

Degree	Type	Year
Neurosciences	OB	1

## Contact

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## Teaching groups languages

You can view this information at the [end](#) of this document.

## Prerequisites

Basic knowledgment from previous subjects in the master is recommended (M1-M3)

## Objectives and Contextualisation

This module offers an updated vision of the processes involved in neurodegeneration and neuroregeneration in the nervous system. The module covers the cellular and molecular mechanisms underlying neurodegenerative diseases, analyzing the etiopathogenesis of these diseases as well as the development of therapies. On the other hand, the module also covers the mechanisms of neuroplasticity after traumas and / or metabolic conditions, both from the molecular and the clinical point of view. Finally, recent articles regarding the different subjects will be discussed in small groups and students will also prepare a workshop, where they would have to propose an innovative therapy for one pathology of the nervous system.

The general objectives of the subject are:

- Learn the basic concepts about the molecular and cellular bases of the neurodegenerative processes of different neurological pathologies.
- Learn the basics about the processes of regeneration and plasticity in the nervous system that underlie and start after traumatic injuries
- To train the student to apply the knowledge acquired on neurodegeneration and regeneration in a scientific context.
- Acquire skills and technical knowledge for scientific research on neurodegeneration and regeneration
- Acquire the ethical and rigorous attitudes to develop the work of scientific research.

## Learning Outcomes

1. CA11 (Competence) Review the scientific literature in the context of neurodegeneration and neuroregeneration.
2. CA12 (Competence) Critically evaluate data and experimental designs in relevant scientific literature in the field of neurodegeneration and neuroregeneration.
3. CA13 (Competence) Combine clinical and scientific perspectives to obtain a comprehensive overview of a specific neurodegenerative disease or a specific neuroregeneration process, all based on ethical responsibility and respect for the fundamental rights and duties of the individual, his or her diversity and democratic values.
4. KA09 (Knowledge) Indicate the processes involved in the degeneration and regeneration of the nervous system.
5. KA10 (Knowledge) Identify the cellular, physiological, and molecular basis of neurodegeneration.
6. KA11 (Knowledge) Recognise the mechanisms of neuroplasticity during adaptation to trauma and/or metabolic alterations.
7. SA10 (Skill) Develop an experimental design to statistically analyse data obtained from experiments involving the nervous system.
8. SA11 (Skill) Distinguish between neurodegeneration, due to spontaneous causes or voluntary exposure to harmful agents, and the regeneration of the central and peripheral nervous systems.
9. SA12 (Skill) Analyse the physiopathology underlying certain neurodegenerative diseases and traumatic processes that affect the nervous system.

## Content

### INTRODUCTION AND BASIC MECHANISMS OF NEUROLOGICAL DISEASES

- Clinical impact of neurological diseases
- Cellular and molecular mechanisms of neuroinflammation
- Molecular mechanisms involved in neuronal death

- Synaptopathies

## NEURODEGENERATION PROCESSES

- Physiopathology of Alzheimer's disease
- Pathophysiology of mitochondrial neurodegenerative diseases
- Pathophysiology of diseases affecting the basal ganglia
- Neurotoxicology
- Emerging research tools in neurodegeneration

## PROCESSES OF NEUROGENERATION AND PLASTICITY OF THE NERVOUS SYSTEM

- Therapeutic strategies for peripheral nerve regeneration
- Pathophysiology of spinal cord damage and therapeutic approaches
- Neuropathic pain
- Neuroprosthesis and new technologies
- Plasticity after damage to the nervous system
- Synaptic plasticity
- Neurorehabilitation

## Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Practical sessions	12	0.48	
Seminar	41	1.64	
Theoretical classes	5	0.2	
Type: Supervised			
Support tutorials	7	0.28	
Type: Autonomous			
Preparation of knowledge and abilities objectives	35	1.4	
Preparation of practicals	35	1.4	
Preparation of seminars	90	3.6	

Theoretical classes:

Systematized presentation of the subject's syllabus, giving relevance to the most important concepts. The students acquire the basic scientific knowledge of the subject by attending the theory classes, which they will complement with the personal study of the subjects of the teaching program.

