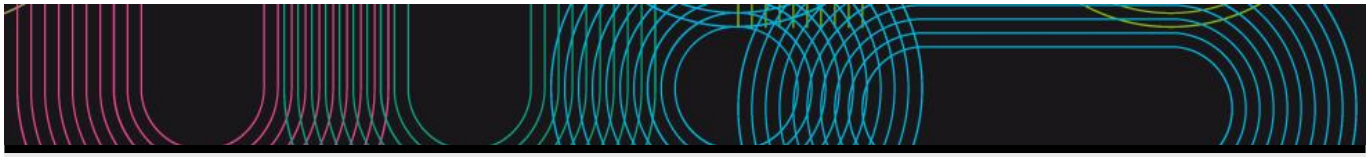

(*)Facultade de Bioloxía

Presentación

http://bioloxia.uvigo.es/en/faculty/presentation

Dean Team

(*)
http://bioloxia.uvigo.es/gl/facultade/equipo-decanal

Web

http://bioloxia.uvigo.es/en/

Grado en Biología

Subjects

Year 1st

Code	Name	Quadmester	Total Cr.
V02G031V01101	Biology: Evolution	1st	6
V02G031V01102	Physics: Physics of biological processes	1st	6
V02G031V01103	Geology: Geology	1st	6
V02G031V01104	Mathematics: Mathematics applied to Biology	1st	6
V02G031V01105	Chemistry: Chemistry applied to biology	1st	6
V02G031V01106	Biology: Soil, aquatic environment and climate	2nd	6
V02G031V01107	Statistics: Biostatistics	2nd	6
V02G031V01108	Biology: Basic laboratory techniques	2nd	6
V02G031V01109	Biology: Basic field techniques	2nd	6
V02G031V01110	Biology: Informatic tools in biology	2nd	6

Year 2nd

Code	Name	Quadmester	Total Cr.
V02G031V01201	Biochemistry I	1st	6
V02G031V01202	Botany I: Algae and fungi	1st	6

V02G031V01203	Animal and plant histology and cytology I	1st	6
V02G031V01204	Microbiology I	1st	6
V02G031V01205	Zoology 1: Non-arthropod invertebrates	1st	6
V02G031V01206	Biochemistry II	2nd	6
V02G031V01207	Botany II: Archegonia	2nd	6
V02G031V01208	Animal and plant histology and cytology II	2nd	6
V02G031V01209	Genetics I	2nd	6
V02G031V01210	Zoology 2: Arthropod invertebrates and chordates	2nd	6

Year 3rd

Code	Name	Quadmester	Total Cr.
V02G031V01301	Ecology I	1st	6
V02G031V01302	Animal physiology I	1st	6
V02G031V01303	Plant physiology I	1st	6
V02G031V01304	Genetics II	1st	6
V02G031V01305	Immunology and parasitology	1st	6
V02G031V01306	Ecology II	2nd	6
V02G031V01307	Animal physiology II	2nd	6
V02G031V01308	Plant physiology II	2nd	6
V02G031V01309	Microbiology II	2nd	6
V02G031V01310	Technics in cellular and molecular biology	2nd	6

Year 4th

Code	Name	Quadmester	Total Cr.
V02G031V01401	Quality management and control	1st	6
V02G031V01402	Pollution	2nd	6
V02G031V01403	Bioinformatics	2nd	6
V02G031V01404	Drafting and execution of projects	2nd	6
V02G031V01405	Clinical biochemistry and inmunology	1st	6
V02G031V01406	Public health microbiology and parasitology	1st	6
V02G031V01407	Integrative cell biology and physiology: Implications for health	1st	6
V02G031V01408	Human genetics and molecular pathology	1st	6
V02G031V01409	Agri-food analysis and diagnostic	1st	6
V02G031V01410	Biotechnology applied to animal production	1st	6
V02G031V01411	Biotechnology applied to plant production	1st	6

V02G031V01412	Biotechnology applied to microbiological production	1st	6
V02G031V01413	Environmental analysis and diagnosis	1st	6
V02G031V01414	Environmental impact evaluation	1st	6
V02G031V01415	Biodiversity: management and conservation	1st	6
V02G031V01416	Management and Conservation of spaces	1st	6
V02G031V01981	Internships	2nd	6
V02G031V01991	Final Year Dissertation	2nd	12

IDENTIFYING DATA

Biology: Evolution

Subject	Biology: Evolution			
Code	V02G031V01101			
Study programme	Grado en Biología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	1st
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	Rolán Álvarez, Emilio			
Lecturers	Copete Hernández, María Fernanda Díez Ferrer, José Bienvenido Galván Arcones, Sofía Martínez Mariño, Víctor Megías Pacheco, Manuel Navarro Echeverría, Luis Rolán Álvarez, Emilio Velando Rodríguez, Alberto Luís			
E-mail	rolan@uvigo.es			
Web	http://http://evolucion.webs7.uvigo.es/index.html			
General description	English Friendly subject: International students may request from the teachers: a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English. WEB PAGE of divulging where find good part of the contents of the matter			

Training and Learning Results

Code	
A1	Students should prove understanding and knowledge in this study field that starts in the Secundary Education and with a level that, even though it is suppported in advanced books, also includes some aspects that involve knowledge from the vanguard of the study field.
A2	Students should know how to apply their knowledge to their work or vocation in a professional way. They also should have the competences that are usually proved through the elaboration and defence of arguments and the resolution of problems within their study field.
B2	Manage scientific-technical information using diverse and reliable sources. Analyze data and documents and interpret them critically and rigorously, including considerations on their social relevance and in the professional field of Biology.
B6	Develop analysis and synthesis, critical reasoning and argumentation skills, applying them in Biology and other scientific-technical disciplines.
C1	Solve problems by applying the scientific method, the concepts and terminology specific to biology, mathematical models and statistical and computer tools.
C2	Identify levels of organisation of living beings through the study of current specimens and fossils. Carry out phylogenetic analyses and study the mechanisms of heredity, evolution and biodiversity.
C6	Understanding and integrate the functioning of living beings (cellular, tissue, organ and individual level), explaining their homeostatic and adaptive responses.
C7	Sampling, characterising, cataloguing and managing natural and biological resources (populations, communities and ecosystems).
D3	Commitment to sustainability and the environment. Equal, sensible and efficient use of resources.

Expected results from this subject

Expected results from this subject	Training and Learning Results			
Recognise the proofs that confirm the existence of biological evolution.	A1 A2	B2 B6	C7	D3
Recognise the mechanisms that determine the biological evolution.	A1	B2 B6	C2	
Gather an integral vision of the history of the life and of his moments more determinants by means of the study of the register fossil and the current organisms.		B2	C6	
Recognise the main hypotheses and existent proofs in relation to the evolution of our own species.	A1 A2	B2 B6		
Recognise, examine, and identify specimens fossils and his applications.	A1	B2	C7	

Identify and give to know the adaptations of the living beings.	A1 A2		C1 C6
Recognise the social projection of the evolution and his repercussion in the professional exercise, as well as know give to know his contents to give teaching and during his divulging.	A1	B6	
Recognise and reproduce the concepts and own basic terminology of the evolutionary theory.	A1	B6	

Contents	
Topic	
Introduction (3 hours)	1. Evidences on the evolution. Concept of Evolution. Evidences of the fact of the evolution. 2. History of the evolutionary ideas. From the antiquity until the modernity. Charles Darwin and the eclipse of the Darwinism. The modern evolutionary synthesis. The evolution in the 20th century. The actuality. 3. Evolution and society. Current applications of the evolutionary theory. The evolution and the religion.
The evolutionary mechanisms (10 hours)	4. Introduction to the evolutionary theory. Structure of the theory. Mutations. It derives genetic. Migration. Natural selection. 5. Natural selection and adaptation. The characters object of the selection. Some basic concepts: natural selection, biological efficiency and adaptation. *Plasticidad *fenotípica And adaptation. Types of natural selection. 6. Measure of the natural selection. The natural selection and his practical decomposition in components. The measure of the selection in qualitative characters. The measure of the selection in quantitative characters. The sexual selection and his measure. Potentiality and limit of the natural selection. 7. Cooperation and conflict. The cooperation and the altruism. The study of the evolutionary conflict.
The species and his evolutionary interactions (3 hours)	8. Species and speciation. Concept of species and of reproductive isolation. The measure of the reproductive isolation. The origin of species. 9. Coevolution. Interactions between species and natural selection. Negative Coevolution: predation, parasitism and competition. *Positive Coevolution: mutualism and symbiosis. 10. Evolution and development. Deveolpment in model organisms. Evo-Devo tools. Evo-Devo example. Canalization and convergence.
I register fossil (4 hours)	11. Nature and meaning of the register fossil. Importance and representativeness of the register fossil. 12. Relation between the history of the life and the earth. The main biological events along the geological history.
Origin and diversification of the life (9 hours)	13. The origin of the life. Data theories and problems. 14. The tree of the life. Tools and methods of inference. 15. Bacteria, arch and eukaryotic. Evolutionary relations. 16. Origin and diversification of multicellular organisms. Origin and consequences of the multicellularity. 17. Macroevolution. Patterns and explanation of the macroevolution.
Human evolution (6 hours)	18. The human lineage: evolutionary history of primates and hominids. I register fossil and studies of ancient genetic material. 19. Evolution and diversity of human characters. Brain and language, Theory of the mind. Vital strategies: evolutionary commitments, senescence. 20. Social evolution in hominids. Systems of mating and sexual selection. Familiar selection. Cooperation and altruism.

