COURSE DESCRIPTION

COURSE DETAILS

Title (of the course): **NEUROANATOMÍA Y ANATOMÍA TOPOGRÁFICA**
Code: 101456
Degree/Master: **GRADO DE VETERINARIA** Year: 2
Name of the module to which it belongs: FORMACIÓN BÁSICA COMÚN
Field: ANATOMÍA Y EMBRIOLOGÍA VETERINARIAS
Character: BASICA Duration: FIRST TERM
ECTS Credits: 6.0 Classroom hours: 60
Face-to-face classroom percentage: 40.0% Study hours: 90
Online platform: http://moodle.uco.es/m2324/

LECTURER INFORMATION

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PREREQUISITES AND RECOMMENDATIONS

Prerequisites established in the study plan

Have passed the following subjects in the same study plan:
Embryology (101454)
Systematic anatomy (101455)
To study the subject in the multilingual plan of the Degree in Veterinary Medicine, the student must accredit an English level equivalent to the B1 certificate

Recommendations

Attention, monitoring and continuous study of training activities. It is especially recommended to attend the face-to-face, theoretical and practical activities of the subject, as they are essential for their learning as well as an assessment instrument.

INTENDED LEARNING OUTCOMES

CE7 Morphology and Topography of organs and systems.

CE8 Structure of organs and systems.

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OBJECTIVES

1. To aquire a basic and comprehensive knowledge of the central nervous system, sense organs and common integument of domestic animals.

2. To know specifically the morphology, situation, topography and relationships of the organs and structures of body regions in veterinary species: carnivores, horse, ruminants, pig and birds.

CONTENT

1. Theory contents

I. **NERVOUS SYSTEM**

Topic 1. Introduction to the nervous system. Elements and structural organization: the neuron, synapse, neuroglia. Stimulus-response: functioning of the nervous system, reflex arcs. Subdivisions of the nervous: anatomical division and functional division.

Topic 2. General morphology and embryology of the nervous system. General morphology of the central nervous system: shape, size and evolutionary development; introductory morphological study. Embryonic development: neural tube formation, spinal cord differentiation, and brain vesicle formation.

Topic 3. Spinal cord. Configuration: extension and portions, grooves and fissures, cords of the spinal cord. Organization and structure: central cavity, gray matter and white matter.

Topic 4. Rhombencephalon. Division. Medulla oblongada and pons. Fourth ventricle. Nuclei of cranial nerves: somatic efferent column, visceral efferent column, visceral afferent column, somatic afferent column, special somatic afferent column. Other internal structures of the hindbrain: nuclei, reticular formation and nerve tracts. Cerebellum: external configuration, structure, peduncles of the cerebellum and (brief) functional meaning.

Topic 5. Mesencephalon. Configuration. Aqueduct of the midbrain. Tectum of the mesencephalon. Tegmentum. Cerebral peduncles.

Topic 6. Diencephalon. Setting. Third ventricle. Epithalamus. Thalamus. Hypothalamus-pituitary.

Topic 7. Telencephalon (Brain). Configuration: hemispheres, lateral ventricles, telencephalon components. Striated body (Basal nuclei). Paleopallium. Arquipallium. Neopallium.

Topic 8. Somatic afferent pathways (general). Previous concepts: exteroceptive and proprioceptive receptors, primary sensory neurons, other sensory neurons. Lemniscal system: limbs, trunk, neck and head. Extralemniscal system: lateral group, medial group, sensibility of the head. Unconscious proprioception. Reticular formation.

Topic 9. Special somatic afferent pathways. Visual pathways: conscious visual perception, reflex acts. Auditory pathways: conscious auditory perception, reflex acts. Vestibular pathways: vestibular nuclei, postsynaptic connections.

Topic 10. Somatic efferent pathways. Motor neuron systems: lower motor neurons, upper motor neurons. Pyramidal system: origin, route and projection. Extrapyramidal system: origin, relay stations and connections. Functions of the cerebellum.

