

## ANIMAL PHYSIOLOGY COURSE SYLLABUS

ACADEMIC YEAR: 2017-2018

*"All organisms are professional problem solvers: before life, problems did not exist. Problems and life entered the world together, and with them problem solving".*

*Sir Karl Raimund Popper*  
(Austrian and British philosopher)

### Welcome to Animal Physiology

Please, remember that it is very important to read and understand the syllabus. It is the best source of information about the subject and it contains all the information you need to follow the course over the term.

Remember that it's your responsibility to read and understand all the material on the syllabus. If you find that the syllabus is missing some information, please make sure you ask me to provide it.

### 1. SUBJECT DESCRIPTION

<b>Degree:</b>	<b>Biotechnology</b>
<b>Course:</b>	<b>Animal Physiology</b>
<b>Module:</b>	<b>Fundamentals of Biology, Microbiology and Genetics</b>
<b>Department:</b>	<b>Physiology, Anatomy and Cellular Biology</b>
<b>Academic Year:</b>	<b>2017-18</b>
<b>Term:</b>	<b>First Semester</b>
<b>Total Credits:</b>	<b>6</b>
<b>Year:</b>	<b>Year Three</b>
<b>Type of Course:</b>	<b>Compulsory Subject</b>
<b>Course Language:</b>	<b>English</b>

<b>Teaching Model</b>	<b>A2</b>
<b>a. Lectures (General Background):</b>	<b>70%</b>
<b>b. Labs and experimental procedures:</b>	<b>15%</b>
<b>c. Guided Academic Activities:</b>	<b>15%</b>

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### 2. SUBJECT COORDINATOR

<b>Name:</b>	Antonio Prado Moreno
<b>School:</b>	Experimental Sciences
<b>Department:</b>	Physiology, Anatomy and Cellular Biology
<b>Academic Area:</b>	Physiology
<b>Category:</b>	T.U.
<b>Tutorials:</b>	Friday: 10:00 to 14:00 Thursday: 12:00 to 14:00 On line: 24/7 (through the virtual classroom)
<b>Office:</b>	Building 22, 1 <sup>st</sup> Floor, Office 4
<b>E-mail:</b>	apramor@upo.es
<b>Telephone:</b>	+34 954 348 936 68936 (on campus)

### 3. CONTEXT

#### 3.1. Course Description and Objectives

This course is an introduction to concepts and basic issues in Animal Physiology, Students will master the basic principles of physiology and use these to understand and interpret the operation of the physiological systems, as well as the structural design that allows this operation. At the end of the semester, the student:

- Meet the nomenclature and the basics in animal physiology and processes that allow the operation of physiological systems, particularly, their regulation and interaction.
- Understands and can efficiently handle texts and manuals of Animal Physiology.
- Able to develop experiments animal physiology laboratory under supervision.
- Can solve problems based on the diversity of the physiological processes of different animal groups.

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### **3.2. Contributions to the training plan**

Among the main contributions of the subject "Animal Physiology" to the Graduate Training Plan in Biotechnology, knowledge and understanding of the physiological mechanisms underlying animal life, has to be noted. The subject uses a comparative and multidisciplinary approach and devotes special attention to the regulatory mechanisms.

- Throughout the course, students become familiar with the basic terminology in Physiology.
- Students will acquire the right knowledge about the basic principles of the discipline.
- The course should provide students an integrated view of the functioning of biological systems animals.
- Upon completion of the course students must know the functions of the organs and systems and their control, and have a clear idea about the physiological mechanisms developed by different groups of animals to survive in their habitat.
- While exploring the content mentioned, students will strengthen several transferable skills and they should be able to apply the fundamental concepts of physics and chemistry in their understanding of physiological phenomena.
- Students will improve their ability to verbally articulate themselves to a group during guided academic activities.

### **3.3. Recommended or required prior knowledge**

- General knowledge of biology.
- Understanding and familiarity of the essential concepts of physics and chemistry
- Good English (spoken and written)
- Managing the WebCT platform is of great interest to follow the course.

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### **4. SKILLS**

#### **4.1 Degree skills developed in the course**

##### **General skills and cross-cutting**

The following text is in Spanish to preserve the official level of the skills and proficiencies as they appear in the Report of the Degree.

