

COURSE DESCRIPTION**COURSE DETAILS**

Title (of the course): **CITOLOGÍA E HISTOLOGÍA**

Code: 101465

Degree/Master: **GRADO DE VETERINARIA**

Year: 1

Name of the module to which it belongs: FORMACIÓN BÁSICA COMÚN

Field: HISTOLOGÍA Y ANATOMÍA PATOLÓGICA VETERINARIA

Character: BASICA

Duration: FIRST TERM

ECTS Credits: 6.0

Classroom hours: 60

Face-to-face classroom percentage: 40.0%

Study hours: 90

Online platform: www.moodle.es

COURSE DESCRIPTION

LECTURER INFORMATION

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PREREQUISITES AND RECOMMENDATIONS

Prerequisites established in the study plan

The B1 in english is REQUIRED to take this subject.

Recommendations

None specified



COURSE DESCRIPTION

INTENDED LEARNING OUTCOMES

- CE8 Structure of organs and systems.
- CE9 Structure of the eukaryotic cell and its organisation in tissues and organs.

OBJECTIVES

The general objective of this subject is the knowledge of the structure and ultrastructure of the cells, tissues and animal organs in relation to the functional activities. Therefore, this subject is closely related to Anatomy (Embryology and Systematic Anatomy, Neuroanatomy and Topographic Anatomy), Biochemistry and Physiology. Moreover, it is a key subject for the subsequent study of General Pathological Anatomy and Systematic Pathology.

Generics

- Knowledge of the structure and ultrastructure of animal cells in relation to the functional activities they develop.
- Knowledge of the structure and ultrastructure of animal tissues.
- Knowledge of the tissue architecture of the organs of domestic animals.

Terminology

Acquisition by students of a basic histological vocabulary (G6).

CONTENT

1. Theory contents

Theory contents

LESSON 1.- CONCEPT OF CYTOLOGY AND HISTOLOGY

- Historical considerations. Objectives of the subject. Interdisciplinary relationships.
- The cell: Generalities. Constitution and morphology. Cytoskeleton and cytoplasmic matrix. Microtubules, microfilaments and intermediate filaments. Cytoplasmic matrix.

LESSON 2.- CELLULAR WRAPPING

- Concept and components. Glucocalyx, ectoplasm, cell membrane.
- Cell membrane models. Specializations of the cell membrane. Intercellular binding modes.

LESSON 3.- CYTOPLASMATIC ORGANOIDS

- Ribosomes: Concept, morphology and types.
- Rough and smooth endoplasmic reticulum: Concept, morphology and function. Histophysiology of protein synthesis.
- Golgi Complex: Concept, morphology and function.
- Mitochondria: Origin, concept, morphology and function.

LESSON 4.- CELLULAR NUCLEUS

- Nuclear envelope: Concept, structure and relationships. Pore complex.
- Nucleolo: General characteristics, morphology and function.
- Cell division: morphological changes.

LESSON 5.- VITAL MANIFESTATIONS OF THE CELL

- Lysosomes: primary and secondary.
- Substance uptake: Pinocytosis and phagocytosis.
- Cell Center: Concept, Morphology and Function.

COURSE DESCRIPTION

- Cellular mobility: Cilia and flagella. Concept, morphology and function.
- Cell differentiation: Cell populations, cell differentiation mechanism. Cell dedifferentiation. Cell death.

LESSON 6.- EPITHELIAL TISSUE

- Concept of epithelium and types.
- Lining epithelial tissue: Concept and types. Simple epithelia, stratified epithelia. Histophysiology.
- Glandular epithelial tissue: generalities, exocrine glandular tissue and endocrine glandular tissue. Histophysiology of glandular epithelial tissue.

LESSON 7.- CONJUNCTIVE TISSUE

- Concept, generalities and components. Connective tissue cells: resident cells (mesenchymal cells, fibroblasts and fibrocytes, adipocytes, macrophages, reticular cells) and migratory cells (plasma cells, pigmented cells and blood cells). - Fundamental substance configured (collagen fibers, elastic fibers, reticulin fibers) and non-configured fundamental substance.
- Types of connective tissue: Embryonic, lax, dense, reticular and adipose.

LESSON 8.- CARTILAGINOUS TISSUE

- Concept and generalities. Histogenesis of cartilage. Cells of cartilaginous tissue.
- Types: Hyaline cartilage, elastic cartilage, fibrocartilage.

