



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

93001322 - Neurociencia

DEGREE PROGRAMME

09BQ - Master In Science In Neurotechnology

ACADEMIC YEAR & SEMESTER

2024/25 - 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..... | 2 |
| 5. Schedule..... | 4 |
| 6. Activities and assessment criteria..... | 6 |
| 7. Teaching resources..... | 7 |
| 8. Other information..... | 8 |

1. Description

1.1. Subject details

| | |
|---------------------------------------|---|
| Name of the subject | 93001322 - Neurociencia |
| 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 - E.T.S. 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 * |
|-------------------------------------|--------------------|-----------------------|-------------------------|
| Bryan Strange (Subject coordinator) | | bryan.strange@upm.es | -- |
| Lidia Blazquez Llorca | | lidia.blazquez@upm.es | Sin horario. |

* The tutoring schedule is indicative and subject to possible changes. Please check tutoring times with the faculty member in charge.

2.3. External faculty

| Name and surname | Email | Institution |
|------------------|--------------------|--|
| Angel Merchan | amerchan@fi.upm.es | Dept. Arquitectura y Tecnología de Sistemas Informáticos, ETS de Ingenieros Informáticos |

3. Skills and learning outcomes *

3.1. Skills to be learned

K1 - Comprender los fundamentos de la neurociencia y conocer la neuroanatomía a nivel mesoscópico y macroscópico y la fisiología del sistema nervioso central y periférico, así como la función y plasticidad neuronal.

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

* 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

This course provides students with a comprehensive introduction to neuroscience, to lay the foundations for understanding neurotechnology. Students will gain in-depth knowledge of Neurons and glia, Neurotransmitters, Genetics and genetic manipulation, Mesoscopic and Macroscopic anatomy,, Electrophysiology, Systems neuroscience and Cognition. The curriculum combines theoretical foundations with practical hands-on experience, providing graduates with in-depth neuroscientific expertise. Critically, it will also provide students with the

knowledge required in other courses in this Masters to understand the principles of neurotechnology

4.2. Syllabus

1. Introduction to the course. Neurons and Glia
2. Synaptic signalling
3. Mesoscopic neuroanatomy - the synapse
4. Macroscopic anatomy - systems
5. Electrophysiology for neurotechnology
6. Systems neuroscience and cognition
7. Laboratory experiences with mesoscale anatomy
8. Laboratory experience with human electrophysiology

5. Schedule

5.1. Subject schedule*

| Week | Type 1 activities | Type 2 activities | Distant / On-line | Assessment activities |
|------|--|---|-------------------|---|
| 1 | <p>Presentation of the course and introduction Duration: 02:00</p> <p>Neurons and glia Duration: 02:00</p> | | | |
| 2 | <p>Synaptic signalling Duration: 04:00</p> | | | |
| 3 | <p>Mesosopic anatomy - the synapse Duration: 02:00</p> | <p>Visit and practical exercises at the Cajal Cortical Circuits laboratory Duration: 02:00</p> | | |
| 4 | <p>Macroscopic anatomy - systems Duration: 04:00</p> | | | |
| 5 | <p>Macroscopic anatomy - systems Duration: 04:00</p> | | | |
| 6 | <p>Macroscopic anatomy - systems Duration: 04:00</p> | | | |
| 7 | <p>Macroscopic anatomy - systems Duration: 02:00</p> <p>Questions and Answers Duration: 02:00</p> | | | |
| 8 | <p>Midterm exam Duration: 02:00</p> | | | <p>Midterm exam Progressive assessment Presential Duration: 02:00</p> |
| 9 | <p>Electrophysiology for Neurotechnology Duration: 04:00</p> | | | |
| 10 | <p>Systems neuroscience and cognition Duration: 04:00</p> | | | |

| | | | | |
|----|--|---|--|---|
| 11 | | Visit and practical exercises to the Laboratory for Clinical Neuroscience Duration: 04:00 | | Laboratory practical work Group presentation in the lab Progressive assessment and Global Examination Presential Duration: 01:00 |
| 12 | | Laboratory Practical Exercises Duration: 04:00 | | Laboratory practical work Group presentation in the lab Progressive assessment and Global Examination Presential Duration: 01:00 |
| 13 | | Laboratory Practical Exercises Duration: 04:00 | | Laboratory practical work Group presentation in the lab Progressive assessment and Global Examination Presential Duration: 01:00 |
| 14 | Sesión de problemas y ajuste de programación docente. Duration: 02:00 Second midterm exam Duration: 02:00 | | | Second midterm exam Progressive assessment Presential Duration: 02:00 |
| 15 | | | | |
| 16 | | | | |
| 17 | | | | Written exam (global evaluation) 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.

