Information about the subject

Degree: Bachelor of Science Degree in Veterinary Medicine

Faculty: Faculty of Veterinary Medicine and Experimental Sciences

Code: 1261204 **Name:** Animal Physiology II and Immunology

Credits: 6,00 **ECTS Year:** 2 **Semester:** 2

Module: Module of Common Basic Training

Subject Matter: Animal Physiology **Type:** Basic Formation

Field of knowledge: Health Sciences

Department: Basic and Cross-disciplinary Sciences

Type of learning: Classroom-based learning

Languages in which it is taught: Spanish

Lecturer/-s:

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Module organization

Module of Common Basic Training

Subject Matter	ECTS	Subject	ECTS	Year/semester
Statistics	6,00	Biometrics and Statistics	6,00	1/1
Biology	6,00	Animal and Plant Biology	6,00	1/1
Biochemistry	6,00	Biochemistry	6,00	1/2
Animal Anatomy	18,00	Animal Anatomy I and Embryology	6,00	1/1
		Animal Anatomy II	6,00	1/2
		Animal Cytology and Histology	6,00	1/2
Animal Physiology	12,00	Animal Physiology I	6,00	2/1
		Animal Physiology II and Immunology	6,00	2/2
Genetics	6,00	Genetics	6,00	1/2
Animal Domestication	6,00	Animal Domestication (Ethnology, Ethology and Animal Welfare)	6,00	1/2
Biological Agents of Interest in Veterinary Medicine	12,00	Veterinary Microbiology	6,00	2/2
		Veterinary Parasitology	6,00	2/1
Veterinary Medicine and Society	6,00	Veterinary Regulations and Legislation, Social Morality and Professional Deontology	6,00	5/1

Physics and Chemistry	6,00	Physico-chemical fundamentals of veterinary medicine	6,00	1/1

Recommended knowledge

To have knowledge of Biology, Anatomy, Embryology, Histology, Biochemistry and Animal Physiology I.

Learning outcomes

At the end of the course, the student must be able to prove that he/she has acquired the following learning outcomes:

R1	The student knows and understands with a critical attitude the concepts that are included in the syllabus/contents of the module of animal physiology.
R2	The student is able to solve problems related to the contents of the module.
R3	The student knows how to use different working techniques in the laboratory.
R4	The student is capable of working in a physiology laboratory correctly performing the basic operations both in the planning and development of each of the laboratory practices.
R5	The student is able to write a comprehensible and organized text on various physiological aspects in the veterinary field.
R6	The student searches bibliographic information from different sources and knows how to analyse it with a critical and constructive spirit.
R7	The student is able to produce documents on animal physiology, working as a team.
R8	The student argues according to rational criteria based on his or her work.

Competencies

Depending on the learning outcomes, the competencies to which the subject contributes are (please score from 1 to 4, being 4 the highest score):

BASIC		Weighting			
		1	2	3	4
CB1	Students must show that they have and understand knowledge in a field of study that is based on general secondary education on a level that, although supported by advanced text books, includes also some aspects that involve knowledge belonging to the vanguard of their field of study.				x

SPECIFIC		Weighting			
		1	2	3	4
E7	Understanding and applying principles and bases of cellular excitability and communication.			x	
E8	Knowing and applying principles and bases of body system operation and adjustment.				x
E9	Knowing and applying principles and bases of homeostasis.			x	
E10	Knowing and applying principles, foundations and applications of the immune response.			x	

TRANSVERSAL		Weighting			
		1	2	3	4
T1	Capacity of analysis, synthesis, implementation of knowledge for problem-solving and decision-making.				x
T4	Mastering fluency in oral and written mother tongue communication, listening and responding effectively using a language appropriate to audience and context.				x

T6	Using information technology to communicate, share, search for, collect, analyze and manage information, especially related to the veterinarian practice.		x	
T8	Efficient and effective work, both independently and as a member of a multidisciplinary team or unit, showing respect, appreciation and sensitivity to the work of others.		x	
T10	Ability to learn, to research, and to be aware of the need to keep knowledge updated, and attending training programs.		x	

Assessment system for the acquisition of competencies and grading system

Assessed learning outcomes	Granted percentage	Assessment method
R1, R5, R8	60,00%	Written assessment of acquired knowledge and skills. The test may consist of a series of open-ended questions or multiple-choice questions about the theoretical contents of the module and/or practical exercises (problem-solving).
R3, R4, R8	0,00%	Evaluation of the use of the practical lessons in the classroom, of problems or computer science, seminars and tutorials, by means of participation, computer-supported problem solving and the elaboration of the corresponding reports.
R3, R4, R8	30,00%	Evaluation of the practical laboratory work, which must demonstrate the competences acquired by the student and his or her ability to use them to solve the different situations and problems that arise in a laboratory; this assessment may consist of one of the following methods, or a combination of several of them: an individual written test, the individual or group performance of a laboratory experience, the delivery of an individual or group report on the work carried out in the laboratory.
R5, R6, R7, R8	5,00%	Evaluation of group work through a system of continuous assessment throughout the course based on the delivery of assignments the objectives and content of which will be proposed by the teacher.
R1, R2, R3, R4, R5, R6, R7, R8	5,00%	Evaluation of activities in which the student must do some research individually and structure information related to each of the topics through a system of continuous assessment throughout the course based on the delivery of papers, the objectives and contents of which will be proposed by the teacher.