- CB2 - Que los estudiantes sepan aplicar sus conocimientos a su trabajo o vocación de una forma profesional y posean las competencias que suelen demostrarse por medio de la elaboración y defensa de argumentos y la resolución de problemas dentro de su área de estudio.
- CB3 - Que los estudiantes tengan la capacidad de reunir e interpretar datos relevantes (normalmente dentro de su área de estudio) para emitir juicios que incluyan una reflexión sobre temas relevantes de índole social, científica o ética.
- CB4 - Que los estudiantes puedan transmitir información, ideas, problemas y soluciones a un público tanto especializado como no especializado.
- CB5 - Que los estudiantes hayan desarrollado aquellas habilidades de aprendizaje necesarias para emprender estudios posteriores con un alto grado de autonomía.
- CG1 - Conocer y comprender los procesos biológicos generales desde un punto de vista molecular, celular, fisiológico y, en su caso, de comunidades, de los seres vivos.
- CG3 - Utilizar con rigor la terminología, nomenclatura y sistemas de clasificación en cada una de las materias impartidas.
- CG4 - Comprender el método científico. Conocer, entender y aplicar las herramientas, técnicas y protocolos de experimentación en el laboratorio y adquirir las capacidades de observación e interpretación de los resultados obtenidos.
- CG5 - Adquirir las habilidades adecuadas a cada una de las materias impartidas, mediante la descripción, cuantificación, análisis y evaluación crítica de los resultados experimentales obtenidos de forma autónoma.
- CG6 - Trabajar de forma adecuada en un laboratorio biológico, químico o bioquímico, conociendo y aplicando las normativas y técnicas relacionadas con seguridad e higiene, manipulación de animales de laboratorio y gestión de residuos.
- CG9 - Desarrollar los métodos de adquisición, interpretación y análisis de la información biológica junto con una comprensión crítica de los contextos apropiados para sus uso, mediante el estudio de manuales, monografías, ensayos, artículos originales, etc.
- CG10 - Utilizar la literatura científica y técnica de vanguardia, adquiriendo la capacidad de percibir claramente los avances actuales y los posibles desarrollos futuros
- CG11 - Conocer las metodologías y tecnologías apropiadas para la correcta exposición y comunicación de los diferentes aspectos que afectan a la biotecnología (análisis de datos, bioestadística, etc.).
- CG12 - Ser consciente de la importancia del trabajo en equipo y potenciación de la discusión crítica de objetivos comunes.
- CG14 - Ser capaz de implicarse en el desarrollo actual de la biotecnología y sus aplicaciones, así como de los aspectos filosóficos y éticos implicados.

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- CG15 - Ser capaz de comunicar los aspectos fundamentales de la biotecnología tanto a otros profesionales de su tarea de trabajo o de áreas afines, como a un público no especializado, así como emitir juicios que incluyan una reflexión sobre temas relevantes de índole social, científica o ética.
- CG16 - Ser capaz de concienciar a otros sobre la importancia de las aportaciones de la biotecnología a los debates y controversias que su desarrollo genera y como este conocimiento y su comprensión mejora la generación de una opinión informada sobre la calidad y sostenibilidad de los recursos.
- CG17 - Ser capaz de organizar y planificar un trabajo de investigación de forma que se optimicen los recursos.
- CG18 - Asimilar conocimientos relevantes de procedencia multidisciplinar, así como emitir reflexiones y juicios basados en la integración de dichos conocimientos.
- CG19 - Ser capaz de demostrar capacidad de iniciativa responsable en el ámbito de trabajo.
- CG20 - Desarrollar hábitos de estudio y capacidad de reflexión y crítica para que los ideales profesionales y sus comportamientos se muevan buscando la excelencia profesional.
- CG22 - Desarrollar las habilidades de aprendizaje necesarias que le permitan emprender, con un elevado nivel de autonomía, estudios posteriores.
- CG23 - Saber analizar, sintetizar y utilizar el razonamiento crítico en ciencia.
- CG24 - Comprensión de los mecanismos básicos de análisis y diseño de sistemas descendente y ascendente para la resolución de problemas y procesos complejos.
- CG25 - Desarrollar la capacidad creativa que incentive el dinamismo y la capacidad emprendedora e innovadora así como la identificación de las analogías entre situaciones que permita la aplicación de soluciones conocidas a nuevos problemas.

