



POLITÉCNICA

INTERNATIONAL
CAMPUS OF
EXCELLENCE

COORDINATION PROCESS OF
LEARNING ACTIVITIES
PR/CL/001



E.T.S. de Ingenieros de
Telecomunicacion

ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

93001325 - NeuroseÑales Y NeuroimÁgenes

DEGREE PROGRAMME

09BQ - Master In Science In Neurotechnology

ACADEMIC YEAR & SEMESTER

2024/25 - Semester 1

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1. Description

1.1. Subject details

Name of the subject	93001325 - Neuroseñales y Neuroimágenes
No of credits	6 ECTS
Type	Compulsory
Academic year of the programme	First year
Semester of tuition	Semester 1
Tuition period	September-January
Tuition languages	English
Degree programme	09BQ - Master In Science In Neurotechnology
Centre	09 - Escuela Tecnica Superior De Ingenieros De Telecomunicacion
Academic year	2024-25

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Enrique Javier Gomez Aguilera (Subject coordinator)		enriquejavier.gomez@upm.es	--
Patricia Sanchez Gonzalez		p.sanchez@upm.es	Sin horario.
Ignacio Oropesa Garcia		i.oropesa@upm.es	Sin horario.
Alexander Peter Seiffert		ap.seiffert@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. Skills and learning outcomes *

3.1. Skills to be learned

C4 - Resolver problemas de neurodispositivos, neuroseñales e inteligencia artificial, integrando conocimiento en aspectos nuevos o escasamente definidos y en entornos multidisciplinares. Competencias

C5 - Aplicar metodologías, procedimientos, herramientas y normas del estado del arte para la creación de nuevos componentes tecnológicos, y construir nuevas hipótesis y modelos, evaluarlos y aplicarlos a la resolución de problemas en el área de la neurotecnología. Competencias

K3 - Comprender los fundamentos físicos de las señales neurofisiológicas y las técnicas del estado de arte en neuroimagen avanzada. Conocimientos

S1 - Aplicar técnicas de neurotecnología adecuadas (neurodispositivos, neuroprótesis, procesamiento de neuroseñales, inteligencia artificial) ante problemas mixtos tecnológicos y clínicos y entender los desafíos y oportunidades asociados con su aplicación en este campo. Habilidades

S3 - Seleccionar y aplicar técnicas avanzadas para el procesamiento de señales neuroelectrofisiológicas e imágenes cerebrales para diseño, implementación y evaluación de interfaces cerebro-máquina, y dispositivos de neurorehabilitación que permitan diagnosticar y tratar enfermedades neurológicas y neuropsiquiátricas. Habilidades

S4 - Comunicar trabajos y conclusiones a comunidades de iguales o a públicos generales de una manera razonada, clara y sin ambigüedades, elaborar artículos o memorias técnicas, y transmitir de un modo claro los avances científicos y tecnológicos o de la innovación más avanzada a audiencias especializadas y no especializadas. Habilidades

S5 - Utilizar las tecnologías de la información y la comunicación para la búsqueda de información y datos bibliográficos, y para la adquisición de nuevo conocimiento para la formación permanente y el trabajo autónomo. Habilidades

3.2. Learning outcomes

RA6 - Seleccionar y aplicar técnicas avanzadas para el procesamiento de señales neuroelectrofisiológicas e imágenes cerebrales para diseño, implementación y evaluación de interfaces cerebro-máquina, y dispositivos de neurorehabilitación que permitan diagnosticar y tratar enfermedades neurológicas y neuropsiquiátricas.
Habilidades

RA5 - Comprender los fundamentos físicos de las señales neurofisiológicas y las técnicas del estado de arte en neuroimagen avanzada. Conocimientos

* 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

No hay descripción de la asignatura.