Planning

	Class hours	Hours outside the classroom	Total hours
Laboratory practical	13	26	39
Studies excursion	3	6	9
Lecturing	36	54	90
Objective questions exam	2	10	12

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies

	Description
Laboratory practical	They will make practices of 3 or 4 hours each one: 1. Recognition and interpretation of the register fossil (3 hours). The students will confront to a real statigraphic series, with included fossils in his taphonomic environment and will have to learn the keys of his interpretation. 2. Phylogenetic analysis (3 hours). The main aims of the activity is that the students learn to apply the tools but simple of phylogenetic analysis. For this used a small group of data of different species, and selecting the characters, will expose a phylogenetic hypothesis of this group of organisms, with the end to make the evolutionary interpretations between the groups. 3. Human evolution (4 hours). One of the main tools of the human evolution is the comparison of skulls of different hominid species. The practice will allow that the students infer the evolutionary relations in the human lineage using a collection of replies of skulls fossils. Besides, it will retort an experiment on social selection in humans with the end to know and interpret the evolutionary studies on the human behaviour. 4. Practice of visualisation of videos (3 hours). Format of audiovisual communication and evolutionary divulging. Viewing of series of evolutionary videos. Discussion and review of concepts and evolutionary mechanisms. Preparation of report of understanding of the videos visualised by the student. Explanation of the protocol of preparation of scripts to make short videos. Preparation, by part of the student, of a script for an evolutionary video.
Studies excursion	The students displaced to a zone of the intertidal rocky shore (cape Estai coast) with the instruction to observe copulas in situ of one or several species to be able to estimate the component of sexual efficiency for any trait of easy determination as it is the colour of the shell. Also they will study for the same characters the frequency of the same in different stadiums of the cycle of life, with the instruction to estimate the component of feasibility.
Lecturing	The mattter of the lecturer will be teached to students by means of magistral classes, prepared with the presentation of some occasional professional video. The students will be presents in shape of an alone face-to-face group. In the educational platform will be able to have of didactic material of support, presentations in pdf, etc. Also will have of the information (still is not complete) explained in shape of text and images in the web page that is developing for the subject: http://evolucion.webs7.uvigo.es/

Personalized assistance

Methodologies	Description
Studies excursion	The students will have of time of *tutoría of skilled attention, with schedules and location described for each professor in the educational platform, where will be able to clear doubts arisen during the realisation of the exit of study.
Lecturing	The students will have of time of *tutoría of skilled attention, with schedules and location described for each professor in the educational platform, where will be able to clear doubts arisen during the masterclasses.

Assessment

	Description	Qualification	Training and Learning Results			
Laboratory practical	The responsible professor will evaluate each practice by means of report written, survey or practical work depending on each case.	20		B2 B6	C1 C2 C6 C7	
Studies excursion	The evaluation will make by means of an individual survey made in the corresponding educational platform	5		B2 B6	C1 C2 C7	D3
Lecturing	At the end of course will make a type test prove (preferably) but that also can carry any practical problem.	40	A1 A2	B2 B6	C1 C2 C6	D3

Objective questions exam	You will make 2 partial, to half of course and at the end (before the final proof type test (see Lecturing). In this case they will do questions, preferably, of concept and of short answer or problems.	35	B2 B6	C1 C2 C6

Other comments on the Evaluation

CONTINUOS EVALUATION:

This is the normal way of evaluation and the system hasd been designed to obtain the better qualifications.
The assistance to Laboratory practice (field excursion as well) and to the Objective question exam is COMPULSORY, lose some practice or partial without justification. It could be sufficient reason to fail the final evaluation of the same.

The model of normal evaluation goes through to present to:
1. Practices (including gone out of study) and his corresponding method of evaluation.
2. Partials (Objective question exams). These are two exams from different contents of the lecture.
3. Lecturing Final (including all contents of the lecture).

To pass the lecture any student may get a minimum qualification of 5 in average and larger than 2.5 in any part.

SECOND OPORTUNITY:

The second opportunity exam is a new final test exam, while the rest of qualifications (Practice, Partials) will be hold during the same course.

GLOBAL EXAM:

Nevertheless, It may be possible to do just a final writing exam for the whole former activities. However, this may be agreed with the lecture coordinator at the beginning of the course (before the deadline existing in the faculty).This final alternative consist in a single written exam that includes evaluation of all the former parts: laboratory practices, studies excursion, lecturers, Objective question exams, etc). This exam will be presented in the same dates than the final exam dates (first and second option). To pass the student may get larger than 5 in average and larger than 2.5 in any part.

EXAM DATES AND TIMES:

The times of the course activities can be obtained from the Faculty WEB page: https://bioloxia.uvigo.es/es/docencia/horarios/

The dates and classrooms of the examinations will appear in the following WEB direction from the start of the course: http://bioloxia.uvigo.es/es/docencia/examenes/

Sources of information

Basic Bibliography

Megias, Gefaelll y Rolán-Alvarez, **Evolución: http://evolucion.webs7.uvigo.es/index.html**, Universidade de Vigo, actualización contin

Complementary Bibliography

Freeman y Herron, **Análisis evolutivo**, 2 edición, Pearson Educación, 2002

Futuyma, **Evolution**, 2 Edición, Sinauer associates, 2009

Boyd y Silk, **How Humans Evolved?**, 4 Edición, Norton and co., 2005

Fontdevila y Moya, **Evolución: origen, adaptación y divergencia de las especies**, 1 Edición, Síntesis, 2003

Dopazo y Navarro, **Evolución y adaptación: 150 años después del origen de las especies**, Obra propia (difusión gratuita), 2009

Saetre y Ravinet, **Evolutionary Genetics**, 1 Edición, Oxford, 2019

Recommendations

Subjects that continue the syllabus

Genetics I/V02G031V01209
Zoology 1: Non-arthropod invertebrates/V02G031V01205
Zoology 2: Arthropod invertebrates and chordates/V02G031V01210
Ecology II/V02G031V01306
Genetics II/V02G031V01304

IDENTIFYING DATA

Physics: Physics of biological processes

Subject	Physics: Physics of biological processes			
Code	V02G031V01102			
Study programme	Grado en Biología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	1st
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	Martínez Piñeiro, Manuel Ulla Miguel, Ana María			
Lecturers	Martínez Piñeiro, Manuel Mato Corzón, Marta María Pérez Iglesias, María Teresa Ulla Miguel, Ana María			
E-mail	ulla@uvigo.es mmpineiro@uvigo.es			
Web				
General description	To know the biological phenomenology from the Physics laws and principles, that will allow student to analyze and interpret the environment, as well as to understand the design of biological process models. To understand the fundamental physical concepts in order to understand the working principles of instruments and their application to different measurement and control techniques. To analyze and interpret the adaptations of living beings to their environment, terrestrial or external, as well as their behavior using physical or astrobiological laws and concepts. English Friendly subject: International students may request from the teachers: a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English. Also, it makes use of the MOOVI teleteaching platform.			