### **4.2. Module Competencies developed in the course**

- CE14 - Know and understand the physiological mechanisms underlying animal life and understand the fundamental physiological differences between different animal groups.
- CE15 - Understand the principles and mechanisms of regulation in animal physiology, as well as the relationship between structure and function in Physiology.

### **4.3. Specific skills of the subject**

- CP1 - Know and understand the physiological mechanisms that underlie animal life and understand the fundamental physiological differences between the different animal groups.
- CP2 - Understand the principles and mechanisms of regulation in animal physiology, and the relationship between structure and function in physiology.
- CP3 - Be able to integrate and explain the concepts acquired during the study of physiology, in particular the interactions between the different systems and feedback mechanisms.

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### 5. COURSE CONTENT (COURSE TOPICS)

The emphasis will be on comparative physiology but there will be some coverage of other physiology approaching. The laboratory component of the course is designed to reinforce some of the topics discussed in lecture, as well as to familiarize students with some of the laboratory techniques and equipment used in the acquisition of physiological data.

The course is divided into the following eight units (each including several topics of about one hour "EB" session). Most of the topics will be presented in the classes and the students will be asked to present the others as a summary in their portfolio.

#### I. INTRODUCTION. PRINCIPLES OF PHYSIOLOGY

We can define physiology as “*the study of how living systems function*”. We study living systems from the subcellular level all the way to the level of the whole organism and how organisms adapt to enormously different environmental conditions such as hot, cold, dry, humid, or high altitude. Even in the face of constantly changing external environmental conditions, the physiological parameters in the animal body are persistently maintained within very narrow limits.



#### **Topic 1. Introduction to Animal Physiology.**

Concept of Physiology. Basic characteristics of living organisms. Fundamentals of issues of Physiology. Contents of the course. Discussion and literature program.

#### **Topic 2. Central principle of physiology. Concept medium**

Central principle of physiology. Organizational levels. The external environment as determinant of physiological processes. The internal environment and constancy. Homeostasis and regulation. Integration of biological functions. Levels of adaptation.

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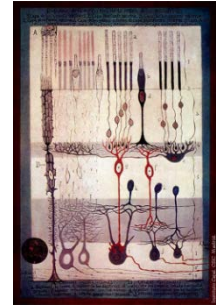
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### II. NEURONAL FUNCTION

Neurons are the central components of the nervous system.

In this unit we will try to give answer to questions like “What makes neurons different from all other cells” or “When, during the course of evolution, did neurons first appear”

Once we can understand the basic principles governing the neuron function, we will focus on how the neurons can process and transmit information through electrical and chemical signals.



#### **Topic 3. General organization of the nervous system**

General Organization of the Nervous System. General principles from an evolutionary perspective. Invertebrate nervous system. Sensory neurons. Motoneurons. Centralization and cephalization. Segmentation. Basic elements of the vertebrate nervous system.

#### **Topic 4. Central Nervous System and Peripheral Nervous System**

Central Nervous System. Elements of the Brain. Peripheral Nervous System. Overview of the Nervous System. Autonomic Nervous System. Sympathetic and parasympathetic divisions. Spinal and cranial nerves. Coordination of sympathetic and parasympathetic systems.

#### **Topic 5. General physiology of excitable cells**

Concept of excitability. The neuron as excitable cell model. Cell types in the nervous system. Nerve cells. Glia. Electrical properties of excitable cells. Ion Channels. Concept of local potential. Action potential. Action potential propagation.

#### **Topic 6. Signalling in the nervous system**

Concept of synapses. Synaptic transmission. Cholinergic synapses. Synaptic regulatory mechanisms. Chemical nature of neurotransmitters. Functional classification. Molecular classification. Neuromodulators. Integration at synapses.

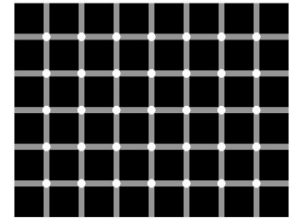
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### III. SENSORY RECEPTION

Aristotle's description of our senses has influenced our culture in such a way that many people still think that we only have five senses.