Topic 11. Visceral nervous system (or autonomous). Introduction. Hypothalamus-hypophysis. Visceral

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afferent pathways: general visceral afferent pathways, special visceral afferent pathways (gustatory sensitivity, olfactory sensitivity). Visceral efferent pathways: pre and postganglionic neurons, sympathetic system, parasympathetic system. Limbic system: limbic cortex, subcortical nuclei.

Topic 12. Protection and irrigation of the central nervous system. Bone protection: vertebral canal, skull cavity. Meninges: spinal meninges, encephalic meninges. Cerebrospinal fluid (cerebrospinal fluid): production, circulation and resorption. Irrigation of the central nervous system: arterial irrigation and venous drainage.

Topic 13. Cranial nerves. Classification. Nerves related to the special senses: olfactory, optic and vestibulocochlear. Nerves related to somatic musculature: oculomotor, trochlear, abducent and hypoglossal. Nerves related to branchial arches: trigeminal, facial, glossopharyngeal and vagus. Accessory nerve.

II. ORGANS OF THE SENSES

T**opic 14. Fundamental organs of the eye: eyeball.** Eyeball: morphology. Fibrous tunic of the eyeball: sclera and cornea. Vascular tunic of the eye: choroid, ciliary body and iris. Internal tunic of the eyeball: retina. Refractive media of the eyeball: cornea, aqueous humor, lens and vitreous body.

Topic 15. Accessory organs, irrigation and innervation of the eye. Eyeball muscles. Orbit and orbital fascias. Eyelids Conjunctive tunic. Lachrymal apparatus. Irrigation and innervation of the eye: arterial irrigation, venous drainage and innervation of the eye.

Topic 16. Vestibulocochlear organ: internal ear. Vestibulocochlear organ. Membranous labyrinth: vestibular portion (static), cochlear (auditory) portion, perilymphatic space. Bone labyrinth: vestibule and osseus semicircular canals, cochlea, internal acoustic meatus. Vessels and nerves: arterial irrigation, venous drainage and nerve components.

Topic 17. Middle ear and external ear. Middle ear: cavity of the eardrum, membrane of the eardrum, ossicles of the ear and associated muscles, mucosa of the tympanic cavity, auditory tube and nerves of the middle ear. External ear: external acoustic meatus, auricle, auricular muscles, innervation and irrigation.

Topic 18. Smell, taste and touch. Smell organ: olfactory mucosa, structure and organ of the vomer. Organ of taste: taste buds, taste buds and taste nerve fibers. Sense of touch: free and corpuscular nerve endings, tactile hairs, areas of cutaneous innervation. Propioception and enteroception.

III. COMMON TEGUMENT

Topic 19. Common integument: skin and appendages of the skin. Common integument: concept. Structure of the skin: epidermis, dermis and subcutaneous tissue. Hairs: configuration, structure and types of hairs. Specific modifications of the skin: horns, skin pads and spurs, unguicule (claw and claw) and unguide (helmet and hoof).

Topic 20. Cutaneous glands and mamma. Cutaneous glands: sweat glands, sebaceous glands, other specific skin glands. Breast: concept, number of breasts, mammary gland (concept, anatomical constitution, structure and number), male breasts and accessory breasts. Blood, lymphatic and innervation irrigation.

IV. RESEARCH LINES

1. Anatomical techniques of conservation of specimens
2. Animal biomechanics
3. Veterinary rehabilitation
4. Architecture and muscular composition
5. Neuromuscular diseases of domestic mammals

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2. Practical contents

I. CARNIVORES

Practice 1. Head, neck, back and thorax

Head. Conformation and external features. Surface structures. Nasal cavity and paranasal sinuses. Oral cavity. Teeth and full dentition. Salivary glands. Pharynx and larynx. Orbit and eye. Ear and inner ear. Blood irrigation and lymphatic structures. Neck. Conformation and external features. Surface anatomy. Deep structures. Back. Conformation and surface anatomy. Spine. Muscles of the back. Spinal canal and tail anatomy. Thorax. Conformation and surface anatomy. Walls of the thorax. Pleura and lungs. Mediastinum. Heart. Esophagus, trachea and thymus. Vessels, nerves and lymphatics. Notions of anatomy by image.

