ANX-PR/CL/001-01
LEARNING GUIDE

SUBJECT
103000934 - Software Verification And Validation

DEGREE PROGRAMME
10AZ - Master Universitario En Innovación Digital

ACADEMIC YEAR & SEMESTER
2024/25 - Semester 1
Index

Learning guide

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1. Description

1.1. Subject details

<table>
<thead>
<tr>
<th>Name of the subject</th>
<th>103000934 - Software Verification And Validation</th>
</tr>
</thead>
<tbody>
<tr>
<td>No of credits</td>
<td>6 ECTS</td>
</tr>
<tr>
<td>Type</td>
<td>Optional</td>
</tr>
<tr>
<td>Academic year of the programme</td>
<td>First year</td>
</tr>
<tr>
<td>Semester of tuition</td>
<td>Semester 1</td>
</tr>
<tr>
<td>Tuition period</td>
<td>September-January</td>
</tr>
<tr>
<td>Tuition languages</td>
<td>English</td>
</tr>
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<td>Degree programme</td>
<td>10AZ - Master Universitario en Innovación Digital</td>
</tr>
<tr>
<td>Centre</td>
<td>10 - Escuela Tecnica Superior De Ingenieros Informaticos</td>
</tr>
<tr>
<td>Academic year</td>
<td>2024-25</td>
</tr>
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</table>

2. Faculty

2.1. Faculty members with subject teaching role

<table>
<thead>
<tr>
<th>Name and surname</th>
<th>Office/Room</th>
<th>Email</th>
<th>Tutoring hours *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sira Vegas Hernandez</td>
<td>5105</td>
<td><a href="mailto:sira.vegas@upm.es">sira.vegas@upm.es</a></td>
<td>M - 12:00 - 15:00, Th - 14:00 - 17:00</td>
</tr>
<tr>
<td>(Subject coordinator)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Natalia Juristo Juzgado</td>
<td>5104</td>
<td><a href="mailto:natalia.juristo@upm.es">natalia.juristo@upm.es</a></td>
<td>Sin horario.</td>
</tr>
</tbody>
</table>

* 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

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

CB08 - 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

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

CG03 - La capacidad de usar la lengua inglesa de manera competente, es decir, con capacitación para tareas complejas de trabajo y estudio.

CG06 - Capacidad para gestionar la información.
4.2. Learning outcomes

RA124 - Know and apply product and process quality control techniques

RA126 - Document the testing process

RA125 - Know and determine the most appropriate verification and validation techniques to be applied in a software development project with the aim of assuring the quality level required

