Teaching Guide				
Identifying Data				2019/20
Subject (*)	Animal Physiology II		Code	610G02036
Study programme	Grao en Bioloxía			
Descriptors				
Cycle	Period	Year	Type	Credits
Graduate	2nd four-month period	Third	Obligatory	6
Language	SpanishGalician			
Teaching method	Face-to-face			
Prerequisites				
Department	Bioloxía			
Coordinador	Álvarez Bermúdez, María	E-mail	maria.alvarez.bermudez@udc.es	
Lecturers	Álvarez Bermúdez, María Couceiro López, Lucía	E-mail	maria.alvarez.bermudez@udc.es lucia.couceiro@udc.es	
Web	ciencias.udc.es			
General description	- Animals as an open and integrated system. - Regulation of its functions and properties. - Macro regulatory systems. - The nervous system and its information integrative function. - Sensory Physiology: sensory systems. - Endocrine system and the regulation of the metabolism. - Physiology of reproduction. - Comparative Physiology.			

Study programme competences / results	
Code	Study programme competences / results
A1	Recoñecer distintos niveis de organización nos sistemas vivos.
A4	Obter, manexar, conservar e observar especímenes.
A10	Avaliar actividades metabólicas.
A17	Realizar bioensaios e diagnósticos biolóxicos.
A18	Levar a cabo estudos de produción e mellora animal e vexetal.
A19	Analizar e interpretar o comportamento dous seres vivos.
A21	Deseñar modelos de procesos biolóxicos.
A26	Deseñar experimentos, obter información e interpretar os resultados.
A28	Desenvolver e implantar sistemas de xestión relacionados coa Bioloxía.
A29	Impartir coñecementos de Bioloxía.
A30	Manexar adecuadamente instrumentación científica.
A31	Desenvolverse con seguridade nun laboratorio.
B1	Aprender a aprender.
B2	Resolver problemas de forma efectiva.
B3	Aplicar un pensamento crítico, lóxico e creativo.
B4	Traballar de forma autónoma con iniciativa.
B5	Traballar en colaboración.
B6	Organizar e planificar o traballo.
B7	Comunicarse de maneira efectiva nunha contorna de traballo.
B8	Sintetizar a información.
B9	Formarse unha opinión propia.
B11	Debater en público.

Learning outcomes

Learning outcomes	Study programme competences / results		
To acquire basic knowledge to understand the physiology of animals as a system, including experimental animal managing, cultures, production, etc., as well as to value the incident of possible environmental changes.	A1 A10 A19 A21 A26 A28 A29 A30 A31	B1 B3 B8 B9	
Development of skills related with intensive and extensive cultures in a laboratory.	A4 A10 A17 A18 A26 A28 A30 A31	B2 B3 B4 B6	
Be able to define terms, abstraction and managing of information from different origins (bibliography, experimental, virtual, etc.).	A26 A29	B5 B6 B8 B11	
Workshops and skills related with work in group as well as design, elaboration and presentations of works.	A29	B5 B6 B7 B8 B11	