Practice 2. Abdomen, pelvis, genitals and limbs

Abdomen. Conformation and surface anatomy. Abdominal wall. General visceral topography. Spleen. Stomach and omentos. Bowels. Liver and pancreas. Kidneys and adrenal glands. Vascular, nervous and lymphatic formations. Abdominal palpation. Pelvis. General considerations. Straight and anal canal. Urinary bladder. Fondling. Female genitals. Ovaries and uterine tubes. Uterus. Vagina, vaginal vestibule and vulva. Male genitalia. Scrotum, testicle and epididymis. Spermatic cord and testicular casings. Pelvic ureter and accessory genital glands. Penis and urethra. Thoracic limb. Scapula, shoulder and arm. Elbow and forearm. Hand. Nerves of the thoracic member. Pelvic limb. Croup, hip and thigh. Knee and leg. Foot. Nerves of the pelvic limb. Notions of anatomy by image.

II. HORSE

Practice 3. Head and neck

Head. Conformation and external features. Compared aspects of the skeleton. Surface structures. Nasal cavity and paranasal sinuses. Mouth. Teething and chewing apparatus. Salivary glands. Pharynx and diverticulum of the auditory tube. Larynx. Eye and accessory organs. Blood and lymphatic irrigation. Neck. Conformation and superficial features. Cervical skeleton. Musculature. Visceral space of the neck.

Practice 4. Back and thorax

Back. Conformation and superficial features. Spine. Muscles of the back. Biomechanics. Spinal canal. Anatomy of the tail. Thorax. Conformation and surface anatomy. Thoracic wall. Pleural cavities. Lungs. Mediastinum. Heart. Esophagus, trachea and thymus. Vessels and nerves inside the thorax. Lymphatic structures of the thorax.

Practice 5. Abdomen

Conformation and surface anatomy. Abdominal wall: stratigraphy, inguinal canal, innervation and irrigation. Spleen. Stomach. Intestines: small intestine and large intestine. Irrigation, lymphatic drainage and innervation of the gastrointestinal tract. Liver. Pancreas. Kidneys and adrenal glands. Roof of the abdomen.

Practice 6. Pelvis, genitals and udder

Pelvis. General anatomy of the pelvis and perineum. Innervation and irrigation of the pelvic walls. Straight and anal canal. Urinary bladder and female urethra. Female genital organs. Ovaries Uterine tubes. Uterus. Vagina. Vaginal vestibule and external genitalia. Irrigation of the female genital tract. Modifications of the genital tract of the mare. Male genital organs. Scrotum and testicle. Spermatic cord and testicular casings. Pelvic genital organs. Penis and foreskin. Irrigation and innervation. Rectal examination and udder. Anatomy of the rectal examination. Udder of the mare.

Practice 7. Thoracic limb

Generalities and conformation. Interconnecting muscles: superficial and deep layers. Back and shoulder: scapula, shoulder joint and muscles. Arm and elbow: humerus, elbow joint and flexor and extensor muscles. Forearm and carpus: skeleton, joints of the carpus and extensor muscles and flexors. Distal part of the thoracic limb

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(Metacarpus and finger): skeleton, joints, tendons, annular ligaments, synovial and interosseous muscle. Passive support apparatus. Blood vessels and lymphatic structures. Nerves of the thoracic limb: brachial plexus and distal innervation. Notions of anatomy by image.

Practice 8. Pelvic limb and hoof

Pelvic limb. Generalities and conformation. Croup, hip and thigh: conformation of the rump, skeletal references, bones, hip joint, muscles of the rump and hip, caudal, medial and cranial muscles of the thigh. Articulation of the knee. Leg and tarsus: skeleton, joints and cranial-lateral muscles and caudal of the leg. Distal part of the pelvic member (foot). Passive support apparatus. Vascular formations. Nerves of the pelvic member. Hoof. Parts of the hoof. Ungular capsule. Dermis (chorion) of the hoof. Subcutaneous structures. Blood flow. Biomechanics of the hoof. Notions of anatomy by image.

