



Teaching Guide				
Identifying Data			2021/22	
Subject (*)	Functional Adaptations of Animals in the Environment		Code	610G02037
Study programme	Grao en Bioloxía			
Descriptors				
Cycle	Period	Year	Type	Credits
Graduate	2nd four-month period	Fourth	Obligatory	6
Language	SpanishGalician			
Teaching method	Face-to-face			
Prerequisites				
Department	Bioloxía			
Coordinador	Galan Regalado, Pedro Manuel		E-mail	pedro.galan@udc.es
Lecturers	Couceiro López, Lucía Fernández Rodríguez, Nuria Galan Regalado, Pedro Manuel		E-mail	lucia.couceiro@udc.es n.fernandez1@udc.es pedro.galan@udc.es
Web				
General description	Study of the factors that affect the distribution of fauna in different media. - Characterization of environments and communities in the marine environment, freshwater and terrestrial environment. - Functional adaptations (thermal, respiratory, locomotives, trophic, reproductive, etc.), anatomical and behavioral of the fauna in the different environments.			



Contingency plan	(i) In the event of capacity problems in the spaces designated for face-to-face activities, additional spaces will be reserved in which students can follow the activities through the TEAMS platform. In the case of practical activities, the groups will be split to adapt to the capacity of the laboratory. (ii) In the event of non-presentiality, the following modifications shall apply: 1. Modifications to the contents No changes will be made to the content. 2. Methodologies *Teaching methodologies that are maintained - Master session. - Discussion led in the seminars (computes in the evaluation). - Personalized attention. *Teaching methodologies that are modified - Master sessions: in the event that they cannot be taught in person due to a new confinement, the master sessions will be taught by teleteaching on Moodle / Streams / Steam. - Laboratory practices: in the event that they cannot be taught in person due to a new confinement, the laboratory practices will be exchanged for tasks by teleteaching with the same contents as the practice. - Seminars: in the event that they cannot be taught in person due to a new confinement, the seminars will be exchanged for online tasks in Moodle / Streams / Steam. - Objective exam: in the event that it cannot be done in person due to a new confinement, a final exam will be conducted online in Moodle. 3. Mechanisms for personalized attention to students - Email: daily. Use to make inquiries, request virtual meetings to answer questions. - Moodle: daily. According to the needs of the students. - Teams. In the time slot assigned to the subject in the calendar of classrooms of the Faculty. 4. Modifications in the evaluation - Objective exam: online exam. Final exam online in Moodle. Rating weight: 60%. (It will be necessary to obtain a minimum of 4.5 points out of 10 (2.7 out of 6) in this exam to pass the subject). - Seminars: online tasks. Rating weight: 15%. - Laboratory practices: tasks by teleteaching. Rating weight: 25%. *Evaluation observations: The same observations that are in the teaching guide are maintained. 5. Modifications to the bibliography or webgraphy No changes will be made. All work materials will be digitally available in Moodle.
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	Study programme competences
Code	Study programme competences
A1	Recoñecer distintos niveis de organización nos sistemas vivos.
A2	Identificar organismos.
A4	Obter, manexar, conservar e observar espécimes.
A6	Catalogar, avaliar e xestionar recursos naturais.
A10	Avaliar actividades metabólicas.



A11	Identificar e analizar material de orixe biolóxica e as súas anomalías.
A19	Analizar e interpretar o comportamento dous seres vivos.
A20	Muestrear, caracterizar e manexar poboacións e comunidades.
A22	Describir, analizar, avaliar e planificar o medio físico.
A23	Avaliar o impacto ambiental. Diagnosticar e solucionar problemas ambientais.
A24	Xestionar, conservar e restaurar poboacións e ecosistemas.
A26	Deseñar experimentos, obter información e interpretar os resultados.
A27	Dirixir, redactar e executar proxectos en 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.
B13	Comportarse con ética e responsabilidade social como cidadán e como profesional.

