

**COURSE DATA****DATA SUBJECT**

Code: 36853
Name: Neurobiology
Cycle: Undergraduate Studies
ECTS Credits: 4.5
Academic year: 2026-27

STUDY (S)

Degree	Center	Acad. year	Period
1106 - Degree in Biology	Facultat de Ciències Biològiques	4	Sin determinar, Second quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1106 - Degree in Biology	Optatividad	ELECTIVES

COORDINATION

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SUMMARY

Neurobiology is an elective course offered in the second semester. Its importance lies in the crucial role of the nervous system, upon which lie our mental functions, individual identity, and even the legal definition of life and death. Furthermore, neurobiology is one of the most active and fruitful areas of modern biology. The Neurobiology course aims to address the study of some fundamental aspects of the structure, function, and pathologies of the nervous system from a multidisciplinary perspective, encompassing cellular and molecular aspects as well as behavioral ones. It also seeks to provide students with insights into how neurobiology can be integrated with other disciplines related to health biology, such as endocrinology (neuroendocrinology) and genetics (genetics of neurological and psychiatric diseases). Therefore, we have designed various activities (lectures, laboratory sessions, and tutorials) throughout which the content described in the corresponding section will be reviewed.

PREVIOUS KNOWLEDGE**RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE**

There are no specified enrollment restrictions with other subjects of the curriculum.



COMPETENCES / LEARNING OUTCOMES

1106 - Degree in Biology

(CB5) Students must have developed the learning skills needed to undertake further study with a high degree of autonomy.

Design and conduct experiments by using scientific techniques and instruments appropriately and complying with laboratory safety regulations.

Knowing how to integrate the biological processes of obtaining energy and the mechanisms of cell signaling.

Knowing how to obtain, process and analyze material of biological origin applying histological techniques for optical and electron microscopy.

Organise, plan and manage information in a manner that allows the individual to analyse, synthesise and develop critical reasoning that can be applied to solve problems, make decisions and carry out work.

Students must be able to apply their knowledge to their work or vocation in a professional manner and have acquired the competences required for the preparation and defence of arguments and for problem solving in their field of study.

Students must have acquired knowledge and understanding in a specific field of study, on the basis of general secondary education and at a level that includes mainly knowledge drawn from advanced textbooks, but also some cutting-edge knowledge in their field of study.

To know how to interpret the biological bases of nervous and mental function, its pathological alterations and the pharmacological strategies for its treatment.

DESCRIPTION OF CONTENTS

MODULE 1: ANATOMY OF THE NERVOUS SYSTEM AND DEVELOPMENT

TOPIC 1. Comparative neuroanatomy of the nervous system. The basic plan of the vertebrate central nervous system. Neuroanatomy of the peripheral nervous system.

TOPIC 2. Development, formation of the brain vesicles and the PNS. Neurogenesis, differentiation, radial and tangential migrations in the cortex. TOPIC 3. Neuritic growth and synaptogenesis. Neurotrophins, neuronal survival and death. Neuronal plasticity and critical periods. Neuronal regeneration.

MODULE 2: NEURONAL STRUCTURE AND FUNCTION

TOPIC 4. Structure of the neuron and the synapse. Glia: role in development, neural function, and neurodegeneration.



TOPIC 5. Synaptic transmission, neurotransmitters, and receptors: pharmacological characterization. Generation of excitatory and inhibitory postsynaptic potentials. Biogenic amines, ATP, peptide neurotransmitters. Non-conventional neurotransmitters: nitric oxide and endocannabinoids. Production, degradation, and reuptake of neurotransmitters: pharmacological potential.

MODULE 3: SYSTEMS NEUROBIOLOGY

TOPIC 6. Sensory systems. Primary and multimodal sensory cortices. Chemosensory systems: olfaction and taste. The auditory and vestibular systems. Organization of somatosensory information and nociception. The visual system: retinohypothalamic pathway, retinopretectal and tectal pathways, geniculostriate pathway or primary visual pathway.

TOPIC 7. Motor systems. Voluntary movement: the pyramidal motor system. Motor control: the basal ganglia and the cerebellum.