4.2. Syllabus

1. Introduction to neurosignals and neuroimaging
2. Advanced Biomedical Signal Processing
3. Neuroelectrophysiology: EEG, EMG, EOG, MEG, OPM, evoked potentials, etc.
4. Neuroimaging techniques
5. Advanced neuroimaging processing
6. Brain mapping
7. Other main topics

5. Schedule

5.1. Subject schedule*

Week	Type 1 activities	Type 2 activities	Distant / On-line	Assessment activities
1	<p>Course presentation and introduction to biomedical neuro signals and neuroimaging Duration: 02:00</p> <p>Unit 1 Duration: 02:00</p>			<p>Participation</p> <p>Progressive assessment Presential Duration: 00:00</p>
2	<p>Unit 1 Duration: 04:00</p>			
3	<p>Unit 2 Duration: 04:00</p>			
4	<p>Unit 3 Duration: 02:00</p>			
5		<p>Practical session 1 Duration: 02:00</p>		<p>Practical session 1 - Report</p> <p>Progressive assessment Presential Duration: 00:00</p>
6	<p>Unit 3 Duration: 02:00</p>	<p>Practical session 1 Duration: 02:00</p>		
7	<p>Unit 4 Duration: 04:00</p>			
8	<p>Unit 5 Duration: 04:00</p>			
9	<p>Unit 5 Duration: 04:00</p>			
10		<p>Practical session 2 Duration: 04:00</p>		
11	<p>Unit 7 Duration: 02:00</p>	<p>Practical session 2 Duration: 02:00</p>		

12	Unit 7 Duration: 04:00			
13	Unit 8 Duration: 04:00			
14		Practical session-work group Duration: 02:00		Practical session-work group Group presentation in the classroom Progressive assessment Presential Duration: 02:00
15				
16				
17				Exam Progressive assessment Presential Duration: 02:00 Exam Global examination Presential Duration: 02:00 Practical session reports Global examination Not Presential Duration: 00:00

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.

6. Activities and assessment criteria

6.1. Assessment activities

6.1.1. Assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
1	Participation		Face-to-face	00:00	5%	0 / 10	S4 K3
5	Practical session 1 - Report		Face-to-face	00:00	20%	0 / 10	C5 S1 S3 S4 S5 K3
14	Practical session-work group	Group presentation in the classroom	Face-to-face	02:00	20%	0 / 10	C4 C5 S1 S3 S4 S5 K3
17	Exam		Face-to-face	02:00	55%	5 / 10	C4 C5 S1 S3 S4 S5 K3

6.1.2. Global examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
17	Exam		Face-to-face	02:00	70%	5 / 10	C4 C5 S1 S3 K3
17	Practical session reports		No Presential	00:00	30%	0 / 10	C5 S3 S5 K3

6.1.3. Referred (re-sit) examination

No se ha definido la evaluación extraordinaria.

6.2. Assessment criteria

General dispositions

The course follows a progressive assessment system.

The course will be passed when a grade greater than or equal to 5 points out of a total of 10 is obtained, according to the rules indicated in this section.

All the assignments that are carried out must be the result of the student's personal work, although discussion and group work will be encouraged to help better understand the problems that are trying to be solved. Copy detection in an activity will mean failing said activity, both for those who copy and for those who allow themselves to be copied.

Global assessment

Students will have the chance to complete the course practical sessions on their own and with their own means, before the end of the course. These will be taken into account as part of the assessment and have a weight of 30%.

They will have to complete an exam, with a weight of 70% over the final score. Students will need to attain a score of 5 or above to pass the course.

Extraordinary call

Extraordinary assessment is based mainly on an exam. Students will need to attain a score of 4 or above to pass the course.

The weight of the practical session reports will be the same as that applied to each individual student during the regular teaching period (70% or 30%). Students who did not hand in any of the assignments during the regular teaching period will be required to do it for the extraordinary call. In these cases, the weight of the assignments on the final score will be of 10%, and 90% for the exam.

7. Other information

7.1. Other information about the subject

It is recommended that students bring their own laptops to practical sessions