III. RUMINANTS

Practice 9. Head, neck, back and thorax

Head. Conformation and epidermal specizlizations. Surface structures. Skeleton. Nasal cavity and paranasal sinuses. Oral cavity and tongue. Dentition. Salivary glands. Pharynx and larynx. Lymph nodes and irrigation of the head. Neck. Conformation and surface features. Skeleton and musculature. Visceral block. Endocrine glands and lymph nodes. Back and tail. Conformation and surface features. Spine. Spinal canal. Glasses of the tail. Thorax. Conformation and thoracic walls. Pleura. Lungs. Mediastinum and its content. Heart. Esophagus, trachea, thymus, vagus nerve and brachiocephalic trunk. Lymphatic structures.

Practice 10. Abdomen

Conformation and surface anatomy. Abdominal walls: structure, innervation and irrigation. Stomach: general considerations and postnatal development. Rumen-Reticulum: external and internal configuration of the rumen-reticle. Omaso. Abomasum. Oments. Innervation and irrigation of the stomach. Spleen. Liver. Intestines: Small intestine, large intestine, blood supply and lymphatics. Pancreas. Kidneys and adrenal glands. Lymphatic structures.

Practice 11. Pelvis, genital organs, udder and limbs

Pelvis (generalities). Pelvic cavity. Straight and anus. Urinary bladder and female urethra. Lymphatic structures of the pelvis. Female genital organs. Ovary and uterine tube. Uterus. Vagina and vaginal vestibule. External genital organs. Dependencies of the peritoneum. Blood flow. Male genital organs. Scrotum, testicles and epididymis. Pelvic genital organs: deferent duct, male urethra and accessory genital glands. Penis and foreskin. Blood flow. Anatomical bases of the rectal examination. Anatomy of rectal examination of cattle. Udder. External features of the udder. Breast suspension device. Structure of the breast. Blood, lymphatic and innervation irrigation. Udder of small ruminants. Thoracic limb. Back, shoulder and arm. Elbow, forearm and carpus. Distal portion (metacarpus and fingers): skeleton and tendons. Hoof. Blood and lymphatic vessels. Nerves of the thoracic limb. Pelvic limb. Croup, hip and thigh. Knee, leg and tarsus. Blood and lymphatic vessels. Nerves of the pelvic member.

IV. PIG AND BIRDS

Practice 12. Pig and Birds

Pig. Head and neck: skeleton, surface features, nasal cavity and paranasal sinuses, oral cavity and dentition, major salivary glands, pharynx and larynx, viscera of the neck and lymphatic structures. Spine, back and thorax: conformation and skeleton, thoracic viscera, lymphatic structures of the thorax and diaphragm. Abdomen: abdominal walls and breasts, abdominal viscera, and lymphatic structures of the abdomen. Pelvis and genital organs: conformation and skeleton, female genital organs and male genital organs. Limbs: thoracic limb and pelvic limb. Anatomy of birds. External features and tegument: feathers. Musculoskeletal system: general characteristics of the skeleton, cephalic, axial and appendicular skeletons, pectoral and appendicular muscles. Digestive system: oropharynx, esophagus, stomach, intestines, pancreas, liver, spleen and body cavity. Respiratory system: nasal cavity, larynx, trachea, syringe, lungs and air sacs. Urogenital apparatus: kidneys and ureters, female genital organs, male genital organs, cloaca. Circulatory system and endocrine glands. Organs of the senses and nervous

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system.

V. CENTRAL NERVOUS SYSTEM AND ORGANS OF THE SENSES
Practice 13. Practical objectives on the central nervous system and organs of the senses
Spinal cord and brain. Division and cavities of the brain. Rombencephalon, mesencephalon and prosencephalon. Organs of the sense of sight and hearing. Medullary reflexes and cranial nerves. Alterations of nociception and proprioception. Upper and lower motor neuron systems.