Classroom practices:

Development of critical thinking through the analysis of scientific publications and debate. The skills of bibliographic research and selection criteria for rigor are also developed, active self-learning, the clear presentation of one's own ideas and respectful debate are encouraged.

Seminars:

Work, presentation and discussion on neurodegenerative processes and their possible therapeutic approaches. In these sessions, the acquired knowledge is applied and the inventiveness, reflection and critical analysis skills essential for their future scientific activity are demonstrated.

Tutored teaching:

Availability of support tutorials for the study and autonomous development of biological and medical concepts.

Note: if applicable, 15 minutes of a class will be set aside, within the calendar established by the center/degree, for students to complete the evaluation surveys of the teachers' performance and evaluation of the subject/module.

Language: The different activities scheduled in this module may be carried out in either Spanish or English, as determined by the participating faculty.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

## Assessment

### Continuous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Magistral lectures	20	0	0	CA13, KA09, KA10, KA11, SA11, SA12
Seminar Discussion	40	0	0	CA11, CA12, KA11
Workshop (oral presentation)	40	0	0	CA12, CA13, SA10, SA12

The evaluation of the M4 Physiopathology and Regeneration of Neurological Diseases subject will consist of three evaluation sections:

1. In the M4 theory sessions, there will be on-site evaluation tests, at the end or throughout the session, of the concepts acquired in the classroom, through virtual quizzes (Moodle or Socrative classroom) or through written or oral tests. The average of the grades obtained in the on-site assessments carried out in the theory sessions will correspond to 20% of the overall grade of M4. In case of not attending the theoretical sessions and not being able to take the relevant assessment, the grade obtained for that session will be 0.

2. In the seminar sessions, the students will debate in small groups scientific articles previously provided by the teaching staff and in each seminar session they will take an individual written test on the concepts worked on. The average of the grades obtained in the seminar sessions will correspond to 40% of the overall grade of M4. If you do not attend the seminar sessions, the grade obtained for that session will be 0.

3. In the workshop session, the students will have to prepare a scientific project in a small group and present it orally. The grade obtained for the work presented in the workshop session will be equivalent to 40% of the overall grade of M4. If you do not attend the workshop session, the grade obtained for this section will be 0.

To pass the subject M4 Physiopathology and Regeneration of Neurological Diseases, you must obtain a minimum grade of the average between the three assessment sections (points 1, 2 and 3) of 5.0.

In order to take the recovery exam, students must have been previously assessed in a set of activities whose weight is equivalent to at least two-thirds of the total grade for the subject or module. Students will receive a grade of "Not Evaluated" when the completed assessment activities account for less than a third of the final grade.

Use of AI in seminar and workshop activities:

For this course, the use of Artificial Intelligence (AI) technologies is permitted exclusively for supporting scientific bibliographic research. Students must clearly identify which parts have been generated using this technology, specify the tools used, and include a critical reflection on how these tools have influenced the process and the final outcome of the activity. Lack of transparency in the use of AI in these assessed activities will be considered a breach of academic honesty and may result in a partial or total penalty in the activity grade, or more severe sanctions in serious cases.

## Bibliography

Up-to-date review papers that will be recommended by each of the lecturers during the theoretical classes.

Handbooks:

Beal MF, Lang EA, Ludolph AC. Neurodegenerative Diseases: Neurobiology, Pathogenesis and Therapeutics. Cambridge University press, 2005  
Kordower J, Tuszynski MH. CNS regeneration: basic science and clinical advances. 2ª ed, 2007

## Software

No specific program is used

## Groups and Languages

Please note that this information is provisional until 30 November 2025. You can check it through this [link](#). To consult the language you will need to enter the CODE of the subject.

Name	Group	Language	Semester	Turn
(SEMm) Seminars (master)	1	Spanish	annual	morning-mixed
(SEMm) Seminars (master)	2	English	annual	morning-mixed

(TEm) Theory (master)	1	Spanish	annual	morning-mixed
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