



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

**103000859 - Experimentation In Software Engineering**

### DEGREE PROGRAMME

10AZ - Master Universitario en Innovación Digital

### ACADEMIC YEAR & SEMESTER

2019/20 - Semester 2

## Index

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### Learning guide

1. Description.....	1
2. Faculty.....	1
3. Prior knowledge recommended to take the subject.....	2
4. Skills and learning outcomes .....	2
5. Brief description of the subject and syllabus.....	3
6. Schedule.....	5
7. Activities and assessment criteria.....	7
8. Teaching resources.....	9

## 1. Description

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### 1.1. Subject details

<b>Name of the subject</b>	103000859 - Experimentation In Software Engineering
<b>No of credits</b>	4.5 ECTS
<b>Type</b>	Optional
<b>Academic year of the programme</b>	First year
<b>Semester of tuition</b>	Semester 2
<b>Tuition period</b>	February-June
<b>Tuition languages</b>	English
<b>Degree programme</b>	10AZ - Master Universitario en Innovación Digital
<b>Centre</b>	10 - Escuela Tecnica Superior de Ingenieros Informaticos
<b>Academic year</b>	2019-20

## 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>
Sira Vegas Hernandez (Subject coordinator)	5105	sira.vegas@upm.es	Tu - 14:00 - 17:00 Th - 12:00 - 15:00
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

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#### 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 \*

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#### 4.1. Skills to be learned

CB06 - Poseer y comprender conocimientos que aporten una base u oportunidad de ser originales en el desarrollo y/o aplicación de ideas, a menudo en un contexto de investigación

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

CE-CD07 - Capacidad para diseñar y gestionar proyectos de ciencia de datos

CE-CD09 - Capacidad para explorar formas de utilizar nuevas herramientas y técnicas de ciencia de datos con una mentalidad empresarial para enfrentar los desafíos empresariales y organizativos con una mentalidad empresarial

CG01 - Que los estudiantes sean capaces de predecir y controlar la evolución de situaciones complejas mediante el desarrollo de nuevas e innovadoras metodologías de trabajo adaptadas al ámbito científico/investigador, tecnológico o profesional concreto, en general multidisciplinar, en el que se desarrolle su actividad.

CG02 - Que los estudiantes desarrollen la autonomía suficiente para participar en proyectos de investigación y colaboraciones científicas o tecnológicas dentro su ámbito temático explorando y generando nuevas ideas sistemáticamente, en contextos interdisciplinarios y, en su caso, con una alta componente de transferencia del conocimiento.

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

CG07 - Capacidad de trabajar y comunicarse también en contextos internacionales.

## 4.2. Learning outcomes

RA58 - Understand the application of the experimental paradigm in software engineering

RA56 - develop data science projects following a methodology

RA59 - Design experiments in software engineering, including experimental replications

\* 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

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### 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.

## 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. IBM SPSS: An overview
  - 5.3. Parametric tests for independent samples
  - 5.4. Parametric tests for related samples
  - 5.5. Non parametric tests

## 6. Schedule

### 6.1. Subject schedule\*

Week	Face-to-face classroom activities	Face-to-face laboratory activities	Other face-to-face activities	Assessment activities
1	<b>Chapter 1</b> Duration: 04:00			
2	<b>Chapter 2</b> Duration: 02:00  <b>Chapter 5</b> Duration: 02:00			
3	<b>Chapter 3</b> Duration: 02:00  <b>Chapter 5</b> Duration: 02:00			
4	<b>Chapter 3</b> Duration: 01:00  <b>Chapter 3</b> Duration: 01:00  <b>Chapter 5</b> Duration: 02:00			
5	<b>Brainstorming and group discussion of assignment 1</b> Duration: 02:00  <b>Chapter 5</b> Duration: 02:00			
6	<b>Brainstorming and group discussion of assignment 1</b> Duration: 02:00  <b>Chapter 5</b> Duration: 02:00			

7				<b>Presentation of assignment 1</b>  Continuous assessment Duration: 04:00
8	<b>Brainstorming and group discussion of assignment 2</b> Duration: 04:00			<b>Submission of assignment 2</b>  Continuous assessment Duration: 00:00
9				
10				
11				
12				
13				
14				
15				
16				
17				<b>Final exam</b>  Final examination Duration: 04:00

The independent study hours are training activities during which students should spend time on individual study or individual assignments.

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 subject schedule is based on a previous theoretical planning of the subject plan and might go through experience some unexpected changes along throughout the academic year.



## 7. Activities and assessment criteria

### 7.1. Assessment activities

#### 7.1.1. Continuous assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
7	Presentation of assignment 1		Face-to-face	04:00	50%	5 / 10	CB07 CG03 CG07 CB08 CB06 CG01 CG02 CE-CD07
8	Submission of assignment 2		No Presential	00:00	50%	5 / 10	CB07 CG03 CE-CD09 CG07 CB08 CB06 CG01 CG02

#### 7.1.2. Final examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
17	Final exam		Face-to-face	04:00	100%	5 / 10	CB07 CG03 CE-CD09 CG07 CB08 CB06 CG01 CG02 CE-CD07

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

Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
Extraordinary exam		Face-to-face	04:00	100%	5 / 10	CE-CD09 CB07 CG03 CG07 CB08 CB06 CG01 CG02 CE-CD07

### 7.2. Assessment criteria

- Students will be evaluated using the assignments only. No examination will be made.
- The assessment of assignments will depend on (1) presentation made by the students (in case it has been defined) and (2) the correctness of the results
- The final grade will be calculated using a weighted average as described before.

## 8. Teaching resources

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### 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	
Andy Field. Discovering Statistics Using IBM SPSS Statistics. Sage 2017.	Bibliography	
IBM SPSS	Equipment	