGc6JnySNJ-VT5nCz_BPaPMiK2KY/edit?usp=sharing
Jaime Ramirez Rodriguez	5112	jaime.ramirez@upm.es	Sin horario. Previous appointment is recommended. Check tutoring hours at: https://docs.google.com/spreadsheets/d/1O2ElQzNBt7pKt-rTGc6JnySNJ-VT5nCz_BPaPMiK2KY/edit?usp=sharing

* 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

CE1 - Elaborar un plan de proyecto que permita coordinar y priorizar recursos y actividades para obtener los resultados esperados en los plazos, costes y calidad establecidos

CE11 - Identificar, controlar, informar y auditar la configuración de un sistema y sus cambios

CE6 - Diseñar las pruebas de los módulos y ayudar a diseñar las pruebas de integración e instalación. Realizar la integración del sistema, las pruebas de integración y la instalación.

CE7 - Elaborar un plan de verificación y validación que permita coordinar y priorizar recursos y actividades para garantizar el nivel de calidad requerido.

CG1 - 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 (RD)

CG12 - Comprensión amplia de las técnicas y métodos aplicables en una especialización concreta, así como de sus límites

CG18 - Capacidad de trabajar y comunicarse también en contextos internacionales

CG19 - Aproximación sistemática a la gestión de riesgos

CG2 - Que los estudiantes sean capaces de integrar conocimientos y enfrentarse a la complejidad de formular juicios a partir de una información que, siendo incompleta o limitada, incluya reflexiones sobre las responsabilidades sociales y éticas vinculadas a la aplicación de sus conocimientos y juicios (RD)

CG3 - 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 (RD)

3.2. Learning outcomes

RA40 - Es capaz de identificar y establecer las prácticas necesarias para gestionar la configuración de un sistema software

RA42 - Comprende la interrelación entre calidad del producto y calidad del proceso

RA43 - Conoce y aplica técnicas de control de calidad de productos y procesos

RA7 - Knows and applies quality models to identify and specify the quality attributes a software system must satisfy

RA10 - Understands the mission of a quality system and knows the applicable standards and norms

RA8 - Knows and determines the most appropriate verification and validation techniques to be applied in a software development project with the aim of assuring the quality level required

RA9 - Is able to identify and determine the practices needed to manage a software system configuration

RA11 - Understands the interrelation between product quality and process quality

RA12 - Knows and applies product and process quality control techniques

RA38 - Conoce y aplica modelos de calidad para la identificación y especificación de los atributos de calidad a satisfacer por un sistema software

RA41 - Comprende la misión de un sistema de calidad y conoce los estándares y normas aplicables

RA39 - Conoce y determina las técnicas de verificación y validación más apropiadas para aplicar en un proyecto de desarrollo de software con el objetivo de garantizar el nivel de calidad requerido

* 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

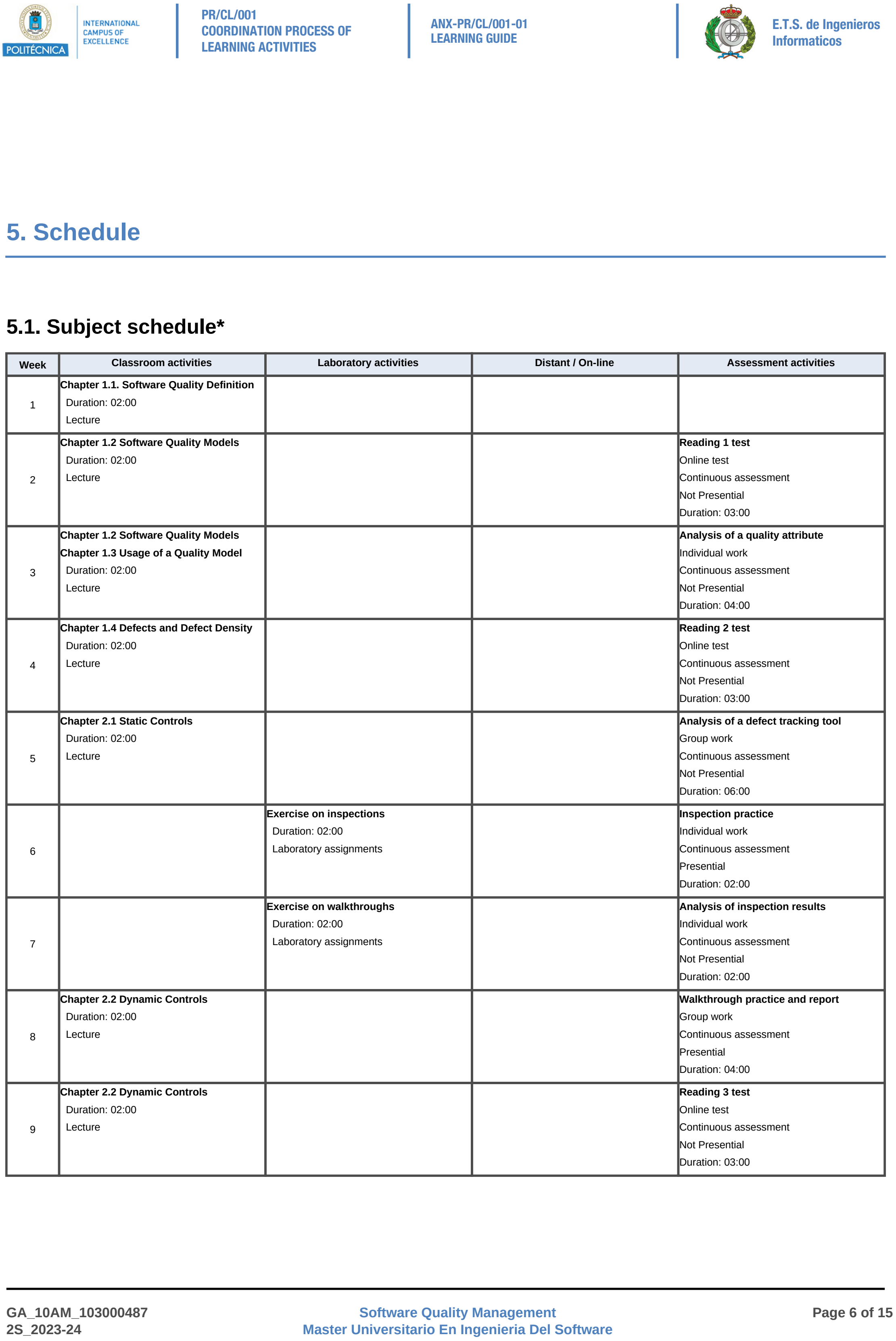
4.1. Brief description of the subject

The goal of the Software Quality Management subject is to provide the student with a broad overview about the different aspects involved in the development of software with a required level of quality. The following questions are addressed:

- What is the meaning of quality in the software domain?
- How can we define precisely the quality required from a software system?
- How can we measure the quality of a software system?
- How can we measure the quality of a software process?
- How can we control quality during the development of a software system?
- How can we control the configuration and evolution of a software system?
- How can we build quality into the software being developed?
- How can we manage software quality from an organizational point of view?
- How can we evaluate the cost and benefits of quality?
- How can we make factual-based decisions about the quality of a software system?

4.2. Syllabus

1. Introduction to Software Quality
    1.1. Software Quality Definition
    1.2. Software Quality Models
    1.3. Usage of a Quality Model
    1.4. Defects and Defect Density
2. Software Quality Control Activities
    2.1. Static Controls
    2.2. Dynamic Controls
3. Quality Metrics
    3.1. Product and Process Quality Metrics
    3.2. Comparison of Quality Control Activities
4. Quality Management and Quality Systems
    4.1. Introduction to Quality Management and related standards and norms
    4.2. The Quality System and the Quality Manual
    4.3. Quality Management Tools
    4.4. The Cost of Quality
5. Software Quality Assurance Activities
    5.1. Introduction to Quality Assurance
    5.2. Quality Construction
    5.3. Quality Assurance Planning
6. Software Configuration Management
    6.1. Basic Concepts of Software Configuration Management
    6.2. Configuration Identification
    6.3. Configuration Change Control
    6.4. Configuration Status Accounting
    6.5. Configuration Audits
    6.6. Configuration Management Plan



INTERNATIONAL CAMPUS OF EXCELLENCE

POLITÉCNICA

PR/CL/001
COORDINATION PROCESS OF
LEARNING ACTIVITIES

ANX-PR/CL/001-01
LEARNING GUIDE

E.T.S. de Ingenieros
Informaticos

5. Schedule

5.1. Subject schedule*

Week	Classroom activities	Laboratory activities	Distant / On-line	Assessment activities
1	**Chapter 1.1. Software Quality Definition** Duration: 02:00 Lecture			
2	**Chapter 1.2 Software Quality Models** Duration: 02:00 Lecture			**Reading 1 test** Online test Continuous assessment Not Presential Duration: 03:00
3	**Chapter 1.2 Software Quality Models** **Chapter 1.3 Usage of a Quality Model** Duration: 02:00 Lecture			**Analysis of a quality attribute** Individual work Continuous assessment Not Presential Duration: 04:00
4	**Chapter 1.4 Defects and Defect Density** Duration: 02:00 Lecture			**Reading 2 test** Online test Continuous assessment Not Presential Duration: 03:00
5	**Chapter 2.1 Static Controls** Duration: 02:00 Lecture			**Analysis of a defect tracking tool** Group work Continuous assessment Not Presential Duration: 06:00
6		**Exercise on inspections** Duration: 02:00 Laboratory assignments		**Inspection practice** Individual work Continuous assessment Presential Duration: 02:00
7		**Exercise on walkthroughs** Duration: 02:00 Laboratory assignments		**Analysis of inspection results** Individual work Continuous assessment Not Presential Duration: 02:00
8	**Chapter 2.2 Dynamic Controls** Duration: 02:00 Lecture			**Walkthrough practice and report** Group work Continuous assessment Presential Duration: 04:00
9	**Chapter 2.2 Dynamic Controls** Duration: 02:00 Lecture			**Reading 3 test** Online test Continuous assessment Not Presential Duration: 03:00

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Software Quality Management
Master Universitario En Ingenieria Del Software

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10	**Chapter 3. Quality Metrics** Duration: 01:00 Lecture			**First Partial exam** Written test Continuous assessment Presential Duration: 01:00
11	**Chapter 4. Quality Management** Duration: 02:00 Lecture			**Reading 4 test** Online test Continuous assessment Not Presential Duration: 03:00
12	**Chapter 4. Quality Management** Duration: 01:00 Lecture **Chapter 5. Quality Assurance** Duration: 01:00 Lecture			
13	**Chapter 6. Software Configuration Management** Duration: 02:00 Lecture			
14	**Chapter 6. Software Configuration Management** Duration: 02:00 Lecture			**Configuration Management exercises** Individual work Continuous assessment Not Presential Duration: 04:00
15				**Analysis of basic quality management tools** Group work Continuous assessment Not Presential Duration: 05:00 **Presentation of work on basic quality management tools** Group presentation Continuous assessment Presential Duration: 02:00
16				**Individual exercises (submitted after the deadline for progressive evaluation, or failed and re-submitted)** Individual work Final examination Not Presential Duration: 00:00 **Student participation** Other assessment Continuous assessment Presential Duration: 00:00 **First partial exam (if the grade obtained in progressive evaluation is below the minimum of 4)** Written test Final examination Presential Duration: 02:00 **Second partial exam**

				Written test Continuous assessment Presential Duration: 02:00 **Reading tests** Online test Final examination Not Presential Duration: 12:00 **Group exercises (submitted after the deadline for progressive evaluation, or failed and re-submitted)** Group work Final examination Not Presential Duration: 00:00
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.

* The schedule is based on an a priori planning of the subject; it might be modified during the academic year, especially considering the COVID19 evolution.

6. Activities and assessment criteria

6.1. Assessment activities

6.1.1. Assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
2	Reading 1 test	Online test	No Presential	03:00	2.5%	/ 10	CG12
3	Analysis of a quality attribute	Individual work	No Presential	04:00	7%	/ 10	CE7 CG12 CG18
4	Reading 2 test	Online test	No Presential	03:00	2.5%	/ 10	CG12
5	Analysis of a defect tracking tool	Group work	No Presential	06:00	7%	/ 10	CG2 CG3 CG12 CG18 CG1 CE11
6	Inspection practice	Individual work	Face-to-face	02:00	7%	/ 10	CE7 CG1 CE6
7	Analysis of inspection results	Individual work	No Presential	02:00	3%	/ 10	CG2 CG3 CG18 CG1
8	Walkthrough practice and report	Group work	Face-to-face	04:00	8%	/ 10	CE7 CG12 CE1
9	Reading 3 test	Online test	No Presential	03:00	2.5%	/ 10	CG12 CE1
10	First Partial exam	Written test	Face-to-face	01:00	20%	4 / 10	CE6 CE7 CE1
11	Reading 4 test	Online test	No Presential	03:00	2.5%	/ 10	CG12
14	Configuration Management exercises	Individual work	No Presential	04:00	3%	/ 10	CE11
15	Analysis of basic quality management tools	Group work	No Presential	05:00	7%	/ 10	CE1 CG19

15	Presentation of work on basic quality management tools	Group presentation	Face-to-face	02:00	3%	/ 10	CG3 CG18
16	Student participation	Other assessment	Face-to-face	00:00	5%	/ 10	
16	Second partial exam	Written test	Face-to-face	02:00	20%	4 / 10	CE6 CE7 CG12 CG1 CG19 CE1 CE11

6.1.2. Global examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
16	Individual exercises (submitted after the deadline for progressive evaluation, or failed and re-submitted)	Individual work	No Presential	00:00	13%	/ 10	CG2 CE7 CG3 CG12 CG18 CG1 CG19 CE11
16	First partial exam (if the grade obtained in progressive evaluation is below the minimum of 4)	Written test	Face-to-face	02:00	40%	4 / 10	CE6 CG2 CE7 CG3 CG12 CG1 CG19 CE1 CE11
16	Reading tests	Online test	No Presential	12:00	10%	/ 10	CG12
16	Group exercises (submitted after the deadline for progressive evaluation, or failed and re-submitted)	Group work	No Presential	00:00	14%	/ 10	CG2 CG3 CG12 CG18 CG1 CG19 CE11

6.1.3. Referred (re-sit) examination

Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
Extraordinary evaluation exam	Written test	Face-to-face	02:00	40%	4 / 10	CE6 CE7 CG12 CE1 CE11
Reading tests	Online test	Face-to-face	12:00	10%	/ 10	CG12
Group exercises (grade obtained in ordinary evaluation, or new submission - see conditions for submission)	Group work	Face-to-face	00:00	25%	/ 10	CG2 CG3 CG12 CG18 CG1 CG19 CE11
Individual exercises (grade obtained in ordinary evaluation, or new submission - see conditions for submission)	Individual work	Face-to-face	00:00	20%	/ 10	CE7 CG3 CG2 CG12 CG18 CG1 CG19
Student participation (grade obtained in progressive evaluation)	Other assessment	Face-to-face	00:00	5%	/ 10	

6.2. Assessment criteria

Course evaluation system:

The course is graded following a progressive assessment method.

The student passes the course in ordinary evaluation only if:

- 5 or more points over 10 are obtained at the end of the course, by applying the formula:

FINAL GRADE = 40% Individual and group exercises + 15% Reading tests in Moodle + 40% Exams + 5% Student participation

- A minimum grade of 4 over 10 is obtained in each of the partial exams

The maximum grade for each of the evaluation components and the minimum grade needed to compensate non-passed parts are indicated in the following table.

	MAXIMUM GRADE (and correspondence over the final grade)	**MINIMUM GRADE TO COMPENSATE NON-PASSED PARTS**
Individual and group exercises (45%)	10 (4,5)	4 over 10
Reading tests (10%). Grade computed as the average of the grade obtained in all reading tests.	10 (1,0)	-
Exams (40%). Grade computed as the average of the grade obtained in both exams.	10 (4,0)	4 over 10
Student participation (5%). Grade obtained through regular attendance to the classes, and active participation in them.	10 (0,5)	-

The grade for the Individual and group exercises component will be obtained through the following evaluation activities:

Individual exercises

- Analysis of a quality attribute. Impact on the final grade: 0,7
- Inspection practice. Impact on the final grade: 0,7. THIS ACTIVITY IS PERFORMED IN THE CLASSROOM AND CANNOT BE RECOVERED IN THE GLOBAL EVALUATION
- Analysis of inspection results. Impact on the final grade: 0,3.
- Configuration management exercises. Impact on the final grade: 0,3.

Group exercises

- Analysis of a defect tracking tool. Impact on the final grade: 0,7
- Walkthrough practice. Impact on the final grade: 0,8. THIS ACTIVITY IS PERFORMED IN THE CLASSROOM AND CANNOT BE RECOVERED IN THE GLOBAL EVALUATION
- Analysis of a basic quality management tool. Impact on the final grade: 0,7.
- Presentation of the analysis of a basic quality management tool. Impact on the final grade: 0,3. THIS ACTIVITY IS PERFORMED IN THE CLASSROOM AND CANNOT BE RECOVERED IN THE GLOBAL EVALUATION

Global evaluation

When failed (grade below the minimum), the first partial exam should be repeated in the global evaluation date fixed in the exam calendar.

The individual and group exercises submitted after the deadline established for the progressive evaluation will be considered as submitted to the global evaluation, and consequently they will be graded at the end of the semester, without the possibility to re-submit them at the global evaluation period.

The individual and group exercises submitted before the deadline established for the progressive evaluation will be graded and, if failed (grade below the minimum), the student will be allowed to re-submit them at the global evaluation period, although re-submission is not mandatory to pass the course.

Some evaluation activities can only be performed in a progressive way, namely:

- Inspection practice. Impact on the final grade: 0,7.
- Walkthrough practice. Impact on the final grade: 0,8.
- Presentation of the analysis of a basic quality management tool. Impact on the final grade: 0,3.

Attendance to the classes in which these activities are performed is mandatory. The dates for these classes will be announced at least 14 days in advance. Students not attending these classes will be graded as 0 in the corresponding evaluation activities, without the possibility to pass them either in the global or in the extraordinary evaluation.

The Student participation will also be graded only progressively, and it will depend on attendance to the classes and active participation in the discussions. Impact on the final grade: 0,5.

Extraordinary evaluation

When failed (grade below the minimum), any of the partial exams should be repeated in the extraordinary evaluation date fixed in the exam calendar.

Only the individual and group exercises not submitted for the ordinary evaluation (progressive or global) can be submitted for the extraordinary evaluation. For all submitted exercises, the grades obtained in ordinary evaluation will be considered for the computation of the final grade.

7. Teaching resources

7.1. Teaching resources for the subject

Name	Type	Notes
Schulmeyer, 2007	Bibliography	Gordon Schulmeyer, G. (2007) Handbook of Software Quality Assurance, Artech House Publishers, 4th ed.
Fagan, 1976	Bibliography	M.E. Fagan, Design and Code Inspections to Reduce Errors in Program Development, IBM Systems Journal, Vol. 15, Nº 3, pp. 182-210, 1976
Galin, 2003	Bibliography	D. Galin (2003) Software Quality Assurance: From Theory to Implementation, Addison-Wesley
McCall, 1977	Bibliography	J.A. McCall, P.K. Richards,.G.F. Walters, Factors in Software Quality, RADC-TR-77-369, Rome Air Development Center, United States Air Force, 1977
Cianfrani, 2009	Bibliography	C.A. Cianfrani, J.J. Tsiakals, J.E. West (2009) ISO 9001:2008 Explained, ASQ Quality Press
ISO/IEC 9126-1:2001	Bibliography	ISO/IEC 9126-1:2001, Software engineering -- Product quality -- Part 1: Quality model
ISO/IEC TR 9126-2:2003	Bibliography	ISO/IEC TR 9126-2:2003, Software engineering -- Product quality -- Part 2: External metrics
ISO/IEC TR 9126-3:2003	Bibliography	ISO/IEC TR 9126-3:2003, Software engineering -- Product quality -- Part 3: Internal metrics
ISO/IEC TR 9126-4:2004	Bibliography	ISO/IEC TR 9126-4:2004, Software engineering -- Product quality -- Part 4: Quality in use metrics

IEEE 983-86	Bibliography	IEEE Guide for Software Quality Assurance Planning, ANSI/IEEE std. 983-1986, IEEE Computer Society, Software Engineering Technical Committee, Software Engineering Standards Subcommittee, 1986
IEEE 1028-2008	Bibliography	IEEE Standard for Software Reviews and Audits, ANSI/IEEE IEEE std. 1028-2008, IEEE Computer Society, Software Engineering Technical Committee, Software Engineering Standards Subcommittee, 2008
The how and why of auditing	Web resource	http://videos.asq.org/the-how-and-why-of-auditing
Guidelines for the Application of ISO 9001:2000 to Computer Software	Bibliography	IEEE Guide Adoption of ISO/IEC 90003:2004 Software Engineering -Guidelines for the Application of ISO 9001:2000 to Computer Software
Subject web site	Web resource	https://moodle.upm.es/titulaciones/oficiales/course/view.php?id=2999

8. Other information

8.1. Other information about the subject

7.4 Advanced Software Engineering Aspects Module

7.4.1 Adaptive Systems

POLITÉCNICA
INTERNATIONAL
CAMPUS OF
EXCELLENCE

COORDINATION PROCESS OF
LEARNING ACTIVITIES
PR/CL/001

E.T.S. de Ingenieros
Informaticos

ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

103000739 - Adaptive Systems

DEGREE PROGRAMME

10AM - Master Universitario En Ingenieria Del Software

ACADEMIC YEAR & SEMESTER

2023/24 - Semester 1

Index

Learning guide

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1. Description

1.1. Subject details

Name of the subject	103000739 - Adaptive Systems
No of credits	4 ECTS
Type	Optional
Academic year ot the programme	First year
Semester of tuition	Semester 1
Tuition period	September-January
Tuition languages	English
Degree programme	10AM - Master Universitario en Ingenieria del Software
Centre	10 - Escuela Tecnica Superior De Ingenieros Informaticos
Academic year	2023-24

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Angelica De Antonio Jimenez	5108	angelica.deantonio@upm.es	Sin horario. The tutoring table can be found at: https://docs.google.com/spreadsheets/d/1O2ElQzNBt7pKt-rTGc6JnySNJ-VT5nCz_BPaPMiK2KY/edit#gid=0

Jaime Ramirez Rodriguez (Subject coordinator)	5112	jaime.ramirez@upm.es	Sin horario. The tutoring table can be found at: https://docs.google.com/spreadsheets/d/1O2ElQzNBt7pKt-rTGc6JnySNJ-VT5nCz_BPaPMiK2KY/edit#gid=0

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

3. Prior knowledge recommended to take the subject

3.1. Recommended (passed) subjects

The subject - recommended (passed), are not defined.

3.2. Other recommended learning outcomes

- Computer programming

4. Skills and learning outcomes *

4.1. Skills to be learned

CE13 - Tener una visión de los distintos aspectos específicos y emergentes de la ingeniería del software, y profundizar en algunos de ellos

CE14 - Comprender lo que pueden y no pueden conseguir las prácticas actuales de ingeniería del software, y sus limitaciones y su posible futura evolución.

CG13 - Apreciación de los límites del conocimiento actual y de la aplicación práctica de la tecnología más reciente

CG18 - Capacidad de trabajar y comunicarse también en contextos internacionales

CG3 - 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 (RD)

CG8 - Planteamiento y resolución de problemas también en áreas nuevas y emergentes de su disciplina

CG9 - Aplicación de los métodos de resolución de problemas más recientes o innovadores y que puedan implicar el uso de otras disciplinas

4.2. Learning outcomes

RA88 - Knowledge of Methods for student modelling and individualized and adapted interaction with learning systems

RA89 - Model the user and to design adaptive user interfaces based on the user

* 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.

