



POLITÉCNICA

INTERNATIONAL  
CAMPUS OF  
EXCELLENCE

COORDINATION PROCESS OF  
LEARNING ACTIVITIES  
PR/CL/001



E.T.S. de Ingenieros  
Informáticos

# 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

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### 1.1. Subject details

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

## 2. Faculty

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### 2.1. Faculty members with subject teaching role

<b>Name and surname</b>	<b>Office/Room</b>	<b>Email</b>	<b>Tutoring hours *</b>
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 \*

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### 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

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### 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.

The 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

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### 7.1. Teaching resources for the subject

Name	Type	Notes
Bibliografía	Bibliography	Bibliografía available in: <a href="https://www.mendeley.com/community/critical-sw">https://www.mendeley.com/community/critical-sw</a>

## 8. Other information

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### 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.