Training and Learning Results

Code	
A1	Students should prove understanding and knowledge in this study field that starts in the Secundary Education and with a level that, even though it is suppported in advanced books, also includes some aspects that involve knowledge from the vanguard of the study field.
A3	Students should prove ability for information-gathering and interpret important data (usually within their study field) to judge relevant social, scientific or ethical topics.
B2	Manage scientific-technical information using diverse and reliable sources. Analyze data and documents and interpret them critically and rigorously, including considerations on their social relevance and in the professional field of Biology.
B6	Develop analysis and synthesis, critical reasoning and argumentation skills, applying them in Biology and other scientific-technical disciplines.
C1	Solve problems by applying the scientific method, the concepts and terminology specific to biology, mathematical models and statistical and computer tools.
C3	Perform and interpret molecular, physicochemical and biological analyses, including samples of human origin. Conduct assays and functional tests under normal and abnormal conditions.
C6	Understanding and integrate the functioning of living beings (cellular, tissue, organ and individual level), explaining their homeostatic and adaptive responses.
C8	Describe, assess and plan the physical environment, use bio-indicators and identify environmental problems. Provide solutions for the control, monitoring and restoration of ecosystems.
D1	Understand the meaning and use of the gender perspective in the different fields of knowledge and in professional practice with the aim of achieving a fairer and more equal society.
D2	Communicate speaking and in writing in Galician.
D4	Collaborate and work in teams or multidisciplinary groups, promote negotiation skills and the ability to reach agreements.

Expected results from this subject

Expected results from this subject	Training and Learning Results			
To understand the biological phenomenology from the Physical Laws and Principles, in order to analyze and interpret theit meanings, as well as to try to understand the design of models of biological processes.	A1	B2 B6	C1 C6	D1 D2

Comprise the fundamental physical concepts to understand the working principles of instruments, together with their application to distinct techniques of measure and control.	A1 A3	B2 B6	C1 C8	D1 D2 D4
To analyze and interpret the adaptations of living entities to the terrestrial or external media, and their behaviour by means of the laws and physical or astrobiological concepts.	A3	B6	C3 C6	D1 D2 D4
To apply Physics knowledge to comprise how to evaluate and solve physical problems, that may contribute to diagnose and sort out environmental problems.	A1 A3	B2 B6	C1 C8	D2 D4
To comprise the social projection of Physics and its repercussion on the biological or astrobiological contexts.	A3	B6	C8	D1 D2
To know and handle concepts, terminology and scientific or technical instrumentation, relative to this subject entitled "Physics of Biological Processes".	A1 A3	B2 B6	C1	D2 D4

Contents	
Topic	
0. Review topics	0.1 Introduction 0.2 Magnitudes 0.3 Units 0.4 Conversions
1. Biomechanics	1.1 Principles of the movement 1.2 Types of movement 1.3 Balance 1.4 Forces and moments
2. Laws of Thermodinamics	2.1 Heat and temperature 2.2 Principles of Thermodinamics 2.3 Heat transmission
3. Fluids	3.1 Fluid Statics 3.2 Surface phenomena 3.3 Fluid Dynamics 3.4 Movement of bodies inside a fluid
4. Waves	4.1 Wave properties 4.2 Sound Waves 4.3 Electromagnetic waves
5. Optics	5.1 Optics principles 5.2 Geometric Optics 5.3 Lenses
6. Radiation and radioactivity	6.1 Nucleus and particles 6.2 Natural Radioactivity 6.3 Radioactivity applications
7. Astrobiology	7.1 The bases of life in the Universe 7.2 The search for life in the Solar System and in exoplanets
Program of laboratory practices	Theory of errors and their evaluation (previous knowledge) 1. Length and area measurements 2. Density measurements of solids and liquids 3. Viscosity measurements in a liquid 4. Surface tension measurements in a liquid 5. Specific heat measurements by the method of mixtures 6. Springs 7. Lenses

Planning			
	Class hours	Hours outside the classroom	Total hours
Seminars	8	6	14
Laboratory practical	20	20	40
Mentored work	0	10	10
Lecturing	20	30	50
Autonomous problem solving	0	20	20
Essay questions exam	2	12	14
Self-assessment	0	2	2
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description

Seminars	Seminars/problems classes: problems on practical cases of application of the theory and numerical data, will be treated employing the required mathematical tools and/or necessary computing settings.
Laboratory practical	Practical laboratory classes: will be held in the Physics laboratory 21 block C, 3rd floor. Each practice has a script that, prior to execution, will be given to each student. The results obtained after carrying out each practice in the laboratory will be delivered by the students for evaluation.
Mentored work	Group work: a group work will be carried out on physical aspects applied to Biology.
Lecturing	Theoretical lectures: they will be given in a classroom and, in them, the theoretical contents of the program will be developed.
Autonomous problem solving	The problems with resolution of autonomous form will be proposed how reinforcement, and will be aboout similar practical cases to the ones treated in the context of seminars and practical sessions.

Personalized assistance

Methodologies	Description
Laboratory practical	If needed, personalized assistance can take place by means of previous appointment at the teachers' offices, or by ICT means.
Lecturing	If needed, personalized assistance can take place by means of previous appointment at the teachers' offices, or by ICT means.
Seminars	If needed, personalized assistance can take place by means of previous appointment at the teachers' offices, or by ICT means.
Mentored work	If needed, personalized assistance can take place by means of previous appointment at the teachers' offices, or by ICT means.
Autonomous problem solving	If needed, personalized assistance can take place by means of previous appointment at the teachers' offices, or by ICT means.
Tests	**Description**
Essay questions exam	If needed, personalized assistance can take place by means of previous appointment at the teachers' offices, or by ICT means.
Self-assessment	If needed, personalized assistance can take place by means of previous appointment at the teachers' offices, or by ICT means.

Assessment

	Description	Qualification	Training and Learning Results
Laboratory practical	Laboratory practices and the result of practices is 20% of the mark.	20	A1 B2 C3 D2 A3 B6 C6 D4 C8
Mentored work	There will be a group work, including an oral presentation of it, that represents 16% of the mark.	16	A1 B2 C1 D1 A3 B6 D2 D4
Lecturing	The contents exposed in the theory lessons suppose an important part of the global note. Its evaluation will be integrated in the context of the test assignments and/or examinations, accounting for 20%. There are two theory tests that can free matter, but each of them owed to be surpassed with one minimum of 4 points on 10, so that they are taken into account in the continuous evaluation.	20	A1 B2 C6 D2
Essay questions exam	Problems suppose an important part of the global note. Its evaluation will be integrated in the context of the test assignments and/or examinations, accounting for 40%. There are two problems tests that can free matter, but each of them owed to be surpassed with one minimum of 3,5 points on 10, so that they are taken into account in the continuous evaluation.	40	A1 B2 C1 D1 A3 B6 D2
Self-assessment	A self-assesmemt writing will be up to 4% of the mark.	4	A1 B6 C1 D1 A3 D2 D4

Other comments on the Evaluation

CONTINUOUS EVALUATION:

Evaluation will be made by means of the sum of the marks for four written tests (two for theory and two for problems), laboratory practices, a self-evaluation written report and a group work to be expossed in class. All practical activities of this subject (in laboratory, classroom informatics, seminars, etc.) are considered of experimental nature.

Theory tests account for 20% of the global note; problem tests, 40%; laboratory practices, 20%; self-evaluation, 4%; and the group work, together with its corresponding oral exposition, 16%. Each theory or problems test owes to be surpassed with a 4 or 3,5, respectively, on 10 for power do average in the continuous evaluation system. The 1st theory test together with the 2nd problems one, can be compensated to obtain a minimum of 5 points (passed). Equally for the 3rd (theory) and 4th (problems) tests. Any of them that do not surpass 3,5 or 4, correspondingly, points on 10 --and that could not had been compensated-- must be passed, with a minimum mark of 5, in the final examination of the subject. That final examination is NOT to go up mark, since all the tests free matter along the course in continuous evaluation system. Attending to seminars, and the realization and delivery of all the practices, are mandatory to pass the subject. Possible particular cases and/or under special circumstances will be considered individually only.

N.P.: Those students that do not attend any of the punctuable tests. Those who do not present or do not deliver any of the punctuable tests/practices/works/expositions will receive as course mark the average weighed marks obtained, but pondered by a factor 0,5.

2nd OPPORTUNITY:

The same applies in the July examination.

GLOBAL EVALUATION:

Students can communicate, during the 1st course month , their renounce to the continuous evaluation system. In that case, the realization and delivery of all the practices, are mandatory to pass the subject anyway.