Contents	
Topic	Sub-topic

REGULATORY SYSTEMS. Nervous System. Units 1 to 3. Overview, types, organization and function. Nervous System of Vertebrates. Interneuronal communication. Synapses.	Unit 1.- General functions and characteristics of the nervous system: the nervous system as information integrator. Anatomical synopsis and nervous systems types. Cellular organization of the nervous system. Types of nerve cells. Citophysiology of neuron and glia cells. Unit 2.- The Nervous System of Vertebrates. 1) Central Nervous System (CNS) the spinal cord and brain. Levels of integration. 2) Peripheral SN: afferent and efferent pathways. 2.1.) Somatic Nervous System (SNS). 2.2) Autonomic Nervous System (ANS): sympathetic division and parasympathetic division. Functional characteristics of each division. Neurotransmitters and Receptors. Autonomic reflex arc. Organs stimulation by the ANS. Control of integration processes: regulation of SNA by SN Central. Unit 3.- Interneuronal communication: synapses. Electrical synapses. Chemical synapses. The neuromuscular junction. Excitation and inhibition. functional associations of neurons. Neurotransmitters: types and functional characteristics.
Sensory Physiology: Units 4-9. Sensory Receptors. Concept, types and features. Somatic sensitivity. Photoreception. Phonoreception. Chemoreception.	Unit 4.- Sensory systems. Sensory Receptors: concept and features. Receptor types and general properties of the receptor organs: specificity and adaptation. Receptor potential. Unit 5.- Somatic sensitivity (I). Tactile receptors: touch, pressure and vibration sensations. Thermoreceptors and temperature sensitivity. Pain reception: physiological basis and receptors. Mechanisms of analgesia. Sensory pathways of the Central Nervous System: Posterior column pathway. Spinothalamic pathway. Unit 6.- Somatic Sensitivity (II). Position sense or proprioception. Muscle and joint receptors, muscle spindle and Golgi organ. Invertebrate proprioception. Position and balance control. Statocysts. Vestibular organs and receptors. Unit 7.- Photoreception. Basic types of photoreceptors. Photoreception and orientation to light in invertebrates. Ocelli. The compound eye of arthropods. The vertebrate eye. Anatomophysiology of the retina. Receptor cells and nerve cells. Mechanism of light transduction by the visual pigments. Analysis of visual information. Receptive fields. Neural integration of information. The perception of colors. Unit 8.-Phonoreception. Perception and production of sounds by Invertebrates. Anatomy of the auditory system of Vertebrates. Organ of Corti and receptor cells. Transduction of sounds. Neural pathway and hearing information processing. The basilar membrane and the perception of frecuencies. The mechanism of Echolocation. Groups of animals with echolocation. Special anatomical structures. Evolutionary perspective. The lateral line. Features and receptor cells. Main functions and perception of the environment. Unit 9.- Chemoreception. The general chemical sense. Physiology of Taste. Physiology of Smell. Chemoreception in aquatic animals.

Effectors and motor coordination: Units 10 to 12. Skeletal muscle. Contraction mechanism. Smooth and cardiac muscle. Spinal cord and cortical movement control. Motor control by the brainstem, basal ganglia and cerebellum. Other effectors: bioelectricity and bioluminescence.	Unit 10.-Physiology of movement (I). Effectors. Muscle fiber as base of movement. Structure and function of muscle. Sliding filament theory. Contraction mechanism. Physiochemistry of skeletal muscle fiber contraction. Excitation- contraction coupling. Smooth muscle physiology. Cardiac muscle physiology. Unit 11.- Physiology of movement (II). Motility. Levels of coordination. Integration of muscle activity in the spinal cord: the reflex arc. Types of reflexes. Cortical control of muscle activity: pyramidal tract. Extrapyramidal tract. Brainstem. Basal ganglia. The cerebellum and the movement control. Unit 12.- Other effectors: bioelectricity and bioluminescence. Electric organs and electroreception: functional significance. Mechanisms of light output: luminescent organs and structures. Symbiotic bacteria; intra and extracellular luminescence. Functional significance of bioluminescence.

REGULATORY SYSTEMS. Endocrine system. Units 13 to 22. Chemical communication. Endocrine glands and tissues. Hormones. Functions and regulation. Endocrine control of reproduction.	Unit 13.- The Endocrine System and its role in the homeostasis regulation. Mechanisms of chemical regulation. Chemical messengers: Hormones. Endocrine glands and tissues. Classification and types of hormones. Mechanisms of hormonal action. Neurosecretion. Neuroendocrine integration. Unit 14.- General organization of the pituitary. Adenohypophysis: synthesis, secretion and function of the anterior pituitary hormones. Growth hormone (GH). The hypothalamus-pituitary system. Hypothalamic control of the adenohypophysis: hypothalamic hormones. Neurohypophysis: synthesis, secretion and function of neurohypophyseal hormones. antidiuretic hormone (ADH) and oxytocin. Unit 15.- The intermediate lobe of the pituitary and the physiology of color changes: the stimulating melanophores hormone MSH. Pineal gland: synthesis, secretion and function of melatonin. Pigmentary effector cells: physiology of color changes and regulatory factors. Types of chromatophores. Unit 16.- Thyroid Gland. Thyroid hormones. Main actions of thyroid hormones. Effects on metabolism. Involvement in the thermogenic response. Other effects of thyroid hormones. Regulation of secretion. Unit 17.-Calcium metabolism and bone formation. Parathyroid hormone (PTH), calcitonin (CA) and cholecalciferol (D3). The thymus gland. Unit 18.- Adrenal glands. 1) Adrenal cortex: glucocorticoids, mineralocorticoids, adrenal androgens and estrogens. Functions of glucocorticoids. Regulation of secretion. Mineralocorticoid: Aldosterone. 2) Adrenal medulla: synthesis, secretion and function of catecholamines. Unit 19.- Endocrine pancreas: insulin, glucagon and somatostatin. Functions. Regulation of secretion. Importance of regulation of glycemia. Unit 20.- Endocrine systems of Invertebrates. General model of the endocrine system of Invertebrates. Endocrine mechanisms and processes under hormonal control: endocrine control of development and molting by Insects. Unit 21.-Endocrine control of reproduction (I). Sex hormones. Prenatal sexual differentiation of the genital tract. Male reproductive system and testicular androgens. Female reproductive system. Ovarian hormones and their regulation. Female reproductive cycles: ovarian cycle and uterine cycle. Unit 22.- Endocrine control of reproduction (II). Fertilization. Pregnancy and hormones during pregnancy. Birth: mechanical factors and hormonal factors. Lactation and its homonal control.