Learning outcomes			
Learning outcomes		Study programme competences	
- Adquirir coñecementos básicos que permitan comprender o funcionamento dos animais no seu medio, susceptíbeis de aplicación en estudos do medio natural, biodiversidade e manexo de organismos en condicións experimentais.		A1	B1
		A2	B2
		A4	B3
		A10	B5
		A11	
		A19	
		A20	
		A22	
		A24	
		A29	
		A30	
		A31	
- Habilidades de aplicación en estudos ambientais.		A2	B2
		A4	B3
		A6	B4
		A11	B5
		A19	
		A20	
		A22	
		A23	
		A24	



- Capacidade de definir conceptos, síntese e relación dos mesmos, abstracción e manexo de información de diferente procedencia (bibliográfica, manexos virtuais, etc.), redactar, coordinar e executar proxectos.	A19	B1	
	A22	B3	
	A26	B4	
	A27	B5	
	A29	B6	
		B7	
		B8	
		B9	
		B11	
		B13	

Contents	
Topic	Sub-topic
MARINE ENVIRONMENT. Units 1-7	Unit 1.- The marine environment. Factors affecting the distribution of fauna. Biotic divisions of the marine environment.
	Unit 2.- The pelago: plankton and nekton. Plankton: generalities; spatial, temporal, vertical distribution and nictimeric migrations (significance). The nekton: concept and composition.
	Unit 3. Adaptations of plankton and nekton to pelagic life. Plankton: suspension, flotation and swimming. Nekton: flotation, locomotion.
	Unit 4. Respiratory and circulatory adaptations to diving: circulatory adjustments, metabolic changes, o2 deposits and hydrostatic pressure compensation.
	Unit 5. Soft coastal bottoms: sediment characteristics and influence of animal activity on sediment structure. Adaptations and classification of fauna: habitat, mobility, size and feeding. Excavators and interstitial organisms. Feeding and burial mechanisms.
	Unit 6.-. Life on hard coastal bottoms. Characteristics of the environment. Organisms and trophic adaptations to high temperatures and air exposure, waves and currents, maintenance of populations.
	Unit 7. From the continental shelf to deep waters. Environmental stability in deep waters. The physical environment: general characteristics. Types of organisms. Morphological and functional adaptations to scarcity of food, absence of light, pressure. Deep benthos.



TERRESTRIAL ENVIRONMENTS. Units 8-14

Unit 8.- Introduction to terrestrial environments. Characteristics of terrestrial environments as habitat for animals, in relation to aquatic ones. Main constraints of terrestrial environments for animal life.

Unit 9.- Aquatic origin of life. Origin and evolution of land animals. First land animals. Main routes for the colonization of the terrestrial environments. Evolution of terrestrial animals. Categories of terrestrial animals. Interstitial, cryptozoic, hygrophilous and xerophilous fauna.

Unit 10.- Factors affecting animal life on land. Main factors affecting animal life on land: topographic, edaphic, climatic and biotic factors. The human impact: man's influence on land environments and terrestrial animals.

Unit 11.- Morphological adaptations to terrestrial life. Locomotive and mechanical adaptations of animals to terrestrial life. Size, shape and physical architecture of the animals on land.

Unit 12.- Physiological adaptations to terrestrial life. Main physiological adaptations of animals to life on land. Respiration, skin and cuticles. Water saving in the excretion.

Unit 13.- Reproductive adaptations to terrestrial environments. Constraints of the terrestrial environments for reproduction of animals. Adaptations for protecting gametes in land. Using drops of sperm and spermatophores. Internal insemination. Reproductive adaptations to protect the offsprings. Cleidoic eggs. Oviparous and viviparous animals. Postnatal parental care.

Unit 14.- Animal adaptations to different terrestrial environments. Adaptive models: island populations. Adaptations of open herbaceous environments. Adaptation to seasonality. Adaptations to cold in Arctic, Antarctic environments and high mountains. Adaptations to drought and heat in arid environments. Other adaptations to terrestrial environments.