But today, physiology study receptors in the muscles, tendons and joints, in the vestibular organs, within the circulatory system or in the digestive tract. Even some brain cells have been found to be sensitive to changes in blood chemistry or to changes in temperature within the brain itself.



#### **Topic 7. Sensory mechanisms. General physiology of sensory receptors**

General properties of sensory reception. Concept of sensory receptor. Sensory transduction. Interpretation of sensory information.

#### **Topic 8. Vision**

The vision. Electromagnetic radiation. Structure and components of the vertebrate eye. Retina. Photoreceptors. Visual pigments and phototransduction. Basic mechanisms of vision. Visual perception. Vision in invertebrates. Detection of polarized light.

#### **Topic 9. Mechanoreception.**

Mechanoreceptors. Organization of sensory pathways. Touch receptors. Proprioceptors. Baroreceptors.

#### **Topic 10. Hearing.**

Basics of sound and hearing. Hair cells. Lateral line in fish and amphibians. Body balance. Ear.

#### **Topic 11. Chemoreception. Thermoreception. Nociception.**

Chemoreception: taste and smell. Mechanisms of taste reception. Gustatory chemoreception. Olfaction. Thermoreceptors. Nociceptors.

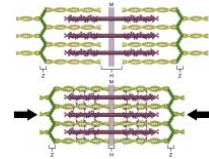


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### IV. EFFECTOR SYSTEMS

An effector is any part of the body that produces a response. A muscle, gland, or organ capable of responding to a stimulus is considered an effector. We will concentrate here on the essential structural aspects of muscle and the biomechanical processes for the understanding of muscle contraction.



#### **Topic 12. Concept and types of effectors. Muscular fibre structure**

Effector systems. Muscle tissue. Skeletal muscle. Structural basis of muscular contraction. Sliding filament theory. Regulation of muscle contraction.

#### **Topic 13. Excitation-contraction coupling**

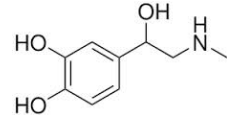
Excitation contraction coupling. The relaxation contraction cycle. Metabolism. Skeletal fiber types. Heart muscle. Smooth muscle.

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### V. ENDOCRINE SYSTEMS

The endocrine system refers to the set of animal glands which produce substances that act as messengers and, released into the blood, carry out their function in different parts of the body.



Ultimately it is a signal system, which analogously to the nervous system, but typically slower and in a lasting way, allows the intercommunication between organs and, therefore, the maintenance of homeostasis organism.

#### **Topic 14. Introduction to the study of endocrine systems**

The concept of homeostasis. The endocrine system and the nervous system work together. Anatomy of the endocrine system. General types of chemical messengers. Mechanisms of hormone action.

#### **Topic 15. The hypothalamic-pituitary axis.**

The hypothalamus. The hypophysis or pituitary gland. Types of cells secreting pituitary. Classification of pituitary hormones. Hypophysiotropic hypothalamic hormones. Preproopiomelanocortin derived hormones. Growth hormone or somatotropin. Prolactin. Oxytocin. Vasopressin.

#### **Topic 16. Pineal gland. Intermediate pituitary.**

Pineal gland and melatonin. Functions of melatonin. The intermediate pituitary. MSH physiological roles. Functions of colour in animals. Stimuli that induce colour changes. Effector pigment cells. Neural and hormonal regulation of the color changes. Hormonal action mechanisms in physiological color changes. Hormonal actions in morphological changes colour. Control MSH secretion.

#### **Topic 17. The thyroid and thyroid hormones. Parathyroid hormone.**

The thyroid gland. Thyroid hormone biosynthesis and secretion of hormones. Mechanisms of action of thyroid hormones. Regulating the secretion of thyroid hormones. Physiological actions. Parathyroid hormone. Functional importance and calcium homeostasis. Bone tissue. Types of bone. Osteogenesis and bone remodelling. Hormonal regulation of bone cell activity

#### **Topic 18. Adrenal glands**

Adrenal glands. Hormones of the adrenal cortex. Mechanisms of action of intracellular receptors. Mineralocorticoids. Glucocorticoids. Adrenal medulla. The adrenal sympathetic system. Neurotransmitters of the sympathetic-adrenal. Catecholamines. Adrenergic receptors and mechanisms of action. Physiological effects of hormones on the bone.