SUSTAINABLE DEVELOPMENT GOALS RELATED TO THE CONTENT

Quality education
Gender equality
Decent work and economic growth

METHODOLOGY

General clarifications on the methodology (optional)

Due to their eminently practical profile (two thirds of the contents), the face-to-face activities are essential for learning the subject. Therefore, a minimum attendance of 80% is required to overcome it.

Methodological adaptations for part-time students and students with disabilities and special educational needs

The teaching methodology will be adapted, as far as possible, to the particular needs of part-time students, with disabilities and with special needs. To do this, students affected by special circumstances should talk to teachers at the beginning of the course to take appropriate measures.

Face-to-face activities

Activity	Large group	Medium group	Total
Assessment activities	1	2	3
Lab practice	-	23	23
Lectures	23	-	23
Seminar	-	11	11
Total hours:	***24***	***36***	***60***

Off-site activities

Activity	Total
Information search	10
Reference search	20
Self-study	60
Total hours	***90***

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WORK MATERIALS FOR STUDENTS

Coursebook
Dossier
Lessons summary
Oral presentations
Placement booklet

Clarifications

The instructors responsible for the teaching groups of the subject will provide the teaching materials (practical guides, theoretical and practical objectives, guided presentations, text contents, practical videos, recordings, virtual classes, etc.) that they consider appropriate to facilitate the learning of the subject. This material will be uploaded on the platform http://moodle.uco.es/m2021/

EVALUATION

Intended learning	Exams	Laboratory Practice	Real and/or simulated tasks
CE7	X	X	X
CE8	X	X	X
Total (100%)	***25%***	***55%***	***20%***
Minimum grade	***5***	***5***	***5***

(*)Minimum mark (out of 10) needed for the assessment tool to be weighted in the course final mark. In any case, final mark must be 5,0 or higher to pass the course.

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Method of assessment of attendance:

A minimum attendance of 80% of the theoretical and practical classroom activities is required to pass the subject.

The value of attendance in the final grade will be 20%.

General clarifications on instruments for evaluation:

A minimum attendance of 80% of the theoretical and practical face-to-face activities is required. The value of attendance in the final grade will be 20%, and this value is distributed between the assessment instruments of theoretical content (10%) and practical content (10%). Absences to face-to-face classes may not be taken into account when there is a justified cause, but absences will be counted if the alleged reason is to have or have had another face-to-face activity in subjects of the same (2nd year) or higher courses of the Degree in Veterinary Medicine.

The application of the evaluation instruments of the practical and theoretical contents will consist of two types of evaluations, one continuous and the other global for each content, each of which must be passed with a minimum grade of 5. The continuous evaluation will be carried out through exams, Laboratory practices and questionnaires carried out periodically and which may be face-to-face or online. The global evaluation of the practical and theoretical contents will consist of written exams that may be face-to-face or online.

At the end of the practical program, there will be a partial test on this content, which will be eliminatory only for the final calls in January and February. The contents partially passed during the course will not be kept for the following course or for extraordinary calls within the same course.

The weighting of the different assessment instruments in the final grade will be as follows:

1) Task execution tests: 20% of the final grade

2) Laboratory practices: Practical content: 55% of the final mark
Continuous assessment of practices: 60% of the practical content
Global practical assessment: 40% of practical content

3) Exams: Theoretical content: 25% of the final grade
Continuous assessment of theory: 25% of the theoretical content
Global theory assessment: 75% of the theoretical content

The tests corresponding to continuous assessment of practice and theory are not recoverable in the ordinary final calls nor will they be saved for the extraordinary final call in October of the following year.

Clarifications on the methodology for part-time students and students with disabilities and special educational needs:

Whenever possible, the special needs of these students are met, who, at the beginning of the course, should communicate them to the teachers for their particular consideration.

Clarifications on the evaluation of the extraordinary call and extra-ordinary call for completion studies:

In these extraordinary calls, the evaluation of the subject will consist of a theoretical exam (35% of the final grade) and a practical exam (65% of the final grade), which may be written or oral, on the theoretical and practical contents of the present academic year, and will include tests equivalent to the continuous evaluations of theory

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and practice, which may be face-to-face or online.