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student?s personal work hours	Total hours
Guest lecture / keynote speech	A1 A19 A29 B1 B3 B6 B8 B9	29	29	58

Laboratory practice	A4 A10 A17 A26 A28 A29 A30 A31 B1 B2 B3 B4 B5 B6 B7 B9 B11	15	0	15
Seminar	A18 A19 A21 A28 A29 B1 B2 B3 B5 B7 B8 B9 B11	5	2.5	7.5
Short answer questions	A4 A10 A17 A26 A28 A29 B1 B2 B3 B8 B9	1	7	8
Objective test	A1 A18 A29 B1 B3 B4 B8 B9	3	55.5	58.5
Personalized attention		3	0	3
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	Description
Guest lecture / keynote speech	Fifty minutes oral presentation of the material explaining the theoretical aspects of the program by using PowerPoint presentations that students will be able to download from moodle. The objective of these sessions is to transmit the knowledge about the topic treated helping with pictures and squemes so the students can learn easier.
Laboratory practice	Laboratory practices with OBLIGATORY CHARACTER in meetings of 4 hours, developing approximately 6-7 practices (1 or 2 for session). They imply animal managing and/or virtual managing of laboratoy experiments with animals, in order to study different functions and reactions of the body.
Seminar	Reduced groups of students will allow to further explain basic knowledge or extend in some cases the theory from the lectures to learn complementary concepts. We will also so some practical work about the theory. Discussions among students will be wellcome during these seminars and they will also permorm group-works. Active participation will be positively evaluated
Short answer questions	Final test at the end of the practises about the contents.
Objective test	Final test at the end of the lessons. This exam will evaluate the contents of the subject, seminars and practises.

Personalized attention	
Methodologies	Description
Laboratory practice Seminar	The student will have personalized explanations with the proffesor previous appointment and as many as the student needs. For the following students: ?Alumnado con recoñecemento de dedicación a tempo parcial e dispensa académica de exención de asistencia?, they will have in addition personalized attention about the seminars they couldn't atted and additional explanations about the practices they couldn't perform in order to facilitate the comprehension and help to prepare the exam.

Assessment			
Methodologies	Competencies / Results	Description	**Qualification**
Objective test	A1 A18 A29 B1 B3 B4 B8 B9	There will be a final test about the theory of the program at the end of the four-month period. The test will be composed by short questions. IT IS NECESSARY TO OBTAIN A MINIMUM of 4.0 points over 10 to pass the objective test.	65

Seminar	A18 A19 A21 A28 A29 B1 B2 B3 B5 B7 B8 B9 B11	Discussions, tests and activities related with the theory, developed by groups. The qualification of the seminars will be individual and will depend on the participation / contribution / exercises / tests made by the student. Not comming to a seminar will have a qualification of 0 points.	20
Short answer questions	A4 A10 A17 A26 A28 A29 B1 B2 B3 B8 B9	Final test at the end of the practises about the contents. Qualification of practises will take in account both the questionaire made by the students during practises and the short test made the last day of practises.	15
Others			