FRESHWATERS. Units 15-21	Unit 15.- Freshwaters. Typology of inland waters. Lotic and lentic environments: general characteristics. Groundwater and other special environments. Unit 16.- Factors affecting the distribution of fauna: chemical characteristics of inland waters. River morphology and dynamics. Galician river ecosystems. Types of communities of organisms in aquatic environments. Unit 17.- Benthos (I). Benthic macroinvertebrates. Reproductive adaptations and life cycles. Feeding adaptations. Unit 18.- Benthos (II). Osmoregulation. The importance of temperature and the freezing problem. Respiratory adaptations. Adaptations to life in running waters. Unit 19.- Drift. Composition of drift. Temporal and spatial variations. Functions of drift. Compensating mechanisms of drift. Unit 20.- The neuston. Special features of the water surface. Major groups of neuston. General adaptations. Unit 21.- The nekton. Composition. Way of life. Feeding strategies. Physiological and behavioural adaptations related to migration and reproduction.
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Planning				
Methodologies / tests	Competencies	Ordinary class hours	Student?s personal work hours	Total hours
Guest lecture / keynote speech	A1 A6 A19 A20 A22 A29 B1 B3 B6 B8	28	84	112
Objective test	A6 A10 A19 A22 A23 A24 A29 B1 B3 B4 B8 B9	3.03	0	3.03
Laboratory practice	A1 A2 A4 A6 A11 A19 A20 A29 A30 A31 B1 B2 B3 B5 B6 B13	15	1.35	16.35
Seminar	A6 A19 A20 A22 A23 A26 A27 A29 B1 B2 B3 B5 B7 B8 B9 B11	8	7.68	15.68
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	Leccións maxistras presenciais, duns 50 minutos de duración, sobre aspectos teóricos do programa. O material gráfico (presentacións en PowerPoint ou outro tipo de imaxes) estará a disposición dos alumnos na UCV. Nestas sesións, cun contido que supón unha elaboración orixinal, trátase de transmitir coñecementos e facilitar a aprendizaxe. A docencia nas sesións maxistras terá lugar seguindo o modelo híbrido establecido pola Facultade de Ciencias.
Objective test	Realización dun exame final ao remate do cuadrimestre. Esta proba combina distintos tipos de preguntas sobre os principais aspectos/contidos do programa teórico. Alternativamente, os/as estudantes terán a posibilidade de realizar probas obxectivas parciais ao longo do curso (unha proba por cada bloque teórico, 3 probas en total) que lles permitirán superar a materia mediante unha avaliación continua.



Laboratory practice	CARÁCTER OBRIGATORIO. Desenvolvemento das mesmas en 3 sesións, que requiren do manexo de organismos mariños, de augas doces e terrestres, entroncando os datos obtidos con aspectos biolóxicos e do medio natural correspondente. AO REMATE de cada sesión de prácticas de laboratorio, farán ENTREGA dun RESUME DE DATOS obtidos no seu desenvolvemento e CONCLUSIÓNs das mesmas (nunha folia por posto de traballo, común para os alumnos do mesmo).
Seminar	A desenvolver nas horas de teoría en grupos reducidos, nos que se poderá incidir sobre os aspectos máis relevantes tratados previamente nas sesións maxistrais, ou ben complementarios e de interese en relación coa materia. Nestes seminarios levaranse a cabo debates conxuntamente, téndose en conta a participación dos diversos alumnos que conforman o grupo. Poderán traducirse en discusión e exames curtos no seminario, e que serán considerados como PARTE DA AVALIACIÓN INDIVIDUAL. O ALUMNO AUSENTE nun seminario terá unha cualificación de 0 puntos na actividade desenvolvida nesa sesión.

