

**Structure and Function of the Nervous System**

Code: 101919  
ECTS Credits: 6

Degree	Type	Year	Semester
2501230 Biomedical Sciences	OB	2	2

**Contact**

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**Use of Languages**

Principal working language: spanish (spa)  
Some groups entirely in English: No  
Some groups entirely in Catalan: No  
Some groups entirely in Spanish: No

**Teachers**

Berta González de Mingo  
Jordi Gascón Bayarri  
Francisco Javier Carrasco Trancoso  
Albert Quintana Romero

**Prerequisites**

It is convenient that the student has reached basic knowledge and skills about the structure and organization of the human body and its cellular systems.

It is important that the student has achieved the basic knowledge and skills of the subjects of Histology and General Physiology.

**Objectives and Contextualisation**

The subject Structure and Function of the Nervous System is programmed during the second semester of the second year of the Degree in Biomedical Sciences and develops the integrated knowledge of the anatomy, histology and normal functioning of the nervous system. Particular emphasis is placed on the human nervous system.

The acquisition of the basic competences of the subject will allow the student to face with a sufficient base the study of the physiopathology and the understanding of the mechanisms of injuries, diseases and degenerative processes that affect the human nervous system during the following courses.

The general formative objectives of the subject are:

- Know the anatomical organization of the nervous system.
- Identify the different cell types that make up nervous tissue and their organizational differences in different regions of the nervous system.

- Learn the basic concepts of the physiology of the nervous system in health.
- Identify the circuits and mechanisms responsible for the main neural, motor, sensory and cognitive functions.
- Train the student to apply the knowledge acquired in the deduction of the consequences of pathological alterations of the nervous system.
- Acquire the practical skills necessary to perform microscopic, macroscopic and functional techniques frequent in the biomedical field (laboratory II).

## Competences

- Describe biomedical problems in terms of causes, mechanisms and treatments.
- Develop critical thinking and reasoning and communicate ideas effectively, both in the mother tongue and in other languages.
- Develop independent learning habits and motivation to continue training at postgraduate level.
- Develop independent learning strategies.
- Develop scientific knowledge, critical reasoning and creativity.
- Display knowledge of the bases and elements applicable to the development and validation of diagnostic and therapeutic techniques.
- Display knowledge of the basic life processes on several levels of organisation: molecular, cellular, tissues, organs, individual and populations.
- Generate innovative and competitive proposals for research and professional activities.
- Identify and understand the advances and challenges of research.
- Plan and implement laboratory analysis experiments and procedures belonging to the biomedical field.

## Learning Outcomes

1. Analyse and identify the functional alterations, at the level of the nervous system, nerve cells and neurotransmitters, that are caused by various types of pathologies.
2. Analyse the functional mechanisms that allow the organism to adapt to the principal variations in the environment.
3. Describe the functioning of the nervous system.
4. Develop critical thinking and reasoning and communicate ideas effectively, both in the mother tongue and in other languages.
5. Develop independent learning habits and motivation to continue training at postgraduate level.
6. Develop independent learning strategies.
7. Develop scientific knowledge, critical reasoning and creativity.
8. Display the necessary practical skills to perform the most common functional neuroscience study techniques in the biomedical field.
9. Generate innovative and competitive proposals for research and professional activities.
10. Identify and understand the advances and challenges of research.
11. Identify the macroscopic and microscopic structure of the nervous system.
12. Perform basic techniques for assessing neurophysiological functioning and disorders.
13. Understand the basic mechanisms of cell and tissue physiology.

## Content

Anatomy of the nervous system

1- Introduction to neuroanatomy.

2- Brain hemispheres

3- basal nuclei.