EXAMINATION DATES FOR COURSE IN THE FACULTY WEB (#http://bioloxia.uvigo.es/*gl/*docencia/examinations)

COURSE TIMETABLES: http://bioloxia.uvigo.es/es/docencia/horarios/

Sources of information

Basic Bibliography

Simon Mochrie , Claudia De Grandi, **Introductory Physics for the Life Sciences**, Springer, 2023

David V. Guerra, **Introductory Physics for the Life Sciences: Volumes I and II**, Routledge Taylor & Francis Group, 2023

Complementary Bibliography

A. Cromer, **Física para las ciencias de la vida**, Ed. Reverté, 1991,

D. Jou, E. Llebot, C. Pérez García, **Física para Ciencias de la Vida**, Ed. McGraw Hill, 1994,

Hugh D. Young, Roger A. Freedman, **Física universitaria : con física moderna**, Pearson Educación, 2018,

Philip Nelson, **Física biológica : energía, información, vida**, Reverte, cop. 2005,

J.A. Fidalgo, M. Fernández, **Física general**, Everest, D.L. 2000,

Álvaro Giménez Cañete et al., **Astrobiología : sobre el origen y evolución de la vida en el universo**, Los Libros de la Catarata : CSIC, 2011,

Carlos Briones Lorente, **¿Estamos solos?**, Editorial Crítica, 2020,

Emilio J. Sánchez Barceló, **Hicimos la luz... y perdimos la noche : efectos biológicos de la luz**, Universidad de Cantabria, 2017

Emilio J. Sánchez Barceló, **...Porque la noche ya no es oscura: Los efectos de la contaminación lumínica**, BABIDI-BU LIBROS, 2023

Recommendations

Other comments

The general schedules/timetables can be found in the WEB page of the FACULTY OF BIOLOGY: http://bioloxia.uvigo.es/en/teaching/timetables/

IDENTIFYING DATA				
Geology: Geology				
Subject	Geology: Geology			
Code	V02G031V01103			
Study programme	Grado en Biología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	1st
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	Diz Ferreiro, Paula			
Lecturers	Diz Ferreiro, Paula García Gil, María Soledad Marino , Gianluca Piñeiro Juncal, Nerea Rey García, Daniel			
E-mail	pauladiz@uvigo.es			
Web	http://bioloxia.uvigo.es/es/			
General description	English Friendly subject: International students may request from the teachers: a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English. In this matter, the basic functioning of the physical environment in which the current biosphere sits and develops is analysed. Because of that, the sedimentary environments (continental, coastal and marine) are studied from Actualism point of view. It allows laying the foundations for understanding the interaction of living beings with the environment in which they inhabit. From this point of view, the subject provides a primary and complementary knowledge of the concepts developed in other subjects, especially those related to Zoology, Botany and Ecology. Likewise, the introduction of the temporal dimension allows raising the basic questions about the origin and evolution of the Earth System in general, and of the biosphere in particular. These aspects will favour the understanding of the concepts related to biodiversity and organic evolution, as well as with the organisation and evolution of populations and ecosystems. Biology professionals, as well as other sciences, often develop their work in multidisciplinary teams, so the biologist must know the terminology and basic concepts of Geology that apply to different professional skills of these graduates. More specifically, professionals who develop their functions in the field of the environment, agricultural professionals, or those dedicated to information, documentation and dissemination should handle geological concepts that allow them to exchange information with other professionals, understand biological processes from a global point of view and make better decisions. A particular impact of Geology on the biologist's professional profile concerns teaching at the middle level. According to the structure and contents of entrance exams, future teachers must acquire knowledge and skills related to Geology. The schedules can be consulted at: http://bioloxia.uvigo.es/es/docencia/horarios/			

Training and Learning Results	
Code	
A1	Students should prove understanding and knowledge in this study field that starts in the Secundary Education and with a level that, even though it is suppported in advanced books, also includes some aspects that involve knowledge from the vanguard of the study field.
A3	Students should prove ability for information-gathering and interpret important data (usually within their study field) to judge relevant social, scientific or ethical topics.
B1	Developing autonomous learning by identifying their own training need and organizing and planning tasks and time.
B2	Manage scientific-technical information using diverse and reliable sources. Analyze data and documents and interpret them critically and rigorously, including considerations on their social relevance and in the professional field of Biology.
B4	Draft and write reports, documents and projects related to Biology. Proceed to their presentation and debate in the teaching and specialized areas, highlighting the competences of the degree.
C7	Sampling, characterising, cataloguing and managing natural and biological resources (populations, communities and ecosystems).
C8	Describe, assess and plan the physical environment, use bio-indicators and identify environmental problems. Provide solutions for the control, monitoring and restoration of ecosystems.
C12	Writing reports and technical dossiers, as well as directing and executing projects on topics related to biology and its applications.
D3	Commitment to sustainability and the environment. Equal, sensible and efficient use of resources.
D4	Collaborate and work in teams or multidisciplinary groups, promote negotiation skills and the ability to reach agreements.
D5	Communicate effectively and appropriately, including the use of computer tools and English.

Expected results from this subject	Training and Learning Results			
Recognize the overall functioning of the Earth system.	A3	B2	C8	D3
Describing the geological cycle.	A3	B2	C8	D3
Define, describe and relate the theory of global tectonics.	A3	B2	C8	D3 D5
Defining the principles of geology.	A3	B2	C8	D5
Recognize the historical dimension of geology.	A3	B2	C8	D3 D5
Identifying external and internal geological processes.	A3	B2	C7 C8	D3
Identifying the fundamental types of rocks and their origin.	A1	B2 B4	C8 C12	D4
Recognize the morphological and sedimentary characteristics of terrestrial, coastal and marine environments.	A3	B2 B4	C7 C8 C12	D3 D4
Relating the abiotic factors of the environment with living beings.	A1 A3	B2 B4	C7 C8 C12	D3 D4 D5
Relating knowledge and techniques of geology to interpret cartography.	A1	B4	C7 C12	D4
Gathering information, reproducing experiments and showing the results in the field of Geology.	A3	B1 B2 B4	C12	D3 D4 D5
Recognize the usefulness of geology and its repercussions on the professional practice of biologists.	A1	B2 B4	C12	D3 D4
Defining and relating the concepts, terminology and scientific-technical instrumentation related to geology.	A1	B2 B4	C8 C12	D4

Contents	
Topic	
1. Concept and Principles of Geology	Geology, a Earth science Physical Geology and historical geolosy Geological principles Time and space in geology
2. Global Tectonics.	Continental drift Inner Earth structure Plate tectonics
3. The rocks cycle	Concept Types of rocks and its relation to the geological cycle Inner geological cycle External geological cycle.
4. The Atmosphere and the Hydrosphere	The Atmosphere: origin, composition, structure and dynamics. The hydrological cycle Oceans and ocean circulation
5. Continental environments	Glacial environment Fluvial enviroment Desertic environment Lacustrine environment
6. Coastal environments.	Coastal areas: agents and sedimentary processes. Erosive coastlines Coastal sedimentation: beaches, deltas, estuaries, tidal flats.
7. Marine and ocean regions.	Morphology and distribution of the marine seabed. Continental shelf. Carbonated shelf. Reefs. Deep sedimentary environments.
SEMINARS	Groups will prepare a technical presentation on a chosen topic related to the subject.
PRACTICALS	Practical 1: Topography Practical 2: Analysis of maps and geological sections Practical 3: Recognition of igneous, metamorphic, and sedimentary rocks
FIELD TRIP	Identification of geomorphological features and sedimentary environments on the southern coast of Galicia.

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	27	48	75
Seminars	1	10	11
Field practice	8	0	8
Laboratory practical	9	9	18
Report of practices, practicum and external practices	0	15	15
Essay questions exam	2	0	2
Presentation	2	15	17
Report of practices, practicum and external practices	0	2	2
Portfolio / dossier	0	2	2
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Lecturing	Presentations in the classroom on the concepts and fundamental contents of the subject. Student participation will be stimulated through questions, group resolution of exercises, etc.
Seminars	Instructions for a collaborative project for the development of a technical presentation on a geology-related topic chosen from a list proposed by the faculty. Students have the option of choosing a topic of interest, but this must be consulted and approved by the faculty. Students will receive detailed instructions on how to present the topic. Consultation of specialized databases will be provided.
Field practice	Field trips to identify different types of rocks, tectonic structures, and diverse sedimentary environments. Learning to use a geological compass.
Laboratory practical	Guided completion of exercises on basic geological topography and mapping, geological cross-sections, and rock recognition.

