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

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	