Personalized attention	
Methodologies	Description
Seminar	A atención personalizada non está restrinxida ao tratado nas sesións de seminario. Trátase de tutorías, sempre que o alumno o requira, nas que se poderán consultar dúbidas e/ou debater sobre do tratado no programa teórico da materia e abordado nas sesións maxistrais, así como nos seminarios, ou ben nas sesións de prácticas de laboratorio. No caso de que puidera haber alumnado matriculado asimilado como ?Alumnado con recoñecemento de dedicación a tempo parcial e dispensa académica de exención de asistencia?, cabe contemplar que este contará coas tutorías tradicionais como as de tódolos alumnos, e de xeito particular aquelas enfocadas a complementar a súa posíbel non participación nas actividades de seminario que tiveran lugar ao longo do curso académico. Así mesmo, e no referente ás actividades prácticas que puideran non ter sido desenvolvidas por estes alumnos -caso de contar coa dispensa oportuna-, contéplanse tamén tutorías dirixidas a aportar información complementaria sobre das prácticas desenvolvidas de xeito xeral polo alumnado, facilitando así a avaliación deste sector de alumnado.

Assessment			
Methodologies	Competencies	Description	Qualification
Seminar	A6 A19 A20 A22 A23 A26 A27 A29 B1 B2 B3 B5 B7 B8 B9 B11	Debates en forma de discusión + exames curtos desenvolvidos por cada grupo reducido de alumnos, e que serán considerados como PARTE DA AVALIACIÓN INDIVIDUAL en función da participación/aportación de cada alumno no debate, e da cualificación obtida no exame curto desenvolto na fase final da sesión do seminario. O ALUMNO AUSENTE nestes debates/exames curtos terá unha cualificación de 0 puntos na actividade desenvolvida nesa xornada.	25



Objective test	A6 A10 A19 A22 A23 A24 A29 B1 B3 B4 B8 B9	Haberá un exame final escrito da materia ao remate do cuadrimestre. Trátase dunha proba con distintos tipos de preguntas sobre os principais aspectos/contidos do programa teórico impartidos nas sesións maxistrais. A nota obtida supoñerá o 60% da cualificación final (máximo 6 puntos sobre 10). Non obstante, é preciso obter un mínimo de 4,5 puntos sobre 10 (2,7 sobre 6) nesta proba para superar a materia. Alternativamente os/as estudantes terán a opción de facer 3 probas obxectivas parciais ao longo do curso. Ao igual que no caso da avaliación por medio dunha única proba, é preciso que os/as alumnos/as acaden un mínimo de 4,5 puntos sobre 10 en cada unha das probas parciais co gallo de superar a materia. Aqueles alumnos/as que opten pola avaliación continua precisarán acadar un mínimo de 4,5 puntos en todas e cada unha das probas parciais. Os/as alumnos/as que non acaden dita puntuación nalgunha das probas quedarán automaticamente excluídos/as deste sistema de avaliación e deberán presentarse á proba obxectiva final de toda a materia.	60
Laboratory practice	A1 A2 A4 A6 A11 A19 A20 A29 A30 A31 B1 B2 B3 B5 B6 B13	Destacar o seu CARÁCTER OBRIGATORIO. Serán avaliadas en base ao traballo realizado no laboratorio ao longo das mesmas e aos datos aportados por cada grupo de alumnos/posto de prácticas en cada sesión de laboratorio, dado que ao remate da sesión deberán facer ENTREGA dun RESUME DE DATOS e CONCLUSIÓN obtidos no desenvolvemento das mesmas. Prácticas realizadas en cursos previos no caso de alumnos repetidores, gárdase a cualificación por 3 anos.	15

Assessment comments



The evaluation of the subject will take into account the knowledge of the theoretical programme, the practical laboratory activities and the debates developed in the seminar sessions. The knowledge acquired, comprehension and ability to synthesise, clarity of exposition and skills acquired will be assessed.

-In the first opportunity of evaluation, those students who do not attend the objective test, having or not previously carried out the laboratory practicals, and/or participated or not in the debates developed in the seminars, will be NOT PRESENTED.

-Those students who, having taken the objective test, do not achieve the minimum qualification mentioned in the Evaluation section, whether or not they have previously taken the laboratory practicals, and/or whether or not they participate in the debates held in the seminars, will be SUSPENDED.