Personalized assistance	
Methodologies	**Description**
Lecturing	Questions can be resolved through individual or group tutoring sessions in person. Exceptionally, questions may be resolved by email or remotely. Students are encouraged to contact the faculty via email with sufficient advance notice to schedule an appointment.
Field practice	In situ instructions for the management of the geological compass, criteria for rock recognition, identification of sedimentary environments in coastal settings.
Laboratory practical	Explanation and guidance on simple geological mapping and rock recognition exercises for small groups. For tutoring, students are encouraged to contact the teacher via email with sufficient advance notice to arrange an appointment.
Seminars	Detailed instructions on how to present the chosen topic. Consultation of specialized databases. Advice on choosing a topic to cover in the report. It is recommended that students contact the faculty via email with sufficient advance notice to arrange an appointment.
Tests	**Description**
Report of practices, practicum and external practices	Detailed instructions on the content and how to present a report. Presentation of data using tables and figures. Questions answered through individualized tutoring.
Essay questions exam	Resolution of doubts through personalized tutoring. It is recommended that students contact the teaching staff by email, with sufficient advance notice to make an appointment.
Presentation	Personalized or group tutoring will be provided to guide students in the elaboration of the presentation. It is recommended that students contact the teaching staff by email, with sufficient advance notice to make an appointment.
Portfolio / dossier	Personalized attention will be provided for the development of a glossary of geological terms

Assessment				
	Description	Qualification	Training and Learning Results	
Report of practices, practicum and external practices	The written report on the fieldwork activities will be evaluated and must be uploaded to Moovi by the indicated date. Content and the inclusion of graphics, diagrams, etc. will be assessed. Attendance at the fieldwork trip is mandatory.	5	A3 B4 C7 D3 C8 D4 C12 D5	

Essay questions exam	Written exam of a theoretical-practical nature on the fundamental contents of the subject.	40	A1 B2 C8 D3 A3 B4 C12
Presentation	The presentation will be evaluated individually and in groups according to the rubric provided by the instructor. Attendance at the seminars is mandatory.	20	A1 B1 D4 A3 B2 D5 B4
Report of practices, practicum and external practices	A report will be submitted at the end of each practice session, following the instructor's instructions. Attendance at the practice sessions is mandatory.	35	A1 B1 C7 D3 A3 B2 C8 D4 B4 C12 D5
Portfolio / dossier	Contributions to the glossary of geological terms are voluntary and may increase the final grade by up to one point once the student has reached the minimum passing grade and follows the general assessment regulations. The rubric for this assessment will be provided by the faculty.	0	

Other comments on the Evaluation

It is recalled that attendance at face-to-face activities is mandatory.
FIRST OPPORTUNITY EVALUATION: As a general rule, the evaluation at the first opportunity will be continuous. To pass the subject it will be necessary to achieve a score of at least 50% of the individual evaluation of the seminars, the presentation and the examination of development questions. In case of not reaching said 50% in any of these three tests, the final mark will be equal to the final weighted average, multiplied by 0.5.
GLOBAL EVALUATION METHOD: It must be requested by each student in the form and term indicated by the center. It will consist of a single theoretical-practical exam that will account for 100% of the evaluation.
SECOND OPPORTUNITY EVALUATION: It will take place under the same conditions as in first opportunity.
Students who take this subject are required to behave responsibly and honestly (See Title VII of the Regulations on the evaluation, qualification and quality of teaching and the student learning process).
Dates of the tests according to the official calendar of the faculty: https://bioloxia.uvigo.es/es/docencia/horarios/ and https://bioloxia.uvigo.es/es/docencia/examenes/

Sources of information

Basic Bibliography

Pozo, M., González, J. y Giner, J., **Geología Práctica**, 1, Pearson, 2004

Monroe, J.S., Wicander, R. y Pozo, M., **Geología. Dinámica y Evolución de la Tierra**, 4, Paraninfo, 2008

Tarbuck, E.D., Lutgens, F.K., Tasa, D., **Ciencias de la Tierra. Una introducción a la Geología Física**, 10, Pearson, 2013

Holden, J, **An introduction to Physical Geography and the Environment**, 978-1-292-08357-5, 1, Pearson Education Limited, 2012

Wicander, R. & Monroe, J.S., **Geology: Earth in Perspective**, 3, CENGAGE, 2019

Complementary Bibliography

Recommendations

IDENTIFYING DATA				
Matemáticas: Matemáticas aplicadas á bioloxía				
Subject	Matemáticas: Matemáticas aplicadas á bioloxía			
Code	V02G031V01104			
Study programme	Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1	1c
Teaching language	Castelán Galego			
Department	Matemáticas			
Coordinator	Sanmartín Carbón, Esperanza			
Lecturers	Sanmartín Carbón, Esperanza			
E-mail	esanmart@uvigo.es			
Web	http://moovi.uvigo.gal			
General description	O obxectivo fundamental da materia é proporcionarlles aos alumnos os coñecementos matemáticos básicos que precisarán na súa formación e exercicio profesional. O enfoque da materia é eminentemente práctico, centrándose na comprensión e nas aplicacións dos resultados matemáticos necesarios para a resolución de problemas que se presentan na Bioloxía, polo que se establecerán os resultados, en xeral, sen demostración, aínda que se manterá un alto nivel de rigor na formulación, enunciado, análise de hipóteses e consecuencias.			

Resultados de Formación e Aprendizaxe	
Code	
A2	Que os estudantes saiban aplicar os seus coñecementos ao seu traballo ou vocación dunha forma profesional e posúan as competencias que adoitan demostrarse por medio da elaboración e defensa de argumentos e a resolución de problemas dentro da súa área de estudo.
A3	Que os estudantes teñan a capacidade de reunir e interpretar datos relevantes (normalmente dentro da súa área de estudo) para emitir xuízos que inclúan unha reflexión sobre temas relevantes de índole social, científica ou ética.
B1	Desenvolver a aprendizaxe autónoma, identificando as súas propias necesidades formativas e organizando e planificando as tarefas e o tempo.
B2	Xestionar información científico-técnica de calidade utilizando fontes diversas. Analizar datos e documentos e interpretalos de forma crítica e rigorosa, incluíndo reflexións sobre a súa relevancia social e no ámbito profesional da Bioloxía.
B6	Desenvolver as capacidades de análises e síntese, de razoamento crítico e argumentación, aplicándoas en contextos propios da Bioloxía e outras disciplinas científico-técnicas.
C1	Resolver problemas aplicando o método científico, os conceptos e a terminoloxía específica da Bioloxía, os modelos matemáticos e as ferramentas estatísticas e informáticas.
C7	Muestrear, caracterizar, catalogar e xestionar recursos naturais e biolóxicos (poboacións, comunidades e ecosistemas).
C10	Identificar procesos biolóxicos e biotecnolóxicos e a súa posible aplicabilidade, en particular nos ámbitos sanitario, agroalimentario e ambiental.
D1	Comprender o significado e aplicación da perspectiva de xénero nos distintos ámbitos de coñecemento e na práctica profesional co obxectivo de alcanzar unha sociedade máis xusta e igualitaria.
D5	Comunicar de maneira eficaz e adecuada, incluíndo o uso de ferramentas dixitais e o inglés.