5. Brief description of the subject and syllabus

5.1. Brief description of the subject

Interaction design methods focused on providing the same content to all users offer limited possibilities in addressing the specific needs and requirements of different types of users. Therefore, an essential feature of certain interactive applications should be their ability to provide some form of automatic adaptation and customization. The main objective of this course is to achieve an understanding of the models, techniques and architectures necessary to make a computer application dynamically adapt to the specific needs and requirements of different types of users at all times.

Adaptive systems maintain a model of the interests, preferences and / or knowledge of each individual user, and use this model to adapt the behavior of the systems to the needs of that user.

This course will cover the main components of the user model in the context of adaptive systems. And within the adaptive systems, the personalized search systems on the Web will be addressed first and it will be explained how these systems are supported by the user model.

Recommendation systems have become essential tools in many areas of application, because they help alleviate information overload as they select the most appropriate content for each user based on their preferences and / or interests. In this sense, these types of systems help users in decision-making by providing personalized services and help information providers and companies to serve customers more effectively.

In this course, the general characteristics of the recommendation systems will be explained and a classification of these systems will be presented according to the type of techniques they use to generate the recommendations. According to this classification, we will distinguish between content-based, collaborative filtering, and hybrid recommenders. Following this, an introduction will be given to the main techniques on which each of these groups of recommenders are based, highlighting the strengths and weaknesses of each group.

E-learning is a traditional domain for the application of personalization and adaptation technologies. One of the main objectives of these applications is to improve the effectiveness and efficiency of learning experiences. The last topic of the course will be about adaptive e-learning systems paying special attention to intelligent tutoring systems.

5.2. Syllabus

1. User Modeling for Adaptive Systems and Adaptive Web

2. Recommender Systems

    2.1. Content based Recommender Systems

    2.2. Collaborative Filter based Recommender Systems

    2.3. Context aware Recommender Systems

3. Technology-enhanced adaptive learning

6. Schedule

6.1. Subject schedule*

Week	Classroom activities	Laboratory activities	Distant / On-line	Assessment activities
1	**Presentation of the subject** Duration: 02:00 Lecture			**Classroom Participation grade** Other assessment Continuous assessment Presential Duration: 00:00
2	**User modeling for Adaptive Systems and Adaptive Web** Duration: 02:00 Lecture			**Classroom Participation grade** Other assessment Continuous assessment Presential Duration: 00:00
3	**Recommender Systems** Duration: 02:00 Lecture			**Classroom Participation grade** Other assessment Continuous assessment Presential Duration: 00:00
4	**Recommender Systems** Duration: 02:00 Lecture			**Classroom Participation grade** Other assessment Continuous assessment Presential Duration: 00:00
5	**Recommender Systems** Duration: 02:00 Lecture			**Exam** Online test Continuous assessment and final examination Not Presential Duration: 01:00 **Classroom Participation grade** Other assessment Continuous assessment Presential Duration: 00:00
6	**Workshop associated with practical exercise 1** Duration: 02:00 Laboratory assignments			**Practical exercise 1** Group work Continuous assessment and final examination Not Presential Duration: 07:00 **Classroom Participation grade** Other assessment Continuous assessment Presential Duration: 00:00

7	**Recommender Systems** Duration: 02:00 Lecture			**Practical exercise 1** Group work Continuous assessment and final examination Not Presential Duration: 07:00 **Classroom Participation grade** Other assessment Continuous assessment Presential Duration: 00:00
8	**Recommender Systems** Duration: 02:00 Lecture			**Practical exercise 1** Group work Continuous assessment and final examination Not Presential Duration: 20:00 **Classroom Participation grade** Other assessment Continuous assessment Presential Duration: 00:00
9	**Workshop associated with practical exercise 2** Duration: 02:00 Laboratory assignments			**Practical exercise 2** Group work Continuous assessment and final examination Not Presential Duration: 20:00 **Classroom Participation grade** Other assessment Continuous assessment Presential Duration: 00:00
10	**Recommender Systems** Duration: 02:00 Lecture			**Practical exercise 2** Group work Continuous assessment and final examination Not Presential Duration: 10:00 **Classroom Participation grade** Other assessment Continuous assessment Presential Duration: 00:00
11	**Recommender Systems** Duration: 02:00 Lecture			**Practical exercise 2** Group work Continuous assessment and final examination Not Presential Duration: 10:00 **Classroom Participation grade** Other assessment Continuous assessment Presential Duration: 00:00

12	**Technology-enhanced adaptive learning** Duration: 02:00 Lecture			**Classroom Participation grade** Other assessment Continuous assessment Presential Duration: 00:00
13	**Technology-enhanced adaptive learning** Duration: 02:00 Lecture			**Classroom Participation grade** Other assessment Continuous assessment Presential Duration: 00:00
14	**Technology-enhanced adaptive learning** Duration: 02:00 Lecture			**Classroom Participation grade** Other assessment Continuous assessment Presential Duration: 00:00
15	**Research topic presentations** Duration: 02:00 Additional activities			**Research topic analysis** Group work Continuous assessment Presential Duration: 08:00 **Design of Adaptive Tutoring System** Group work Continuous assessment Presential Duration: 00:00 **Classroom Participation grade** Other assessment Continuous assessment Presential Duration: 00:00
16				
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.

* The schedule is based on an a priori planning of the subject; it might be modified during the academic year, especially considering the COVID19 evolution.

7. Activities and assessment criteria

7.1. Assessment activities

7.1.1. Assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
1	Classroom Participation grade	Other assessment	Face-to-face	00:00	.33%	0 / 10	CG9 CG13 CG3 CG8 CG18 CE13
2	Classroom Participation grade	Other assessment	Face-to-face	00:00	.33%	0 / 10	CG9 CG13 CG3 CG8 CG18 CE13
3	Classroom Participation grade	Other assessment	Face-to-face	00:00	.33%	0 / 10	CG9 CG13 CG3 CG8 CG18 CE13
4	Classroom Participation grade	Other assessment	Face-to-face	00:00	.33%	0 / 10	CG9 CG13 CG3 CG8 CG18 CE13
5	Exam	Online test	No Presential	01:00	10%	0 / 10	CG13 CE14 CE13
5	Classroom Participation grade	Other assessment	Face-to-face	00:00	.33%	0 / 10	CG9 CG13 CG3 CG8 CG18 CE13

6	Practical exercise 1	Group work	No Presential	07:00	5%	5 / 10	CG13 CE14 CG3 CE13
6	Classroom Participation grade	Other assessment	Face-to-face	00:00	.33%	0 / 10	CG9 CG13 CG3 CG8 CG18 CE13
7	Practical exercise 1	Group work	No Presential	07:00	5%	5 / 10	CG13 CE14 CG3 CE13
7	Classroom Participation grade	Other assessment	Face-to-face	00:00	.33%	0 / 10	CG9 CG13 CG3 CG8 CG18 CE13
8	Practical exercise 1	Group work	No Presential	20:00	15%	5 / 10	CG13 CE14 CG3 CE13
8	Classroom Participation grade	Other assessment	Face-to-face	00:00	.33%	0 / 10	CG9 CG13 CG3 CG8 CG18 CE13
9	Practical exercise 2	Group work	No Presential	20:00	20%	5 / 10	CG9 CG13 CE14 CG8 CG18 CE13
9	Classroom Participation grade	Other assessment	Face-to-face	00:00	.33%	0 / 10	CG9 CG13 CG3 CG8 CG18 CE13
10	Practical exercise 2	Group work	No Presential	10:00	10%	5 / 10	CG9 CG13 CE14 CG8 CG18 CE13

10	Classroom Participation grade	Other assessment	Face-to-face	00:00	.33%	0 / 10	CG9 CG13 CG3 CG8 CG18 CE13
11	Practical exercise 2	Group work	No Presential	10:00	5%	5 / 10	CG9 CG13 CE14 CG8 CG18 CE13
11	Classroom Participation grade	Other assessment	Face-to-face	00:00	.33%	0 / 10	CG9 CG13 CG3 CG8 CG18 CE13
12	Classroom Participation grade	Other assessment	Face-to-face	00:00	.33%	0 / 10	CG9 CG13 CG3 CG8 CG18 CE13
13	Classroom Participation grade	Other assessment	Face-to-face	00:00	.33%	0 / 10	CG9 CG13 CG3 CG8 CG18 CE13
14	Classroom Participation grade	Other assessment	Face-to-face	00:00	.33%	0 / 10	CG9 CG13 CG3 CG8 CG18 CE13
15	Research topic analysis	Group work	Face-to-face	08:00	12.5%	5 / 10	CG13 CE14 CG3 CE13
15	Design of Adaptive Tutoring System	Group work	Face-to-face	00:00	12.5%	5 / 10	CG13 CE14 CG9 CG18 CE13
15	Classroom Participation grade	Other assessment	Face-to-face	00:00	.38%	0 / 10	

7.1.2. Global examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
5	Exam	Online test	No Presential	01:00	10%	0 / 10	CG13 CE14 CE13
6	Practical exercise 1	Group work	No Presential	07:00	5%	5 / 10	CG13 CE14 CG3 CE13
7	Practical exercise 1	Group work	No Presential	07:00	5%	5 / 10	CG13 CE14 CG3 CE13
8	Practical exercise 1	Group work	No Presential	20:00	15%	5 / 10	CG13 CE14 CG3 CE13
9	Practical exercise 2	Group work	No Presential	20:00	20%	5 / 10	CG9 CG13 CE14 CG8 CG18 CE13
10	Practical exercise 2	Group work	No Presential	10:00	10%	5 / 10	CG9 CG13 CE14 CG8 CG18 CE13
11	Practical exercise 2	Group work	No Presential	10:00	5%	5 / 10	CG9 CG13 CE14 CG8 CG18 CE13

7.1.3. Referred (re-sit) examination

Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills

Practical exercise 1	Individual work	Face-to-face	20:00	30%	5 / 10	CG9 CG13 CE14 CG3 CG8 CG18 CE13
Design of Adaptive Tutoring System	Individual work	Face-to-face	02:00	12.5%	5 / 10	CG13 CE14 CE13
Practical exercise 2	Individual work	Face-to-face	40:00	45%	5 / 10	CG9 CG13 CE14 CG3 CG8 CG18 CE13
Research topic analysis	Individual work	Face-to-face	00:00	12.5%	5 / 10	CE14 CG3 CE13 CG9 CG13

7.2. Assessment criteria

1. Regular Period

1.1. Distributed evaluation

The final grade (FG) will be calculated from the grades of the Practical Exercises (PEG1, PE2G), the Exam grade (EG), the Classroom Participation grade (CPG), the grade of the Design of Adaptive Tutoring System (DTG), and the Research Topic Analysis grade (RTG) by means of the following formula:

FG=0.25*PEG1+ 0.35*PEG2 + 0.10*EG + 0.125*RTG + 0.125*DTG + 0.05CPG

Where all the grades take values between 0 and 10.

The classroom participation grade stands for the ratio of attendance multiplied by 10. Additionally, **students will have to attend some prefixed classes associated with evaluation activities, which will be reported at least 15 days prior to the day of the evaluation activity.**

The grades obtained in the passed parts of the subject will be recorded for the global evaluation and the Extraordinary period if needed.

1.2. Global evaluation

If the student fails to pass the exam of the distributed evaluation, he/she will have a second chance in the global evaluation by doing another exam, which will determine the exam grade (EG) of the regular period.

If the student fails to pass some of the practical exercises, he/she will have a second chance in the global evaluation to submit the failed practical exercises.

However, given the proximity of the deadline of the research topic analysis and the Design of the Adaptive Tutoring to the global evaluation, it does not make sense that students can submit these assignments in the global evaluation.

2. Extraordinary Period

When failed, in the extraordinary period the final grade will be obtained from the grades of the Practical Exercises (30% + 45%), the grade of the Design of Adaptive Tutoring System (12.5%), and the Research Topic Analysis grade (12.5%).

8. Teaching resources

8.1. Teaching resources for the subject

Name	Type	Notes
Article	Bibliography	Brusilovsky, Peter, and Eva Millán. 2007. "User Models for Adaptive Hypermedia and Adaptive Educational Systems". The Adaptive Web, 3-53. doi:10.1007/978-3-540-72079-9_1.
book	Bibliography	Ricci, Francesco, Lior Rokach, and Bracha Shapira. 2015. Recommender Systems Handbook. Springer-Verlag. Vol. 54. doi:10.1007/978-0-387-85820-3.
book 2	Bibliography	Brusilovsky, Peter, Alfred Kobsa, and Wolfgang Nejdl. 2007. The Adaptive Web: Methods and Strategies of Web Personalization. The Adaptive Web. Vol. 4321. doi:10.1007/978-3-540-72079-9.
Article 2	Bibliography	O'Donnell, E., Lawless, S., Sharp, M., Wade, V. (2015) A Review of Personalised E-Learning: Towards Supporting Learner Diversity. International Journal of Distance Education Technologies, 13(1), 22-47, January-March 2015
book 3	Bibliography	K. Falk. Practical Recommender Systems. 2019. Publisher: Manning Publications

9. Other information

9.1. Other information about the subject

To contact professors, students can use their email addresses included in this document or a Moodle message.

Professors will publish the teaching materials (slides, assignments, etc.) they use throughout the course on the Moodle site of the subject. Additionally, professors will use the Moodle forum to announce key events and provide relevant information on the subject.

7.4.2 Agent Based Software Development

ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

103000538 - Agent-based Software Development

DEGREE PROGRAMME

10AM - Master Universitario En Ingenieria Del Software

ACADEMIC YEAR & SEMESTER

2023/24 - Semester 2

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1. Description

1.1. Subject details

Name of the subject	103000538 - Agent-Based Software Development
No of credits	6 ECTS
Type	Optional
Academic year ot the programme	First year
Semester of tuition	Semester 2
Tuition period	February-June
Tuition languages	English
Degree programme	10AM - Master Universitario en Ingenieria del Software
Centre	10 - Escuela Tecnica Superior De Ingenieros Informaticos
Academic year	2023-24

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Jose Maria Barambones Ramirez	D-5106	j.barambones@upm.es	M - 10:00 - 12:00 Tu - 10:00 - 12:00 W - 10:00 - 12:00
Ricardo Imbert Paredes (Subject coordinator)	D-5112	ricardo.imbert@upm.es	Tu - 15:00 - 18:00 W - 15:00 - 18:00

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

3. Prior knowledge recommended to take the subject

3.1. Recommended (passed) subjects

The subject - recommended (passed), are not defined.

3.2. Other recommended learning outcomes

- Strong requirement: skills in programming (Java)

- Algorithms and data structure

4. Skills and learning outcomes *

4.1. Skills to be learned

CE13 - Tener una visión de los distintos aspectos específicos y emergentes de la ingeniería del software, y profundizar en algunos de ellos

CE14 - Comprender lo que pueden y no pueden conseguir las prácticas actuales de ingeniería del software, y sus limitaciones y su posible futura evolución.

4.2. Learning outcomes

RA1 - Within an application field of Software Engineering, uses and designs the appropriate solution to solve some of its problems, describing the technical difficulties and the application limits

RA2 - Facing a real problem, chooses an appropriate Software Engineering solution, analyzing its viability, what can and cannot be achieved from the current state of development of the selected solution, and what is expected to advance in the future

RA3 - Explains which are the Software Engineering limits and frontiers, and the base of new tendencies and developments and advanced topics and their possible application

* 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.

5. Brief description of the subject and syllabus

5.1. Brief description of the subject

The continuous search for more powerful and of a higher level new abstraction mechanisms has lead nowadays towards a new development paradigm, based on software agents. This approach, which has been so many times referred as the final solution for all the previously unaffordable problems, far from being a "silver bullet", must be considered as another software development paradigm and, as such, subject to the Software Engineering discipline.

This subject will introduce the students into this new paradigm, settling the basic concepts of the technology, offering them a wide perspective of the current Software Engineering efforts in this area, always from a practical and applied perspective.

5.2. Syllabus

1. Introduction to agents
   1.1. General concepts
   1.2. Agent architectures
   1.3. Social nature of agents
2. Agent oriented software engineering
   2.1. Pitfalls of agent oriented development
   2.2. Standards
   2.3. Agent communication languages
   2.4. Development frameworks
   2.5. Methodologies
   2.6. Development notations
3. Agent oriented analysis
   3.1. Concepts for building agents
   3.2. Analysis according to different methodologies
   3.3. Goal identification
   3.4. Role modelling

- 3.5. Interface description
4. Agent oriented architectural design
   - 4.1. Architectural design according to different methodologies
   - 4.2. Agent type decision
   - 4.3. System architecture
   - 4.4. Interaction model
5. Agent oriented detailed design (part I)
   - 5.1. Detailed design according to different methodologies
   - 5.2. Detailed protocols
   - 5.3. Process specifications
   - 5.4. Ontology design
6. Agent implementation
   - 6.1. Introduction to an agent oriented development framework
   - 6.2. Administrative tools
   - 6.3. Execution of an agent
   - 6.4. Agent behaviors
   - 6.5. Agent messaging
7. Agent oriented detailed design (part II)
   - 7.1. Ontology construction
   - 7.2. Specification of ACL messages
   - 7.3. Packaging protocols
   - 7.4. Agent detailed desing
8. Development process
   - 8.1. Development scenario
   - 8.2. Development strategy
   - 8.3. Development team roles
   - 8.4. Project startup stage
   - 8.5. Project iteration stage

6. Schedule

6.1. Subject schedule*

Week	Classroom activities	Laboratory activities	Distant / On-line	Assessment activities
1	**1. Introduction to agents** Duration: 02:00 Lecture **2 Agent oriented software engineering** Duration: 00:15 Lecture			**Exercise about risks on agent based software engineering** Group work Continuous assessment and final examination Presential Duration: 00:45
2	**3. Agent oriented analysis** Duration: 01:30 Lecture **Second assignment. Analysis of the system** Duration: 01:30 Problem-solving class			
3	**4 Agent oriented architectural design** Duration: 01:30 Lecture **Second assignment. Architectural design of the system** Duration: 01:30 Problem-solving class			**Exercise about systems topology** Group work Continuous assessment and final examination Presential Duration: 01:00
4	**5. Agent oriented detailed design (part I)** Duration: 01:00 Lecture			**Exercise about agent communication protocols** Individual work Continuous assessment and final examination Not Presential Duration: 02:00 **First assignment. Presentation in the classroom** Individual presentation Continuous assessment Presential Duration: 00:15 **First assignment. Delivery of the assignment** Individual work Continuous assessment and final examination Not Presential Duration: 09:45

5	**8. Development process** Duration: 00:20 Lecture **Second assignment. Workshop of user stories - sprint #1** Duration: 00:40 Cooperative activities **6. Agent implementation** Duration: 02:00 Problem-solving class			
6	**6. Agent implementation** Duration: 02:00 Problem-solving class **7. Agent oriented detailed design (part II)** Duration: 01:00 Problem-solving class			**Exercise about agent implementation** Individual work Continuous assessment Not Presential Duration: 05:00
7	**Second assignment. Roadmap. Sprint planning #1** Duration: 03:00 Cooperative activities			
8	**Second assignment. Workshop of user stories - sprint #2** Duration: 03:00 Cooperative activities			
9	**Second assignment. Integration sprint #1** Duration: 02:00 Cooperative activities **Second assignment. Retrospective - sprint #1. Sprint planning #2** Duration: 01:00 Cooperative activities			
10	**Second assignment. Workshop of user stories - sprint #3** Duration: 03:00 Cooperative activities			
11	**Second assignment. Integration sprint #2** Duration: 02:00 Cooperative activities **Second assignment. Retrospective - sprint #2. Sprint planning #3** Duration: 01:00 Cooperative activities			
12	**Second assignment. Workshop of user stories - sprint #4** Duration: 03:00 Cooperative activities			
13	**Second assignment. Integration sprint #3** Duration: 02:00 Cooperative activities **Second assignment. Retrospective - sprint #3. Sprint planning #4** Duration: 01:00 Cooperative activities			

14				
15	**Second assignment. Integration sprint #4** Duration: 02:00 Cooperative activities **Second assignment. Retrospective - sprint #4** Duration: 01:00 Cooperative activities			
16				
17				**Second assignment. Presentation in the classroom** Group presentation Continuous assessment Presential Duration: 04:00 **Student implication and participation** Other assessment Continuous assessment Presential Duration: 00:00 **Second assignment. Delivery of the inform and code** Group work Continuous assessment Not Presential Duration: 100:00

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.

* The schedule is based on an a priori planning of the subject; it might be modified during the academic year, especially considering the COVID19 evolution.

7. Activities and assessment criteria

7.1. Assessment activities

7.1.1. Assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
1	Exercise about risks on agent based software engineering	Group work	Face-to-face	00:45	6%	0 / 10	CE14
3	Exercise about systems topology	Group work	Face-to-face	01:00	6%	0 / 10	CE13
4	Exercise about agent communication protocols	Individual work	No Presential	02:00	3%	0 / 10	CE13
4	First assignment. Presentation in the classroom	Individual presentation	Face-to-face	00:15	1.5%	0 / 10	CE13 CE14
4	First assignment. Delivery of the assignment	Individual work	No Presential	09:45	13.5%	3 / 10	CE14 CE13
6	Exercise about agent implementation	Individual work	No Presential	05:00	3%	0 / 10	CE14
17	Second assignment. Presentation in the classroom	Group presentation	Face-to-face	04:00	12%	0 / 10	CE14 CE13
17	Student implication and participation	Other assessment	Face-to-face	00:00	7%	0 / 10	CE13
17	Second assignment. Delivery of the inform and code	Group work	No Presential	100:00	48%	4 / 10	CE14 CE13

7.1.2. Global examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
1	Exercise about risks on agent based software engineering	Group work	Face-to-face	00:45	6%	0 / 10	CE14
3	Exercise about systems topology	Group work	Face-to-face	01:00	6%	0 / 10	CE13
4	Exercise about agent communication protocols	Individual work	No Presential	02:00	3%	0 / 10	CE13
4	First assignment. Delivery of the assignment	Individual work	No Presential	09:45	13.5%	3 / 10	CE14 CE13

7.1.3. Referred (re-sit) examination

Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
Exercise about risks on agent based software engineering	Individual work	Face-to-face	03:00	6%	0 / 10	CE14
First assignment	Individual work	Face-to-face	03:00	13.5%	3 / 10	CE13 CE14
Exercise about systems topology	Individual work	Face-to-face	03:00	6%	0 / 10	CE13
Exercise about agent communication protocols	Individual work	Face-to-face	03:00	3%	0 / 10	CE13
Second practical assignment	Group work	Face-to-face	50:00	48%	4 / 10	CE13 CE14

7.2. Assessment criteria

Progressive evaluation

The subject is graded following a continuous assessment.

The subject's progressive evaluation consist of:

- *Individual assignments (18% of the final grade):* the student must complete several individual assignments related to some specific aspects of the subject. Some of these activities are performed during class time. These activities, except the exercise about agent implementation, are recoverable in the global and extraordinary evaluation, always that they had been failed (grade below 5).
- *First assignment (15% of the final grade):* the first assignment gives the student a width perspective of the agent paradigm and technology. The student delivers a document with his work and prepares a presentation for a specific live session. Since there will not be enough time in that session for all the students to present their findings, the document weight will be for them of 15% of the final grade, while those presenting will divide their grade between the document (13,5%) and the presentation (1,5%). Only the document part is recoverable in the global and extraordinary evaluation when it has been failed (grade below 3). To pass the subject the student must achieve a minimum grade of 3 between grade and presentation.
- *Second assignment (60% of the final grade):* the second assignment allows the student to learn by doing concepts related to agent analysis, design, software project, agile methodologies, software integration, quality assurance and software configuration management, among others. Students participate in the group development of a big system and, at the end of the course, deliver their code and a document with their work. They also prepare a presentation for a specific classroom session. Only the code and document part is recoverable in the global and extraordinary evaluation when it has been failed (grade below 4). To pass the subject the student must achieve a minimum grade of 4 between grade and presentation.

- *Student participation (7% of the final grade)*: a critical mindset and the analysis skills from the student are valued. These activities are not recoverable, either in the global evaluation or in the final evaluation, since it is the student participation during the classes what it is evaluated.

The student passes the subject only if 5 or more points on 10 are obtained at the end of the course.