- 4- Limbic system.
- 5- Diencephalon
- 6- Brain stem
- 7- Cerebellum
- 8- Spinal cord
- 9- Autonomic nervous system
- 10- Cranial nerves
- 11- Vascularization of the nervous system

12- Nervous System covers

13- Ventricular system and cerebrospinal fluid

Histology of the nervous system

- 1- Cell bases of the nervous system development
- 2- Structural differences in the organization of the central and peripheral nervous system
- 3- Structural differences in the different areas of the central nervous system.
- 4- Response of the nervous system to injury

Physiology of the nervous system

- 1- Functional organization of the cerebral cortex and its relationship with the thalamus
- 2- Introduction to sensory physiology
- 3- Somatic and visceral sensitivity
- 4- Visual sensitivity
- 5- Auditory sensitivity
- 6- Taste and olfactory sensitivity
- 7- Brain electrical activity, mechanisms of arousal, wakefulness and sleep
- 8- Neurobiology of motivation and emotions
- 9- Motor control
- 10- Learning and memory

## **Methodology**

Theoretical classes:

Systematized exposition of the main topics of the subject, giving relevance to the most important concepts. The student acquires the basic scientific knowledge of the subject by attending theory classes, which will complement the personal study of the topics discussed.

Seminars:

Acquisition of complementary knowledge in the theoretical part and presentation and work on cases or situations of nervous system alterations relevant to the learning of the subject. The knowledge acquired in the theory classes and in the personal study is applied to the resolution of cases that arise in the seminars. The students work in small groups.

Tutorials:

They will be done in a personalized way in the teacher's office (schedule to be arranged). They aim to clarify concepts, facilitate the study by the student and solve doubts.

## Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Theoretical classes	36	1.44	3, 7, 10, 11
seminars	10	0.4	7, 5, 4, 10
Type: Supervised			
Tutorials	5	0.2	6, 5, 4
Type: Autonomous			
Problem resolution and analysis of data	30	1.2	1, 7, 5, 4, 9, 10
Study	60	2.4	1, 3, 6, 5, 4, 10, 11

## Assessment

The competences of this subject will be evaluated by:

- Exams of objective multiple-choice tests or short questions on the knowledge acquired (75% of the final grade)

- Evaluation of the content, preparation and presentations of the topics covered in the seminars and of the problems and cases and of the work carried out (25% of the final grade)

Partial evaluations will be made of the three parts that include the structure and function of the nervous system. The percent contribution to the global score will be as follows: Anatomy (33%), Histology (17%) and Physiology (50%). It is necessary to obtain a grade of 5 in each part in the partial tests and 4.5 to average in the final test, where each part will be evaluated independently.

To participate in the recovery, students must have been previously evaluated in a set of activities the weight of which equals a minimum of two thirds of the total grade of the subject or module. Therefore, the students will obtain the "Not Evaluable" qualification when the evaluation activities carried out have a weight lower than 67% in the final grade.

## Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
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Written examn and Multichoice test	70%	6	0.24	8, 3, 7, 6, 5, 4, 9, 10, 11
content of seminars, problems and evaluation of papers	15%	2	0.08	2, 1, 8, 7, 6, 5, 4, 9, 10, 12
practical exam	15%	1	0.04	13, 8, 3, 11, 12

## Bibliography

### ANATOMY

- CROSSMAN AR, NEARY D. *Neuroanatomia* (3ª ed.). Ed. Elsevier-Masson, 2010.
- SCHÜNKE. *Prometheus. Vol 3. Cabeza y Neuroanatomia* (2 ed.). Panamericana, 2010.
- NOLTE J, ANGEVINE JB. *El encéfalo humano en fotografías y esquemas*. Ed. Elsevier, 2009.

### HISTOLOGY

- ROSS. *Histología. Texto y atlas color con biología celular y molecular*. Panamericana, 2009.
- WELSCH. *Sobotta Histología* (2ª ed.). Panamericana, 2008.
- OVALLE. *Netter's Essential Histology*. Saunders, 2008.
- GARTNER, L. *Texto Atlas de Histología*. Mc Graw-Hill, 2008.

### PHYSIOLOGY

- BARRETT KE. et al., *Ganong's Review of Medical Physiology* (23th Ed.), McGraw Hill, 2010
- BERNE R, LEVY M. *Fisiología* (4ª ed.). Elsevier-Mosby, 2009.
- CARDINALI DP, *Neurociencia aplicada. Sus fundamentos*. Panamericana, 2007\*
- GUYTON AC, HALL JE. *Tratado de Fisiología Médica* (11ª ed.). Elsevier-Saunders, 2006.
- KANDELL ER et al. *Principles of Neural Science* (5th ed.). McGraw Hill Medical, 2013
- PURVES. *Neurociencia* ( 3ª ed.). Panamericana, 2007

\* Muy recomendado