Resultados previstos na materia				
Expected results from this subject	Training and Learning Results			
Aplicar as técnicas básicas do álxebra lineal no ámbito da Bioloxía.	A3	B1 B2 B6	C1 C7 C10	D5
Aplicar a derivación parcial e a diferenciabilidad ao estudo dunha función.	A3	B1 B2 B6	C1 C7 C10	D5
Aplicar as técnicas básicas do cálculo integral no ámbito da Bioloxía.	A3	B1 B2 B6	C1 C7 C10	D5
Manexar algún programa informático de utilidade na resolución de problemas relacionados coa materia.	A3	B1 B2 B6	C1 C10	D5

Saber aplicar coñecementos e técnicas matemáticas a procesos e estudos biolóxicos e biotecnolóxicos.	A2 A3	B1 B2 B6	C1 C7 C10	D5
Analizar a información, interpretar os resultados numérica e gráficamente, e obter as conclusións.	A2 A3	B1 B2 B6	C1 C7 C10	D1 D5
Coñecer e manexar a linguaxe matemática e a súa aplicación no ámbito de Bioloxía.	A2 A3	B1 B2 B6	C1 C7 C10	D1 D5

Contidos
Topic
TEMARIO DA MATERIA
1. O ESPAZO Rn: O espazo vectorial Rn. Matrices e determinantes. Aplicacións lineais: matriz asociada. Formas cadráticas.
2. INTRODUCIÓN AO CÁLCULO DIFERENCIAL: Cuestións básicas de funcións reais. Derivación de funcións dunha variable. Derivadas direccionais e derivadas parciais. Diferencial dunha función: matriz jacobiana e vector gradiente. Derivadas de orde superior. Regra da cadea. Plano tanxente. Extremos dunha función escalar.
3. INTRODUCIÓN AO CÁLCULO INTEGRAL: Cálculo da área dunha rexión plana limitada por curvas. Teorema fundamental do cálculo integral. Primitivas.
TEMARIO DE PRÁCTICAS DE ORDENADOR
1. Toma de contacto co programa de cálculo MAXIMA. Álxebra lineal.
2. Funcións dunha e varias variables. Representación gráfica e a súa interpretación.
3. Aplicacións do cálculo diferencial. Integración e as súas aplicacións.

Planificación			
	Class hours	Hours outside the classroom	Total hours
Actividades introdutorias	1	0.5	1.5
Lección maxistral	20	20	40
Resolución de problemas	18	42	60
Prácticas con apoio das TIC	6	2	8
Resolución de problemas e/ou exercicios	3	12	15
Exame de preguntas obxectivas	2	23.5	25.5
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Metodoloxía docente	
	Description
Actividades introdutorias	Explicarase a guía docente da materia. O horario pódese consultar en http://bioloxia.uvigo.es/gl/docencia/horarios
Lección maxistral	Desenvolveranse os contidos necesarios para a adecuada comprensión do programa, facendo fincapé nos aspectos que poidan resultar máis dificultosos. O horario pódese consultar en http://bioloxia.uvigo.es/gl/docencia/horarios
Resolución de problemas	Nas prácticas de encerado realizaranse exercicios que lle permitirán ao alumno afianzar os conceptos teóricos, así como a súa aplicación, e resolveranse as dúbidas que poidan xurdir. O horario pódese consultar en http://bioloxia.uvigo.es/gl/docencia/horarios
Prácticas con apoio das TIC	Tres sesións de dúas horas cada unha, nas que se usará o programa Maxima de software libre para a resolución de problemas relacionados coa materia. O horario pódese consultar en http://bioloxia.uvigo.es/gl/docencia/horarios

Atención personalizada	
Methodologies	**Description**

Resolución de problemas	Atención ás preguntas e dúbidas formuladas polos alumnos nas clases prácticas ou en titorías. O HORARIO DE TUTORIAS pódese consultar en https://moovi.uvigo.gal
Lección maxistral	Atención ás preguntas e dúbidas formuladas polos alumnos nas clases teóricas ou en titorías. O HORARIO DE TUTORIAS pódese consultar en https://moovi.uvigo.gal

Avaliación

	Description	Qualification	Training and Learning Results
Resolución de problemas	Avaliarase o traballo nas prácticas de encerado	20	A2 B1 C1 D1 A3 B2 C7 D5 B6 C10
Prácticas con apoio das TIC	Avaliarase o traballo na aula de informática	10	A2 B1 C1 D5 A3 B2 C10 B6
Resolución de problemas e/ou exercicios	Realizaranse tres probas escritas, nas que o alumno poderá utilizar todo o material NON ELECTRÓNICO que considere necesario. Cada unha das probas puntuarase sobre 10. A nota final sobre 10 desta parte será a media das notas obtidas nas probas. O alumno que non se presente a unha das probas terá un cero na devandita proba. A PRIMEIRA PROBA consistirá de cuestións e/ou exercicios relativos ao tema 1. A SEGUNDA PROBA consistirá de cuestións e/ou exercicios relativos ao tema 2 ata a regra da cadea. A TERCEIRA PROBA consistirá de cuestións e/ou exercicios relativos aos temas 2 e 3. A data das probas pódese consultar nos horarios do curso http://bioloxia.uvigo.es/gl/docencia/horarios A data de cada unha das probas e a materia que entra nas mesmas pode variar para adaptarse á marcha do curso. Neste caso, os cambios serán publicados na plataforma Moovi con suficiente antelación.	30	A2 B1 C1 D1 A3 B2 C7 D5 B6 C10
Exame de preguntas obxectivas	Ao final do semestre realizarase un exame escrito que constará de cuestións e/ou exercicios a desenvolver, relativos a toda a materia vista en clase. A data coincide coa data oficial da avaliación global, pódese consultar en http://bioloxia.uvigo.es/es/docencia/examenes/	40	A2 B1 C1 D5 A3 B2 C7 B6 C10

Other comments on the Evaluation

AVALIACIÓN CONTINUA

Para os estudantes que opten pola AvaliaciónContinua:

-Unha mala nota nas probas prácticas pode recuperarse co traballo nas prácticas de pizarra.

- A nota final será a suma das notas obtidas na resolución de problemas (20%), as prácticas con apoio das TIC (10%), a resolución de problemas e/ou exercicios (30%) e o exame de preguntas obxectivas (40%).

- Considérase alumno/a presentado/a á materia aquel que, ao finalizar o curso, presentarase a máis dunha proba práctica ou ao exame final.

- SEGUNDA OPORTUNIDADE: Os estudantes, que opten pola avaliación continua e non superen a materia na primeira oportunidade, poderán elixir na segunda oportunidade entre dúas opcións:

A- Manter a nota obtida na parte práctica da materia e seguir os criterios de avaliación da primeira oportunidade.

B-Renunciar á nota obtida mediante as actividades de avaliación continua e realizar un exame con cuestións e/ou exercicios a desenvolver, relativos a toda a materia, que representa o 100% da nota.

Fixarase un prazo, previo ao exame da segunda oportunidade, no que o estudante debe comunicar que opción elixe. **En caso de non recibir comunicación**, enténdese que opta pola opción A.

AVALIACIÓN GLOBAL

Os estudantes que opten pola Avaliación Global serán avaliados, NAS DÚAS OPORTUNIDADES DO CURSO, mediante un exame con cuestións e/ou exercicios a desenvolver relativos a toda a materia.

A data dos exames pódese consultar en http://bioloxia.uvigo.es/es/docencia/examenes/

IMPORTANTE

- O alumnado poderá elixir ser avaliado mediante o sistema de Avaliación Continua, ou alternativamente optar por unha proba de Avaliación Global. O alumnado poderá elixir a Avaliación Global segundo o procedemento e o prazo establecido polo centro. A elección da Avaliación Global supón a renuncia ao dereito de seguir avaliándose mediante as actividades de avaliación continua que resten e á cualificación obtida ata ese momento en calquera das actividades que xa se realizaron.

- **A avaliación por defecto é a avaliación continua**. Se o estudante non solicita segundo o procedemento e prazo establecido a avaliación global, enténdese que opta pola avaliación continua.

-Nesta materia non se tolerarán **comportamentos deshonestos**. Os comportamentos deshonestos inclúen entre outros: plaxio, copiar durante as probas ou exames e a presenza visible de calquera tipo de dispositivo electrónico non autorizado, independentemente de que este aceso ou apagado, durante as actividades avaliables. As sancións por condutas deshonestas poden carrexar a non superación da materia.

CONDICIÓNS DE USO DO MATERIAL DEPOSITADO NA PLATAFORMA: O alumnado matriculado na materia non poderá difundir, total ou parcialmente, ningún contido do curso. Este material é para uso exclusivo da materia.