Global evaluation

When failed during the progressive evaluation, the student may have a new opportunity to pass the subject repeating the recoverable failed parts. Since these parts cover a 28,5% of the final grade this will be the margin for passing the subject during the global evaluation, except when the second assignment has been failed (grade under 4). The second assignment is not recoverable for the global evaluation since it is delivered the day before the subject's exam date.

Extraordinary evaluation

For the extraordinary term evaluation the student can repeat the following activities, only if they were graded under 5:

- The individual assignments (15% of the final grade).
- The first assignment (13,5% of the final grade).
- The correction of the second assignment (48% of the final grade).

Zero tolerance against fraud

If fraudulent acts are detected during the development of evaluation tests, the provisions of article 13 of the UPM Evaluation Regulations approved by the Governing Council on May 26, 2022 will apply.

8. Teaching resources

8.1. Teaching resources for the subject

Name	Type	Notes
de Antonio, A. and Imbert, R. (2005) Combining Requirements Engineering and Agents. In A. Silva and J. L. Maté (eds.) Requirements Engineering for Sociotechnical Systems, pp. 68-83. Idea Group Publishing, Hersey, PA, USA.	Bibliography	Agent oriented analysis<br />
Bellifemine, F., Caire, G. and Greenwood, D. (2007) Developing Multi-Agent Systems with JADE. John Wiley & Sons Ltd, England.	Bibliography	Agent implementation
Bratman, M. E., Israel, D. and Pollack, M. (1988) Plans and Resource-Bounded Practical Reasoning. Computational Intelligence, 4(4): pp. 349-355.	Bibliography	Introduction to agents: concepts
Brooks, R. A. (1991) Intelligence without Representation. Artificial Intelligence, 47: p. 139-159.	Bibliography	Introduction to agents: reactive architectures
Franklin, S. and Graesser, A. (1996) Is It an Agent, or Just a Program?: A Taxonomy for Autonomous Agents. In Intelligent Agents III. Agent Theories, Architectures and Languages (ATAL-96), vol. 1193. Springer-Verlag, Berlin, Germany.	Bibliography	Introduction to agents: definition

Jennings, N. R., Sycara, K. and Wooldridge, M. (1998) A Roadmap of Agent Research and Development. Journal of Autonomous Agents and Multi-Agent Systems, 1(1): pp. 7-38.	Bibliography	Introduction to agents: general view
Müller, H. J. (1997) Towards Agent Systems Engineering. Data & Knowledge Engineering, 23: pp. 217?245.	Bibliography	Architecture conceptualization and design
Padgham, L. and Winikoff, M. (2004) Developing Intelligent Agent Systems. John Wiley & Sons Ltd, England.	Bibliography	Agent oriented development
Rao, A. S. and Georgeff, M. P. (1995) BDI Agents: From Theory to Practice. In V. Lesser (ed.), Proceedings of the First International Conference on Multi-Agent Systems, ICMAS-95, pp. 312-319. MIT Press, San Francisco.	Bibliography	Introduction to agents: BDI
Shoham, Y. and Leyton-Brown, K. (2009) Multiagent Systems. Algoritmic, Game-Theoretic, and Logical Foundations. Cambridge University Press, USA.	Bibliography	Design of multiagent systems
Sterling, L.S. and Taveter, K. (2009) The Art of Agent-Oriented Modeling.The MIT Press, Cambridge, Massachusetts, USA.	Bibliography	Modeling of multiagent systems
Sycara, K. (1998) Multiagent Systems. AI Magazine, 19(2): pp. 79-92.	Bibliography	Social nature of agents
Wooldridge, M. (2002) An Introduction to MultiAgent Systems. John Wiley & Sons Ltd. Chichester, England.	Bibliography	Introduction to agents: general view

Wooldridge, M., Jennings, N. R., Kinny, D. (2000) The Gaia Methodology For Agent-Oriented Analysis And Design. Autonomous Agents and Multi-Agent Systems, 3(3), pp. 285-312. Kluwer Academic publishers.	Bibliography	Agent oriented methodology: Gaia
Zambonelli, F., Jennings, N. R. and Wooldridge, M. (2003) Developing Multiagent Systems: The Gaia Methodology. ACM Transactions on Software Engineering and Methodology, 12(3): pp. 317-370.	Bibliography	Agent oriented methodology: Gaia
http://moodle.upm.es/titulaciones/oficiales/course/view.php?id=1054	Web resource	Subject Moodle site
Room assigned by the school for the classes	Equipment	Lecture and group work room

7.4.3 Agile Software Development: Agile Practices and Agile Usability

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COORDINATION PROCESS OF
LEARNING ACTIVITIES
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E.T.S. de Ingenieros
Informaticos

ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

103000545 - Agile Software Development: Agile Practices And Agile Usability

DEGREE PROGRAMME

10AM - Master Universitario En Ingenieria Del Software

ACADEMIC YEAR & SEMESTER

2023/24 - Semester 1

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3. Skills and learning outcomes....2
4. Brief description of the subject and syllabus....3
5. Schedule....4
6. Activities and assessment criteria....6
7. Teaching resources....8

1. Description

1.1. Subject details

Name of the subject	103000545 - Agile Software Development: Agile Practices And Agile Usability
No of credits	4 ECTS
Type	Optional
Academic year ot the programme	First year
Semester of tuition	Semester 1
Tuition period	September-January
Tuition languages	English
Degree programme	10AM - Master Universitario en Ingenieria del Software
Centre	10 - Escuela Tecnica Superior De Ingenieros Informaticos
Academic year	2023-24

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Ana Maria Moreno Sanchez-Capuchino (Subject coordinator)	5102	anamaria.moreno@upm.es	M - 15:00 - 21:00
Tomas San Feliu Gilabert	D5105	tomas.sanfeliu@upm.es	Tu - 10:00 - 14:00 Th - 10:00 - 14:00

* 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

CE13 - Tener una visión de los distintos aspectos específicos y emergentes de la ingeniería del software, y profundizar en algunos de ellos

CG18 - Capacidad de trabajar y comunicarse también en contextos internacionales

CG3 - 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 (RD)

CG9 - Aplicación de los métodos de resolución de problemas más recientes o innovadores y que puedan implicar el uso de otras disciplinas

3.2. Learning outcomes

RA26 - Group work skill SC13, SC14, CG17 A

RA25 - Communication skills in public SC13, SC14, CG3, CG18 S

RA24 - Conflict solving capability SC13, SC14, CG18 C

RA23 - Time organization capability SC13, SC14 K

RA11 - Understands the interrelation between product quality and process quality

RA27 - Negotiation skill SC13, SC14, CG18 C

RA14 - The student will be able to design a software system according to requirements, restrictions, quality standards, and developer criteria

* 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

This subjects provides an overview of the agile development process. We will review the main differences with traditional development and how agile practices can be used to solve some importan lacks in classical methods.

We will pay special attention to agile usability as a new approximation to improve the user experience in agile developments

We will work in agile teams to build a software product according to the previous practices and methods.

4.2. Syllabus

1. Fundamentals of Agile Development
2. Agile Artifacts
3. Description of Agile Methods
4. Agile Usability - Lean UX
5. Agile UX Project

5. Schedule

5.1. Subject schedule*

Week	Classroom activities	Laboratory activities	Distant / On-line	Assessment activities
1	**Unit 1. Agile Fundamentals** Duration: 02:00 Cooperative activities			
2	**Unit 2. Agile Artifacts** Duration: 02:00 Cooperative activities			
3	**Unit 3. Description of Agile Methods** Duration: 02:00			
4	**Unit 3. Description of Agile Methods (Serious Game)** Duration: 02:00			
5	**Unit 3. Description of Agile Methods** Duration: 02:00			
6	**Unit 4. Agile Usability - Lean UX** Duration: 02:00			
7	**Unit 4. Agile Usability - Lean UX** Duration: 02:00			
8	**Unit 4. Agile Usability** Duration: 02:00 Problem-solving class			
9	**Unit 4. Agile Usability** Duration: 02:00 Problem-solving class			
10	**Unit 4. Agile Usability** Duration: 02:00 Problem-solving class			
11	**Unit 5. Agile UX Project** Duration: 02:00 Cooperative activities			
12	**Unit 5. Agile UX Project** Duration: 02:00 Cooperative activities			**Presentation of Project** Group presentation Continuous assessment Presential Duration: 00:30
13	**Unit 5. Agile UX Project** Duration: 02:00 Cooperative activities			**Presentation of Project** Group presentation Continuous assessment Presential Duration: 02:00

14	**Unit 5. Agile UX Project** Duration: 02:00 Cooperative activities			**Presentation of Project** Group presentation Continuous assessment Presential Duration: 02:00
15	**Unit 5. Agile UX Project** Duration: 02:00 Cooperative activities			**Presentation of Project** Group presentation Continuous assessment Presential Duration: 02:00 **Active Participation of Students** Other assessment Continuous assessment Not Presential Duration: 00:00 **Content of Project Report** Group work Continuous assessment Presential Duration: 02:00
16	**Seminar** Duration: 02:00 Additional activities			
17				**Content of the Project Report** Individual work Final examination Not Presential Duration: 00:00 **Presentation of Project** Individual presentation Final examination Presential Duration: 02:00

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.

* The schedule is based on an a priori planning of the subject; it might be modified during the academic year, especially considering the COVID19 evolution.

6. Activities and assessment criteria

6.1. Assessment activities

6.1.1. Assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
12	Presentation of Project	Group presentation	Face-to-face	00:30	10%	0 / 10	CE13 CG9 CG18 CG3
13	Presentation of Project	Group presentation	Face-to-face	02:00	10%	0 / 10	CE13 CG9 CG18 CG3
14	Presentation of Project	Group presentation	Face-to-face	02:00	10%	0 / 10	CE13 CG9 CG18 CG3
15	Presentation of Project	Group presentation	Face-to-face	02:00	10%	0 / 10	CE13 CG9 CG18 CG3
15	Active Participation of Students	Other assessment	No Presential	00:00	10%	0 / 10	
15	Content of Project Report	Group work	Face-to-face	02:00	50%	5 / 10	CE13 CG9 CG18 CG3

6.1.2. Global examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
17	Content of the Project Report	Individual work	No Presential	00:00	50%	5 / 10	CE13 CG9 CG18 CG3
17	Presentation of Project	Individual presentation	Face-to-face	02:00	40%	0 / 10	

6.1.3. Referred (re-sit) examination

Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
Presentation of Project Report	Individual presentation	Face-to-face	00:30	90%	5 / 10	CE13 CG9 CG18 CG3
Active Participation of Students	Other assessment	Face-to-face	00:00	10%	0 / 10	CE13 CG9 CG18 CG3

6.2. Assessment criteria

During progressive evalation, the final grade of students will be calculated according to their performance in the project and their class participation.

- Active participation of students (10%)
- Content of report (50%)
- Presentations (10% each)

Students must get a minimum of 5 points in the assessment of the reports in order to pass the matter.

Students must get a minimum of 5 points (over 10) as final grade in order to pass the matter.

During the global evaluation, the final grade the final grade of the students will be calculated according to their performance in the project and their class participation.If students have attended to the lecturers during the course, they will be evaluated accordingly in the "Active participation" activity. If not, their grade in the "Active participation" activity will be 0.

- Active participation of students (10%)
- Content of report (50%)
- Presentation (40%)

Students must get a minimum of 5 points in the assessment of the report in order to pass the matter.

Students must get a minimum of 5 points (over 10) as final grade in order to pass the matter.

7. Teaching resources

7.1. Teaching resources for the subject

Name	Type	Notes
Bibliography Agile	Bibliography	A. Cockburn. Agile Software Development, Addison Wesley, 2002
Bibliography Scrum	Web resource	http://scrumtraininginstitute.com/library
Process Agility and Software Usability	Web resource	http://citeseer.ist.psu.edu/465732.html
Agile Ecosystems	Bibliography	J. Higsmith. Agile Software Development Ecosystems. Addison-Wesley, 2005
Lean UX. Designing great products with agile teams	Bibliography	Book by Lean UX authors

7.4.4 Challenges for Accessible Computing for People with Functional Diversity

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Informaticos

ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

103000603 - Challenges For Accessible Computing For People With Functional Diversity

DEGREE PROGRAMME

10AM - Master Universitario En Ingenieria Del Software

ACADEMIC YEAR & SEMESTER

2023/24 - Semester 1

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1. Description

1.1. Subject details

Name of the subject	103000603 - Challenges For Accessible Computing For People With Functional Diversity
No of credits	4 ECTS
Type	Optional
Academic year ot the programme	First year
Semester of tuition	Semester 1
Tuition period	September-January
Tuition languages	English
Degree programme	10AM - Master Universitario en Ingenieria del Software
Centre	10 - Escuela Tecnica Superior De Ingenieros Informaticos
Academic year	2023-24

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Jose Luis Fuertes Castro (Subject coordinator)	D4307	joseluis.fuertes@upm.es	Tu - 17:00 - 20:00 W - 12:00 - 15:00
M. Carmen Suarez De Figueroa Baonza	D-2201	mdelcarmen.suarezdefigueroa@upm.es	M - 10:00 - 12:00 W - 10:00 - 12:00 F - 12:00 - 14:00

Loic Antonio Martinez Normand	D3352	loic.mnormand@upm.es	Tu - 13:00 - 15:00 Th - 13:00 - 15:00 F - 13:00 - 15:00 Please confirm appointment via email

* 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

CE13 - Tener una visión de los distintos aspectos específicos y emergentes de la ingeniería del software, y profundizar en algunos de ellos

CE14 - Comprender lo que pueden y no pueden conseguir las prácticas actuales de ingeniería del software, y sus limitaciones y su posible futura evolución.

CG13 - Apreciación de los límites del conocimiento actual y de la aplicación práctica de la tecnología más reciente

3.2. Learning outcomes

RA18 - Given a real problem, the student chooses the most appropriate software engineering solution, analyzing the solution feasibility, what can and cannot be achieved through the current status of the chosen solution, and what it can advance in the future.

RA1 - Within an application field of Software Engineering, uses and designs the appropriate solution to solve some of its problems, describing the technical difficulties and the application limits

RA3 - Explains which are the Software Engineering limits and frontiers, and the base of new tendencies and developments and advanced topics and their possible application

* 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

This course provides a specialization about the accessibility of information and communication technologies (ICT) for persons with functional diversity (disability). It is mainly focused on current research issues in the field.

The course deals with an introduction to ICT accessibility concepts: functional diversity, design for all, user centred design, standards and the assessment of the accessibility degree of ICT products and services, cognitive accessibility and future trends in ICT accessibility.

After that, the students will work on current challenges in the field.

4.2. Syllabus

1. Functional diversity, accessibility and design for all
    1.1. Introduction
    1.2. Functional diversity
    1.3. Assistive products for ICT
    1.4. Principles of accessible design
    1.5. Introduction to Human-centred design
2. ICT accessibility standards
    2.1. Introduction to standards
    2.2. Relevant ICT accessibility standards
    2.3. Deeper study of one accessibility standard
    2.4. Conformity assessment
3. State of the art in ICT accessibility
    3.1. State of the art and future trends
4. Cognitive Accessibility
    4.1. Introduction to the Easy-to-Read Methodology

5. Schedule

5.1. Subject schedule*

Week	Classroom activities	Laboratory activities	Distant / On-line	Assessment activities
1	**Course introduction** Duration: 00:20 Lecture **Chapter 1: 1.1- Introduction** Duration: 01:10 Lecture **Chapter 1: 1.2- Functional diversity** Duration: 00:30 Lecture			
2	**Chapter 1: 1.2- Functional diversity** Duration: 02:00 Lecture			**Personas evaluation** Other assessment Continuous assessment Presential Duration: 00:10 **Individual presentation of personas** Individual presentation Continuous assessment Presential Duration: 00:20
3	**Chapter 1: 1.3- Assistive products** Duration: 02:00 Lecture			
4	**Chapter 1: 1.4- Principles of accessible design** Duration: 01:00 Cooperative activities **Chapter 1: 1.5- Introduction to human-centred design** Duration: 00:30 Lecture **Chapter 2: 2.1- Introduction to standards** Duration: 00:30 Lecture			**Individual presentation of principles of Design for All** Individual presentation Continuous assessment Presential Duration: 00:30 **Desgin for All evaluation** Other assessment Continuous assessment Presential Duration: 00:10
5	**Standards overview discussion** Duration: 00:30 Cooperative activities **Chapter 2: 2.2- Relevant ICT standards** Duration: 00:45 Cooperative activities **Chapter 2: 2.3- Deeper study of one accessibility standard** Duration: 00:30 Lecture			**Test 1** Written test Continuous assessment Not Presential Duration: 00:30 **Standard overview evaluation** Other assessment Continuous assessment Presential Duration: 00:15

	Explanation of exercise 1 Duration: 00:15 Lecture			
6	**Chapter 2: 2.3- Deeper study of one accessibility standard** Duration: 02:00 Cooperative activities			**One accessibility standard evaluation (discussion)** Individual presentation Continuous assessment and final examination Presential Duration: 00:30
7	**Chapter 2: 2.3- Deeper study of one accessibility standard** Duration: 01:40 Cooperative activities **Explanation of exercise 2** Duration: 00:20 Lecture			**One accessibility standard evaluation (discussion)** Individual presentation Continuous assessment and final examination Presential Duration: 00:30 **Delivery of exercise 1** Group work Continuous assessment Not Presential Duration: 00:00
8	**Chapter 2: 2.4- Conformity assesment** Duration: 01:45 Lecture **Classroom tutoring. Exercise 2** Duration: 00:15 Additional activities			**Conformity assesment evaluation** Other assessment Continuous assessment Presential Duration: 00:15
9	**Chapter 3: 3.1- State of the art and future trends** Duration: 01:45 Lecture **Explanation of exercise 3** Duration: 00:15 Lecture			**Delivery of exercise 2** Group work Continuous assessment Not Presential Duration: 00:00 **State of the art in ICT accessibility evaluation** Other assessment Continuous assessment Presential Duration: 00:10
10	**Collective revision of exercise 2** Duration: 02:00 Cooperative activities			**Participation in evaluation of exercise 2** Individual presentation Continuous assessment Presential Duration: 02:00
11	**Chapter 4: Cognitive Accessibility** Duration: 01:45 Lecture **Explanation of exercise 4** Duration: 00:15 Lecture			**Cognitive accessibility evaluation** Other assessment Continuous assessment Presential Duration: 00:15

12	**Chapter 4: Cognitive Accessibility** Duration: 01:45 Lecture			**Cognitive accessibility evaluation** Other assessment Continuous assessment Presential Duration: 00:15
13				
14				**Delivery of exercise 4** Group presentation Continuous assessment Not Presential Duration: 00:00 **Presentation of exercise 3** Group presentation Continuous assessment and final examination Presential Duration: 02:00
15				**Presentation of exercise 3** Group presentation Continuous assessment and final examination Presential Duration: 02:00
16				**Delivery of exercise 3** Group work Continuous assessment Not Presential Duration: 00:00
17				**Test 1** Written test Final examination Not Presential Duration: 00:30 **Test 2** Written test Continuous assessment and final examination Not Presential Duration: 00:30 **Delivery of exercise 1** Group work Final examination Not Presential Duration: 00:00 **Delivery of exercise 2** Group work Final examination Not Presential Duration: 00:00 **Delivery of exercise 3** Group work Final examination Not Presential Duration: 00:00 **Delivery of exercise 4** Group presentation

				Final examination Presential Duration: 00:00

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.

* The schedule is based on an a priori planning of the subject; it might be modified during the academic year, especially considering the COVID19 evolution.

6. Activities and assessment criteria

6.1. Assessment activities

6.1.1. Assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
2	Personas evaluation	Other assessment	Face-to-face	00:10	1%	/ 10	CE13
2	Individual presentation of personas	Individual presentation	Face-to-face	00:20	1%	/ 10	CE13
4	Individual presentation of principles of Design for All	Individual presentation	Face-to-face	00:30	2%	/ 10	CE13
4	Desgin for All evaluation	Other assessment	Face-to-face	00:10	1%	/ 10	CE13
5	Test 1	Written test	No Presential	00:30	10%	/ 10	CG13
5	Standard overview evaluation	Other assessment	Face-to-face	00:15	1%	/ 10	CE13
6	One accessibility standard evaluation (discussion)	Individual presentation	Face-to-face	00:30	5%	/ 10	CE14
7	One accessibility standard evaluation (discussion)	Individual presentation	Face-to-face	00:30	5%	/ 10	CE14
7	Delivery of exercise 1	Group work	No Presential	00:00	10%	/ 10	CG13
8	Conformity assesment evaluation	Other assessment	Face-to-face	00:15	1%	/ 10	CE14
9	Delivery of exercise 2	Group work	No Presential	00:00	15%	/ 10	CG13
9	State of the art in ICT accessibility evaluation	Other assessment	Face-to-face	00:10	1%	/ 10	CG13 CE14 CE13
10	Participation in evaluation of exercise 2	Individual presentation	Face-to-face	02:00	5%	/ 10	CE14
11	Cognitive accessibility evaluation	Other assessment	Face-to-face	00:15	1%	/ 10	CG13
12	Cognitive accessibility evaluation	Other assessment	Face-to-face	00:15	1%	/ 10	CG13
14	Delivery of exercise 4	Group presentation	No Presential	00:00	10%	/ 10	CG13

14	Presentation of exercise 3	Group presentation	Face-to-face	02:00	5%	/ 10	CE13 CG13 CE14
15	Presentation of exercise 3	Group presentation	Face-to-face	02:00	5%	/ 10	CE13 CG13 CE14
16	Delivery of exercise 3	Group work	No Presential	00:00	10%	/ 10	CG13
17	Test 2	Written test	No Presential	00:30	10%	/ 10	CG13 CE14

6.1.2. Global examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
6	One accessibility standard evaluation (discussion)	Individual presentation	Face-to-face	00:30	5%	/ 10	CE14
7	One accessibility standard evaluation (discussion)	Individual presentation	Face-to-face	00:30	5%	/ 10	CE14
14	Presentation of exercise 3	Group presentation	Face-to-face	02:00	5%	/ 10	CE13 CG13 CE14
15	Presentation of exercise 3	Group presentation	Face-to-face	02:00	5%	/ 10	CE13 CG13 CE14
17	Test 1	Written test	No Presential	00:30	10%	/ 10	CE13
17	Test 2	Written test	No Presential	00:30	10%	/ 10	CG13 CE14
17	Delivery of exercise 1	Group work	No Presential	00:00	10%	/ 10	CE14
17	Delivery of exercise 2	Group work	No Presential	00:00	20%	/ 10	CE14
17	Delivery of exercise 3	Group work	No Presential	00:00	15%	/ 10	CG13 CE14 CE13
17	Delivery of exercise 4	Group presentation	Face-to-face	00:00	15%	/ 10	CG13

6.1.3. Referred (re-sit) examination

Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
Test 1	Written test	Face-to-face	00:30	10%	/ 10	CE13
Test 2	Written test	Face-to-face	00:30	10%	/ 10	CG13 CE14
Delivery of exercise 1	Individual work	Face-to-face	00:00	15%	/ 10	CG13

Delivery of exercise 2	Individual work	Face-to-face	00:00	20%	/ 10	CG13
Delivery of exercise 3	Individual work	Face-to-face	00:00	20%	/ 10	CG13 CE14 CE13
Presentation of exercise 3	Individual presentation	Face-to-face	02:00	10%	/ 10	CG13 CE14 CE13
Delivery of exercise 4	Individual work	Face-to-face	00:00	15%	/ 10	CG13

6.2. Assessment criteria

The assessment of this module is divided into two parts: theory and practice. Both parts have to be passed in order to pass the module. The grades obtained in theory and practice are combined as described in the section on evaluation activities.

Theory

The theoretical part of the module contains different assessments: there will be two test-based assessments and there is going to be an assessment of the performance of the collaborative learning sessions that will be part of the study of accessibility standards ("One accessibility standard evaluation", that is not recoverable); there will be also short in-class evaluations during the semester.