Assessment comments
The final qualification will take in account the acquired knowledge of the theoretical program, the practical activities of laboratory and the assistance to seminars. The comprehension and capacity of synthesis, as well as the acquired skills will be evaluated. -NOT PRESENTED (NP) will be the qualification of those students who do not take the test/exam. -FAIL or 'SUSPENSO' will be the qualification of those students who take the exam but didn't reach the minimum final qualification required to pass (see above in qualification). -Students taking the second opportunity of evaluation and they didn't go to practises or they failed the exam, will have to pass an additional test about the practices and they must obtain in these questions a minimal qualification of 5. -For the following students: ?Alumnado con recoñecemento de dedicación a tempo parcial e dispensa académica de exención de asistencia? who couldn't attend to practices, they will have to pass an additional test about the practices and they must obtain in these questions a minimal qualification of 5. -Students with less than 4.0 in the objective test and 5 or more as total qualification, will figure with 4.9 officially.

Sources of information	
Basic	- Guyton, A.C. & J.E. Hall (2006). Tratado de Fisiología Médica (11ª ed.). Ed. Interamericana McGraw-Hill - Hill, R.W., G.A. Wyse & M. Anderson (2006). Fisiología Animal. Ed. Panamericana - Liem, K.F., Bemis, W.E., Walker, W.F. & L. Grande (2001). Functional anatomy of the Vertebrates: an evolutionary perspective. . Fort Worth: Harcourt College - Moyes, C.H. & P.M. Schulte (2007). Principios de Fisiología Animal. Ed. Pearson Education - Nation, J.L. (2008). Insect Physiology and Biochemistry (2ª ed). CRC Press - Norris, D.O. & J.A. Carr (2013). Vertebrate Endocrinology (5ª Ed.). Academic Press, Elsevier - Purves, D., Augustine, G., Fitzpatrick, D., Hall, W., Lamantia, A-S., McNamara, J. & S. Williams (2007). Neurociencia. Ed. Panamericana - Randall; D., W. Burggren & K. French (2002). Eckert. Animal Physiology: mechanisms and adaptations (5ºed.). Ed. McGraw-Hill - Interamericana - Schmidt-Nielsen, K. (1997). Animal physiology. Adaptation and environment (5ª ed.). Ed. Cambridge University Press - Silverthorn, D.U. (2014). Fisiología Humana. Un enfoque integrado (6ª ed.). . Ed. Panamericana - Tresguerres, J.A.F. (2005). Fisiología humana (3ª ed.) . Ed. McGraw-Interamericana. - Willmer, P., G. Stone & I. Johnston (2000). Environmental Physiology of Animals. Ed. Blackwell Science Ltd.

Complementary	- BERTA, A., SUMICH, J.L. & K.M. KOVACS (2006). Marine Mammals: Evolutionary Biology (2nd ed.). . Burlington: Academic Press - CHOWN, S.L. & S.W. NICOLSON (2004). Insect physiological ecology. Mechanisms and patterns. Oxford University Press - Daly, H.V., Doyen, J.T. & A.H. Purcel (1998). Introduction to Insect Biology and Diversity.. 2ª ed. Oxford University Press - DEHNHARDT, G. (2002). Sensory systems. In: Marine Mammalian Biology. An evolutionary approach.. Hoelzel, A.R. (ed) Oxford Blackwell Science - EVANS, D.E. & J.B. CLAIRBONE (2006). The physiology of fishes.. Boca Raton: CRC Press - KARDONG, K.V., (2007). Vertebrados: anatomía comparada, función, evolución. Madrid: MacGraw-Hill Interamericana. - (). .

Recommendations
Subjects that it is recommended to have taken before
Microscopic Organography/610G02009 Biochemistry I/610G02011 Biochemistry II/610G02012 Zoology I/610G02031 Zoology II/610G02032 Animal Physiology I/610G02035
Subjects that are recommended to be taken simultaneously
Subjects that continue the syllabus
Other comments
-The oral lectures about the program are not obligatory but assistance is encouraged.-It is also important the frequent use of the moodle plataform to folow the progress and news related with the subject.-It is important a good writing and a good presentation of a inform/portfolio.-It is recommended to manage basic informatic, text processing or presentation software. -Basic level of english is also useful.

(*)The teaching guide is the document in which the URV publishes the information about all its courses. It is a public document and cannot be modified. Only in exceptional cases can it be revised by the competent agent or duly revised so that it is in line with current legislation.