Recoméndase ao alumnado ter en conta o Título VII (Do uso de medios ilícitos), do Regulamento sobre a Avaliación, a cualificación e a calidade dá docencia e do proceso de aprendizaxe do estudantado https://secretaria.uvigo.gal/uv/web/normativa/public/normativa/documento/downloadbyhash/4904ced4d24eb81fe5715ddde2c48c59c0a7c4d624cd0e7491df7a753985ccfa

Bibliografía. Fontes de información

Basic Bibliography

Besada, M.; García, F. J.; Mirás, M. A.; Quinteiro, C.; Vázquez, C., **Maremáticas**, 978-84-1188-007-7, Servizo de Publicacións da Universidade de Vigo, 2024

Besada, M.; García, F. J.; Mirás, M. A.; Quinteiro, C.; Vázquez, C., **Un mar de Matemáticas. Matemáticas para los grados de Ciencias**, 9788481587210, Servizo de Publicacións da Universidade de Vigo, 2016

Larson, R. E.; Edwards, B. H., **Introducción al álgebra lineal**, 9681848861, Limusa, 1994

Complementary Bibliography

Adams, R. A., **Cálculo**, 978-84-7829-089-5, Addison-Wesley, 2009

Besada, M.; García, F. J.; Mirás, M. A.; Vázquez, C., **Cálculo diferencial en varias variables**, 978-84-9281-283-7, Garceta, 2011

Marsden, J. E.; Tromba, A. J., **Cálculo vectorial**, 0-201-62935-6, Addison-Wesley Iberoamericana, 1991

Neuhauser, C., **Matemáticas para Ciencias**, 84-205-4253-9, Prentice Hall, 2004

Página principal de Maxima, **http://maxima.sourceforge.net/**,

Recomendacións

Other comments

En principio, os coñecementos matemáticos adquiridos polo alumno no bacharelato deberían constituír unha base suficiente para cursar a materia. En particular, os aspectos seguintes: manexo de expresións algebraicas sinxelas, resolución de sistemas de ecuacións sinxelos, propiedades básicas e representación das funcións elementais, cálculo práctico de derivadas e primitivas sinxelas. Convén que o alumno, que presente carencias nalgún destes aspectos, preocúpese por cubrir as mesmas, especialmente se non cursou matemáticas no último curso de bacharelato.

É aconsellable que os alumnos aborden as dificultades da materia desde o principio, polo que se fomentará a participación activa no desenvolvemento das clases e recomendarase especialmente utilizar as tutorías para expor dúbidas e dificultades a modo individual.

IDENTIFYING DATA

Chemistry: Chemistry applied to biology

Subject	Chemistry: Chemistry applied to biology			
Code	V02G031V01105			
Study programme	Grado en Biología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	1st
Teaching language	#EnglishFriendly Spanish English			
Department				
Coordinator	Domínguez Seoane, Marta Salonen , Laura			
Lecturers	Domínguez Seoane, Marta Salonen , Laura			
E-mail	lauramaria.salonen@uvigo.es mseoane@uvigo.es			
Web				
General description	General chemistry oriented to Biology. Terms of English Friendly program. International students may apply to teachers: (a) materials and bibliography for the study of the subject in English, b) attending tutorials in English, c) tests and evaluations in English.			

Training and Learning Results

Code	
A1	Students should prove understanding and knowledge in this study field that starts in the Secundary Education and with a level that, even though it is suppported in advanced books, also includes some aspects that involve knowledge from the vanguard of the study field.
A3	Students should prove ability for information-gathering and interpret important data (usually within their study field) to judge relevant social, scientific or ethical topics.
A4	Students should able to communicate information, ideas, issues and solutions to all audiences (specialist and unskilled audience).
B1	Developing autonomous learning by identifying their own training need and organizing and planning tasks and time.
B2	Manage scientific-technical information using diverse and reliable sources. Analyze data and documents and interpret them critically and rigorously, including considerations on their social relevance and in the professional field of Biology.
B6	Develop analysis and synthesis, critical reasoning and argumentation skills, applying them in Biology and other scientific-technical disciplines.
C1	Solve problems by applying the scientific method, the concepts and terminology specific to biology, mathematical models and statistical and computer tools.
C12	Writing reports and technical dossiers, as well as directing and executing projects on topics related to biology and its applications.
D1	Understand the meaning and use of the gender perspective in the different fields of knowledge and in professional practice with the aim of achieving a fairer and more equal society.
D4	Collaborate and work in teams or multidisciplinary groups, promote negotiation skills and the ability to reach agreements.

Expected results from this subject

Expected results from this subject	Training and Learning Results			
Know and understand the molecular structure of biological compounds and the importance of intermolecular and intramolecular bonds.	A1 A3	B6		
Recognize the different types of chemical bonds, as well as their relationship with the structure of molecules and the macroscopic properties of substances.	A1 A4	B1 B6	C1	
Know general concepts about chemical reactions.	A4	B1 B2 B6		
Recognize especially the acid-base and oxidation-reduction reactions, as well as their application to biological processes.	A1 A3 A4	B2 B6	C1	
Get an overview of the chemical compounds present in Nature and their stereochemical characteristics.	A1 A3 A4	B1 B2 B6	C12	D4

Enumerate the regulations and health and safety techniques in a chemical laboratory.	A3	B6	C1 C12	D1 D4
Identify the basic material and instrumentation in a chemical laboratory.	A1 A3 A4	B1 B6	C1 C12	D1 D4
Identify and understand the basic techniques in a chemical laboratory.	A1 A3 A4	B1 B6	C1 C12	D1 D4
Know the labeling, packaging and storage procedures of chemical reagents and solvents.	A4	B1 B2 B6	C1 C12	D4
Differentiate the different types of chemical waste generated in a laboratory.	A4	B1 B2 B6	C1 C12	D4
Apply knowledge related to Chemistry in the field of Biology.	A1 A3 A4	B1 B2 B6	C1 C12	
Obtain and handle information, develop experiments and interpret the results.	A3 A4	B1 B2 B6	C1 C12	D1 D4
Understand the social projection of Chemistry and its impact on the professional practice of a biologist.	A4	B1 B2 B6		D1 D4

Contents	
Topic	
Topic 1. Structure of matter and chemical bond.	1. Classification of matter. Distribution of the elements in Earth and chemical composition of living matter. Molecular structure. 2. Chemical bond. Intermolecular forces in biomolecules.
Topic 2. Chemical compounds in nature. Stereochemistry.	1. Main families of chemical compounds in natural environment. 2. Chirality, stereogenic centers. Enantiomers and diastereoisomers. Tridimensional representation of the chemical structures. 3. Chemical reactions in biological environments.
Topic 3. Solution process. Colloids.	1. Types of solutions. Units of concentration. Colligative properties. Osmosis in biological processes. 2. Colloids. Structure and properties of colloidal systems.
Topic 4. Reactions and acid-base equilibrium. Redox.	1. Acids and bases. The pH. Buffer solutions. Regulation of pH in body fluids. 2. Redox reactions. Redox processes in the cellular metabolism.
PRACTICAL SESSIONS PRACTICE 1	1. SECURITY RULES IN THE CHEMICAL LABORATORY. 2. PREPARATION OF SOLUTIONS.
PRACTICE 2	LIQUID-LIQUID EXTRACTION. RECRYSTALLIZATION OF CAFFEINE.
PRACTICE 3	EXTRACTION OF LIMONENE FROM ORANGE PEEL.
PRACTICE 4	BUFFER SOLUTIONS: PREPARATION AND EVALUATION OF BUFFERING CAPACITY.
PRACTICE 5	OXIDATION-REDUCTION REACTIONS. EVALUATIONS WITH A PERMANGANATE POTASSIUM SOLUTION.

Planning			
	Class hours	Hours outside the classroom	Total hours
Laboratory practical	15	7	22
Seminars	10	20	30
Lecturing	23	46	69
Problem and/or exercise solving	0	15	15
Problem and/or exercise solving	2	12	14
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Laboratory practical	Application of laboratory techniques in practical problems related to the subject.
Seminars	A series of proposed exercises by the teacher will be solved in the classroom.
Lecturing	Explanation of the units.

Personalized assistance

Methodologies	Description
Seminars	In relation to the resolution of problems and doubts that may arise on the subject, personalized attention may be requested from students (tutorials), which will be carried out by prior appointment (arranged face-to-face modality), or through the virtual office of the teachers responsible (remote campus)

Assessment

	Description	Qualification	Training and Learning Results
Laboratory practical	During the laboratory practices, the teacher will evaluate both the correct application as well as the skills in the instrumental techniques developed by each student in each session. This will amount to 5% of the overall score. In addition, the student must solve, through the MOOVI platform, a questionnaire related to the concepts and techniques developed in each session. In total there will be 5 questionnaires (one for each training session), the average grade of which will contribute to 10% of the overall grade.	15	A1 B1 C12 D1 D4
Seminars	The teacher will propose questions or short problems (deliverables) through the MOOVI platform to be resolved throughout the four-month period (10% of the overall mark). Active participation in the seminars will contribute to 5% of the overall grade.	15	A1 B1 C1 A3 B2
Problem and/or exercise solving	Exam 1: There will be an exam of topics 1 and 2 during the four-month period. The exam is divided into two parts: - Multiple choice questions, which will evaluate the theoretical knowledge acquired by the student of both topics. - Problem solving part related to the subject matter of both topics.	35	A1 B1 C1 A3 B2 A4 B6
Problem and/or exercise solving	Exam 2: There will be an exam of topics 3 and 4 at the end of the four-month period. The exam is divided into two parts: - Multiple choice questions, which will evaluate the theoretical knowledge acquired by the student of both topics. - Problem solving part related to the subject matter of both topics.	35	A1 B1 C1 A3 B2 A4 B6

Other comments on the Evaluation

CONTINUOUS EVALUATION:

IN ORDER TO PASS THE SUBJECT, THE STUDENT MUST OBTAIN AN OVERALL GRADE EQUAL TO OR GREATER THAN 5.