* 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*

<table>
<thead>
<tr>
<th>Week</th>
<th>Type 1 activities</th>
<th>Type 2 activities</th>
<th>Distant / On-line</th>
<th>Assessment activities</th>
</tr>
</thead>
</table>
| 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    | Static evaluation  
Duration: 02:00  
Lecture  
Testing  
Duration: 02:00  
Lecture | | | |
| 4    | Static evaluation  
Duration: 02:00  
Problem-solving class  
Testing  
Duration: 02:00  
Problem-solving class | White box quiz  
Written test  
Progressive assessment  
Presential  
Duration: 01:00 | | |
| 5    | Static evaluation  
Duration: 01:00  
Lecture  
Static evaluation  
Duration: 01:00  
Problem-solving class  
Testing  
Duration: 01:00  
Lecture  
White box quiz  
Duration: 01:00  
Additional activities | | | |
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<tr>
<th>Week</th>
<th>Activity</th>
<th>Duration</th>
<th>Activity</th>
<th>Duration</th>
<th>Activity</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Static evaluation</td>
<td>01:00</td>
<td>Problem-solving class</td>
<td></td>
<td>Static techniques quiz</td>
<td>01:00</td>
</tr>
<tr>
<td></td>
<td>Static techniques quiz</td>
<td>01:00</td>
<td>Additional activities</td>
<td></td>
<td>Testing</td>
<td>02:00</td>
</tr>
<tr>
<td>7</td>
<td>Testing</td>
<td>02:00</td>
<td>Problem-solving class</td>
<td></td>
<td>Static evaluation</td>
<td>02:00</td>
</tr>
<tr>
<td>8</td>
<td>Testing</td>
<td>02:00</td>
<td>Lecture</td>
<td></td>
<td>Black box quiz</td>
<td>01:00</td>
</tr>
<tr>
<td></td>
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<tr>
<td>9</td>
<td>Testing</td>
<td>02:00</td>
<td>Lecture</td>
<td></td>
<td>Testing</td>
<td>02:00</td>
</tr>
<tr>
<td>10</td>
<td>Testing</td>
<td>02:00</td>
<td>Problem-solving class</td>
<td></td>
<td>Testing: follow-up of assignment</td>
<td>02:00</td>
</tr>
<tr>
<td></td>
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<td>Assignment: testing a software system (part 1)</td>
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<td>Assignment: testing a software system (part 1)</td>
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<td>Assignment: testing a software system (part 1)</td>
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<td>Assignment: testing a software system (part 1)</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Testing: follow-up of assignment</td>
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<td>Cooperative activities</td>
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<td>Assignment: testing a software system (part 2)</td>
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<td>Assignment: testing a software system (part 2)</td>
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<td>Assignment: testing a software system (part 2)</td>
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<td>Assignment: testing a software system (part 2)</td>
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<tr>
<td>12</td>
<td>Testing: follow-up of assignment</td>
<td>02:00</td>
<td>Cooperative activities</td>
<td></td>
<td>Testing: follow-up of assignment</td>
<td>02:00</td>
</tr>
<tr>
<td>13</td>
<td>Testing: follow-up of assignment</td>
<td>02:00</td>
<td>Cooperative activities</td>
<td></td>
<td>Testing: follow-up of assignment</td>
<td>02:00</td>
</tr>
<tr>
<td>14</td>
<td>Testing: follow-up of assignment</td>
<td>02:00</td>
<td>Cooperative activities</td>
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<td>Testing</td>
<td>02:00</td>
</tr>
<tr>
<td>15</td>
<td>Testing</td>
<td>02:00</td>
<td>Lecture</td>
<td></td>
<td>Static techniques submission</td>
<td>01:00</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>Static techniques submission</td>
<td>01:00</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>Static techniques submission</td>
<td>01:00</td>
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<tr>
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<td></td>
<td></td>
<td></td>
<td>Static techniques submission</td>
<td>01:00</td>
</tr>
</tbody>
</table>
### Static techniques presentation
Duration: 02:00
Additional activities

### Static techniques presentation
Group presentation
Progressive assessment
Presential
Duration: 02:00

### Attendance
Other assessment
Progressive assessment
Presential
Duration: 00:00

### Static techniques quiz (second trial)
Written test
Global examination
Presential
Duration: 01:00

### White box quiz (second trial)
Written test
Global examination
Presential
Duration: 01:00

### Black box quiz (second trial)
Written test
Global examination
Presential
Duration: 01:00

### Assignment resubmission: testing a software system (part 1)
Group work
Global examination
Not Presential
Duration: 10:00

### Assignment resubmission: testing a software system (part 2)
Group work
Global examination
Not Presential
Duration: 10:00

### Static techniques presentation (second chance)
Group work
Global examination
Presential
Duration: 10:00

### Static techniques resubmission
Group work
Global 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.
### 7. Activities and assessment criteria