Qualifying criteria for obtaining honors:

Final grade, involvement, attitude, accomplishment of directed tasks (optional).

BIBLIOGRAPHY

1. Basic Bibliography

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Constantinescu GM. 2018. Illustrated Veterinary Anatomical Nomenclature, 4th edition. Thieme, Stuttgart.

Singh, B. 2018. Dyce, Sack and Wensing's Texbook of veterinary anatomy, 5th edition. Elsevier, St. Louis, Missouri.

Dyce KM, Sack WO, Wensing CJG. 2012. Anatomía veterinaria, 4ª edición (castellano). Editorial El Manual Moderno, S.A. de C.V., México, D.F.

de Lahunta A, Glass E, Kent M. 2014. Veterinary neuroanatomy and clinical neurology, 4th edition. Saunders Elsevier, St. Louis, MO.

Popesko P. 1998. Atlas de anatomía topográfica de los animales domésticos. Tomos I, II y III. Masson SA, Barcelona.

Sandoval J. 2003. Tratado de anatomía veterinaria. Tomo IV (Tegumento, órganos de los sentidos, sistema nervioso central y anatomía de las aves). Sorles León.

Done SH, Goody PC, Evans SA, Stickland NC. 2010. Atlas en color de anatomía veterinaria. El perro y el gato, 2.ª edición (castellano). Elsevier Mosby, Amsterdam, Barcelona.

Budras KD, McCarthy PH, Fricke W, Richter R. 2010. Anatomy of the dog, 5th revised version. Schütersche, Hannover.

Ashdown RR, Done SH. 2012. Atlas en color de anatomía veterinaria. El caballo. 2ª edición en castellano. Elsevier Espaá SL, Barcelona.

Budras KD, Sack WO, Röck S. 2011. Anatomy of the horse, 6th edition. Schütersche, Hannover.

Clayton HM, Flood PF, Rosenstein DS. 2007. Anatomía clínica del caballo. Versión en español de la 1.ª edición de la obra original en inglés Clinical anatomy of the horse. Elsevier España SA, Madrid.

Budras KD, Habel RE. 2011. Bovine anatomy. 2nd, extended edition. Schlütersche, Hannover.

McLelland. 1990. A colour atlas of avian anatomy. Wolfe Publishing Ltd, Aylesbury.

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2. Further reading

Ashdown RR, Done SH. 2011. Atlas en color de Anatomía veterinaria. Rumiantes, 2ª edición (castellano). Elsevier Mosby, Amsterdam.

Boyd JS, Paterson C. 2008. Atlas en color de anatomía clínica del perro y el gato, 2ª edición (castellano). Elsevier Mosby, Barcelona.

Budras KD, Sack WO, Röck S. 2001. Atlas de anatomía del caballo, edición en castellano. Schütersche, Hannover.

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COORDINATION CRITERIA

Tasks deadlines
Tasks performance

SCHEDULE

Period	Assessment activities	Lab practice	Lectures	Seminar
1# Week	0,0	2,0	2,0	1,0
2# Week	0,0	2,0	2,0	1,0
3# Week	1,0	2,0	2,0	1,0
4# Week	0,0	2,0	2,0	1,0
5# Week	0,0	2,0	2,0	1,0
6# Week	0,0	2,0	2,0	1,0
7# Week	0,0	2,0	2,0	1,0

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Period	Assessment activities	Lab practice	Lectures	Seminar
8# Week	0,0	2,0	2,0	1,0
9# Week	1,0	2,0	2,0	1,0
10# Week	0,0	2,0	2,0	1,0
11# Week	0,0	2,0	2,0	1,0
12# Week	0,0	1,0	1,0	0,0
14# Week	1,0	0,0	0,0	0,0
Total hours:	***3,0***	***23,0***	***23,0***	***11,0***

The methodological strategies and the evaluation system contemplated in this Course Description will be adapted according to the needs presented by students with disabilities and special educational needs in the cases that are required.