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### **Topic 19. Endocrine pancreas**

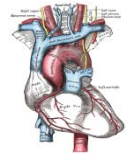
Functional anatomy of the endocrine pancreas. Physiological importance of glucose homeostasis. Insulin. Mechanisms of insulin secretion. Regulation of glucose transport by insulin, the insulin receptor. Actions of insulin. Glucagon. Somatostatin. Pancreatic polypeptide.

### **Topic 20. Sex and Placental Hormones**

Sex hormones. Male reproductive system. Testicular function. Secretion, metabolism and action of androgens. The female reproductive system. Ovarian function. Ovarian follicle development. Hormonal patterns during the menstrual cycle hormonal regulation of oogenesis. Functioning of the corpus luteum. Hormonal regulation of reproductive tract function. Mechanisms of action and metabolism of ovarian steroids. Female puberty and menopause. Placental Hormones.

## **VI. CIRCULATORY SYSTEMS AND GAS EXCHANGE.**

Here we study the circulatory (or cardiovascular) system, responsible for blood circulation and transport of nutrients, gases, hormones, and blood cells. In these topics we will focus mainly on the heart functioning and the transport of the oxygen by the blood.



### **Topic 21. Overview circulatory systems.**

Concept of circulation. General organization of the circulatory systems. Open and closed circulatory systems. The heart. Electrical properties of the heart. Mechanical properties of the heart. The vertebrate heart.

### **Topic 22. Gas transfers in animals.**

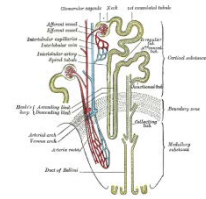
Introduction. Physical gases. Respiratory pigments. Oxygen transport by the blood. Breath. Respiratory systems. Gases in water and in air. Features of breathing in the air environment. Respiration in aquatic environments. Control mechanisms.

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### VII. ION BALANCE AND OSMOTIC. EXCRETORY SYSTEM

Homeostasis (referred to the water content in the body) is performed by osmoregulation. The processes involved in osmoregulation are very different depending on the environment of the animal. During the lessons in this unit, we will pay attention, particularly, to the mechanisms of urine formation and the major problems that different types of animals have to solve based on their environments.



#### **Topic 23. Fluid compartments of organisms. Osmoregulation.**

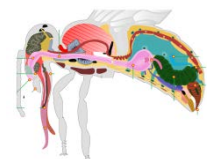
The importance of water. Compartmentalization of living beings. Cell membrane permeability. Osmosis. Functions excretion. Factors contributing to the compulsory exchange of ions and water. Osmoregulatory organs of invertebrates. Osmoregulatory organs of mammals. The kidney of mammals.

#### **Topic 24. Urine formation**

Urine formation. Urine concentration mechanism. Kidneys of non-mammalian vertebrates. Excretion of nitrogenous waste.

### VIII. NUTRITION AND DIGESTION

Nutrition refers to the activities by which living organisms obtain the materials that cells metabolize and from which they synthesize structural components, enzymes, energy-rich compounds, etc. Rarely the organic molecules come in forms that are readily useful. Digestion is the processing of the food into forms that can be absorbed.



#### **Topic 25. Nutrition and digestion.**

Nutritional concepts digestion and metabolism. Biological significance of nutrition. Types of nutrition. Obtaining food. Feeding strategies. Nutritional requirements. Nutrient molecules. Digestion. Digestive hydrolysis. Energy metabolism and metabolic rate.

#### **Topic 26. The digestive system**

The digestive system. Gut motility. Gastrointestinal secretions. Exocrine glands. Gastrointestinal secretions. Bile and digestive enzymes. Control of digestive secretions. Absorption of nutrients.

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### **6. METHODOLOGY AND RESOURCES**

**The course described in this guide, "Animal Physiology" (6 credits, 150 hours), follows a course type A2**

The tandem "student-professor" through the "coincident work" (EB + EPD + AD) represent the 30% of the total time scheduled for this subject. This 30% (45 hours) is distributed as follows: **Basic Teachings** (70%), **Teaching and Development Practices** (15%) and **Guided Activities** (15%).

