ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

103000484 - Software Architecture

DEGREE PROGRAMME

10AM - Master Universitario En Ingenieria Del Software

ACADEMIC YEAR & SEMESTER

2024/25 - Semester 2

Index

Learning guide

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	2024-25

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/172ltDIE_RIUzrrZsQmlKkT2SLLEFskmyuTwRx1WG8Hs/edit?gid=0#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/172ltDIE_RIUzrrZsQmlKkT2SLLEFskmyuTwRx1WG8Hs/edit?gid=0#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	Type 1 activities	Type 2 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 Progressive 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 Progressive 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 Progressive assessment Not Presential Duration: 03:00 **Classroom participation grade** Other assessment Progressive 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 Progressive 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 Progressive 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 Progressive 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 Progressive assessment Not Presential Duration: 05:00 **Classroom participation grade** Other assessment Progressive 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 Progressive 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 Progressive assessment Not Presential Duration: 05:00 **Classroom participation grade** Other assessment Progressive 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 Progressive 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 Progressive assessment Not Presential Duration: 05:00 **Classroom participation grade** Other assessment Progressive 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 Progressive assessment Not Presential Duration: 05:00 **Classroom participation grade** Other assessment Progressive 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 Progressive assessment Not Presential Duration: 05:00 **Classroom participation grade** Other assessment Progressive assessment Presential Duration: 00:00
14	**Oral presentations of the projects** Duration: 02:00 Additional activities **Oral presentations of the projects** Duration: 02:00 Additional activities			**Project** Group work Progressive assessment Not Presential Duration: 09:00 **Classroom participation grade** Other assessment Progressive assessment Presential Duration: 00:00
15	**Exam** Duration: 02:00 Additional activities			**Exam** Written test Progressive assessment Presential Duration: 02:00 **Classroom participation grade** Other assessment Progressive assessment Presential Duration: 00:00
16				**Final Exam** Written test Global examination Presential Duration: 01:00
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.

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	05:00	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	05:00	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	05:00	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
16	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	