-Students who, attending a second evaluation opportunity, have not taken the laboratory practicals, will have to take a supplementary exam with questions related to them as part of the objective test, having to obtain a minimum grade of 5.0 in these questions.

Those students who do not attend the objective test, having or not previously completed the laboratory practicals and participated or not in the debates developed in the seminars, will be considered as NOT PRESENTED.

Those students who have taken the objective test but do not achieve the minimum qualification mentioned in the Evaluation section will be graded with SUSPENDED.

In the case of "Students with recognition of part-time dedication and academic dispensation of exemption from attendance", and who may not have taken the laboratory practicals, these students must specifically take the practical exam. For this, the information they may have obtained in specific tutorials will be essential, which will include documentation prepared by the students as part of the practical sessions previously carried out.

Passing the objective test of the subject, which represents 60% of the final grade, must be complemented by obtaining at least a grade of 5.0 in the aforementioned practical exam. These students, both in the first and in the second evaluation opportunity, must take the aforementioned practice exam.

Students who do not achieve the minimum grade indicated in the objective test will be given a maximum mark of 4.5.

Students who request to take the exam in the December exam session will be governed by what is indicated in the teaching guide for the previous academic year.

The consequences of fraudulent performance of the tests or activities are set out in Article 14 of the Rules for assessment, review and complaints of the qualifications of university degree and master's degree courses, and the UDC Student Statute.

The fraudulent performance of the tests or evaluation activities, once verified, will directly imply a failure grade "0" in the subject at the corresponding opportunity.

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Sources of information

Basic	MEDIO MARIÑO -Castro, P. & M.E. Huber, 2007. Biología Marina (6ª ed.). Madrid: McGraw-Hill/Interamericana, 486pp. -Hill, R.W., G.A. Wyse & M. Anderson, 2006. Fisiología Animal. Ed. Panamericana. -Morrissey, J. & J.L. Sumich 2009. Introduction to the Biology of Marine Life (9th ed.). Sudbury: Jones & Bartlett Publishers, 454pp. -Nybakken, J.W. & M.D. Bertness, 2005. Marine Biology. An Ecological Approach (6th ed). New York: Pearson- Benjamin Cummings Publishers, 579pp. -Levinton, J.S., 2013. Marine Biology. Function, Biodiversity, Ecology (International 4ª ed.). New York: Oxford University Press, 516pp.+glosario e índice. -Randall, D., W. Burggren & K. French, 2002. Eckert Animal Physiology. Mechanisms and Adaptations. (5ª ed.). W.H. Freeman and Company. -Little, C., 2009. The Biology of Soft Shores and Estuaries. New York: Oxford University Press. 219pp.+glosario e índice. -Little, C; Williams ,G.A., Trowbridge, C.D. 2010. (2ª ed.)The Biology of Rocky Shores. New York: Oxford University Press. 316pp.+glosario e índice. AUGAS DOCES -González, M.A. & F. Cobo, 2006. Macroinvertebrados de las aguas dulces de Galicia. Hércules de Ediciones. -Margalef, R., 1983. Limnología. Omega. -Petts, G. & P. Calow (eds.), 1996. River biota. Diversity and dynamics. Blackwell Science. -Tachet, H., P. Ricoux, M. Bournaud & P. Usseglio-Polatera, 2002. Invertébrés d'eau douce. Systématique, biologie, écologie. CNRS Editions. MEDIO TERRESTRE -Pough, F. H., C.M. Janis. & J.B. Heiser 2009. Vertebrate Life (8th ed.). London: Prentice Hall. -Rose, E. 2006. Animal Adaptations for Survival. New York: The Rosen Publishing Group. -Wilmer, P., G. Stone & I. Johnston 2009. Environmental Physiology of Animals (2nd ed.). John Wiley & Sons.
Complementary	MEDIO MARIÑO-Berta, A., J.L. Sumich & K.M. Kovacs 2006. Marine Mammals: Evolutionary Biology (2nd ed). Burlington: Academic Press, 547pp. -Eddy, F.B. & R.D. Handy 2012. Ecological and Environmental Physiology of Fishes. Oxford: Oxford University Press, 253pp.-Herring, P. 2002. The Biology of the Deep Ocean. Oxford: Oxford University Press, 314pp.-Jamieson, A. 2015. The Hadal Zone. Life in the Deepest Oceans. Cambridge: Cambridge University Press, 372pp.-Little, C., G.A. Williams & C.D. Trowbridge, 2010. The Biology of Rocky Shores (2nd ed.). Oxford University Press, 356pp.-Ponganis, P.J. 2015. Diving Physiology of Marine Mammals and Seabirds. Cambridge: Cambridge University Press, 333pp.-Williams, T.M. & G.A.J. Worthy 2002. Anatomy and Physiology: the Challenge of Aquatic Living. In, Marine Mammal Biology. An Evolutionary Approach. Hoelzel, A.R. (ed.) pp. 73-97. Oxford: Blackwell Science, 432pp.AUGAS DOCES -Gibert, J., D.L. Danielopol & J.A. Stanford (eds.) 1994. Groundwater ecology. Academic Press. -Guthrie, M. 1989. Animals of the surface film. Richmond Publishing.-Lancaster, J. & R.A. Briers 2008. Aquatic insects. Challenges to populations. CAB International.-Thorp, J.H. & A. Covich (eds.) 2001. Ecology and classification of North American freshwater invertebrates. Academic Press.MEDIO TERRESTRE-Biewener, A.A. 2003. Animal Locomotion. Oxford Animal Biology Series. Oxford: Oxford University Press.-Chapin, III, F.S., P.A. Matson & H.A. Mooney 2012. Principles of Terrestrial Ecosystem Ecology (2nd ed.). Birkhäuser. -Daly, H.V., J.T. Doyen & A. H. Purcell 1998. Introduction to Insect Biology and Diversity. Oxford University Press USA.-Pechenik, J.A. 2010. Biology of the Invertebrates. McGraw Hill.-Linzey, D.W. 2011. Vertebrate Biology (2nd ed.). Johns Hopkins University Press.-Shugart, H. H. 1998. Terrestrial Ecosystems in Changing Environments. Cambridge University Press.-Vaughan, T.A., J.M. Ryan & N.J. Czaplewski, 2011. Mammalogy. (5th ed.). Sudbury: Jones and Bartlett Publishers.-Vitt, L.J. & J.P. Caldwell, 2009. Herpetology (3rd. ed.). San Diego, CA: Elsevier. Academic Press.