It is expected that the 60% (90 hours) of the time dedicated to an A2 subject is **student autonomous work**. The last 10% (15 hours) is dedicated to **evaluation** tasks.

**The course includes 31 hours of "EB" classes (on site) where we will develop the basics of the subject**

For the development of the basic teachings assigned classrooms will be used, with up to 60 people and equipped with computer for video projection, allowing presentations with images and animations for the presentation of concepts. In addition, all classrooms have slate for the detailed explanation of those concepts requiring additional explanations or detail.

**Throughout the course, part of theoretical knowledge will be developed in 5 ("EPD") lab sessions**

Hands-on lab sessions are conducted primarily in the student's laboratory of Physiology, equipped with the necessary instrumental to perform different practices. Laboratories also have audio visual, simulation tools and consumables necessary for practice. When necessary the sessions will take place in a computer room for the complete development of practices that require it.

**The Guided Activities will take place in small groups**

For the "AD" sessions (4) lab groups splits into two. Students will have the opportunity to discuss videos related to the subject, scientific articles and their own approaches on issues of interest within the scope of the program.

**Personal work**

Taking in consideration that the subject's activities extend throughout 14 week, the 90 hours of autonomous work represent about 6 hours of independent student work per week. The campus has the necessary resources (library fully equipped with library material in paper and on-line subscriptions), sufficient study rooms with flexible schedules, computer rooms open access, etc. This will allow the students, to develop work related to the subject without any lack.

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### Virtual Classroom

As well, at all times the student can use the virtual classroom course, which interactively with the teacher and their classmates. The student should visit this website regularly for further information, outlines, hand-outs, and links to other sites of interest.

All together, the student is expected to spend 150 hours to pass the course, which would be broken down as follows for the present subject:

- **Basic Teachings: 31 hours**
- **Hands-on labs sessions and guided activities: 14 hours**
- **Student work (including tutorials): 90 hours**
- **Evaluation: 15 hours**

### 7. ASSESMENT

The time dedicated to the evaluation of the course is 15 hours. Please, do not forget that we follow a **continuous assessment system**. EPD and AD will be evaluated by the submission of the correspondent reports. The presentation of essays and reviews about the basic teachings will be evaluated. Finally, a written exam will assess the basic teachings of the course. **Only the exam will be mandatory to pass the course.**

#### Continuous assessment

Since the attendance and participation are very important for the qualifications of this subject, the possibility of knowing who is who from the beginning is necessary for the normal development of the course.

For that reason and in order to make possible the continuous assessment, the students are kindly requested to provide an ID-photo at the beginning of the semester. You can post your picture directly through the virtual classroom or, if you prefer, you can send it to your professor by any other means.

You have to understand that without this tool it would not be possible to take into consideration your public contributions to the course.

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### Evaluation

The evaluation will be based on the levels shown in five different sections:

- **Lab sessions (20%).** Is scored separately attendance and participation (5%) and a written report of the work done (15%)
- **Guided activities (10 %).** Attendance and participation.
- **Literature review (20%).** Presentation of a topic related to the course chosen by the student.
- **Summaries of specific topics of the basic teachings (10%).**
- **Active participation (5%).** Involvement will be assessed based on the initiative and involvement of each student in different tasks proposed for both classroom and non-classroom performance.
- **Performing tests (35%).** The exam, to be held at the end of the semester ("first evaluation") consists of two parts (60 multiple choice questions, 15%) and 4 essay questions (20%). As mentioned above, this exam is mandatory and it is needed to get a minimum mark of "5/10" to pass the course.

Those students who do not pass the first exam (the only mandatory exercise for this subject), can (in order to pass the course) perform a second test ("retake or second-chance exam"), to be held in June or July. The student has the option to retain all the other grades acquired during the continuous assessment.

This second-chance examination exam maintains the same structure than the first one (two parts: 60 multiple choice questions and 4 essay questions). Again you need to obtain a grade of "5/10" to pass the course. For the calculation of the final mark the percentages of the different tasks do not change.