6. Activities and assessment criteria

6.1. Assessment activities

6.1.1. Assessment

| Week | Description | Modality | Type | Duration | Weight | Minimum grade | Evaluated skills |
|------|---------------------------|-------------------------------|--------------|----------|--------|---------------|------------------|
| 8 | Midterm exam | | Face-to-face | 02:00 | 35% | 5 / 10 | K1 |
| 11 | Laboratory practical work | Group presentation in the lab | Face-to-face | 01:00 | 10% | 0 / 10 | K1 |
| 12 | Laboratory practical work | Group presentation in the lab | Face-to-face | 01:00 | 10% | 0 / 10 | K1 |
| 13 | Laboratory practical work | Group presentation in the lab | Face-to-face | 01:00 | 10% | 0 / 10 | K1 |
| 14 | Second midterm exam | | Face-to-face | 02:00 | 35% | 5 / 10 | K1 |

6.1.2. Global examination

| Week | Description | Modality | Type | Duration | Weight | Minimum grade | Evaluated skills |
|------|----------------------------------|-------------------------------|--------------|----------|--------|---------------|------------------|
| 11 | Laboratory practical work | Group presentation in the lab | Face-to-face | 01:00 | 10% | 0 / 10 | K1 |
| 12 | Laboratory practical work | Group presentation in the lab | Face-to-face | 01:00 | 10% | 0 / 10 | K1 |
| 13 | Laboratory practical work | Group presentation in the lab | Face-to-face | 01:00 | 10% | 0 / 10 | K1 |
| 17 | Written exam (global evaluation) | | Face-to-face | 02:00 | 70% | 5 / 10 | K1 |

6.1.3. Referred (re-sit) examination

| Description | Modality | Type | Duration | Weight | Minimum grade | Evaluated skills |
|--------------|----------|--------------|----------|--------|---------------|------------------|
| Written exam | | Face-to-face | 02:00 | 70% | 5 / 10 | K1 |

| | | | | | | |
|-----------------|--|--------------|-------|-----|--------|----|
| Laboratory exam | | Face-to-face | 01:00 | 30% | 0 / 10 | K1 |
|-----------------|--|--------------|-------|-----|--------|----|

6.2. Assessment criteria

Evaluation will assess whether students have reached the learning outcomes of the course. Students will pass the course if they obtain a grade greater than or equal to 5 points out of a total of 10. A progressive evaluation scheme based on two midterm exams and practical laboratory exercises will be implemented. If students do not reach a passing grade in the progressive evaluation scheme, they will have the option to renounce the scores of the two written midterm exams and take a global evaluation exercise during the January final exams period (70% of the total score). Attendance and participation in the laboratory sessions will be mandatory. Students who fail to attend a laboratory session will be required to attend a makeup session, which they might have to complete without their group partners.

During the period of extraordinary exams, students will take a written exam (70% of the total score). They can keep their laboratory scores (30%) or choose to repeat the exercises and renounce their original scores.

Copying, plagiarism, or any other form of deception in the submitted works and evaluation activities will result in failure (score: 0) of the corresponding part of the evaluation, according to the UPM evaluation regulations.

7. Teaching resources

7.1. Teaching resources for the subject

| Name | Type | Notes |
|--|--------------|--|
| Principles of Neural Science, Fifth Edition | Bibliography | Eric R. Kandel, James H. Schwartz, Thomas M. Jessell, Steven A. Siegelbaum, A. J. Hudspeth McGraw Hill Professional, Oct 26, 2012 |
| Intracranial EEG A Guide for Cognitive Neuroscientists | Bibliography | Nikolai Axmacher ed. Springer, 2023 eBook ISBN:9783031209109 |

| Moodle | Web resource | UPM Official Moodle Platform |
|--|--------------|------------------------------|
| Haines DE & Mihailoff GA (eds.) ?Fundamental Neuroscience?. Elsevier, 2021 | Bibliography | |
| Purves D, Augustine GJ, Fitzpatrick D, et al (eds). ?Neuroscience?. Sinauer, Oxford University Press, 2018. | Bibliography | |

8. Other information

8.1. Other information about the subject

This course contributes to the Agenda 2030 Sustainable Development Goals (SDG), particularly to SDG 3.