Practical work

The practical work consists of 4 exercises:

- Exercise 1: a document containing change proposals for an accessibility standard.
- Exercise 2: an accessibility assessment of an ICT product, using the standard studied during collaborative learning.
- Exercise 3: state of the art on one topic related to ICT accessibility. Students will make a short presentation (divided into two sessions) and deliver a report.
- Exercise 4: checking cognitive accessibility

Assessment procedure

The module will be assessed in a scale of 10 points, divided into theory and practical exercises. To pass the complete module it will be necessary to obtain a minimum of 3/10 point in theory and 3/10 points in the exercises.

a) Term evaluation

All the practical exercises are mandatory and will be graded according to the section on evaluation activities.

In addition, attendance, class participation and in-class activities will be graded for term evaluation.

b) Final evaluation

At the end of the term, there is the final evaluation. There will be two theory exams (the first one can be done by students having failed the first one). The four exercises have to be delivered in the same time period as the one defined for term evaluation, but they could be delivered again if not passed. The student will also have to attend the two collaborative sessions ("One accessibility standard evaluation") described that are not recoverable in the final evaluation. The exercise 3 presentations cannot be recoverables.

c) Extraordinary evaluation period

In the extraordinary evaluation period the theory tests not passed will be repeated and the pending exercises can be delivered again.

7. Teaching resources

7.1. Teaching resources for the subject

Name	Type	Notes
Don't make me think!: Revisited. A Common Sense Approach to Web Usability. 2014	Bibliography	Krug, S. New Riders, 3rd edition ISBN: 978-0321965516
The Principles of Universal Design. 1997	Bibliography	Connell, B.R.; Jones, M.; Mace, R.; Mueller, J.; Mullick, A.; Ostroff, E.; Sanford, J.; Steinfeld, E.; Story, M.; Vanderheiden, G. Version 2.0. North Carolina State University. http://www.ncsu.edu/ncsu/design/cud/about_ud/udprinciples.htm

Information technology -- User interface accessibility -- Part 1: User accessibility needs. 2018	Bibliography	International Organization for Standardization (ISO), International Electrotechnical Commission (IEC). ISO/IEC 29138-1:2018. (Technical report ISO/IEC TR 29138-1, can be accessed at http://jtc1access.org/TR29138.htm)
El modelo de la diversidad. La Bioética y los Derechos Humanos como herramientas para alcanzar la plena dignidad en la diversidad funcional. 2007	Bibliography	Palacios, A.; Romañach, J. Ediciones Diversitas, ISBN: 8496474402,
A Web for Everyone. Designing accessible user experiences. 2014	Bibliography	Horton, S.; Quesenbery, W. Rosenfeld
SIDAR	Web resource	Fundación Sidar - Acceso Universal: http://www.sidar.org, España
Accessibility Requirements for ICT products and services. V3.2.1. March 2021	Bibliography	EN 301 549. https://www.etsi.org/deliver/etsi_en/301500_301599/301549/03.02.01_60/en_301549v030201p.pdf

8. Other information

8.1. Other information about the subject

Exercises cannot been done just copying from other sources. Personal writing and analysis work by the student should be included (not third party or automatically generated reports are allowed). Failing to do this, implies plagiarism, which is not allowed at this University and will lead to not passing the exercise involved (grade will be 0).

Sustainable development goals (SDGs)

The goal of this course is to learn about enabling access of persons with disabilities to ICT, increasing their inclusion possibilities. Taking this into account, and considering the recommendations from the United Nations on the relationship between the SDGs and accessibility, this course is related to the following sustainable development goals:

- Goal 4 quality education - to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all. In today's education, interactive learning systems are essential, and they need to be accessible and to be compatible with assistive products to enable the education of persons with disabilities.
- Goal 8 decent work and economy growth - to promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all. Today there are many job-related activities that rely on information and communication technology. This technology needs to be accessible and compatible with assistive products to enable inclusion in the workplace.
- Goal 10 reduced inequalities - to reduce inequality within and among countries. To increase inclusion of all persons in society, all interactive systems designed for citizen participation need to be accessible and be compatible with assistive products.

7.4.5 Computer Security

POLITÉCNICA
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COORDINATION PROCESS OF
LEARNING ACTIVITIES
PR/CL/001

E.T.S. de Ingenieros
Informaticos

ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

103000738 - Computer Security

DEGREE PROGRAMME

10AM - Master Universitario En Ingenieria Del Software

ACADEMIC YEAR & SEMESTER

2023/24 - Semester 1

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1. Description

1.1. Subject details

Name of the subject	103000738 - Computer Security
No of credits	4 ECTS
Type	Optional
Academic year ot the programme	First year
Semester of tuition	Semester 1
Tuition period	September-January
Tuition languages	English
Degree programme	10AM - Master Universitario en Ingenieria del Software
Centre	10 - Escuela Tecnica Superior De Ingenieros Informaticos
Academic year	2023-24

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Manuel Carro Liñares (Subject coordinator)	2303	manuel.carro@upm.es	F - 15:00 - 19:00 Please send an e-mail to set up an appointment before going to the instructor's office.
Julio Mariño Carballo	D-2308	julio.marino@upm.es	Tu - 15:00 - 17:00 W - 12:30 - 13:30 Th - 15:00 - 17:00 F - 12:30 - 13:30 Please get in touch

			with the instructor to get an appointment in order to check his availability.

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

2.3. External faculty

Name and surname	Email	Institution
Marco Guarnieri	marco.guarnieri@imdea.org	IMDEA Software Institute
Pedro Moreno	pedro.moreno@imdea.org	IMDEA Software Institute
Dario Fiore	Dario.Fiore@imdea.org	IMDEA Software Institute
Juan Caballero	Juan.caballero@imdea.org	IMDEA Software Institute
Ignacio Cascudo	ignacio.cascudo@imdea.org	IMDEA Software Institute
Srdjan Matic	srdjan.matic@imdea.org	IMDEA Software Institute
Alessandra Gorla	alessandra.gorla@imdea.org	IMDEA Software Institute

3. Prior knowledge recommended to take the subject

3.1. Recommended (passed) subjects

The subject - recommended (passed), are not defined.

3.2. Other recommended learning outcomes

- An undergraduate level course on computer security is desired but not required. Some demonstrable knowledge on the basic principles of computer security is necessary.

4. Skills and learning outcomes *

4.1. Skills to be learned

CE13 - Tener una visión de los distintos aspectos específicos y emergentes de la ingeniería del software, y profundizar en algunos de ellos

CE14 - Comprender lo que pueden y no pueden conseguir las prácticas actuales de ingeniería del software, y sus limitaciones y su posible futura evolución.

CG1 - 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 (RD)

CG13 - Apreciación de los límites del conocimiento actual y de la aplicación práctica de la tecnología más reciente

CG14 - Conocimiento y comprensión de la informática necesaria para la creación de modelos de información, y de los sistemas y procesos complejos

CG3 - 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 (RD)

CG7 E - Especificación y realización de tareas informáticas complejas, poco definidas o no familiares

CG8 - Planteamiento y resolución de problemas también en áreas nuevas y emergentes de su disciplina

CG9 - Aplicación de los métodos de resolución de problemas más recientes o innovadores y que puedan implicar el uso de otras disciplinas

4.2. Learning outcomes

RA80 - Identify computer security threats and decide the best proactive and reactive measures against them

* 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.

5. Brief description of the subject and syllabus

5.1. Brief description of the subject

This course gives students a general view of Computer Security. Lectures are divided in independent blocks which provide basic concepts in Computer Security, such as cryptography, software security, network security, or physical security. Each block includes a theory part to give students the basic concepts and a practical exercise to demonstrate and fix the presented concepts. The particular order and length of the topics in the blocks will ultimately depend on the schedule of the instructors.

- **Introduction to Security.** This module will first cover a general introduction to computer security (what is security, why it is important, what areas of computer science does it draw on, etc.).
- **Cryptography.** Here we will introduce basic concepts of cryptography, including notions of private key and public key cryptography, encryption, and digital signatures.
- **Network Security**. The Internet and other communication networks are critical for most of our daily tasks. This block will discuss problems and solutions in securing Internet-connected communication networks. The block will cover topics such as HTTPS/TLS/SSL, intrusion detection, and denial-of-service protection.
- **Software Security**. Whether you want to understand if your code is vulnerable to possible exploits or rather you want to understand if some third party code is malicious, you have to *analyze* a software artifact. This module will present different static and dynamic analysis techniques that can give a better understanding of a software artifact. Some of the techniques that we will see include symbolic execution, taint analysis, and fuzz testing. We will see that these techniques can be used for different purposes and can work for different platforms (e.g., desktop, Web, mobile).
- **Physical Security**. This module will provide an introduction to the physical aspects of information security. We will discuss so-called side-channel attacks, which exploit secret-dependent variations of a program's execution time, network use, or power consumption. We will start by focusing on side-channel attacks that exploit different in execution time caused by memory caches. Next, we will focus on recent speculative execution attacks such as Spectre, which exploit a CPU optimization called speculative execution to compromise the security of bug-free programs. We will study how speculative execution attacks work and

how one can reason about them.

5.2. Syllabus

1. Introduction to Security
2. Cryptography
3. Network security
4. Software Security
5. Physical Security

6. Schedule

6.1. Subject schedule*

Week	Classroom activities	Laboratory activities	Distant / On-line	Assessment activities
1	**Introduction to Computer Security** Duration: 02:00 Lecture			
2	**Cryptography** Duration: 02:00 Lecture			
3	**Cryptography** Duration: 02:00 Lecture			
4	**Cryptography** Duration: 02:00 Lecture			
5	**Cryptography** Duration: 02:00 Lecture			**Practical problem / exercise on Cryptography** Individual work Continuous assessment Not Presential Duration: 04:00
6	**Network security** Duration: 02:00 Lecture			
7	**Network security** Duration: 02:00 Lecture			
8	**Network security** Duration: 02:00 Lecture			**Practical problem / exercise on Network Security** Individual work Continuous assessment Not Presential Duration: 04:00
9	**Software security** Duration: 02:00 Lecture			
10	**Software security** Duration: 02:00 Lecture			
11	**Software security** Duration: 02:00 Lecture			
12	**Software security** Duration: 02:00 Lecture			**Practical problem / exercise on Software Security** Individual work Continuous assessment Not Presential Duration: 04:00

13	**Physical security** Duration: 02:00 Lecture			
14	**Physical security** Duration: 02:00 Lecture			
15	**Physical security** Duration: 02:00 Lecture			**Practical problem / exercise on Physical Security** Individual work Continuous assessment Not Presential Duration: 04:00
16				
17				**Global exam** Written test Final examination Presential Duration: 02:00

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.

* The schedule is based on an a priori planning of the subject; it might be modified during the academic year, especially considering the COVID19 evolution.

7. Activities and assessment criteria

7.1. Assessment activities

7.1.1. Assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
5	Practical problem / exercise on Cryptography	Individual work	No Presential	04:00	25%	2 / 10	CE13 CE14 CG7 E CG8 CG9 CG13 CG14 CG1 CG3
8	Practical problem / exercise on Network Security	Individual work	No Presential	04:00	25%	2 / 10	CE13 CE14 CG7 E CG9 CG13 CG14 CG1 CG3
12	Practical problem / exercise on Software Security	Individual work	No Presential	04:00	25%	2 / 10	CE13 CE14 CG7 E CG8 CG9 CG13 CG14 CG1 CG3
15	Practical problem / exercise on Physical Security	Individual work	No Presential	04:00	25%	2 / 10	CE13 CE14 CG7 E CG8 CG9 CG13 CG14 CG1 CG3

7.1.2. Global examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
17	Global exam	Written test	Face-to-face	02:00	100%	5 / 10	CE13 CE14 CG7 E CG8 CG9 CG13 CG14 CG1 CG3

7.1.3. Referred (re-sit) examination

Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
Comprehensive exam	Written test	Face-to-face	02:00	100%	5 / 10	CE13 CE14 CG7 E CG8 CG9 CG13 CG14 CG1 CG3

7.2. Assessment criteria

- No mandatory activities are necessary to pass via the global exam.
- The minimum grade to pass the course is 5 over 10 (either when it is calculated as the weighted sum of individual homework or when it is the grade of a single comprehensive exam).
- The global exams, both regular and extraordinary, will be made in person.
- Copying from any source (either textbooks, the Internet, another student, or any other source) with or without the permission of the author of the source, as well as other types of academic fraud, can lead to a 'fail' grade in the course and / or being reported to the academic authorities, who will decide whether to take additional authoritative measures. In particular, in case of non-ethical or fraudulent behavior, the Law 3/2022 of February 24th will be applied, as well as the corresponding UPM regulations. Article 12 and 14 of Law 3/2022 states that a serious fault may mean, among other outcomes, failing the corresponding sitting.
- There are no learning blocks whose earned grades can be carried over to future academic courses.
- Failure to deliver the homework at the time and in the form stated by the instructor(s) may result in a failure for that exercise.
- Active participation in the course can be taken into account to fine-tune the student's final grade.

8. Teaching resources

8.1. Teaching resources for the subject

Name	Type	Notes
Various	Others	Will be decided based on the selected topics.

9. Other information

9.1. Other information about the subject

7.4.6 Correctness by Construction

ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

103000657 - Correctness By Construction

DEGREE PROGRAMME

10AM - Master Universitario En Ingenieria Del Software

ACADEMIC YEAR & SEMESTER

2023/24 - Semester 2

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1. Description

1.1. Subject details

Name of the subject	103000657 - Correctness By Construction
No of credits	6 ECTS
Type	Optional
Academic year ot the programme	First year
Semester of tuition	Semester 2
Tuition period	February-June
Tuition languages	English
Degree programme	10AM - Master Universitario en Ingenieria del Software
Centre	10 - Escuela Tecnica Superior De Ingenieros Informaticos
Academic year	2023-24

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Manuel Carro Liñares (Subject coordinator)	2303	manuel.carro@upm.es	F - 15:00 - 20:00 Please note that the office hours may change during the course. Please get in touch with the instructor to get an appointment.

Manuel De Hermenegildo Salinas	2212	manuel.hermenegildo@upm.es	Sin horario. Please get in touch with the instructor to get an appointment.

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

3. Prior knowledge recommended to take the subject

3.1. Recommended (passed) subjects

The subject - recommended (passed), are not defined.

3.2. Other recommended learning outcomes

- Declarative programming

- First-order logic

- Programming experience (minimum 2 years)

- Formal proofs

- Reasoning about properties of algorithms

4. Skills and learning outcomes *

4.1. Skills to be learned

CE13 - Tener una visión de los distintos aspectos específicos y emergentes de la ingeniería del software, y profundizar en algunos de ellos

CE14 - Comprender lo que pueden y no pueden conseguir las prácticas actuales de ingeniería del software, y sus limitaciones y su posible futura evolución.

CG13 - Apreciación de los límites del conocimiento actual y de la aplicación práctica de la tecnología más reciente

4.2. Learning outcomes

RA66 - RA-AV-2 Acquaintance with various techniques for formal software development

RA25 - Communication skills in public SC13, SC14, CG3, CG18 S

RA50 - Posee las técnicas necesarias para la realización de un informe o memoria sobre un trabajo realizado en un entorno socio?lingüístico nacional/internacional.

RA69 - RA-AV-4 - Knowledge of techniques for formally proving code correctness.

RA65 - RA-AV-1 - Acquaintance with design requirements and implementation requirements.

RA54 - Proponer una solución justificada a un problema real que sea complejo o mal definido, o perteneciente a un área nueva o emergente, o que requiera el desarrollo de enfoques o métodos nuevos y originales, dentro del contexto de la ingeniería del software justificándola de una forma cualitativa y cuantitativa.

RA26 - Group work skill SC13, SC14, CG17 A

RA91 - Apply techniques for modelling the context of use

RA68 - RA-AV-3 - Knowledge of languages for formal specification

* 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.

5. Brief description of the subject and syllabus

5.1. Brief description of the subject

Software is becoming increasingly complex and responsible for critical tasks. Any technology aimed at ensuring the reliability and quality of software will be increasingly relevant, if not utterly necessary.

Only rigorous (e.g., mathematically sound) approaches can certify software with the highest possible assurance. These approaches include, among others, the use of specification languages, high-level programming languages (including equational, functional, and logic languages), the use of model checking and deductive verification, language-based approaches often interacting with theorem provers.

In this course we will give a hands-on introduction to rigorous software development methods that follow a *correctness-by-construction* approach. While the course is not heavy in theory, everyone is expected to have a good understanding of first-order logic and programming experience.

5.2. Syllabus

1. Introduction to Formal Methods: Proving Programs Correct
2. Fundamentals of Formal Methods: Specification, First-Order Logic, Proofs, Programs
3. Event-B Basics and the Rodin Tool
4. Sequential Systems
5. Event B: Mathematical Toolkit and Applications
6. Reactive Systems: Concurrency and Distribution

6. Schedule

6.1. Subject schedule*

Week	Classroom activities	Laboratory activities	Distant / On-line	Assessment activities
1	**Introduction to formal methods and correctness by construction** Duration: 01:30 Lecture **Sample cases of formal development** Duration: 01:30 Cooperative activities			
2	**Event-B and related topics** Duration: 02:00 Lecture **Quizzes** Duration: 01:00 Problem-solving class			
3	**Event-B and related topics** Duration: 02:00 Lecture **Quizzes** Duration: 01:00 Problem-solving class			**Homework** Individual work Continuous assessment Not Presential Duration: 04:00
4	**Event-B and related topics** Duration: 02:00 Lecture **Quizzes** Duration: 01:00 Problem-solving class			
5	**Event-B and related topics** Duration: 02:00 Lecture **Quizzes** Duration: 01:00 Problem-solving class			
6	**Event-B and related topics** Duration: 02:00 Lecture **Quizzes** Duration: 01:00 Problem-solving class			**Homework** Individual work Continuous assessment Not Presential Duration: 04:00

7	**Event-B and related topics** Duration: 02:00 Lecture **Quizzes** Duration: 01:00 Problem-solving class			
8	**Event-B and related topics** Duration: 02:00 Lecture **Quizzes** Duration: 01:00 Problem-solving class			
9	**Event-B and related topics** Duration: 02:00 Lecture **Quizzes** Duration: 01:00 Problem-solving class			**Homework** Individual work Continuous assessment Not Presential Duration: 08:00
10	**Quizzes** Duration: 01:00 Problem-solving class **Event-B and related topics** Duration: 02:00 Lecture			
11	**Presentation of term project** Duration: 01:00 Additional activities **Event-B and related topics** Duration: 02:00 Lecture			**Term project** Group work Continuous assessment Not Presential Duration: 20:00
12	**Event-B and related topics** Duration: 02:00 Lecture **Quizzes** Duration: 01:00 Problem-solving class			
13	**Event-B and related topics** Duration: 02:00 Lecture **Quizzes** Duration: 01:00 Problem-solving class			
14	**Event-B and related topics** Duration: 02:00 Lecture **Quizzes** Duration: 01:00 Problem-solving class			

15				**Homework** Group presentation Continuous assessment Presential Duration: 03:00
16				
17				**Final regular exam** Written test Final examination Presential Duration: 03:00

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.

* The schedule is based on an a priori planning of the subject; it might be modified during the academic year, especially considering the COVID19 evolution.

7. Activities and assessment criteria

7.1. Assessment activities

7.1.1. Assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
3	Homework	Individual work	No Presential	04:00	20%	2 / 10	CE13 CE14 CG13
6	Homework	Individual work	No Presential	04:00	20%	2 / 10	CE13 CE14 CG13
9	Homework	Individual work	No Presential	08:00	20%	2 / 10	CE13 CE14 CG13
11	Term project	Group work	No Presential	20:00	40%	4 / 10	CE13 CE14 CG13
15	Homework	Group presentation	Face-to-face	03:00	%	4 / 10	CE13 CE14 CG13

7.1.2. Global examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
17	Final regular exam	Written test	Face-to-face	03:00	100%	5 / 10	CE13 CE14 CG13

7.1.3. Referred (re-sit) examination

Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
Extra final exam	Written test	Face-to-face	03:00	100%	5 / 10	CE13 CE14 CG13

7.2. Assessment criteria

- No mandatory activities are necessary to pass via the final exams
- The minimum grade to pass the course is 5 over 10 (either when it is calculated as the weighted sum of individual homework or when it is the grade of a single comprehensive exam).
- The topics covered in the different homework assignments cannot be tested separately in the final exam, as they are deeply intertwined and are not isolated units of knowledge.
- The global exams, both the regular and the extraordinary ones, will be in person.

- Copying from any source (either textbooks, the Internet, another student, or any other source) with or without the permission of the author of the source, as well as other types of academic fraud, can lead to a 'fail' grade in the course and / or being reported to the academic authorities, who will decide whether to take additional authoritative measures. In particular, in case of non-ethical or fraudulent behavior, the Law 3/2022 of February 24th will be applied, as well as the corresponding UPM regulations. Article 12 and 14 of Law 3/2022 states that a serious fault may mean, among other outcomes, failing the corresponding sitting.
- There are no learning blocks whose earned grades can be carried over to future academic courses.
- Failure to deliver a homework assignment at the time and in the form stated by the instructor(s) may result in a failure for that exercise.
- For progressive evaluation: if for any reason it is not possible to prepare / hand out some homework assignment, its weight in the final grade will be split among the rest of the homework exercises in such a way that the relative weight of the rest of the assignments, when compared with each other, will be the same they had before removing the homework that could not be handed out.

8. Teaching resources

8.1. Teaching resources for the subject

Name	Type	Notes
Lawrence Paulson's class notes	Bibliography	Lawrence Paulson?s Logic and Proof are the course notes of the author for a Logic course in Cambridge. Highly recommended, as they are both rigorous and very concise. They provide very good background material for both parts of the course.

Logic in Computer Science (Huth and Ryan)	Bibliography	A very good book on the use of logic in computer science is Logic in Computer Science, by Huth and Ryan. The Computer Science School should have several copies. There may be electronic copies on the Internet, if possible of the second edition.
http://wiki.event-b.org/	Web resource	Central Event-B site
Modeling in Event-B: System and Software Engineering, by Jean-Raymond Abrial.	Bibliography	The reference book for Event B, with plenty of worked examples.

9. Other information

9.1. Other information about the subject

This course will be given in English. Please note that in case Spanish appears as the course language in the general description, that would be a clerical mistake.

7.4.7 Critical Software

ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

103000540 - Critical Software

DEGREE PROGRAMME

10AM - Master Universitario En Ingenieria Del Software

ACADEMIC YEAR & SEMESTER

2023/24 - Semester 1

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1. Description

1.1. Subject details

Name of the subject	103000540 - Critical Software
No of credits	4 ECTS
Type	Optional
Academic year ot the programme	First year
Semester of tuition	Semester 1
Tuition period	September-January
Tuition languages	English
Degree programme	10AM - Master Universitario en Ingenieria del Software
Centre	10 - Escuela Tecnica Superior De Ingenieros Informaticos
Academic year	2023-24

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Tomas San Feliu Gilabert	5106	tomas.sanfeliu@upm.es	Tu - 10:00 - 13:00 Th - 10:00 - 13:00
Andres Silva Vazquez (Subject coordinator)	5107	andres.silva@upm.es	Tu - 11:00 - 14:00 Th - 11:00 - 14:00

* 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

CE13 - Tener una visión de los distintos aspectos específicos y emergentes de la ingeniería del software, y profundizar en algunos de ellos

CE14 - Comprender lo que pueden y no pueden conseguir las prácticas actuales de ingeniería del software, y sus limitaciones y su posible futura evolución.

3.2. Learning outcomes

RA19 - The student explains what are the software engineering limits and frontiers, and the base for new trends and developments, and about the advanced issues and their application.

RA17 - Given a specific software engineering field, the student assesses and designs the most appropriate solution to solve some of its problems, presenting the technical difficulties and applicability limitations.

RA18 - Given a real problem, the student chooses the most appropriate software engineering solution, analyzing the solution feasibility, what can and cannot be achieved through the current status of the chosen solution, and what it can advance in the future.