For the completion of any activity (including exams), the use of paper dictionary is allowed. The exam duration is 3 hours and necessary instructions and recommendations are given in situ. As a general rule, for the elaboration of any kind of reports, and particularly for the exams, it is very advisable the use of diagrams and schemes that improve the understanding of the topic.

During the development of the subject, a partial exam (about halfway through the semester) will be proposed, which will allow the exclusion of the assessed subject matter.

To pass the subject a minimal mark of 5/10 (taking together all the scores) is necessary.

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### **Evaluation of "single test"**

In any case, following the current rules from our University<sup>1</sup>, any student can ask for a final exam that permits the assessment of all the knowledge and skills acquired along the course.

In this situation, the student must submit (at least 10 days before the official date for the retake exam) a written renounce to all the obtained previous scores and have to accomplish an exam including:

- a) Written test about all the hands-on and guided activities (30 %)
- b) Written summary about the specific topics selected during the course (10 %)
- c) Literature review of a selected topic related to the course (20%)
- d) Multiple choice test (60 questions) about the topics presented in classes as EB (20%)
- e) Short essay questions test (4) about the topics presented in classes as EB (20%)

### **Plagiarism**

Students have to remember that cheating and plagiarism are violations of University policy and are considered serious offenses and that the "Physiology, Anatomy and Cellular Biology Department" takes all incidences of academic dishonesty seriously and acts accordingly. Self-plagiarism" (the use of your own previous work in a different subject) is also not allowed in any of the activities of this subject.

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<sup>1</sup> <https://upo.gob.es/opencms/AlfrescoFileTransferServlet?action=download&ref=29c3de26-80d5-43c0-a3b8-682187fe36f8>



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### Rubrics

#### a) Rubric for AD and EPD

		0-4	5-8	9-10
20%	<b>Format / Structure</b>	Exercise does not meet the minimum organization and clarity requirements.	Exercise is organized and adequate (but some aspects could be improved).	Exercise noticeably meets the criteria of clarity and structure required.
40%	<b>Content</b>	Content is not appropriate or does not cover satisfactorily the proposed work.	The assigned work meets, reasonably, the criteria requested.	The work highlights the quality of submitted content.
40%	<b>Presentation / Understanding</b>	The presentation of the work presented does not allow the adequate understanding.	Exercise meets the minimum criteria and proper exposure, but complete understanding is not unequivocally showed.	The exposition of work reached a good level and shows the overall understanding of the subject treated.

#### b) Rubric for course assignments.

		0-4	5-6	7-8	9-10
20%	<b>Format / Structure</b>	Exercise does not meet a minimum of clarity and organization	Exercise is enough and is minimally organized, although it can be improved.	The clarity of presentation and structure are good.	The format presented (oral presentation or exposed) document is impeccable.
40%	<b>Content</b>	Content is not appropriate or sufficient for the proposed work.	The presentation uses knowledge which is generally accurate with only minor inaccuracies.	The presented work is notable for the quality of its content. The treatment of the information used is sufficient.	The content and depth of the work, and used bibliography conform to excellent levels.
40%	<b>Presentation / Understanding</b>	The presentation of the work presented does not allow an adequate understanding.	The assigned work meets some assignment requirements.	Both the exposition of work as understanding of the aspects he collected, maintained a good level.	Overall, exposure and understanding of the presented work fully met all requirements.

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### c) Rubric for oral presentations.

		0-4	5-6	7-8	9-10
40 %	<b>Competence and approaching</b>	The presentation does not show a good understanding for the presented subject.	Seems to understand the main points of the topic and presents them with relative ease.	Shows a clear understanding of the subject and presents it with ease.	Shows a deep understanding of the subject and presents it in a convincing way.
30 %	<b>Content</b>	The information presented is not clear or includes significant errors.	The information presented is relatively clear, but includes minor errors.	Most of the information presented is clear, concise and understandable.	The presentation as a whole is clear, concise and understandable.
25 %	<b>Understanding</b>	Wrong answers to the questions posed on by the teacher or classmates.	Only partial answers to the questions posed by the teacher or classmates.	Clear answers to most of the questions posed by the teacher or classmates.	The student answers with a clear grasp of the subject to the questions posed by the teacher or classmates.
5 %	<b>Exhibition / Communication</b>	Difficulty sustaining attention of the audience. Communication style is not correct or does not maintain eye contact with the audience.	Maintains an uncertain attention of the audience. The communication style can improve or maintain sufficient eye contact with the audience.	Can keep the attention of the audience. The style is right and maintains eye contact during the presentation.	Constantly maintains the attention of the audience, the communication style is confident and articulate. Always maintains adequate visual contact with the public.

