

**COURSE DATA****DATA SUBJECT****Code:** 34445**Name:** Neuroanatomy**Cycle:** Undergraduate Studies**ECTS Credits:** 6**Academic year:** 2025-26**STUDY (S)**

Degree	Center	Acad. year	Period
1204 - Degree in Medicine	Facultat de Medicina i Odontologia	2	First quarter
1204 - Degree in Medicine	Facultat de Medicina i Odontologia	2	First quarter

**SUBJECT-MATTER**

Degree	Subject-matter	Character
1204 - Degree in Medicine	Anatomía humana II	BASIC
1204 - Degree in Medicine	Anatomía humana II	BASIC

**COORDINATION**

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**SUMMARY**

The subject provides morphological bases to the nervous system functioning. The organs of senses are studied as elements of perception and information to the nervous system.

The different parts of the central nervous system are studied from the anatomic and functional point of view, from the spinal cord to brain hemispheres.

The descriptive study is combined with the study of circuits and nerve pathways connections established between different structures which aims to provide a global view to the understanding of the subject.

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

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



## OTHER REQUIREMENTS

## COMPETENCES / LEARNING OUTCOMES

### 1204 - Degree in Medicine

Acknowledge diversity and multiculturality.

Be able to formulate hypothesis, gather information and evaluate it critically in order to solve problems by following the scientific method.

Capacity for communicating with professional circles from other domains.

Consideration of ethics as a fundamental value in the professional practise.

Criticism and self-criticism skills.

Establish a good interpersonal communication which may allow professionals show empathy and talk to the patients efficiently, as well as to their relatives, the media and other professionals.

In the professional practise, take a point of view which is critical, creative, constructive and research-oriented.

Know how to use IT in clinical, therapeutic and preventive activities, and those of research.

Know how to use the sources of clinical and biomedical information available, and value them critically in order to obtain, organise, interpret and communicate scientific and sanitary information.

Knows the morphology, structure and function of skin, blood, organs and body systems: circulatory, digestive, locomotor, reproductive, excretory and respiratory systems; endocrine system, immune system, central and peripheral nervous systems.

Knows the processes of growth, maturation and aging of the different organs and systems. Homeostasis. Adaptation to the environment.

Proper organisation and planning of the workload and timing in professional activities.

Recognises the morphology and structure of tissue, organs and systems through macroscopic and microscopic methods, and image techniques.

Team-working skills and engaging with other people in the same line of work or different.

Understand and recognise the effects of growth, development and aging which affect individuals and their social environment.

Understand and recognise the structure and normal function of the human body, at the following levels: molecular, tissue, organic, and of systems, in each phase of human life and in both sexes.

Working capacity to function in an international context.



## DESCRIPTION OF CONTENTS

### 1. SENSE ORGANS

1. Eyeball anatomy: retina, choroid, ciliary bodies, iris and sclera.
2. Eyeball anatomy: transparent and refractory means. Cornea, aqueous humor, crystalline lens and vitreous humor. Elements of protection of the eyeball.
3. Eyeball anatomy: extrinsic and intrinsic musculature of the eyeball. Eye movements.
4. Eyeball vascularization and innervation.
5. Ear anatomy. Outer ear: auricle, external auditory meatus. Outer ear vascularization and innervation. Tympanic membrane. Middle ear: tympanic cavity, ossicles, middle ear muscles. Middle ear vascularization and innervation.
6. Ear anatomy. Inner ear: sense of balance and hearing. Vestibular system. Cochlea. Inner ear vascularization and innervation.

### 2. SPINAL CORD

7. Introduction to the study of the nervous system. Central nervous system and system peripheral nervous concept.
8. Introduction. External morphology. Organization of the gray and white matter. Arterial and venous vascularization. Meninges.
9. Systematization of the gray matter. Rexed laminae. Somatomotor spinal cord: anterior horn. Afferences and efferences. Spinal reflexes. Visceromotor spinal cord: lateral horn. Afferences and efferences.
10. Systematization of the gray matter. Sensitive marrow. Posterior horn. Afferences and efferences.

### 3. BRAINSTEM AND CEREBELLUM

11. Introduction. External morphology of the brainstem. Organization of the grey and white substances.
12. Somatomotor and visceromotor nuclei of the brainstem. Afferences and efferences.
13. Somatosensitive and viscerosensitive nuclei of the brainstem. I. Afferences and efferences. Trigeminal and gustatory ways.
14. Somatosensitive and viscerosensitive nuclei of the brainstem. II. Afferences and efferences. Vestibular and acoustic ways.
15. Systematization of the cranial nerves. Types of constituent fibers. Origin and pathways.
16. Intercalated nuclei of the brainstem. Sensitive: periaqueductal gray matter, colliculus inferior and superior, eye center, pretectal and pretectum area. Motors: lower oliver complex, pons nucleus, substantia nigra, red nucleus. Relation with the motor system, muscle tone and reflexes.
17. Introduction. External and internal morphology of the cerebellum. Cerebellar circuits. Structural



organization of the vestibulocerebellum. Afferences and efferences. Functional significance.  
18. Structural organization of the spinocerebellum. Afferences and efferences. Functional significance. Structural organization of the cortical-cerebellum. Afferences and efferences. Functional significance.  
19. Arterial and venous vascularization of the brainstem and cerebellum.

