



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

**103001022 - Deep Learning And Software Engineering**

### DEGREE PROGRAMME

10AM - Master Universitario En Ingenieria Del Software

### ACADEMIC YEAR & SEMESTER

2022/23 - Semester 1

## Index

---

### Learning guide

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

## 1. Description

---

### 1.1. Subject details

<b>Name of the subject</b>	103001022 - Deep Learning And Software Engineering
<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>	2022-23

## 2. Faculty

---

### 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	M - 12:00 - 15:00 Th - 12:00 - 15:00
Maria Pilar Rodriguez Gonzalez	6203	pilar.rodriguez@upm.es	W - 14:00 - 17:00 F - 12:00 - 15:00

\* 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 \*

---

### 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.

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)

CG13 - Apreciación de los límites del conocimiento actual y de la aplicación práctica de la tecnología más reciente

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

### 3.2. Learning outcomes

RA25 - Communication skills in public SC13, SC14, CG3, CG18 S

RA23 - Time organization capability SC13, SC14 K

RA1 - Within an application field of Software Engineering, uses and designs the appropriate solution to solve some of its problems, describing the technical difficulties and the application limits

RA54 - Proponer una solución justificada a un problema real que sea complejo o mal definido, o perteneciente a un área nueva o emergente, o que requiera el desarrollo de enfoques o métodos nuevos y originales, dentro del contexto de la ingeniería del software justificándola de una forma cualitativa y cuantitativa.

RA56 - Materializar la solución propuesta a un problema dado en términos de código, prototipo, informes, pruebas de concepto, análisis, diseños y/o documentación, ubicándola en un entorno empresarial real.

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.

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.

RA84 - Being able to reframe a business question as a data question, reasoning about what data might be of assistance and how to obtain it

RA26 - Group work skill SC13, SC14, CG17 A

\* 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

---

### 4.1. Brief description of the subject

Deep learning (DL) is emerging as a powerful approach to address very complex problems, including those faced by software engineers. It is now being explored, for example, to automatically document code, automate test generation, and even provide code patches. Yet, the DNNs being developed and their validation are at their infancy, suffering from many limitations that we do not quite understand, which may impact future research and their adoption in practice.

This course aims at understanding how DL can be incorporated to the development of software systems, and in which types of tasks it can be used.

### 4.2. Syllabus

#### 1. Introduction to Deep Learning

- 1.1. What is DL?
- 1.2. Basics of DL
- 1.3. Training Deep Feedforward Networks
- 1.4. Neural Networks Architectures

#### 2. Software Engineering for Deep Learning

- 2.1. Developing a DL System
- 2.2. SE Challenges of DL
- 2.3. Incorporating SE practices to DL

### 3. Deep Learning for Software Engineering

#### 3.1. SE Problems that Use DL

#### 3.2. DL Architectures Used to Solve SE Problems

#### 3.3. Integrating DL into SE

## 5. Schedule

### 5.1. Subject schedule\*

Week	Classroom activities	Laboratory activities	Distant / On-line	Assessment activities
1	<b>Chapter 1: Introduction to DL</b> Duration: 02:00 Lecture			
2	<b>Chapter 1: Introduction to DL</b> Duration: 02:00 Lecture			
3	<b>Chapter 1: Introduction to DL</b> Duration: 02:00 Lecture			
4	<b>Chapter 1: Introduction to DL</b> Duration: 02:00 Problem-solving class			
5	<b>Chapter 2: SE for DL</b> Duration: 02:00 Lecture			
6	<b>Chapter 2: SE for DL</b> Duration: 02:00 Lecture			
7	<b>Chapter 2: SE for DL</b> Duration: 02:00 Lecture			
8	<b>Chapter 2: Follow up of Assignment 1</b> Duration: 02:00 Cooperative activities			
9	<b>Chapter 2: Follow up of Assignment 1</b> Duration: 02:00 Cooperative activities			<b>Submission of Assignment 1</b> Group work Continuous assessment Not Presential Duration: 10:00
10				<b>Presentation of Assignment 1</b> Group presentation Continuous assessment Presential Duration: 02:00
11	<b>Chapter 3: DL for SE</b> Duration: 02:00 Lecture			
12	<b>Chapter 3: DL for SE</b> Duration: 02:00 Lecture			