#### 7.1. Assessment activities

##### 7.1.1. Assessment

<table>
<thead>
<tr>
<th>Week</th>
<th>Description</th>
<th>Modality</th>
<th>Type</th>
<th>Duration</th>
<th>Weight</th>
<th>Minimum grade</th>
<th>Evaluated skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>White box quiz</td>
<td>Written test</td>
<td>Face-to-face</td>
<td>01:00</td>
<td>5%</td>
<td>2 / 10</td>
<td>CB07, CG06</td>
</tr>
<tr>
<td>6</td>
<td>Static techniques quiz</td>
<td>Written test</td>
<td>Face-to-face</td>
<td>01:00</td>
<td>5%</td>
<td>2 / 10</td>
<td>CB07, CG06</td>
</tr>
<tr>
<td>8</td>
<td>Black box quiz</td>
<td>Written test</td>
<td>Face-to-face</td>
<td>01:00</td>
<td>5%</td>
<td>2 / 10</td>
<td>CB07, CG06</td>
</tr>
<tr>
<td>11</td>
<td>Assignment: testing a software system (part 1)</td>
<td>Group work</td>
<td>No Presential</td>
<td>10:00</td>
<td>25%</td>
<td>3 / 10</td>
<td>CB07, CB08, CB09, CG03, CG06</td>
</tr>
<tr>
<td>14</td>
<td>Assignment: testing a software system (part 2)</td>
<td>Group work</td>
<td>No Presential</td>
<td>10:00</td>
<td>25%</td>
<td>3 / 10</td>
<td>CB09, CG03, CG06, CB07, CB08</td>
</tr>
<tr>
<td>15</td>
<td>Static techniques submission</td>
<td>Group work</td>
<td>No Presential</td>
<td>10:00</td>
<td>20%</td>
<td>3 / 10</td>
<td>CB07, CB08, CB09, CG03, CG06</td>
</tr>
<tr>
<td>16</td>
<td>Static techniques presentation</td>
<td>Group presentation</td>
<td>Face-to-face</td>
<td>02:00</td>
<td>5%</td>
<td>5 / 10</td>
<td>CB07, CB08, CB09, CG03, CG06</td>
</tr>
<tr>
<td>17</td>
<td>Attendance</td>
<td>Other assessment</td>
<td>Face-to-face</td>
<td>00:00</td>
<td>10%</td>
<td>8 / 10</td>
<td>CB07, CB08, CB09, CG03, CG06</td>
</tr>
</tbody>
</table>

##### 7.1.2. Global examination
### 7.1.3. Referred (re-sit) examination

<table>
<thead>
<tr>
<th>Description</th>
<th>Modality</th>
<th>Type</th>
<th>Duration</th>
<th>Weight</th>
<th>Minimum grade</th>
<th>Evaluated skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>White box quiz (third trial)</td>
<td>Written test</td>
<td>Face-to-face</td>
<td>01:00</td>
<td>5%</td>
<td>4 / 10</td>
<td>CB07, CG06</td>
</tr>
<tr>
<td>Static techniques quiz (third trial)</td>
<td>Written test</td>
<td>Face-to-face</td>
<td>01:00</td>
<td>5%</td>
<td>4 / 10</td>
<td>CB07, CG06</td>
</tr>
<tr>
<td>Black box quiz (third trial)</td>
<td>Individual work</td>
<td>Face-to-face</td>
<td>01:00</td>
<td>5%</td>
<td>4 / 10</td>
<td>CB07, CG06</td>
</tr>
<tr>
<td>Assignment second resubmission: testing a software system (part 1)</td>
<td>Group work</td>
<td>Face-to-face</td>
<td>10:00</td>
<td>25%</td>
<td>5 / 10</td>
<td>CB07, CB08, CG03, CG06</td>
</tr>
</tbody>
</table>
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:

- Quizzes (5% of the score each one):
  - White box testing.
  - Black box testing.
  - Static analysis.

- Assignment performing testing on a software system (50% 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 (25% of the score). This assignment is divided into two parts:
- Doing the task proposed in the assignment (20% 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 (re-take):

- All quizzes/assignments that do not reach the minimum score required.
- From those 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 assignments that have a score equal or greater than 5 will be re-submitted.
- In any case quizzes that have a score equal or greater than the minimum required will be re-taken.
- 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 (re-take) those quizzes/assignments that have been submitted during the progressive evaluation period. It is not possible to submit (take) quizzes/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/re-take (or submit/take in case (s)he has not done it before):

- All quizzes/assignments that do not reach the minimum score required.
From those 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 assignments that have a score equal or greater than 5 will be re-submitted.

In any case quizzes that have a score equal or greater than the minimum required will be re-taken.

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

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>IEEE V&amp;V standards</td>
<td>Bibliography</td>
<td></td>
</tr>
<tr>
<td>Moodle site of the course</td>
<td>Web resource</td>
<td></td>
</tr>
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</table>