#### **4. DIENCEPHALON**

20. Introduction. Systematization of the diencephalon. External and internal morphology.  
21. Thalamus. Topography systematization. Thalamic nuclei. Afferences and efferences. Functional significance.  
22. Hypothalamus-pituitary contents bloc. Hypothalamus: structural organization. Afferences and efferences. Hypophysis: structural organization. Afferences and efferences. Functional significance.  
23. Subthalamus: subthalamic nucleus. Afferences and efferences. Epithalamus: habenular nuclei, pineal gland. Afferences and efferences. Functional significance.

#### **5. TELEENCEPHALON**

24. Introduction. Structural organization. External morphology of the telencephalon.  
25. Basal ganglia or nuclei. Striatum. Topographic and structural organization. Afferences and efferences. Functional significance.  
26. Limbic system. Hippocampal formation: topographic and structural organization. Afferences and efferences. Hippocampal circuits. Functional significance.  
27. Limbic system. Nucleus amygdalae. Olfactory pathway. Septal nuclei and accumbens nucleus. Topographic and structural organization.  
28. Neocortex. Systematization. Motor areas. Sensitive areas. Language areas. Topographic and structural organization. Afferences and efferences. Functional significance.  
29. Systematization of the white matter of the cerebral hemispheres. Functional significance.  
30. Arterial and venous vascularization of the encephalon. Origin and distribution. Meninges, ventricles and cisternae. Cerebrospinal fluid (CSF). Clinical-applied anatomy.

#### **6. LABORATORY PRACTICAL THEMATIC UNTIS (Dissection room)**

1. Macroscopic view of the visual system. Vascularisation and enervation. Radiological anatomy by using different diagnosis techniques by medical imaging.  
2. Macroscopic view of the auditory system. Vascularisation and enervation. Radiological anatomy by using different diagnosis techniques by medical imaging.  
3. Macroscopic view of the spinal cord. External morphology. Study of the spinal cord horizontal sections at different levels. Radiological anatomy of the spinal cord by using different diagnosis techniques by medical



imaging.

4. Macroscopic view of the Brainstem and Cerebellum. External morphology. Origin of the cranial nerves. Vascularisation. Radiological anatomy of the brainstem and cerebellum by using different diagnosis techniques of imaging.

5. Macroscopic view of the diencephalon. Macroscopic view of the cerebral hemispheres. External morphology. Location of the different areas and gyri. Radiological anatomy of the diencephalon and cerebral hemispheres by using different diagnosis techniques of imaging.

6. Study of the sagittal, axial and coronal encephalic sections. Encephalic vascularization. CSF. Cisterns and ventricles. Radiological anatomy by means of different diagnostic techniques by medical imaging.

## 7. COMPUTER ROOM PRACTICAL

1. Eyeball. Eye movements. Applied Clinical Anatomy: pathologies. Paralysis of the cranial nerves III, IV and VI.

2. Spinal cord. Systematization of the white matter. Ascendant and descendant pathways. Applied clinical anatomy: spinal cord injuries (SCI).

3. Brainstem. Systematization of the white matter. Ascendant and descendant pathways. Study of the brainstem horizontal sections at different levels.

4. Brainstem. Study of the centers and nuclei related to visual reflexes. Study of the pupillar, convergence and accommodation, vestibulocular reflexes.

5. Study the brain by different medical imaging techniques. Applied clinical anatomy.

## 8. SEMINAL PRACTICAL

1. Applied clinical anatomy: brainstem and cerebellum injuries.

2. Integration of the limbic system circuits. Integrating circuits of the amnesic, behavioural and emotional functions. Functional significance and clinical application.

## WORKLOAD

### PRESENCIAL ACTIVITIES

Activity	Hours
Theory	33,00
Seminar	5,00
Laboratory	12,00
Computer classroom practice	10,00
<b>Total hours</b>	<b>60,00</b>

**NON PRESENCIAL ACTIVITIES**

Activity	Hours
Attendance at other activities	0,00
Individual or group project	10,00
Independent study and work	40,00
Preparation of lessons	35,00
Preparation for assessment activities	5,00
Resolution of case studies	0,00
<b>Total hours</b>	<b>90,00</b>

**TEACHING METHODOLOGY**

**Theoretical lessons** (30 thematic units). Taught through expositive lessons in the classroom, encouraging the student's active participation.