* 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 subject provides an introduction to the main concepts and, specially, to the mindset needed for understanding and managing the hazardous behaviours related to complex software systems.

4.2. Syllabus

1. Safeware concepts
    1.1. Normal Accidents theory
    1.2. Basic Concepts
    1.3. Reliability vs. Safety
    1.4. Hazard & Risk Analysis
    1.5. Common Techniques
2. Design and Safeware
    2.1. Hazard elimination
    2.2. Hazard reduction
    2.3. Hazard control
    2.4. Examples
3. Concepts from the IEC61508 Standard
    3.1. Introduction to IEC61508
    3.2. Concepts: SIL, functional safety, etc.
    3.3. Hazard log
    3.4. Limits of IEC61508
4. Human and Organizational Factors
    4.1. Performance models
    4.2. Human error
    4.3. Organizational problems
    4.4. Solution proposals

5. Schedule

5.1. Subject schedule*

Week	Classroom activities	Laboratory activities	Distant / On-line	Assessment activities
1	**Lecture/workshop on topics 1.1 and 1.2** Duration: 02:00 Cooperative activities			
2	**Lecture/workshop on topic 1.3** Duration: 02:00 Cooperative activities			**Elaboration of the presentation and draft of the expository writing** Group presentation Continuous assessment Not Presential Duration: 04:00
3	**Lecture/workshop on topic 1.4** Duration: 02:00 Cooperative activities			
4	**Lecture/workshop on topic 1.5** Duration: 02:00 Cooperative activities			**Elaboration of the presentation and draft of the expository writing** Group presentation Continuous assessment Not Presential Duration: 04:00
5	**Lecture/workshop on topic 2.1** Duration: 02:00 Cooperative activities			
6	**Lecture/workshop on topic 2.2** Duration: 02:00 Cooperative activities			**Elaboration of the presentation and draft of the expository writing** Group presentation Continuous assessment Not Presential Duration: 04:00
7	**Lecture/workshop on topic 2.3** Duration: 02:00 Cooperative activities			
8	**Lecture/workshop on topic 2.4** Duration: 02:00 Cooperative activities			**Elaboration of the presentation and draft of the expository writing** Group presentation Continuous assessment Not Presential Duration: 04:00
9	**Lecture/workshop on topic 3.1** Duration: 02:00 Cooperative activities			
10	**Lecture/workshop on topic 3.2** Duration: 02:00 Cooperative activities			**Elaboration of the presentation and draft of the expository writing** Group presentation Continuous assessment Not Presential Duration: 04:00

11	**Lecture/workshop on topic 3.3** Duration: 02:00 Cooperative activities			
12	**Lecture/workshop on topic 3.4** Duration: 02:00 Cooperative activities			**Elaboration of the presentation and draft of the expository writing** Group presentation Continuous assessment Not Presential Duration: 04:00
13	**Lecture/workshop on topic 4.1** Duration: 02:00 Cooperative activities			
14	**Lecture/workshop on topics 4.2** Duration: 02:00 Cooperative activities			**Elaboration of the presentation and draft of the expository writing** Group presentation Continuous assessment Not Presential Duration: 04:00
15	**Lecture/workshop on topics 4.3 and 4.4** Duration: 02:00 Cooperative activities			**Final expositions and overall conclusions.** Group presentation Continuous assessment Not Presential Duration: 04:00
16				
17				**Final examination for those students with an average inferior to 5.** Written test Final examination Presential Duration: 05:00

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.

* The schedule is based on an a priori planning of the subject; it might be modified during the academic year, especially considering the COVID19 evolution.

6. Activities and assessment criteria

6.1. Assessment activities

6.1.1. Assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
2	Elaboration of the presentation and draft of the expository writing	Group presentation	No Presential	04:00	20%	3 / 10	CE13 CE14
4	Elaboration of the presentation and draft of the expository writing	Group presentation	No Presential	04:00	20%	3 / 10	CE13 CE14
6	Elaboration of the presentation and draft of the expository writing	Group presentation	No Presential	04:00	10%	3 / 10	CE13 CE14
8	Elaboration of the presentation and draft of the expository writing	Group presentation	No Presential	04:00	10%	3 / 10	CE13 CE14
10	Elaboration of the presentation and draft of the expository writing	Group presentation	No Presential	04:00	10%	3 / 10	CE13 CE14
12	Elaboration of the presentation and draft of the expository writing	Group presentation	No Presential	04:00	10%	3 / 10	CE13 CE14
14	Elaboration of the presentation and draft of the expository writing	Group presentation	No Presential	04:00	10%	3 / 10	CE13 CE14
15	Final expositions and overall conclusions.	Group presentation	No Presential	04:00	10%	3 / 10	CE13 CE14

6.1.2. Global examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
17	Final examination for those students with an average inferior to 5.	Written test	Face-to-face	05:00	100%	5 / 10	CE13 CE14

6.1.3. Referred (re-sit) examination

Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
Examen final	Written test	Face-to-face	05:00	100%	5 / 10	CE13 CE14

6.2. Assessment criteria

The grading criteria for this subject are closely linked to the working methods. This method will be concept-oriented. For each topic and subtopic there will be a lecture/workshop in the classroom, and the teacher will choose a key concept. Later, the students, preferably in groups, will have one week for reading concept-related bibliography and elaborate a presentation and an expository writing (8 pages max.).

Each group of students will present a draft of their work in the classroom, which may be evaluated (anonymously) by the other students.The rhythm of work will be, approximately, as follows: every two weeks, each group of students will submit the expository writing of past week's concept. In parallel, the students will attend the lectures/workshops that will be done in the classroom, and possibly qualify them.

With more detail, the following two-week procedure will be followed for each concept:

1. The teacher will provide an introduction to a concept, relevant bibliography and documentation for the concept at hand. Such documentation will be a starting point for the student, who will explore other relevant sources of information.
2. Each group of students will elaborate a presentation related to the concept. In parallel, they should start elaborating a draft document with the expository writing of the concept.
3. The following week, in the classroom, the concept will be presented, the mistakes and problems detected in the presentation will be discussed and a consensus will be achieved. The rest of the students in the classroom may evaluate the presentations.
4. The final expository writing (8 pages max.) will be uploaded to Moodle.

The concepts of the course are listed below, but they could be dynamically modified, along the course. For some topics the teacher will provide problems for being solved by the group: Hazard. Reliability vs. Safety. Risk. SafeWare and associated techniques. Concepts from the Std. IEC 61508: SIL, ALARP. Automation and Overautomation. Norman's Model. Latent errors and violations. Models: STAMP (Leveson), ChiDeltas (Hall-Silva). Other concepts to be announced.

he mechanics of the course will be as follows:

- The communication among the students and the teacher will be done through Moodle. The steps to be done at each point during the course will be announced always through Moodle.
- Problem resolution and clarification of student's questions will be done also through Moodle.
- The documentation for each concept will be provided on demand, via Moodle.
- The purpose of evaluating the presentations by other students is to get an idea on how clear the concept has been explained. Of course, those qualifications are just informative for the teacher, who will have a final

decision on the overall evaluation.

The final qualification will be an average of the teacher's qualifications for each submitted work, taking into account also the effort and overall attitude of each group of students.

7. Teaching resources

7.1. Teaching resources for the subject

Name	Type	Notes
Bibliografía	Bibliography	Bibliografía available in: https://www.mendeley.com/community/criticalsw

8. Other information

8.1. Other information about the subject

The scheduled chronogram follows an ideal situation and it may suffer some changes due to future emergent situations, like it happened in the past due to COVID-19.

7.4.8 Data Engineering

ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

103000541 - Data Mining

DEGREE PROGRAMME

10AM - Master Universitario En Ingenieria Del Software

ACADEMIC YEAR & SEMESTER

2023/24 - Semester 1

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1. Description

1.1. Subject details

Name of the subject	103000541 - Data Mining
No of credits	4 ECTS
Type	Optional
Academic year ot the programme	First year
Semester of tuition	Semester 1
Tuition period	September-January
Tuition languages	English
Degree programme	10AM - Master Universitario en Ingenieria del Software
Centre	10 - Escuela Tecnica Superior De Ingenieros Informaticos
Academic year	2023-24

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Fco.javier Segovia Perez (Subject coordinator)	2305	javier.segovia@upm.es	M - 10:00 - 11:00 Hablar con el profesor
Ernestina Menasalvas Ruiz	4303	ernestina.menasalvas@upm.es	M - 10:00 - 11:00 hablar con la profesora

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

3. Prior knowledge recommended to take the subject

3.1. Recommended (passed) subjects

The subject - recommended (passed), are not defined.

3.2. Other recommended learning outcomes

- Artificial Intelligence

- Statistics

4. Skills and learning outcomes *

4.1. Skills to be learned

CG14 - Conocimiento y comprensión de la informática necesaria para la creación de modelos de información, y de los sistemas y procesos complejos

CG18 - Capacidad de trabajar y comunicarse también en contextos internacionales

CG3 - 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 (RD)

CG8 - Planteamiento y resolución de problemas también en áreas nuevas y emergentes de su disciplina

CG9 - Aplicación de los métodos de resolución de problemas más recientes o innovadores y que puedan implicar el uso de otras disciplinas

4.2. Learning outcomes

RA87 - Being able to translate a data insight into a business decision and action.

RA85 - Being able to understand how to effectively manage the analytical processes and use the results of these processes (models, clusters, etc.) as the basis for making informed, evidence-based decisions for creating value for a company

RA86 - Being able to understand the data science?s implications for management and decision making in a data-rich environment.

RA84 - Being able to reframe a business question as a data question, reasoning about what data might be of assistance and how to obtain it

* 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.

5. Brief description of the subject and syllabus

5.1. Brief description of the subject

The course is mainly dedicated to the improvement of the development of software engineering projects by means of Data Mining.

The course is very interactive, with the development of many short projects and exposition at class. Learning by doing, using the IBM SPSS tool

Students will learn the use of the IBM SPSS tool by themselves, with some teacher support

Topics:

Data Engineering, Data MIning, Business Intelligence

Descriptive, Diagnostic, Predictive and Prescriptive Analysis of data

Techniques:

- Classification

- Regression

- Association

- Clustering

5.2. Syllabus

1. INTRODUCTION TO DATA ENGINEERING
2. THE TOOL: IBM SPSS MODELER
3. Descriptive, Diagnostic, Predictive and Prescriptive Analysis
4. RFM ANALYSIS
5. CLUSTERING
6. LINER REGRESSION
7. LOGISTIC REGRESSION
8. NEAREST NEIGHBOR
9. DECISION TREES
10. NEURAL NETWORKS
11. ENSEMBLE METHODS
12. ASSOCIATION RULES
13. DEALING WITH TIME

6. Schedule

6.1. Subject schedule*

Week	Classroom activities	Laboratory activities	Distant / On-line	Assessment activities
1	**INTRODUCTION TO DATA ANALYTICS** Duration: 02:00 Additional activities			
2				**Supermarket Assignment** Individual work Continuous assessment Presential Duration: 02:00
3	**IBM SPSS: INTRO AND PRACTICE** Duration: 02:00 Problem-solving class			
4				**IBM SPSS EXERCICES** Individual work Continuous assessment Presential Duration: 02:00
5	**A PRACTICAL SESSION ON DESCRIPTIVE ANALYSIS** Duration: 01:00 Problem-solving class			**Descriptive Analysis Questions** Individual work Continuous assessment Presential Duration: 01:00
6	**Some Data Visualization Tools of IBM SPSS** Duration: 01:00 Lecture			**Visual Descriptive Analysis of Supermarket data** Individual work Continuous assessment Presential Duration: 01:00
7	**DESCRIPTIVE ANALYSIS: RFM** Duration: 01:00 Lecture			**Segmentation of supermarket customers** Individual work Continuous assessment Presential Duration: 01:00
8	**DESCRIPTIVE ANALYSIS: CLUSTERING** Duration: 01:00 Lecture			**Clustering of Supermarket Customers** Individual work Continuous assessment Presential Duration: 01:00
9	**DIAGNOSTIC ANALYTICS: CORRELATION, ANOVA AND CHI-SQUARED TESTS** Duration: 01:00 Lecture			**Titanic Survival** Individual work Continuous assessment Presential Duration: 01:00 **Basket Analysis** Individual work Continuous assessment Presential Duration: 01:00

10	**LINEAR REGRESSION** Duration: 01:00 Lecture			**Predicting purchases** Individual work Continuous assessment Presential Duration: 01:00
11	**LOGISTIC REGRESSION** Duration: 01:00 Lecture			**Touchpoints** Individual work Continuous assessment Presential Duration: 01:00
12	**DECISION TREES** Duration: 01:00 Lecture **Instance-Based Classifiers: NEAREST NEIGHBOR** Duration: 01:00 Lecture			
13	**NEURAL NETWORKS** Duration: 01:00 Lecture **ENSEMBLE METHODS** Duration: 01:00 Lecture			
14				**Competition: Predictive Analysis** Individual work Continuous assessment Presential Duration: 04:00
15	**ASSOCIATION RULES** Duration: 01:00 Lecture **DEALING WITH TIME** Duration: 01:00 Lecture			
16				**Competition: Predictive Analysis** Individual work Continuous assessment Presential Duration: 04:00
17				**ALL ASSIGNMENTS** Individual work Final examination Presential Duration: 02:00

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.

* The schedule is based on an a priori planning of the subject; it might be modified during the academic year, especially considering the COVID19 evolution.

7. Activities and assessment criteria

7.1. Assessment activities

7.1.1. Assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
2	Supermarket Assignment	Individual work	Face-to-face	02:00	5%	5 / 10	CG18 CG8 CG9
4	IBM SPSS EXERCICES	Individual work	Face-to-face	02:00	5%	5 / 10	CG14
5	Descriptive Analysis Questions	Individual work	Face-to-face	01:00	5%	5 / 10	CG18 CG9
6	Visual Descriptive Analysis of Supermarket data	Individual work	Face-to-face	01:00	5%	5 / 10	CG18 CG9
7	Segmentation of supermarket customers	Individual work	Face-to-face	01:00	10%	5 / 10	CG18 CG14 CG8 CG9 CG3
8	Clustering of Supermarket Customers	Individual work	Face-to-face	01:00	10%	5 / 10	CG18 CG14 CG8 CG9 CG3
9	Titanic Survival	Individual work	Face-to-face	01:00	10%	5 / 10	CG18 CG14 CG8 CG9 CG3
9	Basket Analysis	Individual work	Face-to-face	01:00	10%	5 / 10	CG18 CG14 CG8 CG9 CG3
10	Predicting purchases	Individual work	Face-to-face	01:00	10%	5 / 10	CG18 CG14 CG8 CG9 CG3

11	Touchpoints	Individual work	Face-to-face	01:00	10%	5 / 10	CG18 CG14 CG8 CG9 CG3
14	Competition: Predictive Analysis	Individual work	Face-to-face	04:00	10%	5 / 10	CG18 CG14 CG8 CG9 CG3
16	Competition: Predictive Analysis	Individual work	Face-to-face	04:00	10%	5 / 10	CG18 CG14 CG8 CG9 CG3

7.1.2. Global examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
17	ALL ASSIGNMENTS	Individual work	Face-to-face	02:00	100%	5 / 10	CG18 CG14 CG8 CG9 CG3

7.1.3. Referred (re-sit) examination

Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
ALL ASSIGNMENTS	Individual presentation	Face-to-face	02:02	100%	5 / 10	CG18 CG14 CG8 CG9 CG3

7.2. Assessment criteria

The evaluation is based on the final project BUT ALL assignments are mandatory for all three types of examinations.

For the continuous or progressive evaluation, it is allowed one resubmission for each assignment.

For the global evaluation, you can only submit once each assignment.

For the extraordinary evaluation, only failed assignments submitted in the continuous or global examinations can be resubmitted.

8. Teaching resources

8.1. Teaching resources for the subject

Name	Type	Notes
Principles of Data Mining (Adaptive Computation and Machine Learning), D Hand, MIT Press, 2001.	Bibliography	
Jiawei Han, Micheline Kamber, Data Mining : Concepts and Techniques, 2nd edition, Morgan Kaufmann, ISBN 1558609016, 2006.	Bibliography	
Data Mining Techniques: Marketing, Sales and Customer Support, Michael J. A. Berry, Gordon Linoff, John Wiley & Sons, 1997.	Bibliography	
Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Introduction to Data Mining, Pearson Addison Wesley (May, 2005). Hardcover: 769 pages. ISBN: 0321321367	Bibliography	MOST RECOMMENDED BOOK

Ian Witten, Eibe Frank, Mark Hall, Data Mining: Practical Machine Learning Tools and Techniques, 3nd Edition, Morgan Kaufmann, ISBN 978-0-12-374856-0, 2011.	Bibliography	
Página web de la asignatura en moodle	Web resource	
IBM SPSS	Others	THE TOOL WE WILL USE
Sala de trabajo en grupo con ordenadores	Equipment	
aula	Equipment	

7.4.9 Deep Learning and Software Engineering

ANX-PR/CL/001-01
LEARNING GUIDE

SUBJECT

103001022 - Deep Learning And Software Engineering

DEGREE PROGRAMME

10AM - Master Universitario En Ingenieria Del Software

ACADEMIC YEAR & SEMESTER

2023/24 - Semester 1

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1. Description

1.1. Subject details

Name of the subject	103001022 - Deep Learning And Software Engineering
No of credits	4 ECTS
Type	Optional
Academic year ot the programme	First year
Semester of tuition	Semester 1
Tuition period	September-January
Tuition languages	English
Degree programme	10AM - Master Universitario en Ingenieria del Software
Centre	10 - Escuela Tecnica Superior De Ingenieros Informaticos
Academic year	2023-24

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Maria Pilar Rodriguez Gonzalez	6203	pilar.rodriguez@upm.es	W - 14:00 - 17:00 F - 12:00 - 15:00
Sira Vegas Hernandez (Subject coordinator)	5105	sira.vegas@upm.es	M - 12:00 - 15:00 Th - 12:00 - 15:00

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

3. Prior knowledge recommended to take the subject

3.1. Recommended (passed) subjects

The subject - recommended (passed), are not defined.

3.2. Other recommended learning outcomes

- Basic knowledge of machine learning (recommended)

- Basic knowledge of software engineering (essential)

- Python programming language (essential)

4. Skills and learning outcomes *

4.1. Skills to be learned

CE13 - Tener una visión de los distintos aspectos específicos y emergentes de la ingeniería del software, y profundizar en algunos de ellos

CE14 - Comprender lo que pueden y no pueden conseguir las prácticas actuales de ingeniería del software, y sus limitaciones y su posible futura evolución.

CG1 - 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 (RD)

CG13 - Apreciación de los límites del conocimiento actual y de la aplicación práctica de la tecnología más reciente

CG14 - Conocimiento y comprensión de la informática necesaria para la creación de modelos de información, y de los sistemas y procesos complejos

CG18 - Capacidad de trabajar y comunicarse también en contextos internacionales

4.2. Learning outcomes

RA23 - Time organization capability SC13, SC14 K

RA25 - Communication skills in public SC13, SC14, CG3, CG18 S

RA1 - Within an application field of Software Engineering, uses and designs the appropriate solution to solve some of its problems, describing the technical difficulties and the application limits

RA84 - Being able to reframe a business question as a data question, reasoning about what data might be of assistance and how to obtain it

RA54 - Proponer una solución justificada a un problema real que sea complejo o mal definido, o perteneciente a un área nueva o emergente, o que requiera el desarrollo de enfoques o métodos nuevos y originales, dentro del contexto de la ingeniería del software justificándola de una forma cualitativa y cuantitativa.

RA56 - Materializar la solución propuesta a un problema dado en términos de código, prototipo, informes, pruebas de concepto, análisis, diseños y/o documentación, ubicándola en un entorno empresarial real.

RA18 - Given a real problem, the student chooses the most appropriate software engineering solution, analyzing the solution feasibility, what can and cannot be achieved through the current status of the chosen solution, and what it can advance in the future.

RA19 - The student explains what are the software engineering limits and frontiers, and the base for new trends and developments, and about the advanced issues and their application.

RA26 - Group work skill SC13, SC14, CG17 A

* 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.

5. Brief description of the subject and syllabus

5.1. Brief description of the subject

Deep learning (DL) is emerging as a powerful approach to address very complex problems, including those faced by software engineers. It is now being explored, for example, to automatically document code, automate test generation, and even provide code patches. Yet, the DNNs being developed and their validation are at their infancy, suffering from many limitations that we do not quite understand, which may impact future research and their adoption in practice.

This course aims at understanding how DL can be incorporated to the development of software systems, and in which types of tasks it can be used.

5.2. Syllabus

1. Introduction to Deep Learning
    1.1. What is DL?
    1.2. Basics of DL
    1.3. Training Deep Feedforward Networks
    1.4. Neural Networks Architectures
2. Deep Learning for Software Engineering
    2.1. SE Problems that Use DL
    2.2. DL Architectures Used to Solve SE Problems
    2.3. Integrating DL into SE
3. Software Engineering for Deep Learning
    3.1. Developing a DL System
    3.2. SE Challenges of DL
    3.3. Incorporating SE practices to DL

6. Schedule

6.1. Subject schedule*

Week	Classroom activities	Laboratory activities	Distant / On-line	Assessment activities
1	**Chapter 1: Introduction to DL** Duration: 02:00 Lecture			
2	**Chapter 1: Introduction to DL** Duration: 02:00 Lecture			
3	**Chapter 1: Introduction to DL** Duration: 02:00 Lecture			
4	**Chapter 1: Introduction to DL** Duration: 02:00 Problem-solving class			
5	**Chapter 2: DL for SE** Duration: 02:00 Lecture			
6	**Chapter 2: DL for SE** Duration: 02:00 Lecture			
7	**Chapter 3: SE for DL** Duration: 02:00 Lecture			**Submission of Assignment: Milestone 1** Group work Continuous assessment Not Presential Duration: 10:00
8	**Chapter 3: SE for DL** Duration: 02:00 Lecture			
9	**Chapter 3: SE for DL** Duration: 02:00 Lecture			
10	**Chapter 3: SE for DL** Duration: 02:00 Lecture			
11	**Chapter 3: SE for DL** Duration: 02:00 Lecture			**Submission of Assignment: Milestone 2** Group work Continuous assessment Not Presential Duration: 20:00
12	**Chapter 3: SE for DL** Duration: 02:00 Lecture			

13	**Chapter 3: SE for DL** Duration: 02:00 Lecture			
14	**Chapter 3: Follow up of Assignment 2** Duration: 02:00 Cooperative activities			
15	**Chapter 3: Follow up of Assignment 2** Duration: 02:00 Cooperative activities			**Submission of Assignment: Milestone 3** Group work Continuous assessment Not Presential Duration: 30:00
16				**Presentation of Assignment** Group presentation Continuous assessment Presential Duration: 02:00
17				**Re-submission of Assignment (all milestones)** Group work Final examination Not Presential Duration: 60:00 **Re-presentation of Assignment** Group presentation Final examination Presential Duration: 02:00

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.

* The schedule is based on an a priori planning of the subject; it might be modified during the academic year, especially considering the COVID19 evolution.

7. Activities and assessment criteria

7.1. Assessment activities

7.1.1. Assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
7	Submission of Assignment: Milestone 1	Group work	No Presential	10:00	20%	3 / 10	CE13 CE14 CG13 CG14 CG1
11	Submission of Assignment: Milestone 2	Group work	No Presential	20:00	30%	3 / 10	CE13 CE14 CG13 CG14 CG1
15	Submission of Assignment: Milestone 3	Group work	No Presential	30:00	40%	3 / 10	
16	Presentation of Assignment	Group presentation	Face-to-face	02:00	10%	3 / 10	CG18

7.1.2. Global examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
17	Re-submission of Assignment (all milestones)	Group work	No Presential	60:00	90%	5 / 10	CE13 CE14 CG13 CG14 CG1
17	Re-presentation of Assignment	Group presentation	Face-to-face	02:00	10%	5 / 10	CG18

7.1.3. Referred (re-sit) examination

Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills

Second re-submission of Assignment (all milestones)	Group work	Face-to-face	60:00	90%	5 / 10	CE13 CE14 CG13 CG14 CG1
Second re-presentation of Assignment	Group presentation	Face-to-face	02:00	10%	5 / 10	CG18

7.2. Assessment criteria

Progressive evaluation period:

- Students will be evaluated using the evaluation tasks described above.
- No examination will be made.
- The final grade will be calculated using a weighted average as explained above.