LESSON 9.- BONE TISSUE

- Concept and generalities. Modalities: spongy and compact bone tissue.
- Histogenesis of bone tissue. Bone tissue cells. Periosteum and endosteum. Histophysiology.
- Ossification: intramembranous or desmal ossification, endochondral ossification.
- Bone growth and remodeling.

LESSON 10.- MUSCLE TISSUE (I)

- Concept, generalities and types.
- Skeletal striated muscle tissue: structure and ultrastructure.
- Mechanism of muscle contraction.

LESSON 11.- MUSCLE TISSUE (II)

- Cardiac muscle tissue: General and morphology. Purkinje cells. Histophysiology.
- Smooth muscle tissue: General and morphology. Histophysiology.

LESSON 12.- NERVOUS TISSUE (I)

- Neurons: Concept and generalities. Types. Neural Soma: morphology. Neural processes: dendrites and axon. Histophysiology.
- Nerve fibre: Morphology, types, histophysiology.
- Synapses: Concept and morphology, chemical mediators of synaptic transmission, types.

LESSON 13.- NERVOUS TISSUE (II)

- Nervous terminations in the tissues and organs.
- Neuroglia: Concept and generalities. Types: Astroglia, oligodendroglia, ependymal epithelium, microglia cells.
- Blood-brain barrier.

LESSON 14.- BLOOD

- Concept and generalities.
- Erythropoiesis (erythrocyte) and thrombocytopoiesis (platelets).
- Granulocytopoiesis: General characteristics of granulocytes. Neutrophil leukocyte, eosinophilic leukocyte, basophil leukocyte.

COURSE DESCRIPTION

- Monocytopoiesis and monocytes: Morphology and function.
- Immunocompetent cells: lymphocytes and plasma cells.

LESSON 15.- CIRCULATORY SYSTEM AND HEMATOPOYETIC ORGANS

- Capillaries, arteries and veins: Concept and types.
- Heart: Morphology and function.
- Lymphatic vessels: morphology and function.

LESSON 16.- LYMPHOID ORGANS (I)

- Bone marrow: Histological structure, types, histophysiology.
- Thymus and Bursa of Fabricio.

LESSON 17.- LYMPHOID ORGANS (II)

- Lymphoid tissue associated with mucous membranes: Tonsils, Peyer's patches, diffuse lymphoid tissue, subepithelial lymphoid follicles.
- Lymph Node: Histological architecture, cortex, medulla, pig lymph node peculiarities. Histophysiology.
- Hemal and hemolymphatic nodes.

LESSON 18.- SPLEEN

- Concept, morphology and function. Blood circulation.
- White pulp and red pulp (venous sinuses, Billroth cords).
- Histophysiology.

LESSON 19.- DIGESTIVE TRACT (I)

- Oral cavity: Lips, cheeks, tongue and lingual papillae. Salivary glands: structure, types and distribution. Tooth: odontogenesis and histological architecture.
- Pharynx and esophagus: morphology and function.
- Crop of the birds: morphology and function.

LESSON 20.- DIGESTIVE TRACT (II)

- Non-glandular stomach of ruminants: Rumen, reticulum, omasum and esophageal leak. Stomach of the monogastric: Generalities and peculiarities of the stomach of equids and pigs. Stomach of birds: Proventriculus and gizzard.
- Small intestine (duodenum, jejunum, ileum), large intestine (colon, caecum, rectum), histology of intestinal absorption. Particularities of the intestine of birds. Peritoneum: morphology and function.

LESSON 21.- DIGESTIVE TRACT (III)

- Liver: histological organization. Hepatocyte (structure, ultrastructure and function), blood circulation in the hepatic lobule, biliary circulation in the hepatic lobule.
- Gallbladder: morphology and function.
- Pancreas: Exocrine pancreas (pancreatic acini and tubular system) and endocrine pancreas (Islets of Langerhans). Histophysiology.

LESSON 22.- RESPIRATORY APPARATUS

- Nasal cavity: Vestibular area, olfactory zone, respiratory zone.
- Paranasal sinuses.
- Guttural pouches.
- Larynx: histological structure and function.
- Trachea: histological structure and function.
- Nasal cavity and trachea of birds.
- Lung: Bronchial tree and bronchioles, extra and intrapulmonary bronchi, lobule and pulmonary acini.