Observations

According to the general evaluation and qualification regulations, the preferred evaluation system will be by means of continuous evaluation. There will be a continuous evaluation of the theoretical and practical part of the course. After the teaching of the theoretical part of each didactic unit, there will be questionnaires in class type test, for the theoretical part, and of development for the practical part, imitating the evaluation system of both parts of the final exam of the course, and after the realization, it will be corrected in class so that all students receive feedback of their results. This subject cannot be assessed by means of a single assessment.

The average mark must be equal to or greater than 50%, in written assessment and evaluation of the practical work in the laboratory, in order to be taken into account with the rest of the items.

Attendance at practices is mandatory, so unjustified absence every one of the practices of the subject will be a discount of 10% of the final practice score.

The use of tools based on artificial intelligence (AI) is subject to the teacher's criteria, who may establish specific limits or conditions depending on the training or assessment activity.

MENTION OF DISTINCTION:
In accordance with the regulations governing the assessment and grading of subjects in force at UCV, the distinction of "Matrícula de Honor" (Honours with Distinction) may be awarded to students who have achieved a grade of 9.0 or higher. The number of "Matrículas de Honor" (Honours with Distinction) may not exceed five percent of the students enrolled in the group for the corresponding academic year, unless the number of enrolled students is fewer than 20, in which case a single "Matrícula de Honor" (Honours with 9 Distinction) may be awarded. Exceptionally, these distinctions may be assigned globally across different groups of the same subject. Nevertheless, the total number of distinctions awarded will be the same as if they were assigned by group, but they may be distributed among all students based on a common criterion, regardless of the group to which they belong. The criteria for awarding "Matrícula de Honor" (Honours with Distinction) will be determined according to the guidelines stipulated by the professor responsible for the course, as detailed in the "Observations" section of the evaluation system in the course guide.

Learning activities

The following methodologies will be used so that the students can achieve the learning outcomes of the subject:

M1 On-site training activity aimed primarily at acquiring knowledge acquisition skills. It is characterised by the fact that students are spoken to. Also called master class or exposition, it refers to the oral presentation made by the teacher, (with the support of blackboard, a computer and a projector for the display of texts, graphs, etc.), in front of a group of students. They are expository, explanatory or demonstrative sessions of contents. The size of the group is determined by the limit or physical capacity of the classroom; therefore, it is a single group.

M2 On-site training activity aimed primarily at obtaining knowledge application and research skills. Knowledge is built through interaction and activities. The activity consists of supervised monographic sessions with shared participation (teachers, students, experts). The size of the group is variable, from one large group to various small groups, with a minimum of 6 students to ensure interaction. The evaluation will be based on follow-up records kept by the teacher. Participation and the development of the capacity to problematize should be taken into account.

M4 On-site training activity in groups that takes place in the classroom. It includes working with documents and formulating ideas without handling animals, organs, objects, products, or corpses (e.g., work with articles or documents, clinical case studies, diagnostic analyses, etc.). It would correspond to "Animal-free supervised practical work", type e1, from the European evaluation of EAEVE. The size of the group is variable, in a range of 10 to 20 students.

M5 On-site training activity in groups that takes place in the Computer Lab where the computer is used as support for learning. It includes work with computer models, specific software, Web queries, etc. It would correspond to "Animal-free supervised practical work", type e1, from the European evaluation of EAEVE. The size of the group is variable, in a range of 10 to 20 students.

M6 On-site training activity in groups carried out in the laboratory. It includes the sessions where the students develop laboratory experiments, make dissections or use the microscopes for the study of histological or histopathological samples actively and autonomously, under the supervision of the professor. It also includes work with healthy animals, objects, products, corpses (e.g., animal handling, bacteriological practices, physiology or biochemistry, meat inspection, etc.). It would correspond to the "Supervised practical non-clinical animal work" type e2 of the European evaluation of EAEVE. The size of the group is variable, in a range of 10 to 20 students.

M8 A set of on-site training activities carried out by the teacher to provide personalised attention to the student or in small groups with the aim of reviewing and discussing the materials and topics presented in classes, seminars, readings, carrying out projects, etc. The aim is to ensure a truly comprehensive education of the student rather than a mere transfer of information. It is, therefore, a personalized assistance relationship in which the tutor assists, facilitates and guides one or more students in the learning process.