Global evaluation:

When the overall score obtained by the student in the progressive evaluation period is smaller than 5, the student will have to re-submit those milestones of the assignment (and/or repeat the presentation) that do not reach the minimum score required. It is not possible to complete evaluation tasks for which there is not a submission/presentation in the progressive evaluation period. In no case assignments/presentations that have a score equal or greater than 5 will be repeated.

Extraordinary evaluation:

When the overall score obtained by the student in the global evaluation period is smaller than 5, the student will have to repeat (or perform in case (s)he has not done it before) all evaluation tasks that do not reach the minimum score required. In no case evaluation tasks that have a score equal or greater than 5 will be repeated.

8. Teaching resources

8.1. Teaching resources for the subject

Name	Type	Notes
Deep Learning. I. Goofellow, Y. Bengio, A. Courville. The MIT Press	Bibliography	
Neural Networks and Deep Learning.C.C. Aggarwal. Springer	Bibliography	

7.4.10 E-Health: Promoting Active And Healthy Ageing

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E.T.S. de Ingenieros
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ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

103001025 - E-health: Promoting Active And Healthy Ageing

DEGREE PROGRAMME

10AM - Master Universitario En Ingenieria Del Software

ACADEMIC YEAR & SEMESTER

2023/24 - Semester 1

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1. Description

1.1. Subject details

Name of the subject	103001025 - E-Health: Promoting Active And Healthy Ageing
No of credits	4 ECTS
Type	Optional
Academic year ot the programme	First year
Semester of tuition	Semester 1
Tuition period	September-January
Tuition languages	English
Degree programme	10AM - Master Universitario en Ingenieria del Software
Centre	10 - Escuela Tecnica Superior De Ingenieros Informaticos
Academic year	2023-24

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Cristian Moral Martos	5110	cristian.moral@upm.es	W - 10:00 - 14:00 F - 10:00 - 12:00 Please, ask for an appointment
Elena Villalba Mora (Subject coordinator)	5110	elena.villalba@upm.es	M - 10:00 - 12:00 W - 10:00 - 12:00 F - 10:00 - 12:00 Please, ask for an appointment

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

member in charge.

3. Prior knowledge recommended to take the subject

3.1. Recommended (passed) subjects

The subject - recommended (passed), are not defined.

3.2. Other recommended learning outcomes

- User Centred Design. User Experience basic knowledge.

4. Skills and learning outcomes *

4.1. Skills to be learned

CG1 - 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 (RD)

CG18 - Capacidad de trabajar y comunicarse también en contextos internacionales

CG8 - Planteamiento y resolución de problemas también en áreas nuevas y emergentes de su disciplina

4.2. Learning outcomes

RA90 - Apply techniques for designing and implementing prototypes of different fidelity levels

RA93 - Evaluate the usability of prototypes

RA91 - Apply techniques for modelling the context of use

RA92 - Understand how user-centred design methods are used in non-academic environments

* 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.

5. Brief description of the subject and syllabus

5.1. Brief description of the subject

The main focus of this subject is achieving an understanding of the necessary models, techniques and architectures that allow the development of interactive systems in the E-health domain. Topics to be covered include eHealth, eInclusion, co-production of health, empowerment, social innovation, social networks, serious games, and participation in society.

5.2. Syllabus

1. Active and Health Ageing
   1.1. Course introduction
   1.2. Definition and frameworks
2. Clinical perspective. Intrinsic capacity and frailty
3. Political perspective
4. Technological perspective
5. Social and personal perspective
6. Active and Healthy Ageing Project

6. Schedule

6.1. Subject schedule*

Week	Classroom activities	Laboratory activities	Distant / On-line	Assessment activities
1	**1. Active and Healthy Ageing: 1.1 Course introduction 1.2. Definitions and frameworks** Duration: 02:00 Lecture			
2	**2. Clinical perspective.** Duration: 02:00 Lecture			
3	**6. Introduction to AHA project. 6.1 Topic choice** Duration: 02:00 Cooperative activities			
4	**3. Political perspective.** Duration: 02:00 Lecture			
5	**5.Technological perspective I** Duration: 02:00 Lecture			**Assignment of political and technological perspective** Individual presentation Continuous assessment and final examination Not Presential Duration: 04:00
6	**6. AHA Project. 6.1. Topic choice and planning of context of use observation** Duration: 02:00 Additional activities			
7	**4. Social and personal perspective** Duration: 02:00 Lecture			**Assessment. AHA Project: Planification of the observation of the context of use [non recoverable]** Group work Continuous assessment Not Presential Duration: 02:00
8	**5. Technological perspective II** Duration: 02:00 Lecture			
9	**6. AHA project. 6.2 Observation, analysis and specification of context of use** Duration: 02:00 Additional activities			
10				**Assessment. AHA Project: Context of use [non recoverable]** Group presentation Continuous assessment Presential Duration: 02:00

11	**6. AHA Project. 6.3 Design and implementation of a prototype** Duration: 02:00 Additional activities			
12	**6. AHA Project. 6.3 Design and implementation of a prototype. Tutoring.** Duration: 02:00 Additional activities			
13				**Assessment. AHA Project: prototype [non recoverable]** Group presentation Continuous assessment Presential Duration: 02:00
14	**6. AHA project. 6.4 Evaluation of the prototype. Expert evaluation of heuristics** Duration: 02:00 Additional activities			
15	**6. AHA Project. 6.5 Analysis of results and reporting.** Duration: 02:00 Additional activities			
16	**6. AHA project. Tutoring** Duration: 02:00 Additional activities			
17				**Final Exam: Assessment: AHA project. Results [non recoverable]** Group presentation Continuous assessment Presential Duration: 03:00

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.

* The schedule is based on an a priori planning of the subject; it might be modified during the academic year, especially considering the COVID19 evolution.

7. Activities and assessment criteria

7.1. Assessment activities

7.1.1. Assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
5	Assignment of political and technological perspective	Individual presentation	No Presential	04:00	30%	5 / 10	CG1 CG18
7	Assessment. AHA Project: Planification of the observation of the context of use [non recoverable]	Group work	No Presential	02:00	10%	/ 10	CG1 CG18
10	Assessment. AHA Project: Context of use [non recoverable]	Group presentation	Face-to-face	02:00	20%	/ 10	CG1 CG18
13	Assessment. AHA Project: prototype [non recoverable]	Group presentation	Face-to-face	02:00	20%	/ 10	CG1 CG18 CG8
17	Final Exam: Assessment: AHA project. Results [non recoverable]	Group presentation	Face-to-face	03:00	20%	/ 10	CG1 CG18 CG8

7.1.2. Global examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
5	Assignment of political and technological perspective	Individual presentation	No Presential	04:00	30%	5 / 10	CG1 CG18

7.1.3. Referred (re-sit) examination

Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
Final written exam	Written test	Face-to-face	03:00	100%	5 / 10	CG1 CG18 CG8

7.2. Assessment criteria

Grading criteria

The projects will be evaluated during their iterative development during the course. Grading of students will be based on:

- Quality of the oral presentations (content, communication, slides)
- Quality of the intermediate and final results
- Ability to debate
- Active participation in class

Progressive evaluation system

The evaluation of this course is based on a progressive evaluation system (continuous evaluation), which grades the active participation of the student during the iterative development of an interactive project carried out in groups, following the human-centred design process. The project accounts for 70% of the final grade.

Besides, there is an individual assignment that accounts for the 30% of the final grade, that can be re-submitted in case a student fails it.

The evaluation activities and their concrete weight in the grading are described in "Continuous evaluation" ("Evaluación continua") above.

Global evaluation process

This course is based on the iterative development of an interactive system. Thus, the evaluation is a progressive one during the semester. Students unable to attend the classes can still submit the assignments in Moodle and will be evaluated at the same time as other students.

Given the iterative and incremental approach of the course, it is not possible to re-submit assignments related to the project at the end of the semester, but there are not minimal grades per assignment.

The political and technological individual assignment can be re-submitted if a student fails, accounting for 30% of the final grade.

Extraordinary evaluation

The extraordinary evaluation exists for students unable to pass the course during the semester. For that extraordinary evaluation students either must finish a concrete milestone they haven't passed (normally the last iteration; high-fidelity prototype and its evaluation, or the individual assignment), or a final exam that replace 100% of the grade.

8. Teaching resources

8.1. Teaching resources for the subject

Name	Type	Notes
Operational definition of Active and Healthy Ageing (AHA): A conceptual framework	Bibliography	Paper: Bousquet, Jean, et al. "Operational definition of Active and Healthy Ageing (AHA): A conceptual framework." The journal of nutrition, health & aging 19.9 (2015): 955-960.
Political context	Bibliography	Beard et al. (2016). The World Report on ageing and health: a policy framework for healthy ageing. Lancet 2016; 387: 2145-54 <br />
Age Friendly Cities	Bibliography	OMS. Global age-friendly cities: a guide (2017). Disponible en: http://www.who.int/ageing/publications/age_friendly_cities_guide/en/
mHealth	Bibliography	Mapping mHealth research: a decade of evolution. Fiordelli, Maddalena, Nicola Diviani, and Peter J. Schulz. Journal of medical Internet research 15.5 (2013).

mHealth review	Bibliography	? From Personal to Mobile Healthcare: Challenges and Opportunities Villalba-Mora, Elena, Ignacio Peinado, and Leocadio Rodriguez-Mañas. (2016). Emerging Perspectives on the Mobile Content Evolution. IGI Global, 2016. 124-137.
Inspection Methods	Bibliography	Usability Inspection Methods. Edited by Jakob Nielsen and Robert L. Mack, published by John Wiley & Sons, New York, NY ISBN 0-471-01877-5. 1994

9. Other information

9.1. Other information about the subject

This course contributes to the objectives 4 and 10 of the UN Sustainable Development Goals.

Note 1: please, always ask for an appointment before visiting a professor.

Note 2: please note that cocrete dates for the assignments will be informed at the begining of the course.

7.4.11 Experimental Software Engineering

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LEARNING GUIDE

SUBJECT

103000542 - Experimental Software Engineering

DEGREE PROGRAMME

10AM - Master Universitario En Ingenieria Del Software

ACADEMIC YEAR & SEMESTER

2023/24 - Semester 2

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1. Description

1.1. Subject details

Name of the subject	103000542 - Experimental Software Engineering
No of credits	6 ECTS
Type	Optional
Academic year ot the programme	First year
Semester of tuition	Semester 2
Tuition period	February-June
Tuition languages	English
Degree programme	10AM - Master Universitario en Ingenieria del Software
Centre	10 - Escuela Tecnica Superior De Ingenieros Informaticos
Academic year	2023-24

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Natalia Juristo Juzgado	D-5104	natalia.juristo@upm.es	Sin horario.
Sira Vegas Hernandez (Subject coordinator)	D-5105	sira.vegas@upm.es	Tu - 14:00 - 17:00 Th - 12:00 - 15:00

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

3. Prior knowledge recommended to take the subject

3.1. Recommended (passed) subjects

The subject - recommended (passed), are not defined.

3.2. Other recommended learning outcomes

- Basic knowledge of statistics.

4. Skills and learning outcomes *

4.1. Skills to be learned

CE13 - Tener una visión de los distintos aspectos específicos y emergentes de la ingeniería del software, y profundizar en algunos de ellos

CE14 - Comprender lo que pueden y no pueden conseguir las prácticas actuales de ingeniería del software, y sus limitaciones y su posible futura evolución.

CG1 - 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 (RD)

CG13 - Apreciación de los límites del conocimiento actual y de la aplicación práctica de la tecnología más reciente

CG14 - Conocimiento y comprensión de la informática necesaria para la creación de modelos de información, y de los sistemas y procesos complejos

CG18 - Capacidad de trabajar y comunicarse también en contextos internacionales

CG3 - 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 (RD)

CG6 - Gestión de la información

CG7 E - Especificación y realización de tareas informáticas complejas, poco definidas o no familiares

CG8 - Planteamiento y resolución de problemas también en áreas nuevas y emergentes de su disciplina

CG9 - Aplicación de los métodos de resolución de problemas más recientes o innovadores y que puedan implicar el uso de otras disciplinas

4.2. Learning outcomes

RA13 - Given a particular software engineering field, the student will be able to design and evaluate the most adequate approach to solve some of the related problems, highlighting the technical difficulties and limits of application.

* 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.

5. Brief description of the subject and syllabus

5.1. Brief description of the subject

Software engineering technologies are not being adequately evaluated. That is, professionals do not know for sure whether a technology is effective or not and, if so, cannot be sure how effective and applicable it is. This lack of proper evaluation undermines the ability of the industry to produce competitive quality software.

Experimental Software Engineering (ESE) is a discipline of Software Engineering that aims to produce reliable information for professionals about what technologies should be used in software development projects. ESE uses empirical studies (experiments, quasi-experiments, case studies, etc.) to evaluate the effectiveness of technologies for software development.

This course aims to train students in the basic skills necessary to apply the empirical methods. It focuses on the experiments, since they constitute the most mature and best understood type of empirical study in the field of SE. Students will learn how to perform, analyze, aggregate and replicate experiments (in industry and in academic settings).

5.2. Syllabus

1. Introduction to Experimental Software Engineering
   1.1. Basics of experimentalism
   1.2. The scientific method
   1.3. Scientific rules: cause-effect relationships
   1.4. Scientific immaturity of software engineering
2. Laboratory and Experiment
   2.1. The concept of laboratory
   2.2. The concept of experiment
   2.3. A lab for software engineering
   2.4. An experiment for software engineering
3. Elements of an Experiment
   3.1. Response variables
   3.2. Factors and levels
   3.3. Types of empirical studies
4. Designing Experiments
   4.1. Types of variables
   4.2. Types of control
   4.3. Validity
5. Data Analysis
   5.1. Basics of inferential statistics
   5.2. Parametric tests for independent samples

5.3. Parametric tests for related samples

5.4. Non parametric tests

6. Schedule

6.1. Subject schedule*

Week	Classroom activities	Laboratory activities	Distant / On-line	Assessment activities
1	**Lecture: Chapter 1** Duration: 04:00 Lecture			
2	**Lecture: Chapter 2** Duration: 02:00 Lecture **Problem-solving activity: Chapter 3** Duration: 02:00 Problem-solving class			
3	**Lecture: Chapter 3** Duration: 01:00 Lecture **Problem-solving activity: Chapter 3** Duration: 01:00 Problem-solving class	**Lecture: Chapter 5** Duration: 02:00 Laboratory assignments		
4	**Lecture: Chapter 4** Duration: 02:00 Lecture **Problem-solving activity: Chapter 4** Duration: 02:00 Problem-solving class			
5	**Brainstorming and group discussion of assignment 1** Duration: 02:00 Problem-solving class	**Lecture: Chapter 5** Duration: 02:00 Laboratory assignments		
6	**Brainstorming and group discussion of assignment 1** Duration: 02:00 Problem-solving class	**Lecture: Chapter 5** Duration: 02:00 Laboratory assignments		
7				
8		**Lecture: Chapter 5** Duration: 04:00 Laboratory assignments		
9				**Presentation and submission of assignment 1** Group presentation Continuous assessment Presential Duration: 15:00

10		**Brainstorming and group discussion of assignment 2** Duration: 04:00 Laboratory assignments		
11		**Brainstorming and group discussion of assignment 2** Duration: 04:00 Laboratory assignments		
12				**Submission of assignment 2** Group work Continuous assessment Not Presential Duration: 10:00
13				
14				
15				
16				
17				**Re-submission and presentation of assignment 1** Group work Final examination Presential Duration: 15:00 **Re-submission of assignment 2** Group work Final examination Not Presential Duration: 10:00

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.

* The schedule is based on an a priori planning of the subject; it might be modified during the academic year, especially considering the COVID19 evolution.

7. Activities and assessment criteria

7.1. Assessment activities

7.1.1. Assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
9	Presentation and submission of assignment 1	Group presentation	Face-to-face	15:00	50%	5 / 10	CE13 CE14 CG6 CG7 E CG8 CG9 CG13 CG14 CG18 CG1 CG3
12	Submission of assignment 2	Group work	No Presential	10:00	50%	5 / 10	CE13 CE14 CG6 CG7 E CG8 CG9 CG13 CG14 CG18 CG1 CG3

7.1.2. Global examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
17	Re-submission and presentation of assignment 1	Group work	Face-to-face	15:00	50%	5 / 10	CE13 CE14 CG6 CG7 E CG8 CG9 CG13 CG14 CG18 CG1 CG3

17	Re-submission of assignment 2	Group work	No Presential	10:00	50%	5 / 10	CE13 CE14 CG6 CG7 E CG8 CG9 CG13 CG14 CG18 CG1 CG3

7.1.3. Referred (re-sit) examination

Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
Extraordinary exam	Written test	Face-to-face	02:00	100%	5 / 10	CE13 CE14 CG6 CG7 E CG8 CG9 CG13 CG14 CG18 CG1 CG3

7.2. Assessment criteria

Progressive evaluation period:

- Students will be evaluated using the assignments only.
- No examination will be made.
- The assessment of assignments will depend on the correctness of the results.
- Additionally, for assignment 1 the presentation made by the students will be taken into consideration.
- The final grade will be calculated using a weighted average (each assignment counts 50% of final score).

Global evaluation:

When the overall score obtained by the student in the progressive evaluation period is smaller than 5, the student will have to re-submit (and/or present) those assignments that do not reach the minimum score required. It is not possible to submit assignments for which there is not a submission in the progressive evaluation period. In no case assignments that have a score equal or greater than 5 will be re-submitted.

Extraordinary evaluation:

When the overall score obtained by the student in the global evaluation period is smaller than 5, the student will have to perform an exam. After 2 submission trials (during progressive evaluation and global evaluation), if a student has not been able to pass the course, it means that the assignments mode is not suitable for him/her. Therefore, a different evaluation method should be used.

8. Teaching resources

8.1. Teaching resources for the subject

Name	Type	Notes
Natalia Juristo, Ana Moreno. Basics of software engineering experimentation. Kluwer 2001	Bibliography	
Claes Wohlin et al. Experimentation in software engineering: an introduction. Kluwer 2000.	Bibliography	
Course Moodle site	Web resource	www.moodle.upm.es
Laboratory	Equipment	TBD
Room	Equipment	MUIS room

7.4.12 Fundamentals of Business Administration

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LEARNING GUIDE

SUBJECT

103000680 - Fundamentals Of Business Administration

DEGREE PROGRAMME

10AM - Master Universitario En Ingenieria Del Software

ACADEMIC YEAR & SEMESTER

2023/24 - Semester 2

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8. Other information........8

1. Description

1.1. Subject details

Name of the subject	103000680 - Fundamentals Of Business Administration
No of credits	4 ECTS
Type	Optional
Academic year ot the programme	First year
Semester of tuition	Semester 2
Tuition period	February-June
Tuition languages	English
Degree programme	10AM - Master Universitario en Ingenieria del Software
Centre	10 - Escuela Tecnica Superior De Ingenieros Informaticos
Academic year	2023-24

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Raul Gutierrez Sanchis (Subject coordinator)		raul.g.sanchis@upm.es	- -

* 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

CE13 - Tener una visión de los distintos aspectos específicos y emergentes de la ingeniería del software, y profundizar en algunos de ellos

CE14 - Comprender lo que pueden y no pueden conseguir las prácticas actuales de ingeniería del software, y sus limitaciones y su posible futura evolución.

CG1 - 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 (RD)

CG18 - Capacidad de trabajar y comunicarse también en contextos internacionales

CG8 - Planteamiento y resolución de problemas también en áreas nuevas y emergentes de su disciplina

3.2. Learning outcomes

RA73 - The students will be able to elicit and conceptualize customer and user's needs

RA25 - Communication skills in public SC13, SC14, CG3, CG18 S

RA2 - Facing a real problem, chooses an appropriate Software Engineering solution, analyzing its viability, what can and cannot be achieved from the current state of development of the selected solution, and what is expected to advance in the future

RA85 - Being able to understand how to effectively manage the analytical processes and use the results of these processes (models, clusters, etc.) as the basis for making informed, evidence-based decisions for creating value for a company

RA77 - Understands basic business principles

RA26 - Group work skill SC13, SC14, CG17 A

RA87 - Being able to translate a data insight into a business decision and action.

* 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 course introduces the student to the contemporary global business world, entrepreneurship, business modeling, managing people and organizations, organizational design, resources and capabilities, leadership, and managing information and financial issues. The primary objective is to give the student an understanding of basic business principles.

4.2. Syllabus

1. Global business environment
2. Entrepreneurship
3. Business strategy
4. Business modelling
5. Managing the business
6. Planning the business
7. Organizational design
8. Managing human resources
9. Leading the business
10. Controlling the business
11. Accounting information and finance
12. Business ethics and communication

5. Schedule

5.1. Subject schedule*

Week	Classroom activities	Laboratory activities	Distant / On-line	Assessment activities
1	**Course foundations and Intro** Duration: 02:00 Lecture			
2	**Global business environment** Duration: 02:00 Lecture			
3	**Managers and identity** Duration: 02:00 Cooperative activities			
4	**Business strategy and modelling** Duration: 02:00 Lecture			
5	**Value proposition** Duration: 02:00 Lecture			
6	**Value creation, delivery, and capture** Duration: 02:00 Lecture			
7	**Managing the business** Duration: 02:00 Lecture			
8	**Planning the business** Duration: 02:00 Lecture			**Business concept note** Group presentation Continuous assessment and final examination Presential Duration: 01:00
9	**Organizational design** Duration: 02:00 Lecture			
10	**Managing human resources** Duration: 02:00 Lecture			
11	**Leading the business** Duration: 02:00 Lecture			
12	**Controlling the business** Duration: 02:00 Lecture			
13	**Accounting information and finance** Duration: 02:00 Lecture			

14	**Business ethics and communication** Duration: 02:00 Cooperative activities			
15				**Final presentation** Group presentation Continuous assessment and final examination Presential Duration: 02:00 **Final report** Group work Continuous assessment and final examination Presential Duration: 04:00 **Attendance and participation** Individual work Continuous assessment and final examination Presential Duration: 02:00
16				
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.

* The schedule is based on an a priori planning of the subject; it might be modified during the academic year, especially considering the COVID19 evolution.

6. Activities and assessment criteria

6.1. Assessment activities

6.1.1. Assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
8	Business concept note	Group presentation	Face-to-face	01:00	20%	5 / 10	CE13 CE14 CG8 CG18 CG1
15	Final presentation	Group presentation	Face-to-face	02:00	25%	5 / 10	CE13 CE14 CG8 CG18 CG1
15	Final report	Group work	Face-to-face	04:00	35%	5 / 10	CE13 CE14 CG8 CG1
15	Attendance and participation	Individual work	Face-to-face	02:00	20%	5 / 10	CE13 CG18

6.1.2. Global examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
8	Business concept note	Group presentation	Face-to-face	01:00	20%	5 / 10	CE13 CE14 CG8 CG18 CG1
15	Final presentation	Group presentation	Face-to-face	02:00	25%	5 / 10	CE13 CE14 CG8 CG18 CG1
15	Final report	Group work	Face-to-face	04:00	35%	5 / 10	CE13 CE14 CG8 CG1

15	Attendance and participation	Individual work	Face-to-face	02:00	20%	5 / 10	CE13 CG18

6.1.3. Referred (re-sit) examination

Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
Course evaluation exam	Individual work	Face-to-face	04:00	80%	5 / 10	CE13 CE14 CG8 CG18 CG1

6.2. Assessment criteria

Progressive and global evaluation:

Students will complete a group project. This project is based on developing a business plan for the creation of a new company. Students will develop their projects through continuous work throughout the semester. All lectures will provide them with the proper grounds for their projects. Moreover, they will be presenting their business plan in the class on a continuous basis throughout the semester, and they will receive feedback from the lecture accordingly.