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### 8. LITERATURE

As general references following books are recommended. During the development of the course may suggest additional manuals for tracking specific topics. References marked with an asterisk (\*), and some others, are available online.

#### Basic Literature:

- Richard W. Hill, Gordon A. Wyse, and Margaret Anderson (2012). **Animal Physiology\***. 3rd edition. Sinauer Associates, Inc.  
\* [www.coursesmart.com/9780878935598](http://www.coursesmart.com/9780878935598)
- Randall, D., Burggren, W. and French, K. (2002). **Eckert Animal Physiology\***. 5th Ed. W.H. Freeman.  
\* <http://www.whfreeman.com/Catalog/product/eckertanimalphysiology-fifthedition-randall>

#### Additional Bibliography:

- Hall J.E. (2012). **Guyton and Hall Textbook of Medical Physiology**. 12th Edition. Saunders.
- C.D. Moyes and P.M.Schulte (2007). **Principles of Animal Physiology: International Edition (2e)**. Pearson Higher Ed USA
- Eric R. Kandel, James H. Schwartz, Thomas M. Jessell and Steven A. Siegelbaum (2012). **Principles of Neural Science**, Fifth Edition. McGraw-Hill Companies Inc.
- Thomas W. Sadler (2010). **Langman's Medical Embryology** (11th Editon). Lippincott Williams and Wilkins.
- Kim E. Barrett, Susan M. Barman, Scott Boitano and Heddwen Brooks (2012). **Ganong's Review of Medical Physiology**, 24th Edition. McGraw-Hill Companies Inc.
- Hochachka Peter W. and Somero George N. (2002). **Biochemical adaptation: mechanism and process in physiological evolution**. Oxford University Press.

#### Laboratory Manuals:

- Dee U. Silverthorn, Bruce R. Johnson and Alice C. Mills (2005). **Lab Manual for Physiology**. Benjamin-Cummings Publishing Company.



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### Additional Internet Resources:

- The Physiology Place:  
(<http://www.pearsonhighered.com/thephysiologyplace/>)
- UTK Mathematical Life Sciences Page for Education  
(<http://www.tiem.utk.edu/~gross/bioed/modulelist.html>)
- Pat Brown's Path webpage Interactive Physiology  
(<http://faculty.alverno.edu/bowneps/>)
- Quantitative Literacy  
(<http://faculty.alverno.edu/bowneps/new%20indexes/quantindex.html>)
- Moyes and Schulte Animal Physiology Textbook  
(<http://www.pearsonhighered.com/educator/product/Principles-of-Animal-Physiology-2E/9780321501554.page>)
- Companion Website for Principles of Animal Physiology.  
([http://wps.aw.com/bc\\_moyes\\_animalphys\\_2/](http://wps.aw.com/bc_moyes_animalphys_2/))
- Eckert Animal Physiology  
(<http://www.whfreeman.com/Catalog/product/eckertanimalphysiology-fifthedition-randall>)
- Eckert Animal Physiology. Student resources  
(<http://www.whfreeman.com/Catalog/product/eckertanimalphysiology-fifthedition-randall/studentresources>)
- Sherwood Animal Physiology Textbook  
([http://www.brookscole.com/cgi-wadsworth/course\\_products\\_wp.pl?fid=M20b&flag=student&product\\_isbn\\_issn=9780534554040&discipline\\_number=22](http://www.brookscole.com/cgi-wadsworth/course_products_wp.pl?fid=M20b&flag=student&product_isbn_issn=9780534554040&discipline_number=22))
- Physiology by Numbers Richard F. Burton Chapter 1: Introduction to Physiological Calculation  
(<http://assets.cambridge.org/97805217/72006/sample/9780521772006wsc00.pdf>)
- Physioviva Educational Videos  
(<http://www.youtube.com/user/llkeelely?feature=mhee>)