TOPIC 8. Learning and memory: types of memory, circuits, and animal models. Motivation and learning. Cellular and molecular mechanisms of learning and memory.

MODULE 4: NEUROPATHOLOGY

TOPIC 9. Neurodegenerative diseases and their animal models. Alzheimer's disease and other dementias. Parkinson's disease and other neurodegenerative movement disorders. Therapies and perspectives.

TOPIC 10. Mental illnesses: schizophrenia, bipolar disorder, and depression. Therapies, hypotheses, and animal models.

LABORATORY

PRACTICAL 1. Macroscopic anatomy of the nervous system. Dissection of a lamb brain. Comparative anatomy.

PRACTICAL 2. Microscopic anatomy: arrangement and mounting on slides of a histological series of mouse brain sections for microscopic observation. Use of the mouse brain histological atlas.

PRACTICAL 3. Structure and function of the different types of cortex. pulse-and-hunt technique with nucleoside analogues for the study of embryonic corticogenesis and adult neurogenesis.

PRACTICAL 4. Study of the dopaminergic pathways of the basal ganglia motor circuit and the reward system. Basic principles of stereotactic surgery. Neuroanatomical tracers: analysis of an experiment.

PRACTICAL 5. Human neuroanatomy. Tests of immediate and working memory

PRACTICAL 6. Study of brain samples labeled by immunohistochemistry in animal models of nervous



system disease.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Tutorials	2,00
Theory	28,00
Laboratory	15,00
Total hours	45,00

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	10,00
Independent study and work	57,50
Preparation of lessons	0,00
Preparation for assessment activities	0,00
Resolution of case studies	0,00
Total hours	67,50

TEACHING METHODOLOGY

- Lecture.
- Practical class.
- Participatory class.
- Reading/discussion of texts.
- Information search.
- Problem-based learning.
- Case analysis/study.

EVALUATION

THEORY 60% of the final grade.



Exam. Theoretical knowledge will be assessed through an exam at the end of the semester according to a calendar approved by the Faculty Board. The exam will consist of questions for the resolution of which it is necessary to understand the basic concepts of the subject and the ability to use them to give plausible answers to problems related to neurological pathology or experimental neurobiology.

PRACTICALS 30% of the final grade.

Attendance to the laboratory is mandatory. According to the evaluation regulations (Art. 6.9) students must be considered to have complied if they have attended a minimum of 80%, therefore a maximum of 1 unjustified absence is allowed. Absences due to force majeure must be duly justified.

Exam. The use of the practices will be evaluated through a final exam that may include the interpretation of macroscopic or histological images of the nervous system related to experiments or pathologies. To complete the exam, students may use the mouse brain atlas. Students who have not met 80% attendance will lose the right to take the practical exam.

TUTORIALS 10% of the final grade. Individual or pair activities will be carried out on clinical cases or problems discussed in the tutorial sessions. This activity is considered non-retrievable.

To add the grades of the theory and practical exams, students must have achieved a passing grade (5/10)

REFERENCES

- Bianchi, L. M. (2022). *The Developing Brain and its Connections* (1st ed.). CRC Press.
- Bianchi, L. (2017). *Developmental Neurobiology* (1st ed.). Garland Science.
- Augustine, G. J., Groh, M. J., Huettel, S. A., LaMantia, A. S., White, L. E., i Purves, D. (Eds.). (2023). *Neuroscience* (7a ed.). Oxford University Press.
- Traducción al castellano de la 7ª ed.: *Neurociencias*, Editorial Médica Panamericana. Disponible en la plataforma Eureka de la UV: <https://www.medicapanamericana.com/es-ES/iniciar-sesion?miEureka=true>
- Kandel, E. R., Koester, J. D., Mack, S. H., & Siegelbaum, S. A. (Eds.). (2021). *Principles of neural science* (6th ed.). McGraw Hill LLC.
- Squire LR, Berg D, Bloom FE, du Lac S, Ghosh A, Spitzer NC. 2012. *Fundamental Neuroscience*, 4ª edicion. Academic Press.

WEB

- <https://mouse.brain-map.org/static/atlas>
- Online atlas Mouse Brain Library. http://www.mbl.org/atlas170/atlas170_frame.html
- <http://brainmaps.org/index.php>