- A business concept note will be prepared throughout the first part of the course and presented as a mid-term evaluation. The grading scale to evaluate it will be from 0 to 10 and the grade will be common for the whole group.
- The final report will be developed throughout the semester and delivered as the final evaluation item. The grading scale to evaluate it will be from 0 to 10 and the grade will be common for the whole group.
- A final presentation (oral defense) is compulsory. Students will be developing their presentations throughout the semester receiving continuous feedback in the class. The presentation will be in groups, and the grade will be common for the whole group. The grading scale to evaluate it will be from 0 to 10 and the grade will be common for the whole group.
- Attendance and active participation **in all lectures will be considered to contribute to the final grade by 20%. The grading scale to evaluate it will be from 0 to 10 and the grade will be on an individual basis. This examination item cannot be recovered by the extraordinary exam.**

Extraordinary exam:

- **The course evaluation exam as the extraordinary exam can only contribute to a maximum of 80% of the final grade, and will only be provided to the students who pass the "attendance and participation" item.**

7. Teaching resources

7.1. Teaching resources for the subject

Name	Type	Notes
Ebert and Griffin (2016): Business Essentials. Prentice Hall	Bibliography	
Johnson et al. (2014): Exploring Strategy: Text and Cases. Pearson	Bibliography	
Robbins and Coulter (2017): Management. Pearson	Bibliography	Main book
Economics @Intelligence Database, UPM	Web resource	

8. Other information

8.1. Other information about the subject

In this course, and in case of any eventuality, although it will be a small group of students, every session could be moved to online teaching through Teams or Collaborate via Moodle. Uncertainty is rather high at the moment this guide is being validated, but everything has been defined to switch from unperson teaching to online sessions automatically.

The subject is related to SDGs 1, 4, 8, 9, 10 and 12.

7.4.13 Management, Relationships and Communication in Working Groups

POLITÉCNICA
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COORDINATION PROCESS OF
LEARNING ACTIVITIES
PR/CL/001

E.T.S. de Ingenieros
Informaticos

ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

103000544 - Management, Relationships And Communication In Working Groups

DEGREE PROGRAMME

10AM - Master Universitario En Ingenieria Del Software

ACADEMIC YEAR & SEMESTER

2023/24 - Semester 1

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1. Description

1.1. Subject details

Name of the subject	103000544 - Management, Relationships And Communication In Working Groups
No of credits	4 ECTS
Type	Optional
Academic year ot the programme	First year
Semester of tuition	Semester 1
Tuition period	September-January
Tuition languages	English
Degree programme	10AM - Master Universitario en Ingenieria del Software
Centre	10 - Escuela Tecnica Superior De Ingenieros Informaticos
Academic year	2023-24

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Santiago Eibe Garcia	D2311	santiago.eibe@upm.es	M - 12:00 - 13:30 M - 15:30 - 17:00 W - 15:00 - 16:30 Th - 15:30 - 17:00 To arrange an appointment it is mandatory to send an email in advance to susana.munoz@up

			m.es.
Susana Muñoz Hernandez (Subject coordinator)	D2310	susana.munoz@upm.es	Tu - 14:00 - 17:00 Th - 12:00 - 15:00 To arrange an appointment it is mandatory to send an email in advance to susana.munoz@upm.es.

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

3. Prior knowledge recommended to take the subject

3.1. Recommended (passed) subjects

The subject - recommended (passed), are not defined.

3.2. Other recommended learning outcomes

- English knowledge to follow the class and be able to participate.

4. Skills and learning outcomes *

4.1. Skills to be learned

CE13 - Tener una visión de los distintos aspectos específicos y emergentes de la ingeniería del software, y profundizar en algunos de ellos

CG18 - Capacidad de trabajar y comunicarse también en contextos internacionales

CG3 - 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 (RD)

4.2. Learning outcomes

RA24 - Conflict solving capability SC13, SC14, CG18 C

RA26 - Group work skill SC13, SC14, CG17 A

RA27 - Negotiation skill SC13, SC14, CG18 C

RA21 - Listening capability SC13, SC14, CG10 A

RA22 - Observing capability SC13, SC14, CG10 C

RA23 - Time organization capability SC13, SC14 K

RA25 - Communication skills in public SC13, SC14, CG3, CG18 S

* 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.

5. Brief description of the subject and syllabus

5.1. Brief description of the subject

Outline

Within the sphere of business, research or development and cooperation, finishing a project successfully depends on several factors. So does efficiency and effectiveness of the project. One of the most important of these factors is the human factor. Communication and management skills, together with the relationship between workgroup members are some of the deciding elements for developing a well-done job. Social skills are a key aspect during the development of a task in an environment where the different members don't necessarily need to share the same characteristics.

Learning Goals

This course studies in depth the factors that determine the human skills for managing and administering a work group, aside from its supervision and smooth running assurance. It will emphasize the importance of communication (motivational, negotiation) and self-control processes, as well as the methods connected to the decision-making processes and team management abilities (leadership, conflict mediation, etc.).

5.2. Syllabus

1. Introduction
    1.1. Motivation I3
    1.2. Topics Definition I3, I1
2. Communication Basis
    2.1. Communication I1, I2, I4
    2.2. Relation I1, I2, I4
    2.3. Team Group I1, I2, I4
3. Personal Skills
    3.1. Assertiveness I1, I2, I4
    3.2. Negotiation I1, I2, I4
    3.3. Conflict Solving I1, I2, I4
    3.4. Intercultural differences management I1, I2, I4
    3.5. Time Management I1, I2, I4
    3.6. Body Language & Non verbal communication I1, I2, I4
    3.7. Public Presentations I1, I2, I4
    3.8. Meeting Management I1, I2, I4
    3.9. Emotional Intelligence I1, I2, I4
    3.10. Motivation I1, I2, I4
    3.11. Coaching I1, I2, I4
    3.12. Social Engineering I1, I2, I4
    3.13. Creativity I1, I2, I4
    3.14. Leadership I1, I2, I4

6. Schedule

6.1. Subject schedule*

Week	Classroom activities	Laboratory activities	Distant / On-line	Assessment activities
1	**Section 1.1 and Section 1.2** Duration: 02:00 Lecture **Indivitual work and group work.** Duration: 01:00 Cooperative activities			**Participation in class discussions Topic selection** Individual presentation Continuous assessment Presential Duration: 01:00
2	**Section 2.1** Duration: 02:00 Lecture **Indivitual work and group work.** Duration: 01:00 Cooperative activities			**Participation in class discussions Topic selection** Individual presentation Continuous assessment Presential Duration: 01:00
3	**Section 2.2** Duration: 02:00 Lecture **Indivitual work and group work.** Duration: 01:00 Cooperative activities			**Participation in class discussions Topic selection** Individual presentation Continuous assessment Presential Duration: 01:00
4	**Section 3.1, Section 3.6 and Section 3.7** Duration: 01:00 Lecture **Indivitual work and group work.** Duration: 01:00 Cooperative activities			**Participation in class discussions Topic selection** Individual presentation Continuous assessment Presential Duration: 01:00
5	**Section 3.2, Section 3.6 and Section 3.7.** Duration: 01:00 Lecture **Indivitual work and group work.** Duration: 01:00 Cooperative activities			**Participation in class discussions Topic selection** Individual presentation Continuous assessment Presential Duration: 01:00
6	**Section 3.3, Section 3.6 and Section 3.7.** Duration: 01:00 Lecture **Indivitual work and group work.** Duration: 01:00 Cooperative activities			**Participation in class discussions Topic selection** Individual presentation Continuous assessment Presential Duration: 01:00

7	**Section 3.4, Section 3.6 and Section 3.7.** Duration: 01:00 Lecture **Indivitual work and group work.** Duration: 01:00 Cooperative activities			**Participation in class discussions Topic selection** Individual presentation Continuous assessment Presential Duration: 01:00
8	**Section 3.5, Section 3.6 and Section 3.7.** Duration: 01:00 Lecture **Indivitual work and group work.** Duration: 01:00 Cooperative activities			**Participation in class discussions Topic selection** Individual presentation Continuous assessment Presential Duration: 01:00
9	**Section 3.8, Section 3.6 and Section 3.7.** Duration: 01:00 Lecture **Indivitual work and group work.** Duration: 01:00 Cooperative activities			**Participation in class discussions Topic selection** Individual presentation Continuous assessment Presential Duration: 01:00
10	**Section 3.9, Section 3.6 and Section 3.7** Duration: 01:00 Lecture **Indivitual work and group work.** Duration: 01:00 Cooperative activities			**Participation in class discussions Topic selection** Individual presentation Continuous assessment Presential Duration: 01:00
11	**Section 3.10, Section 3.6 and Section 3.7.** Duration: 01:00 Lecture **Indivitual work and group work.** Duration: 01:00 Cooperative activities			**Participation in class discussions Topic selection** Individual presentation Continuous assessment Presential Duration: 01:00
12	**Section 3.11, Section 3.6 and Section 3.7.** Duration: 01:00 Lecture **Indivitual work and group work.** Duration: 01:00 Cooperative activities			**Participation in class discussions Topic selection** Individual presentation Continuous assessment Presential Duration: 01:00
13	**Section 3.12, Section 3.6 and Section 3.7.** Duration: 01:00 Lecture **Indivitual work and group work.** Duration: 01:00 Cooperative activities			**Participation in class discussions Topic selection** Individual presentation Continuous assessment Presential Duration: 01:00
14	**Section 3.13, Section 3.6 and Section 3.7.** Duration: 01:00 Lecture **Indivitual work and group work.** Duration: 01:00 Cooperative activities			**Participation in class discussions Topic selection** Individual presentation Continuous assessment Presential Duration: 01:00

15				**Work and Presentation evaluation** Individual work Continuous assessment Presential Duration: 01:00
16				
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.

* The schedule is based on an a priori planning of the subject; it might be modified during the academic year, especially considering the COVID19 evolution.

7. Activities and assessment criteria

7.1. Assessment activities

7.1.1. Assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
1	Participation in class discussions Topic selection	Individual presentation	Face-to-face	01:00	5%	0 / 10	CE13 CG18 CG3
2	Participation in class discussions Topic selection	Individual presentation	Face-to-face	01:00	5%	0 / 10	CE13 CG18 CG3
3	Participation in class discussions Topic selection	Individual presentation	Face-to-face	01:00	5%	0 / 10	CE13 CG18 CG3
4	Participation in class discussions Topic selection	Individual presentation	Face-to-face	01:00	5%	0 / 10	CE13 CG18 CG3
5	Participation in class discussions Topic selection	Individual presentation	Face-to-face	01:00	5%	0 / 10	CE13 CG18 CG3
6	Participation in class discussions Topic selection	Individual presentation	Face-to-face	01:00	5%	0 / 10	CE13 CG18 CG3
7	Participation in class discussions Topic selection	Individual presentation	Face-to-face	01:00	5%	0 / 10	CE13 CG18 CG3
8	Participation in class discussions Topic selection	Individual presentation	Face-to-face	01:00	5%	0 / 10	CE13 CG18 CG3
9	Participation in class discussions Topic selection	Individual presentation	Face-to-face	01:00	5%	0 / 10	CE13 CG18 CG3
10	Participation in class discussions Topic selection	Individual presentation	Face-to-face	01:00	5%	0 / 10	CE13 CG18 CG3
11	Participation in class discussions Topic selection	Individual presentation	Face-to-face	01:00	5%	0 / 10	CE13 CG18 CG3

12	Participation in class discussions Topic selection	Individual presentation	Face-to-face	01:00	5%	0 / 10	CE13 CG18 CG3
13	Participation in class discussions Topic selection	Individual presentation	Face-to-face	01:00	5%	0 / 10	CE13 CG18 CG3
14	Participation in class discussions Topic selection	Individual presentation	Face-to-face	01:00	5%	0 / 10	CE13 CG18 CG3
15	Work and Presentation evaluation	Individual work	Face-to-face	01:00	30%	0 / 10	CE13 CG18 CG3

7.1.2. Global examination

No se ha definido la evaluacion sólo por prueba final.

7.1.3. Referred (re-sit) examination

Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
Oral presentations about some topics selected in advance by the professor.	Individual presentation	Face-to-face	02:00	40%	5 / 10	CE13 CG18 CG3
Feedback about other presentations provided by the professor.	Individual presentation	Face-to-face	02:00	30%	5 / 10	CE13 CG18 CG3
Work about the topic of the course that the professor propose to the student previously.	Individual work	Face-to-face	04:00	30%	5 / 10	CE13 CG18 CG3

7.2. Assessment criteria

The attendance to the classes (face to face or using video conference online at real time according the the sanitary authorities recommendations) to the classes is important because the mark of the course is spread on the participation of the students in all the sessions. So, the activities for the evaluation cannot be repeated or recuperated later because the participation of the whole class is needed to evaluate them. The observation of the other presentations to provide feedback to the classmates and demonstrate the assimilation of the contents of the course implies attending to the class and it is impossible to compensate with other non face to face activities for the characteristics of the course. A high number of missing classes will be enough for failing the course (observing the percentages to understand it).

The final grade will be calculated taking into account:

- the participation of the students during the classes. Specially during the discussions,

- the work in that the students should prepare related one of the topics of the course,
- the presentation in public of that work (face to face or online is needed by the sanitary circumstances) and
- the feedback to the classmates during the presentations of the rest of students.

The evaluation of the course is distributed during all the face to face classes. No possibility of alternative final examination is possible for this course because the interaction between the students is needed for the evaluation.

8. Teaching resources

8.1. Teaching resources for the subject

Name	Type	Notes
Recommended reading	Bibliography	Recommended books and references related to the topic. Some of them listed in the course web site.
Subject web site	Web resource	http://babel.ls.fi.upm.es/~susana/teaching/Gestion/
Moodle site	Web resource	http://moodle.upm.es/titulaciones/oficiales/course/view.php?id=882
Equipment for presentations	Equipment	Beamer, speakers, blackboard.
Library	Equipment	Library for consulting reference books and papers.
Group work room	Equipment	Room for working in group.
Classroom	Equipment	Classroom for the presential classes and the presentations.

9. Other information

9.1. Other information about the subject

7.4.14 Programming of User Interfaces

ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

103000871 - Programming Of User Interfaces

DEGREE PROGRAMME

10AM - Master Universitario En Ingenieria Del Software

ACADEMIC YEAR & SEMESTER

2023/24 - Semester 1

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1. Description

1.1. Subject details

Name of the subject	103000871 - Programming Of User Interfaces
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	10AM - Master Universitario en Ingenieria del Software
Centre	10 - Escuela Tecnica Superior De Ingenieros Informaticos
Academic year	2023-24

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Angel Lucas Gonzalez Martinez	D2310	lucas.gmartinez@upm.es	M - 09:30 - 11:00 M - 16:30 - 17:30 Tu - 09:30 - 10:30 W - 10:00 - 12:30 Please, set up an appointment by email

Guillermo Roman Diez	D2304	guillermo.roman@upm.es	M - 12:00 - 15:00 W - 12:00 - 15:00 Please, set up an appointment by email
Raul Alonso Calvo (Subject coordinator)	D2315/5004	raul.alonso@upm.es	M - 10:00 - 13:00 W - 10:00 - 13:00 Please, set up an appointment by email

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

3. Prior knowledge recommended to take the subject

3.1. Recommended (passed) subjects

The subject - recommended (passed), are not defined.

3.2. Other recommended learning outcomes

- Programming skills, including elementary knowledge of object-oriented programming.

4. Skills and learning outcomes *

4.1. Skills to be learned

CE4 - Aplicar los modelos de proceso de desarrollo a las características de un proyecto software

CG1 - 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 (RD)

CG4 - Que los estudiantes posean las habilidades de aprendizaje que les permitan continuar estudiando de un modo que habrá de ser en gran medida autodirigido o autónomo (RD)

CG9 - Aplicación de los métodos de resolución de problemas más recientes o innovadores y que puedan implicar el uso de otras disciplinas

4.2. Learning outcomes

RA26 - Group work skill SC13, SC14, CG17 A

RA90 - Apply techniques for designing and implementing prototypes of different fidelity levels

RA99 - Implement basic interactive desktop applications

RA100 - Implement basic interactive web applications using different JavaScript frameworks

RA101 - Implement basic interactive android applications

* 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.

5. Brief description of the subject and syllabus

5.1. Brief description of the subject

This course introduces the fundamentals of programming techniques for interactive systems. Students will learn how to design and implement good user interfaces, how user interface systems work and integrate with operating systems.

The course will focus on prototyping and development of simple graphical user interfaces (GUI) using rapid development tools such as graphical user interface layout editors combined with simple code to create functioning interfaces.

The course also focuses on practice in the skills needed for development of user interfaces to be deployed on desktop, on the World Wide Web, and on mobile platforms.

Concretely, students will learn to use technologies that are used for desktop, web and mobile applications:

- Basics on GUI, such as event-driven programming, or design patterns, like Model-View-Controller (MVC).
- Android framework and development, including system interaction, application states, layout generation, basic UI components.
- Web programming, learning basics of HTML, CSS, DOM, JavaScript client-side Frameworks, server-side

languages, and, client-server communications .

- Java Swing and JavaFX and their UI components, including aspects like drag-and-drop, data transfer, etc.

5.2. Syllabus

1. Introduction

    1.1. Introduction to principles in software design and development processes

    1.2. Principles of object oriented programming and design techniques for GUI

2. Programming Web Apllications

    2.1. Introduction to Web applications development

    2.2. Web UI client-side components

    2.3. Developing UI using Javascript Frameworks

3. Programming Mobile Applications

    3.1. Introduction to Android architecture

    3.2. Android UI layouts and components

    3.3. Developing UI in Android

4. Programming Desktop Applications

    4.1. Desktop application interfaces

    4.2. UI desktop common components

    4.3. Developing UI using Java Swing and JavaFX

6. Schedule

6.1. Subject schedule*

Week	Classroom activities	Laboratory activities	Distant / On-line	Assessment activities
1	**1.1 Introduction to principles in software design and development processes** Duration: 01:00 Lecture **1.2 Principles of object oriented programming and design techniques for GUI** Duration: 01:00 Lecture **2.1 Introduction to Web applications development** Duration: 02:00 Lecture			
2	**2.2 Web UI client-side components** Duration: 02:00 Lecture	**4.2 Web UI client-side components** Duration: 02:00 Laboratory assignments		
3	**2.3 Developing UI using Javascript Frameworks** Duration: 02:00 Lecture	**2.3 Developing UI using Javascript Frameworks** Duration: 02:00 Laboratory assignments		
4				**Group assignment 3 (GA3): Implementation of a web application UI prototype** Group work Continuous assessment and final examination Not Presential Duration: 08:00
5	**4.1 Desktop application interfaces** Duration: 02:00 Lecture **4.2 UI desktop common components** Duration: 01:00 Lecture	**4.2 UI desktop common components** Duration: 01:00 Laboratory assignments		
6	**4.3 Developing UI using Java Swing and JavaFX** Duration: 02:00 Lecture	**4.3 Developing UI using Java Swing and JavaFX** Duration: 02:00 Laboratory assignments		
7	**4.3 Developing UI using Java Swing and JavaFX** Duration: 02:00 Lecture	**4.3 Developing UI using Java Swing and JavaFX** Duration: 02:00 Laboratory assignments		

8				**Group assignment 2 (GA2): Implementation of a desktop application UI prototype** Group work Continuous assessment and final examination Not Presential Duration: 08:00
9	**3.1 Introduction to Android architecture** Duration: 02:00 Lecture **3.2 Android UI layouts and components** Duration: 01:00 Lecture	**3.2 Android UI layouts and components** Duration: 01:00 Laboratory assignments		
10	**3.2 Android UI layouts and components** Duration: 02:00 Lecture	**3.2 Android UI layouts and components** Duration: 02:00 Laboratory assignments		
11	**3.3 Developing UI in Android** Duration: 02:00 Lecture	**3.3 Developing UI in Android** Duration: 02:00 Laboratory assignments		
12		**Workgroup** Duration: 04:00 Laboratory assignments		**Group assignment 1 (GA1): Implementation of an Android application UI prototype** Group work Continuous assessment and final examination Not Presential Duration: 08:00
13		**Workgroup** Duration: 04:00 Laboratory assignments		
14		**Workgroup** Duration: 04:00 Laboratory assignments		
15		**Workgroup** Duration: 04:00 Laboratory assignments		
16				
17				**Pupil portfolio presentation** Individual presentation Continuous assessment and final examination Presential Duration: 03:00

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.

* The schedule is based on an a priori planning of the subject; it might be modified during the academic year, especially considering the COVID19 evolution.

7. Activities and assessment criteria

7.1. Assessment activities

7.1.1. Assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
4	Group assignment 3 (GA3): Implementation of a web application UI prototype	Group work	No Presential	08:00	30%	3 / 10	CE4 CG9 CG1 CG4
8	Group assignment 2 (GA2): Implementation of a desktop application UI prototype	Group work	No Presential	08:00	30%	3 / 10	CE4 CG9 CG1 CG4
12	Group assignment 1 (GA1): Implementation of an Android application UI prototype	Group work	No Presential	08:00	30%	3 / 10	CE4 CG9 CG1 CG4
17	Pupil portfolio presentation	Individual presentation	Face-to-face	03:00	10%	5 / 10	CE4 CG9 CG1 CG4

7.1.2. Global examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
4	Group assignment 3 (GA3): Implementation of a web application UI prototype	Group work	No Presential	08:00	30%	3 / 10	CE4 CG9 CG1 CG4
8	Group assignment 2 (GA2): Implementation of a desktop application UI prototype	Group work	No Presential	08:00	30%	3 / 10	CE4 CG9 CG1 CG4
12	Group assignment 1 (GA1): Implementation of an Android application UI prototype	Group work	No Presential	08:00	30%	3 / 10	CE4 CG9 CG1 CG4

17	Pupil portfolio presentation	Individual presentation	Face-to-face	03:00	10%	5 / 10	CE4 CG9 CG1 CG4

7.1.3. Referred (re-sit) examination

Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
Group assignment 1 (GA1): Implementation of a desktop application UI prototype	Group work	Face-to-face	08:00	30%	3 / 10	CE4 CG9 CG1 CG4
Group assignment 2 (GA2): Implementation of a web application UI prototype	Group work	Face-to-face	08:00	30%	3 / 10	CE4 CG9 CG1 CG4
Group assignment 3 (GA3): Implementation of an Android application UI prototype	Group work	Face-to-face	08:00	30%	3 / 10	CE4 CG9 CG1 CG4
Pupil portfolio presentation	Individual presentation	Face-to-face	00:30	10%	5 / 10	CE4 CG9 CG1 CG4

7.2. Assessment criteria

Student portfolio presentation will be held on final exam date. So, **it will not be resit in global evaluation** due to a lack of time. So, it will be retaken in referred (re-sit) examination.

Assessment projects for web UI, desktop GUI and Android UI. **They will not be retaken in global evaluation** due to:

- **Working overload for students**. Project retakes in the global evaluation, could interfere whit other subjects or courses
- **Working overload for teachers**. Evaluation process takes a lot of effort. So, it is impossible to make

projects evaluations in global evaluation

So, they will be retaken in referred (re-sit) examination

Grade Criteria based on:

- Students proactive participation in class
- Quality of pupil assignment
- Ability to understand concepts
- Capacity of presenting their work

NOTE: The groups of 3 people created to develop GA1, GA2 and GA3 cannot change along the course.

8. Teaching resources

8.1. Teaching resources for the subject

Name	Type	Notes
Moodle	Web resource	https://moodle.upm.es/titulaciones/oficiales
Java Foundations: Introduction to Program Design and Data Structures	Bibliography	Lewis J., DePasquale P., Chase J., 2/E, Pearson, 2010
Java SDK	Others	
Eclipse EE	Others	
Android SDK	Others	
Android Studio	Others	

9. Other information

9.1. Other information about the subject

NOTE: This course has 4 hours per week, thus, the course has a duration of 12 weeks instead of 15 weeks.