M9 Set of processes that attempt to evaluate the learning outcomes of students expressed in terms of acquired knowledge, capacities, skills or abilities developed and manifested attitudes. It covers a wide range of activities that can be developed for students to demonstrate their training (e.g. written, oral and practical tests, projects or assignments). It also includes the Official Calls.

M10 Autonomous training activity, including activities and coursework, bibliographic searches. The results obtained from unsupervised group and teamwork will be evaluated, with particular attention paid at the time of evaluation to the acquisition of specific knowledge development skills through group work.

M11 Autonomous training activities related to personal study, or the preparation of individual course assignments. The individual preparation of readings, essays, problem solving, papers, reports, etc. will be evaluated through presentations or submissions during theoretical classes, practical classes, seminars and/or tutorials. The evaluation of the submitted papers will consider the structure of the paper, the quality of the documentation, originality, spelling and presentation.

IN-CLASS LEARNING ACTIVITIES

	LEARNING OUTCOMES	HOURS	ECTS
Theoretical lessons (TL) M1	R1, R2, R4, R8	44,00	1,76
Seminars (S) M2	R1, R2, R3	2,00	0,08
Computer Practice (CoP) M5	R1, R4, R5	2,00	0,08
Laboratory Practice (LP) M6	R1, R3, R4, R5	6,00	0,24
Clinical Practice (CP) M2	R1, R2, R3, R4	2,00	0,08
Tutorial M8	R8	2,00	0,08
Evaluation (Ev) M9	R1, R2, R3, R4, R5, R6, R7, R8	2,00	0,08
TOTAL		**60,00**	**2,40**

LEARNING ACTIVITIES OF AUTONOMOUS WORK

	LEARNING OUTCOMES	HOURS	ECTS
Group work M10	R1, R2, R5, R6, R7, R8	30,00	1,20
Individual work M11	R1, R2, R5, R6, R7, R8	60,00	2,40
TOTAL		**90,00**	**3,60**

Description of the contents

Description of the necessary contents to acquire the learning outcomes.

Theoretical contents:

Content block	Contents
DU1: CARDIOVASCULAR SYSTEM	ITEM 1. Concept of movement. Heart and blood vessels: function. Erythrocytes. Erythropoiesis. Hemoglobin. Iron metabolism. Functional significance of bile pigments. ITEM 2. The heart. Electrical properties of the heart. Mechanical properties of the heart. Action potentials, electrocardiogram. Cardiac action potential. Cardiac cycle. Phases of the cardiac cycle. Cardiac output: definition, regulation of cardiac output and factors of variation. ITEM 3. Blood pressure. Factors affecting blood pressure. Peripheral resistance. Blood pressure regulation.

DU2: RESPIRATORY SYSTEM	ITEM 1. Breathing in the air and water. Functions of the respiratory system. Pulmonary ventilation: intrapulmonary and intrapleural pressure, respiratory cycle, factors affecting ventilation. ITEM 2. Gas exchange: composition and partial pressures of gases, external respiration and internal gas exchange process, ventilation-perfusion. ITEM 3. Gas Transport. Oxygen transport by blood. Factors affecting the saturation of hemoglobin. Transport of CO2 in blood. ITEM 4. Control of breathing. Inspiratory center. Central and peripheral chemoreceptors. Hyperventilation. Hypoventilation. ITEM 5. Structure of the respiratory system of birds. Breathing in the aquatic environment. Gas exchange in the gills.
DU3: RENAL SYSTEM	ITEM 1. Kidney functions. The nephron. Glomerular filtration: the filtration process, composition of glomerular filtration, glomerular filtration rate. Self-regulation. ITEM 2. Routes of absorption: water diffusion, interstitial osmolality, activity of the membrane. Reabsorption in the proximal convoluted tubule. Reabsorption in the loop of Henle. ITEM 3. Filtering process in the distal convoluted tubule and collecting duct. Mechanisms of concentration and dilution of urine. ITEM 4. Acid-base balance. Role of the renal pelvis and ureter. Function of the bladder and urethra. Urination. Repletion and evacuation. ITEM 5. Excretory function in birds and fish. Characteristics for the urine. Mechanisms of urine concentration. Mechanisms of dilute urine.