13	<b>Chapter 3: DL for SE</b> Duration: 02:00 Lecture			
14	<b>Chapter 3: Follow up of Assignment 2</b> Duration: 02:00 Cooperative activities			
15	<b>Chapter 3: Follow up of Assignment 2</b> Duration: 02:00 Cooperative activities			<b>Submission of Assignment 2</b> Group work Continuous assessment Not Presential Duration: 10:00
16				<b>Presentation of Assignment 2</b> Group presentation Continuous assessment Presential Duration: 02:00
17				<b>Re-submission of Assignment 1</b> Group work Final examination Not Presential Duration: 10:00  <b>Re-presentation of Assignment 1</b> Group presentation Final examination Presential Duration: 02:00  <b>Re-presentation of Assignment 2</b> Group presentation Final examination Presential Duration: 02:00  <b>Re-submission of Assignment 2</b> Group work Final examination Not Presential Duration: 10:00

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
9	Submission of Assignment 1	Group work	No Presential	10:00	40%	3 / 10	CG13 CG14 CE13 CG1 CE14
10	Presentation of Assignment 1	Group presentation	Face-to-face	02:00	10%	3 / 10	CG18
15	Submission of Assignment 2	Group work	No Presential	10:00	40%	3 / 10	CG13 CG14 CE13 CG1 CE14
16	Presentation of Assignment 2	Group presentation	Face-to-face	02:00	10%	3 / 10	CG18

#### 6.1.2. Global examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
17	Re-submission of Assignment 1	Group work	No Presential	10:00	40%	5 / 10	CE13 CG1 CG13 CG14 CE14
17	Re-presentation of Assignment 1	Group presentation	Face-to-face	02:00	10%	5 / 10	CG18
17	Re-presentation of Assignment 2	Group presentation	Face-to-face	02:00	10%	5 / 10	CG18
17	Re-submission of Assignment 2	Group work	No Presential	10:00	40%	5 / 10	CE13 CG1 CG13 CG14 CE14

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

Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
Second re-submission of Assignment 1	Group work	Face-to-face	10:00	40%	5 / 10	CG1 CG13 CG14 CE13 CE14
Second re-presentation of Assignment 1	Group presentation	Face-to-face	02:00	10%	5 / 10	CG18
Second re-presentation of Assignment 2	Group presentation	Face-to-face	02:00	10%	5 / 10	CG18
Second re-submission of Assignment 2	Group work	Face-to-face	10:00	40%	5 / 10	CE13 CG1 CG13 CG14 CE14

## 6.2. Assessment criteria

### Progressive evaluation period:

- Students will be evaluated using the evaluation tasks described above.
- No examination will be made.
- The final grade will be calculated using a weighted average as explained above.

### 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 those assignments (repeat those presentations) that do not reach the minimum score required. It is not possible to complete evaluation tasks for which there is not a submission/presentation in the progressive evaluation period. In no case assignments/presentations that have a score equal or greater than 5 will be repeated.

**Extraordinary evaluation:**

When the overall score obtained by the student in the global evaluation period is smaller than 5, the student will have to repeat (or perform in case (s)he has not done it before) all evaluation tasks that do not reach the minimum score required. In no case evaluation tasks that have a score equal or greater than 5 will be repeated.

## 7. Teaching resources

---

### 7.1. Teaching resources for the subject

Name	Type	Notes
Deep Learning. I. Goofellow, Y. Bengio, A. Courville. The MIT Press	Bibliography	
Neural Networks and Deep Learning.C.C. Aggarwal. Springer	Bibliography	