7.4.15 Strategic Management and Entrepreneurship

ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

103001023 - Strategic Management & Entrepreneurship

DEGREE PROGRAMME

10AM - Master Universitario En Ingenieria Del Software

ACADEMIC YEAR & SEMESTER

2023/24 - Semester 2

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1. Description

1.1. Subject details

Name of the subject	103001023 - Strategic Management & Entrepreneurship
No of credits	4 ECTS
Type	Optional
Academic year ot the programme	First year
Semester of tuition	Semester 2
Tuition period	February-June
Tuition languages	English
Degree programme	10AM - Master Universitario en Ingenieria del Software
Centre	10 - Escuela Tecnica Superior De Ingenieros Informaticos
Academic year	2023-24

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Claudio Antonio Feijoo Gonzalez (Subject coordinator)		claudio.feijoo@upm.es	- -

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

3. Prior knowledge recommended to take the subject

3.1. Recommended (passed) subjects

The subject - recommended (passed), are not defined.

3.2. Other recommended learning outcomes

- Interest in entrepreneurship and / or innovation

4. Skills and learning outcomes *

4.1. Skills to be learned

CE13 - Tener una visión de los distintos aspectos específicos y emergentes de la ingeniería del software, y profundizar en algunos de ellos

CG1 - 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 (RD)

CG18 - Capacidad de trabajar y comunicarse también en contextos internacionales

CG3 - 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 (RD)

CG9 - Aplicación de los métodos de resolución de problemas más recientes o innovadores y que puedan implicar el uso de otras disciplinas

4.2. Learning outcomes

RA57 - Exposición y defensa de la solución propuesta de un modo claro y sin ambigüedades ante un público especializado y no especializado.

RA25 - Communication skills in public SC13, SC14, CG3, CG18 S

RA97 - The student is expected to analyse, design and develop an open innovation project in a software-related company

RA26 - Group work skill SC13, SC14, CG17 A

RA95 - The student is expected to understand the basics of strategic management in a software-related company

RA94 - Students are expected to understand and be able to use a number of very practical methods to manage innovative and entrepreneurial projects and performance indicators as part of a company or organization strategy

RA98 - The student is expected to acquire practical knowledge on entreprenership techniques such as design thinking, value proposition and lean startup in the context of software-related company

RA22 - Observing capability SC13, SC14, CG10 C

RA21 - Listening capability SC13, SC14, CG10 A

RA23 - Time organization capability SC13, SC14 K

RA24 - Conflict solving capability SC13, SC14, CG18 C

RA27 - Negotiation skill SC13, SC14, CG18 C

RA36 - Posee dotes para liderar el cambio dentro de la organización

RA37 - Está capacitado para introducir mejoras en la organización

* 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.

5. Brief description of the subject and syllabus

5.1. Brief description of the subject

Summary ? Course description

After completing the course, students are expected to understand and be able to use a number of very practical methods to manage innovative and entrepreneurial projects and performance indicators as part of a company or organization strategy.

This subject departs from the idea that the new methods originated in the entrepreneurial arena in the last decade can be extremely useful for managers as they allow to understand the customer better and from the start, rapidly adapting any theoretical project to realistic metrics, acknowledging the fact that innovation and business models are created in a learning process, and that innovation can be ?engineered? to increase the chances of success of any organization.

From a strategic perspective, organizations need to use new approaches to innovation and entrepreneurship to guarantee their competitive advantages in the mid to long term. Open innovation schemes or lean approaches to customers have become key elements of a renewed strategic management.

The course consists of several parts. It starts with an introduction to a revisited strategic management, including economic foundations and the increasingly relevant role of innovation and entrepreneurship. From here a number of cases and projects will be selected for the students to team work on them. All the projects will loosely follow the lean approach to innovation using methodologies such as creative thinking, value creation, ecosystem analysis, business model canvas and lean startup. It will also include practical sessions about other aspects of the strategic management with a view on (open) innovation and entrepreneurship such as the role of organizational structure, technology, communication, IPR and internationalization.

The course will emphasize the practical side of the tools and will introduce related key concepts on the innovation / entrepreneurial ecosystems with a particular focus on software-related companies.

During the course, students will team work in a practical project of their own that will be presented, discussed and evaluated in a final pitch session.
?

Objectives and requirements

This is a practical graduate-level course on tools and methodologies for strategic managers based on new developments in entrepreneurship and innovation.

There are three major objectives of this course: (i) to provide students with some conceptual and practical tools to improve their strategic management skills in particular on innovation-related projects and situations; (ii) to provide students with the general rationale and ordered logical steps when approaching innovation from a strategic management perspective; (iii) to provide hands-on knowledge on tools, methods and approaches to tap on innovation and entrepreneurship from the perspective of strategic management.

Students are recommended to enjoy practical interest in innovation and entrepreneurship. Ideally, they should have an innovation strategy for a company or organization of their own, although this is not a strict requisite since during first classes some cases will be provided for the students so they can choose.

Sessions will include work on projects to be developed and discussed during the classes. Therefore, it is highly recommendable to bring a laptop or tablet with basic applications (word processor, presentation software, spreadsheet) and Internet connection. Students are also requested to read the references assigned to each session and to provide results for the assignments.

?

Programme & Schedule

NB: This is a tentative programme. The topics are indicative. Program might be modified depending on the interest of students about the subjects covered, on the level and depth of the discussion, and on the availability of the possible invited lecturers.

Session Time Subject
1 2h Introduction to the course. Presentation of students (background and motivation). Program, assignments and evaluation. Background: The increasing relevance of innovation and entrepreneurship.
2 2h What it is strategy? How to study strategy? The evolution of strategy. Economic foundations of strategy. The role of innovation and entrepreneurship in strategy
3 2h Individual work assignment
4 2h Economies of scale and scope. Sources of economies of scale and scope. Diseconomies of scale. The learning curve. Diversification.
5 2h Value network. Make vs. buy. Integration.
6 2h Innovation and Entrepreneurship ecosystem
7 2h Industry analysis. Competition and cooperation

8 2h The role of innovation. Types of innovation. Open innovation.
9 2h Idea market. Team setting and assignment
10 2h Entrepreneurship: concepts
11 2h Cases in strategic management & entrepreneurship. Design thinking
12 2h Strategic positioning. Competitive advantage. Value creation.
13 2h DNA of a project.
14 2h Value proposition canvas
15 2h Testing & experimenting. Customer development. Validated learning. Minimum viable product. Product-market fit
16 2h Experiment board.
17 2h Business and lean model canvas in a strategic setting. Tools and methodologies for high-risk, high-uncertainty environments
18 2h Lean startup and open innovation
19 2h Engaging with startups to enhance corporate innovation. Corporation entrepreneurship
20 2h Information and value creation
21 2h Sustaining competitive advantage
22 2h Open science, open software and open standards. User innovation
23 2h Preparing the pitch: How to. Pre-mortem analysis. Beyond the pitch
24 4h Visits / Guest lectures / webinars / online events from incubators, accelerators and open innovation initiatives
25 4h Workshops (pitch) for presentation and discussion of results of workgroups projects

5.2. Syllabus

1. Introduction to the course. Presentation of students (background and motivation). Program, assignments and evaluation. Background: The increasing relevance of innovation and entrepreneurship

2. What it is strategy? How to study strategy? The evolution of strategy. Economic foundations of strategy. The role of innovation and entrepreneurship in strategy

3. Individual work assignment

4. Economies of scale and scope. Sources of economies of scale and scope. Diseconomies of scale. The learning curve. Diversification

5. Value network. Make vs. buy. Integration

6. Innovation and Entrepreneurship ecosystem

7. Industry analysis. Competition and cooperation

8. The role of innovation. Types of innovation. Open innovation

9. Idea market. Team setting and assignment

10. Entrepreneurship: concepts

11. Cases in strategic management & entrepreneurship. Design thinking

12. Strategic positioning. Competitive advantage. Value creation

13. DNA of a project

14. Value proposition canvas

15. Testing & experimenting. Customer development. Validated learning. Minimum viable product. Product-market fit

16. Experiment board

17. Business and lean model canvas in a strategic setting. Tools and methodologies for high-risk, high-uncertainty environments

18. Lean startup and open innovation

19. Engaging with startups to enhance corporate innovation. Corporation entrepreneurship

20. Information and value creation

21. Sustaining competitive advantage

22. Open science, open software and open standards. User innovation

23. Preparing the pitch: How to. Pre-mortem analysis. Beyond the pitch

24. Visits / Guest lectures / webinars / online events from incubators, accelerators and open innovation initiatives

25. Workshops (pitch) for presentation and discussion of results of workgroups projects

6. Schedule

6.1. Subject schedule*

Week	Classroom activities	Laboratory activities	Distant / On-line	Assessment activities
1	**Regular session in the classroom** Duration: 03:00 Lecture			
2	**Regular session in the classroom** Duration: 03:00 Lecture			
3				**Individual assignment** Individual work Continuous assessment Presential Duration: 03:00
4	**Regular session in the classroom** Duration: 03:00 Lecture			
5	**Regular session in the classroom** Duration: 03:00 Lecture			
6	**Regular session in the classroom** Duration: 03:00 Cooperative activities			
7				**Teamwork assignment** Group presentation Continuous assessment Presential Duration: 03:00
8	**Regular session in the classroom** Duration: 03:00 Cooperative activities			
9	**Regular session in the classroom** Duration: 03:00 Cooperative activities			
10	**Regular session in the classroom** Duration: 03:00 Cooperative activities			
11	**Regular session in the classroom** Duration: 03:00 Cooperative activities			
12	**Visits / guest lectures** Duration: 03:00 Additional activities			

13	**Regular session in the classroom** Duration: 03:00 Cooperative activities			
14	**Regular session in the classroom** Duration: 03:00 Cooperative activities			
15	**Regular session in the classroom** Duration: 03:00 Cooperative activities			
16	**Project Mentoring** Duration: 04:00 Additional activities			
17				**Pitch. Teamwork presentation** Group presentation Final examination Presential Duration: 04:00 **Participation and contributions during classes** Other assessment Continuous assessment Presential Duration: 01:00

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.

* The schedule is based on an a priori planning of the subject; it might be modified during the academic year, especially considering the COVID19 evolution.

7. Activities and assessment criteria

7.1. Assessment activities

7.1.1. Assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
3	Individual assignment	Individual work	Face-to-face	03:00	40%	6 / 10	CE13 CG9 CG18 CG1 CG3
7	Teamwork assignment	Group presentation	Face-to-face	03:00	20%	5 / 10	CE13 CG9 CG18 CG1 CG3
17	Participation and contributions during classes	Other assessment	Face-to-face	01:00	20%	5 / 10	CE13 CG9 CG18 CG1 CG3

7.1.2. Global examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
17	Pitch. Teamwork presentation	Group presentation	Face-to-face	04:00	20%	/ 10	CE13 CG9 CG18 CG1 CG3

7.1.3. Referred (re-sit) examination

Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills

Compensation work - Just for the individual assignment and participation. Teamwork is not possible to be compensated	Individual work	Face-to-face	02:00	60%	6 / 10	CE13 CG9 CG18 CG1 CG3

7.2. Assessment criteria

Evaluation criteria

The evaluation will be based on the individual assignments and teamwork:
? Individual assignment / exam: 40%
? Teamwork (including pitch / online presentation): 40%
? Contributions / participation during classes: 20%

The criteria for evaluation will be:
? Understanding of the concepts explained
? Ability to apply them in an actual strategic setting
? Contributions to discussion
? Thinking outside the box

8. Teaching resources

8.1. Teaching resources for the subject

Name	Type	Notes
Lecture Notes	Web resource	Notes for each session
[1] Economic Foundations of Strategy, Joseph T. Mahoney, Sage Publications Inc, 2005.	Bibliography	
[2] Osterwalder, A., Pigneur, Y., & Clark, T. (2010). Business model generation: A handbook for visionaries, game changers, and challengers. Hoboken. NJ: Wiley.	Bibliography	
[3] Blank, S., & Dorf, B. (2012). The startup owner's manual. K&S; Ranch	Bibliography	
[4] Ries, E. (2011). The lean startup: How today's entrepreneurs use continuous innovation to create radically successful businesses. Random House LLC.	Bibliography	
[5] Besanko, D., Dranove, D., Shanley, M., Schaefer, S. (2017). Economics of strategy. Wiley, 7th Ed.	Bibliography	
[8] Chesbrough, H. (2020). Open innovation results. Going beyond the hype and getting down to business. Oxford: Oxford University Press.	Bibliography	

9. Other information

9.1. Other information about the subject

The subject is related to digital governance and tranformation. Therefore has some connection with SDG 16 about promoting peaceful and inclusive societies, providing access to justice for all and building effective, accountable and inclusive institutions at all levels.

7.4.16 User Experience and Mobile Interaction

POLITÉCNICA

INTERNATIONAL
CAMPUS OF
EXCELLENCE

COORDINATION PROCESS OF
LEARNING ACTIVITIES
PR/CL/001

E.T.S. de Ingenieros
Informaticos

ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

103000874 - User Experience And Mobile Interaction

DEGREE PROGRAMME

10AM - Master Universitario En Ingenieria Del Software

ACADEMIC YEAR & SEMESTER

2023/24 - Semester 1

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1. Description

1.1. Subject details

Name of the subject	103000874 - User Experience And Mobile Interaction
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	10AM - Master Universitario en Ingenieria del Software
Centre	10 - Escuela Tecnica Superior De Ingenieros Informaticos
Academic year	2023-24

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Ricardo Imbert Paredes (Subject coordinator)	D-5112	ricardo.imbert@upm.es	Tu - 15:00 - 18:00 W - 15:00 - 18:00 It is advisable to confirm by email the availability of the professor
Jose Maria Barambones Ramirez	5106	j.barambones@upm.es	M - 10:00 - 12:00 Tu - 10:00 - 12:00 Th - 12:00 - 14:00 It is advisable to confirm by email the

			availability of the professor

* 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

CE13 - Tener una visión de los distintos aspectos específicos y emergentes de la ingeniería del software, y profundizar en algunos de ellos

CE14 - Comprender lo que pueden y no pueden conseguir las prácticas actuales de ingeniería del software, y sus limitaciones y su posible futura evolución.

3.2. Learning outcomes

RA102 - RA102 - Understand the particularities of the user experience beyond usability, considering emotions

RA103 - RA103 - Understand the particularities of user-centered design in mobile platforms and ubiquitous computing.

RA104 - RA104 - Apply techniques and processes for prototyping, developing, and refining interactive digital systems in different technological platforms.

* 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

This course will be focused on designing mobile interactions with good user experience (UX). Contents of the course include: UX as a broadening of the scope of usability, design concepts, global user interfaces, designing for mobile experiences, interaction design patterns for mobile applications, mobile wireframes and prototypes and platform-specific design guidelines.

4.2. Syllabus

1. Introduction to UX and mobile interaction
2. Context and specific needs related solution
3. Design of memorable experiences
4. UX & UI: Visual principles
5. UX in the product design
6. Mobile prototyping
7. Design guidelines
8. Evaluation of the UX

5. Schedule

5.1. Subject schedule*

Week	Classroom activities	Laboratory activities	Distant / On-line	Assessment activities
1	**1. Introduction to UX&MI** Duration: 03:00 Lecture			
2	**2. Context and specific needs related solution** Duration: 01:00 Cooperative activities			**Affinity diagraming (needs)** Group work Continuous assessment Presential Duration: 02:00
3	**2. Context and specific needs related solution** Duration: 01:00 Cooperative activities			**Value proposition canvas exercise** Group work Continuous assessment Presential Duration: 02:00
4	**2. Context and specific needs related solution** Duration: 00:30 Lecture			**Personas workshop** Other assessment Continuous assessment Presential Duration: 02:30
5	**3. Design of memorable experiences** Duration: 00:30 Lecture **3. Design of memorable experiences** Duration: 02:00 Cooperative activities			**User profiles, empathy map and refinement of value proposition** Group work Continuous assessment Not Presential Duration: 00:00 **User journey map exercise** Group presentation Continuous assessment Presential Duration: 00:30
6	**4. UX&UI: Visual principles** Duration: 01:00 Lecture **4. UX&UI: Visual principles** Duration: 01:00 Cooperative activities			**Contrast exercise** Group work Continuous assessment Presential Duration: 01:00 **Assignment about color observation** Individual work Continuous assessment and final examination Not Presential Duration: 00:00

7	**4. UX&UI: Visual principles** Duration: 00:15 Lecture **4. UX&UI: Visual principles** Duration: 01:30 Cooperative activities			**Assignment about typefaces** Individual work Continuous assessment and final examination Not Presential Duration: 00:00 **Mood board exercise** Group work Continuous assessment Presential Duration: 00:00
8	**5. UX in the product design** Duration: 03:00 Cooperative activities			
9	**5. UX in the product design** Duration: 03:00 Cooperative activities			**Assignment about product design** Group work Continuous assessment Presential Duration: 00:00
10	**6. Mobile prototyping** Duration: 03:00 Cooperative activities			
11	**7. Design guidelines** Duration: 00:15 Lecture **7. Design guidelines** Duration: 00:15 Lecture			**Analysis of mobile apps with UX problems** Group work Continuous assessment and final examination Not Presential Duration: 00:00
12	**6. Mobile prototyping** Duration: 03:00 Cooperative activities			
13	**8. UX evaluation** Duration: 00:30 Lecture **8. UX evaluation** Duration: 02:30 Cooperative activities			**Assignment about 5 seconds test** Group work Continuous assessment Presential Duration: 00:00
14	**8. UX evaluation** Duration: 00:30 Lecture **8. UX evaluation** Duration: 02:30 Cooperative activities			**Assignment about UEQ** Group work Continuous assessment Presential Duration: 00:00
15				
16				
17				**Mobile prototype evaluation assignment** Group work Continuous assessment Not Presential Duration: 00:00 **Student implication and participation** Other assessment Continuous assessment Presential Duration: 00:00

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.

* The schedule is based on an a priori planning of the subject; it might be modified during the academic year, especially considering the COVID19 evolution.

6. Activities and assessment criteria

6.1. Assessment activities

6.1.1. Assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
2	Affinity diagraming (needs)	Group work	Face-to-face	02:00	1.44%	0 / 10	CE13
3	Value proposition canvas exercise	Group work	Face-to-face	02:00	3.96%	0 / 10	CE14 CE13
4	Personas workshop	Other assessment	Face-to-face	02:30	5.4%	0 / 10	CE13
5	User profiles, empathy map and refinement of value proposition	Group work	No Presential	00:00	10.8%	0 / 10	CE13 CE14
5	User journey map exercise	Group presentation	Face-to-face	00:30	7.2%	0 / 10	CE14
6	Contrast exercise	Group work	Face-to-face	01:00	7.2%	0 / 10	CE14
6	Assignment about color observation	Individual work	No Presential	00:00	7.2%	0 / 10	CE14
7	Assignment about typefaces	Individual work	No Presential	00:00	7.2%	0 / 10	CE13
7	Mood board exercise	Group work	Face-to-face	00:00	7.2%	0 / 10	
9	Assignment about product design	Group work	Face-to-face	00:00	7.2%	0 / 10	CE13 CE14
11	Analysis of mobile apps with UX problems	Group work	No Presential	00:00	7.2%	0 / 10	CE13 CE14
13	Assignment about 5 seconds test	Group work	Face-to-face	00:00	7.2%	0 / 10	CE13
14	Assignment about UEQ	Group work	Face-to-face	00:00	7.2%	0 / 10	CE13
17	Mobile prototype evaluation assignment	Group work	No Presential	00:00	7.2%	0 / 10	CE13 CE14
17	Student implication and participation	Other assessment	Face-to-face	00:00	6.4%	0 / 10	

6.1.2. Global examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
6	Assignment about color observation	Individual work	No Presential	00:00	7.2%	0 / 10	CE14

7	Assignment about typefaces	Individual work	No Presential	00:00	7.2%	0 / 10	CE13
11	Analysis of mobile apps with UX problems	Group work	No Presential	00:00	7.2%	0 / 10	CE13 CE14

6.1.3. Referred (re-sit) examination

Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
Mobile prototype refactoring and evaluation	Group work	Face-to-face	00:00	7.2%	0 / 10	CE13 CE14
Assignment about color observation	Individual work	Face-to-face	00:00	7.2%	0 / 10	CE14
Assignment about typefaces	Individual work	Face-to-face	00:00	7.2%	0 / 10	CE13
Assignment about 5 seconds test	Group work	Face-to-face	00:00	7.2%	0 / 10	CE13
Assignment about UEQ	Group work	Face-to-face	00:00	7.2%	0 / 10	CE13
Analysis of mobile apps with UX problems	Group work	Face-to-face	00:00	7.2%	0 / 10	CE13 CE14

6.2. Assessment criteria

Progressive evaluation

The subject is graded following a continuous assessment.

The subject's progressive evaluation consist of:

- *Individual assignments (14,4% of the final grade):* the student must complete several individual assignments related to some specific aspects of the subject. These activities **are recoverable** in the global and extraordinary evaluation, always that they had been failed (grade below 5).
- *Group assignments (79,2% of the final grade):* the purpose of the group assignments is to learn basic concepts and techniques by applying them to a product that will be developed by the students in an incremental and iterative way during the semester. That means that the assignments corresponding to the last steps (prototype refactoring, prototype evaluation, 5 seconds test and UEQ) are **the only recoverable ones**. Since these products are delivered the day before the final presentation, it is impossible to evaluate them in the global evaluation. Therefore, they will be only recoverable in the extraordinary evaluation. However, the group activity "Analysis of mobile apps with UX problems (7,2% of the final grade) is also recoverable in both the global and extraordinary evaluation, since it is not part of the whole project.
- *Student participation (6,4% of the final grade):* a critical mindset and the analysis skills from the student are valued. These activities are **not recoverable**, either in the global evaluation or in the final evaluation, since

it is the student participation during the classes what it is evaluated.

The student passes the subject only if 5 or more points on 10 are obtained at the end of the course, regarding the following criteria:

FINAL GRADE = 14,4% Individual assignments + 79,2% Group assignments + 6,4% Student participation

Global evaluation

When failed during the progressive evaluation, the student may have a new opportunity to pass the subject repeating the recoverable failed parts. Since these parts cover a 21,6% of the final grade this will be the margin for passing the subject during the global evaluation.

Extraordinary evaluation

For the extraordinary term evaluation the student can repeat the following activities, only if they are graded under 5:

- The correction of the mobile HiFi prototype, taking into account the errors made and the results of the evaluation performed during the ordinary period, and its evaluation (7,2% of the final grade).
- The analysis of mobile apps with UX problems (7,2%).
- The evaluation of the HiFi prototype UX through the technique of the 5 seconds test (7,2% of the final grade).
- The evaluation of the HiFi prototype UX through the UEQ technique (7,2% of the final grade).
- The individual assignment about color observation (7,2%).
- The individual assignment about typefaces (7,2%).

Zero tolerance against fraud

If fraudulent acts are detected during the development of evaluation tests, the provisions of article 13 of the UPM Evaluation Regulations approved by the Governing Council on May 26, 2022 will apply.

7. Teaching resources

7.1. Teaching resources for the subject

Name	Type	Notes
Norman, D. (2013) The Design of Everyday Things. Zone Books	Bibliography	UX and general design essential
Griffiths, S. (2015) Mobile App UX Principles. Improving user experience and optimising conversion. Google (https://www.thinkwithgoogle.com/intl/en-gb/articles/mobile-app-ux-principles-improving-user-experience-and-optimising-conversion.html)	Bibliography	UX in mobile design
Mendoza, A (2013) Mobile User Experience. Patterns to Make Sense of it All. Morgan Kaufmann	Bibliography	UX in mobile design
Doncaster, P. (2014) The UX Five Second Rules. Guidelines for User Experience Design's Simplest Testing Technique. Elsevier	Bibliography	UX testing
Subject's Moodle site	Web resource	https://moodle.upm.es/titulaciones/oficiales/course/view.php?id=7964
Subject MS Teams group	Web resource	Live online lectures, workshops and presentations

8. Other information

8.1. Other information about the subject