COURSE DESCRIPTION

Morphology and function. Pleura: Morphology and function. Particularities of the lung of birds, air sacs.

LESSON 23.- URINARY APPARATUS

- Kidney: Blood circulation. The nephron: renal glomerulus, juxtaglomerular apparatus. Tubular system. Histophysiology of the kidney.
- Urinary tract: renal pelvis, ureter, urinary bladder, urethra.

LESSON 24.- ENDOCRINE SYSTEM (I)

- Pituitary gland: generalities and histogenesis. Adenohypophysis, hypothalamus-adenohypophysis relationship, portal-pituitary system. Neurohypophysis: structure and function, hypothalamus-neurohypophysis relationship. Control of the release of pituitary hormones.
- Pineal Gland: Morphology and function.

LESSON 25.- ENDOCRINE SYSTEM (II)

- Thyroid gland: Thyroid follicle, parafollicular cells, histophysiology.
- Parathyroid gland: Histological structure, histophysiology.
- Adrenal glands: cortex and medulla. Histological structure, histophysiology.

LESSON 26.- MALE REPRODUCTIVE TRACT

- Testicle: Seminiferous tubules, blood-testicular barrier, interstitial or Leydig cells, histophysiology.
- Epididymis, vas deferens, seminal vesicles, prostate, penis.

LESSON 27.- FEMALE REPRODUCTIVE TRACT

- Ovary: concept and general structure. Ovarian follicles (structure and ultrastructure, evolution, ovulation), Corpus luteum (types, morphology and function). Particularities of the ovary of the mare and the birds.
- Uterine tubes: structure and function.
- Uterus: Histological structure and function. Cyclical changes Gravid uterus. Uterus of the birds.
- Placenta: morphology and varieties in the different domestic species.
- Vagina, vestibule, clitoris, vulva. Cloaca of the birds.

LESSON 28.- TEGUMENTARY SYSTEM

- Histophysiology of the skin: Epidermis, dermis (hair, and wool, sweat glands, sebaceous and hepatoid), hypodermis. Skin of birds and feathers.
- Mammary gland: concept and morphology. Particularities in the different species.
- Horny formations: Helmet, hoof, nail, horns, eyeglasses, spurs.

LESSON 29.- CENTRAL NERVOUS SYSTEM

- Meninges.
- Brain: Gray substance (isocortex and allocortex), white matter.
- Cerebellum: histological structure and function.
- Spinal cord: histological structure and function.

PERIPHERAL NERVOUS SYSTEM

- Spinal brain ganglia.
- Vegetative nervous system.

LESSON 30.- ORGANS OF THE SENSES

- Eye: General structure (fibrous tunic: sclera and cornea, vascular tunic: choroid, ciliary body, iris, nervous tunic: retina, crystalline and vitreous body) and accessory organs (lacrimal apparatus and eyelids). Particularities of the eye of birds.
- Ear: General structure (external ear, auricle and external auditory canal, middle ear, eardrum, ossicles, Eustachian tube, inner ear, vestibular apparatus, organ of Corti). Histophysiology of hearing.

COURSE DESCRIPTION

2. Practical contents

Practical contents

1. Introduction to optical and electronic microscopy.
2. Cytology: Cytoplasm and nucleus.
3. Collection and fixation of samples for optical microscopy. Personal work.
4. General Histology: Lining epithelial tissue.
5. General Histology: Glandular epithelial tissue and connective tissue.
6. General Histology: Muscle tissue and nervous tissue.
7. Special Histology: Lymphoid system.
8. Special Histology: Digestive tract I.
9. Special Histology: Cardiovascular system and digestive tract II.
10. Special Histology: Digestive tract III and respiratory system.
11. Special Histology: Urinary tract and endocrine system.
12. Special Histology: Reproductive tract and central nervous system.
13. Review of practical work.

SUSTAINABLE DEVELOPMENT GOALS RELATED TO THE CONTENT

Unrelated

METHODOLOGY

General clarifications on the methodology (optional)

The attendance to the practices is obligatory, being essential to have 80% of attendances to be able to sit the practical examination. The participation of part-time students in the practical sessions will be facilitated.

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

There will be methodological adaptations for part-time students and students with disabilities and special educational needs. The needs of part-time students will be taken into account.