Recommendations

Subjects that it is recommended to have taken before

Zoology I/610G02031

Zoology II/610G02032

Animal Physiology I/610G02035

Animal Physiology II/610G02036

Ecology I: Individuals and Ecosystems/610G02039

Ecology II: Populations and Communities/610G02040

Subjects that are recommended to be taken simultaneously



Subjects that continue the syllabus
Other comments



-As sesións maxistrais son especialmente recomendábeis con vistas ao seguimento do programa teórico da materia. Particularmente, dado que non se segue ningún texto concreto, recoméndase o seguimento das sesións maxistrais como o xeito máis idóneo para abordar a materia.-Igualmente esencial para os alumnos facer uso da Plataforma Virtual da UCV para o desenvolvemento da materia.-Recoméndase contar con coñecementos a nivel de usuario de ferramentas informáticas básicas (navegación, procesador de textos, preparación de presentacións, etc).-Recoméndase coñecemento de inglés cun nivel de comprensión de lectura medio.Para axudar a conseguir unha contorna inmediata sostible e cumprir co punto 6 da "Declaración Ambiental da Facultade de Ciencias (2020)", os traballos documentais que se realicen nesta materia: a. Solicitaranse maioritariamente en formato virtual e soporte informático.b. De realizarse en papel: - Non se empregarán plásticos. - Realizaranse impresións a dobre cara.- Empregarase papel reciclado. - Evitarase a realización de borradores.

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mso-bidi-font-family:"Times New Roman";}div.Section1
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(*)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.