COURSE DATA

Data Subject	
Code	34445
Name	Neuroanatomy
Cycle	Grade
ECTS Credits	6.0
Academic year	2021 - 2022

Study (s)

Degree	Center	Acad. year	Period
1204 - Degree in Medicine	Faculty of Medicine and Odontology	2	First term

Subject-matter

Degree	Subject-matter	Character
1204 - Degree in Medicine	2 - Human anatomy II	Basic Training

Coordination

Name	Department
ZABALETA MERI, MARIA MERCEDES	17 - Human Anatomy and Embryology

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 (RD 1393/2007) // LEARNING OUTCOMES (RD 822/2021)

1204 - Degree in Medicine

- 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.
- Understand and recognise the effects of growth, development and aging which affect individuals and their social environment.
- 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.
- Know how to use IT in clinical, therapeutic and preventive activities, and those of research.
- In the professional practise, take a point of view which is critical, creative, constructive and research-oriented.
- Be able to formulate hypothesis, gather information and evaluate it critically in order to solve problems by following the scientific method.
- 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.
- Organizar y planificar adecuadamente la carga de trabajo y el tiempo en las actividades profesionales.
- Capacidad para trabajar en equipo y para relacionarse con otras personas del mismo o distinto ámbito profesional.
- Criticism and self-criticism skills.
- Capacity for communicating with professional circles from other domains.
- Acknowledge diversity and multiculturality.
- Consideration of ethics as a fundamental value in the professional practise.
- Working capacity to function in an international context.
- 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.

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

LEARNING OUTCOMES (RD 1393/2007) // NO CONTENT (RD 822/2021)

- Morphological recognition and fundamental significance of the senses organs.

- Macroscopic recognition and connexion pathways of the different structures of the central nervous system.

- Section and medical imaging structures recognition in health status.

- Knowing the principal circuits and nervous connexion pathways targeted to its clinical practice applicability.

- Preparing the student to perform a topographic diagnosis of the nervous system lesion.

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 and cerebellum. 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. TELENCEPHALON

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

ACTIVITY	Hours	% To be attended
Theory classes	33,00	100
Laboratory practices	12,00	100
Computer classroom practice	10,00	100
Seminars	5,00	100
Development of group work	5,00	0
Development of individual work	5,00	0
Study and independent work	40,00	0
Preparation of evaluation activities	5,00	0
Preparing lectures	20,00	0
Preparation of practical classes and problem	15,00	0
TOTAL	**150,00**	

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.

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 have to be the result of the sum of both theoretical and practical

qualifications.

Attendance to practical sessions is mandatory.

The unjustified absence to more than a 20% of the practical sessions will suppose the impossibility of presenting to the examination of the subject.

REFERENCES

Basic

- CROSSMAN, A.R.; NEARY, D. Neuroanatomia. 6ª edición. Ed. Elsevier Masson. 2019.
- HAINES, D. E. Principios de Neurociencia. 5ª edición. Elsevier Saunders. 2019.
- HAINES, D.E. Neuroanatomía Clínica. Texto y atlas. 9ª edición. Ed. Lippincott Williams. 2015.
- NOLTE, JOHN, ANGEVINE,JAY B. Jr. El encéfalo humano en fotografías y esquemas.3ª edición. Ed. Elsevier Mosby.2009.
- PURVES. Neurociencia. 5ª edición. Ed. Panamericana. 2016.
- WILSON-PAUWELS, L.; AKESSON, E.Nervios Craneales. En la salud y la enfermedad. 3ª edición. Ed. Panamericana. 2013.

Additional

- KANDEL,E.R; SCHWARTZ, J.H; JESSELL,T.M. Principios de Neurociencia. Ed. Mcgraw-Hill. 2001.
- NIEUWENHAUYS. El sistema nervioso central humano. 4ª edición. Ed. Panamericana. 2009.
- PUELLES LÓPEZ. Neuroanatomía. Ed. Panamericana. 2008.

ADDENDUM COVID-19

This addendum will only be activated if the health situation requires so and with the prior agreement of the Governing Council

Siguiendo las recomendaciones del Ministerio, la Consellería y el Rectorado de nuestra Universidad, para el período de la "nueva normalidad", la organización de la docencia para el segundo cuatrimestre del curso 2021-22, seguirá un modelo híbrido, donde tanto la docencia teórica como práctica se ajustará a los horarios aprobados por la CAT pero siguiendo un modelo de Presencialidad / No presencialidad en la medida en que las circunstancias sanitarias y la normativa lo permitan y teniendo en cuenta el aforo de las aulas y laboratorios docentes. Se procurará la máxima presencialidad posible y la modalidad no presencial se podrá realizar mediante videoconferencia cuando el número de estudiantes supere el coeficiente de ocupación requerido por las medidas sanitarias. De manera rotatoria y equilibrada los estudiantes que no puedan entrar en las aulas por las limitaciones de aforo asistirán a las clases de manera no presencial mediante la transmisión de las mismas de manera síncrona/asíncrona via “on line”.