Face-to-face activities

Activity	Large group	Medium group	Total
<i>Assessment activities</i>	1	-	1
<i>Lab practice</i>	-	23	23
<i>Lectures</i>	36	-	36
Total hours:	37	23	60

COURSE DESCRIPTION

Off-site activities

Activity	Total
<i>Self-study</i>	90
<i>Total hours</i>	90

WORK MATERIALS FOR STUDENTS

Case studies
 Lessons summary
 Oral presentations
 Placement booklet
 References

EVALUATION

Intended learning	Exams	Laboratory Practice	Practice Book	Problem solving
CE8	X	X	X	X
CE9	X	X	X	X
Total (100%)	32%	25%	10%	33%
Minimum grade	5	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.

COURSE DESCRIPTION

Attendance will be assessed?:

No

General clarifications on instruments for evaluation:

- The qualification of the theoretical exam carried out in the official calls will suppose 32% of the final mark of the course.
- Continuous assessment or evaluation (problem solving) will be composed of midterm exams and group work based seminars (flipped classrooms). A total of one midterm exam will be carried out and will represent 23% of the final mark of the course. Group works will be given as seminars by groups of 2 to 3 students per group. These seminars will be part of the final mark of the students and will represent the 10% of the final mark. The students will develop the seminars under the supervision and tutorship of the professors of the subject.
- When the mark obtained in the midterm exam is equal to or greater than 6.0, the subject evaluated will be removable, and its evaluation is not mandatory in ordinary calls. The students who do not reach a mark of 6.0 in the midterm exam will have to examine the entire subject in the official calls, assuming then the value of the exam 55% of the mark.
- Students who do not take the theoretical exam will not be able to pass the subject, even if they have the rest of the activities done.
- It will be required to pass the theoretical part (theoretical exam and midterm exam) to carry out the global evaluation (theoretical and practical) of the subject.
- The mark obtained in the midterm exam that is equal to or greater than 6.0 are saved until the February call but not until the extraordinary call in September.
- The qualifications of the practical exam are saved for the ordinary call for February and extraordinary call of September of the following academic year.

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

There will be methodological adaptations for part-time students and students with disabilities and special educational needs.

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

The practical exam qualification and the problem solving evaluation (continuing evaluation) are saved for February and September calls.

Qualifying criteria for obtaining honors:

9,5

BIBLIOGRAPHY

1. Basic Bibliography

- Bacha WJ, Bacha LM (2011). Color Atlas of Veterinary Histology. , second edition. Editorial Blackwell.
- Banks WJ (1986). Histología Veterinaria Aplicada. Willians &Wilkins.
- Bloom W, Fawcett DW (1995). Tratado De Histología. Mcgraw- Hill/Interamericana.
- Dellmann HD, Brown EM (1994). Histología Veterinaria. Lea & Febiger.
- Eroschenko VP (2017).Atlas of Histology with Functional Correlates. 13thEdition. Wolters Kluwer.
- Fawcett DW (1995). Tratado de Histología de Bloom y Fawcett. Interamericana-McGraw Hill.
- Gartner LP (2017).Textbook of Histology. 4thEdition. Elsevier



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- Mills SE (2020). Histology for Pathologists. 5th Edition. Wolters Kluwer.
- Salguero FJ y Pallarés FJ (2023). Aughey and Frye's Comparative Veterinary Histology with Clinical Correlates. Taylor & Francis Group.
- Young B, Heath JW (2000). Wheater's Histología funcional. Texto y atlas. 4th ed.

2. Further reading

<http://www.e-histologia.unileon.es/1inicio/home/Inicio800x600.html>

<http://www.ulb.ac.be/sciences/biolhc/>

<http://www.path.uiowa.edu/virtualslidebox/>

http://wzar.unizar.es/acad/histologia/paginas/Atlas_inicio.htm

COORDINATION CRITERIA

Common evaluation criteria

Joint activities: lectures, seminars, visits ...

Tasks deadlines

SCHEDULE

Period	Assessment activities	Lab practice	Lectures
1# Fortnight	0,0	3,0	5,0
2# Fortnight	0,0	4,0	5,0
3# Fortnight	0,0	3,0	5,0
4# Fortnight	0,0	3,0	5,0
5# Fortnight	0,0	4,0	5,0
6# Fortnight	0,0	3,0	5,0
7# Fortnight	1,0	3,0	6,0
Total hours:	1,0	23,0	36,0

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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.