**Practical lessons in the laboratory** (6 thematic units). Performed in the dissection room through a brief exposition of the content of the Thematic Unit and posterior essay in reduced groups using the corpse material as well as models and other practical support material.

**Practical lessons in the computer room** (5 thematic units). Through the using of programs and imaging diagnostic techniques, that reinforce the learning and the knowledge of the anatomical structures.

**Seminar practical lessons** (2 thematic units). Using the auxiliary resources to develop certain topics in reduced groups, setting the problem solving and propitiating auto-assessment systems.

The gender perspective, the respect for diversity, and the sustainable development goals (SDGs) will be incorporated into teaching, whenever possible.

**EVALUATION**

**Theoretical evaluation: 60% of the final mark (6 points).**

This will be done by a **written test** that will include the contents of the theoretical program and which aim will be to evaluate the acquisition of the acquired knowledge. The content of the test will be the same for all the groups of the subject.

It will consist of **60 test, multiple choice questions** (5 possible answers, 1 true / 4 false). Qualification criteria: 0.1 point / correct answer. The formula for removal of the random component will be applied; this means that 0.025 points will be subtracted for each question wrongly answered. Un answered questions do not subtract points. **This part will have a maximum value of 6 points.**

**The theoretical evaluation must be passed with a minimum of 3 points.**



**Practical evaluation: 40% of the final mark (4 points).**

This will be carried out by evaluating the students' participation in the different activities and by carrying out **two tests** that will assess the acquisition of skills related to general and specific skills.

**1. Evaluation of 10 questions which will include contents of the practical programme**, and taught in the practical classes in the dissection room. This test will be performed in the dissection classroom. **This part will have a maximum value of 2 points.**

**2. Evaluation of 20 test, multiple choice questions** (5 possible answers, 1 true/4 false) of the practical program content taught in computer and seminars practices. Qualification criteria: 0.1 point / correct answer. The formula for removal of the random component will be applied; this means that 0.025 points will be subtracted for each question wrongly answered. Unanswered questions do not subtract points. This test will be carried out together with the theoretical evaluation in the classroom. The content of the test will be the same for all groups of the subject. **This part will have a maximum value of 2 points.**

**The practical evaluation will have a maximum value of 4 points.**

**The practical evaluation must be passed with a minimum of 2 points** among all, being able to average whenever a 40% score is reached in each of them.

**In order to pass the subject, the final grade must be at least 5 points, which will be the result of the sum of both theoretical and practical qualifications.**

Attendance at practical activities is mandatory. The student is considered to meet this requirement if he or she has attended a minimum of 80% of these activities and has adequately justified the impossibility of attending the remaining sessions due to the occurrence of a cause of force majeure. It will be essential to comply with this requirement to pass the subject.

Students are reminded of the importance of carrying out evaluation surveys on all the teaching staff of the degree subjects.

## REFERENCES

### BASIC:

- CROSSMAN, A.R.; NEARY, D. Neuroanatomía. 6ª edición. Ed. Elsevier. 2019.
- FITZGERALD. Neuroanatomía clínica y neurociencia. 8ª edición. Ed. Elsevier. 2022.
- HAINES, D. E. Principios de Neurociencia. 5ª edición. Ed. Elsevier. 2019.
- HAINES, D.E. Neuroanatomía Clínica. Texto y atlas. 10ª edición. Ed. Wolters Kluwer. 2021.
- NETTER. Atlas de Neurociencia. 4ª edición. Ed. Elsevier. 2022.
- NOLTE, JOHN; ANGEVINE, JAY B. Jr. El encéfalo humano en fotografías y esquemas. 3ª edición. Ed. Elsevier. 2009.



- PURVES. Neurociencia. 5ª edición. Ed. Panamericana. 2020.
- WILSON-PAUWELS, L.; AKESSON, E. Nervios Craneales. En la salud y la enfermedad. 3ª edición. Ed. Panamericana. 2013.
- Recursos e-Salut: ClinicalKey Student Medicina, Odontologia y Enfermería [<https://uv-es.libguides.com/RecursosSalut>] Acces Medicina [[https://uv-es.libguides.com/Access\\_Medicina](https://uv-es.libguides.com/Access_Medicina)] Médica Panamericana [[https://uv-es.libguides.com/Medica\\_Panamericana](https://uv-es.libguides.com/Medica_Panamericana)]

COMPLEMENTARY:

- KANDEL, E.R; KOESTER, J.D; MACK, S.H; SIEGELBAUM, S. Principles of Neural Science. 6ª edition. Ed. Mcgraw-Hill. 2021.
- NIEUWENHAUYS. El sistema nervioso central humano. 4ª edición. Ed. Panamericana. 2009.
- PUELLES LÓPEZ. Neuroanatomía. Ed. Panamericana. 2019.