DU4: DIGESTIVE SYSTEM	ITEM 1. The digestive process. Food and nutrient. Gripping of the food. Chewing. Insalivation. Swallowing. Esophageal transit. ITEM 2. Gastric digestion. Components of gastric juice. Regulation of gastric secretion. Gastric motility. Gastric emptying. Digestion in the small intestine. Exocrine pancreatic secretion. Biliary secretion. Gastrointestinal hormones. Intestinal motility. Processes of digestion in the small intestine. ITEM 3. Digestive absorption. Intestinal absorption. Absorption of water, electrolytes, carbohydrates and amino acids. Gastrointestinal blood system. Digestion and absorption of fats. ITEM 4. Digestion in the large intestine. Functions. Motility. Fermentation processes. Absorption processes. Absorption of lipids. Absorption of carbohydrates. Absorption of proteins and amino acids. Defecation. ITEM 5. Liver physiology. Liver function. Vascular functions. Metabolic functions. Secretory and defense. Biliary secretion. Biliary lipids. Biliary pigments. ITEM 6. Digestion in ruminants. Prehension, mastication and insalivation. Rumen Microbiology. Metabolism of carbohydrates, proteins and lipids. Ruminal motility. Rumination. Passageway and ruminal absorption. Functions of the omasum and abomasum. ITEM 7. Digestive physiology of birds. Regulation of food intake. Motility. Secretion and digestion. Absorption.
DU5: EXERCISE PHYSIOLOGY AND THERMOREGULATION	ITEM 1. Respiratory adaptations to exercise. Mechanisms of regulation of ventilator responses. Variation and maintenance of acid-base balance during exercise. Cardiovascular adaptations to exercise. Changes in the circulation during exercise. ITEM 2. Heat transfer mechanisms. Regulation of body temperature. Neuroendocrine adaptations to exercise. Hematological adaptations to exercise.

DU6: IMMUNOLOGY	ITEM 1. Introduction to Immunology: Concept of Immunity and Immune Response. History of Immunology. Field applications and Immunology. ITEM 2. Natural or Nonspecific Immune Response: Natural immunity in skin and mucous membranes, effect of chemical and biological agents. Chemotaxis, margination, diapedesis, phagocytosis. Humoral factors of the immune response. ITEM 3. Specific Immune Response: Humoral and Cellular Immunity. Properties of the Immune Response: Specificity, diversity, memory, self-non-self-discrimination. Phases of the Immune Response. ITEM 4. Defense cells: B lymphocytes and T Mononuclear phagocytes. Dendritic Cells. Granulocytes: neutrophils, eosinophils and basophils. ITEM 5. Tissue Immune System: primary and secondary lymphoid organs. Bone marrow, thymus, lymph nodes, spleen, and mucosa-associated lymphoid tissue. ITEM 6. Structure of Immunoglobulin's: Structure biochemistry of antibodies. Classes and subclasses of antibodies. Antigen-antibody binding: Affinity and Avidity. Primary and secondary response. Mechanisms for affinity maturation. ITEM 7. General features of cytokines. Cytokines that mediate innate immune response. Cytokines that mediate the specific immune response. Complement Activation. Biological functions of complement.
UD 7. PRACTICES	P.1 CARDIOVASCULAR P. 2 URINARY P.3 DIGESTIVE P.4 EXERCISE P.5 ELISA

Organization of the practical activities:

	Content	Place	Hours
PR1.	Electrocardiography	Laboratory	2,00
PR2.	Assessment of digestive functionality	Laboratory	2,00
PR3.	Urinalysis	Laboratory	2,00
PR4.	equine exercise physiology	Riding club	2,00
PR5.	Applications of immunology to a diagnosis test.	Laboratory	2,00

Temporary organization of learning:

Block of content	Number of sessions	Hours
DU1: CARDIOVASCULAR SYSTEM	4,00	8,00
DU2: RESPIRATORY SYSTEM	4,00	8,00
DU3: RENAL SYSTEM	4,00	8,00
DU4: DIGESTIVE SYSTEM	5,00	10,00
DU5: EXERCISE PHYSIOLOGY AND THERMOREGULATION	2,00	4,00
DU6: IMMUNOLOGY	6,00	12,00
UD 7. PRACTICES	5,00	10,00

References

BASIC:
GUYTON A.C. Y HALL J. Tratado de fisiología médica. Interamericana-McGraw-Hill.
HILL R.W., WYSE G.A., ANDERSON M. Animal physiology. Sinauer Associates.
CUNNINGHAM J. G. Fisiología veterinaria. Elsevier.

COMPLEMENTARY:
ECKERT. Fisiología animal: mecanismos y adaptaciones. Interamericana-McGraw-Hill.
WILLIAM O.REECE. Dukes Fisiología de los animales domésticos. Acribia.
HILL RICHARD W. Fisiología animal comparada. Reverté.
BOFFI FEDERICO M. Fisiología del ejercicio en equinos. Inter-Médica.
ABUL K. ABBAS, ANDREW H. LICHTMAN, SHIV PILLAI. Inmunología celular y molecular. Elsevier.
TIZARD, I.R. Inmunología veterinaria. Elsevier.
HALLIWELL, E.W. R. MA, VetMB, PhD. MRCVS DACVD, GORMAN, T. N. BVSc, PhD. FRCVS, DACVIM. Inmunología clínica veterinaria. Acribia.