1) The continuous evaluation supposes an overall grade ofthe subject resulting from weighting the grade of each of the activities as indicated above (laboratory practices, seminar, problem solving and/or exercises: exams 1 and 2). Attendance at a practice session or a seminar test implies that the student is being evaluated, so their grade in the minutes cannot be "not presented".
2) The average with the grade of laboratory practices and seminar (in the indicated percentage) will only be made if the average grade of exams 1 and 2 is equal to or greater than 3.5 points. A grade lower than 3.5 supposes suspending the subject and will be the grade that appears in the minutes.
3) Attendance at laboratory practices is mandatory, so non-attendance means suspending the subject. In the case of obtaining a grade lower than 5 in the practices, the grade can be recovered in the second opportunity exam (July). The grade of practices passed in previous courses will be saved.
4) 2nd CHANCE: The grades of the activities passed in the first opportunity will be saved for the second opportunity. For this second opportunity, the same requirements described in point 2 are established, being, in this case, the exam grade that limits the average with the rest of the activities. In addition, this call will have a specific test for the recovery of the practice grade if necessary.
GLOBAL ASSESSMENT:
The students who renounce the continuous evaluation may request global evaluation in the period established by the center. This evaluation will be carried out on the official dates of the first and second opportunity.
IN ORDER TO PASS THE SUBJECT, THE STUDENT MUST OBTAIN AN OVERALL GRADE EQUAL TO OR GREATER THAN 5.
5) The average will only be made with the grade ofl aboratory practices when the grade of the exam is equal to or greater than 4.25 points (calculated taking into account the overall grade of 85% for the exam and 15% for the grade of practices). A grade lower than 4.25 supposes suspending the subject and will be the grade that appears in the minutes.
6) Attending the laboratory practices is mandatory, so non-attendance will mean the suspension of the subject. In the case of obtaining a grade lower than 5 in the practices, the grade can be recovered in the official exam. The grade of practices passed in previous courses will be saved.
7) 2nd CHANCE: For this second chance, the same requirements described in point 5 are established.
The dates of the exams will be published on the website of the faculty

(http://bioloxia.uvigo.es/es/docencia/examenes). Schedules are available at http://bioloxia.uvigo.es/es/docencia/horarios

Sources of information
Basic Bibliography
R. Chang, **Química General**, 12ª Ed McGraw-Hiil, Madrid 2017,
R. H. Petrucci, **Química General**, 11ª Ed Person Educación, S. A. Madrid 2017,
Kenneth W. Whitten et al, **Química**, 10ª Ed México D.F. : Cengage Learning 2015,
R. Chang, **Chemistry**, 7ª ed New York : McGraw Hill Education 2002,
Complementary Bibliography
3D structures of biological molecules, http://www.biotopics.co.uk/JmolApplet/jcontentstable.html,

Recommendations

IDENTIFYING DATA

Bioloxía: Solo, medio acuático e clima

Subject	Bioloxía: Solo, medio acuático e clima			
Code	V02G031V01106			
Study programme	Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1	2c
Teaching language	Castelán			
Department	Bioloxía vexetal e ciencias do solo Ecoloxía e bioloxía animal			
Coordinator	Soto González, Benedicto			
Lecturers	Fernández Covelo, Emma Soto González, Benedicto Teira Gonzalez, Eva Maria			
E-mail	edbene@uvigo.es			
Web				
General description	O solo, xunto coa auga e o aire son os recursos máis importantes do medio natural xa que deles depende a vida sobre a terra. Estúdase a estrutura e a dinámica de cada un destes subsistemas terrestres, como son, como funcionan, así como a necesidade de comprender as súas interaccións complexas xa que son indispensables para un enfoque integral da calidade ambiental.			

Resultados de Formación e Aprendizaxe

Code	
A1	Que os estudantes demostrasen posuír e comprender coñecementos nunha área de estudo que parte da base da educación secundaria xeral, e adóitase atopar a un nivel que, aínda que se apoia en libros de texto avanzados, inclúe tamén algúns aspectos que implican coñecementos procedentes da vangarda do seu campo de estudo.
A3	Que os estudantes teñan a capacidade de reunir e interpretar datos relevantes (normalmente dentro da súa área de estudo) para emitir xuízos que inclúan unha reflexión sobre temas relevantes de índole social, científica ou ética.
B1	Desenvolver a aprendizaxe autónoma, identificando as súas propias necesidades formativas e organizando e planificando as tarefas e o tempo.
B2	Xestionar información científico-técnica de calidade utilizando fontes diversas. Analizar datos e documentos e interpretalos de forma crítica e rigorosa, incluíndo reflexións sobre a súa relevancia social e no ámbito profesional da Bioloxía.
B6	Desenvolver as capacidades de análises e síntese, de razoamento crítico e argumentación, aplicándoas en contextos propios da Bioloxía e outras disciplinas científico-técnicas.
C7	Muestrear, caracterizar, catalogar e xestionar recursos naturais e biolóxicos (poboacións, comunidades e ecosistemas).
C8	Describir, avaliar e planificar o medio físico, usar bioindicadores e identificar problemas ambientais. Achegar solucións para o control, seguimento e restauración dos ecosistemas.
D3	Comprometerse coa sustentabilidade e medio ambiente. Uso de forma equitativa, responsable e eficiente dos recursos.
D5	Comunicar de maneira eficaz e adecuada, incluíndo o uso de ferramentas dixitais e o inglés.

Resultados previstos na materia

Expected results from this subject	Training and Learning Results			
Comprender as propiedades do medio físico que soporta a vida dun modo integrado.	A1	B2 B6	C8	D3
Adquirir os coñecementos básicos sobre o medio edáfico, acuático, atmosférico e o clima e a súa transcendencia na Bioloxía.	A1 A3	B1 B2 B6	C7 C8	D3 D5
Comprender os conceptos de cambio global e cambio climático.	A3	B2 B6	C8	D3
Aplicar coñecementos e técnicas propios da materia en diferentes procesos relacionados coa xestión de recursos naturais.	A1 A3	B2	C7 C8	D3 D5
Comprender a proxección social do medio físico e a súa repercusión no exercicio profesional.	A3	B2	C8	D3 D5
Coñecer e manexar os conceptos, terminoloxía e instrumentación científico-técnica relativos á materia.	A1 A3	B1 B2 B6	C7 C8	D3 D5

Contidos

Topic

CLASES TEÓRICAS	CLASES TEÓRICAS
INTRODUCCIÓN	Tema 1. A Terra como sistema biofísico. Relacións entre os subsistemas terrestres.
SOLO	Tema 2. O solo como recurso medioambiental. Funcións do solo. Tema 3. Composición e organización do solo. Tema 4. Propiedades do solo. Tema 5. Edafoxénese: factores e procesos de formación. Tema 6. Tipoloxía de solos.
ATMOSFERA E CLIMA	Tema 7. A atmosfera: estrutura, composición e dinámica. Tema 8. Clima, Climatoloxía e Meteoroloxía. Tema 9. Elementos e factores do clima.
MEDIO ACUÁTICO	Tema 10. Ciclo da auga e recursos hídricos. Tema 11. Factores físico-químicos do medio acuático. Tema 12. Ambientes acuáticos: continentais e mariños.
MEDIO FÍSICO E CAMBIO GLOBAL	Tema 13. O solo como recurso non renovable. Degradación e conservación do solo. Tema 14. Cambio global e auga.
CLASES PRÁCTICAS	1. Descrición de solos no campo e métodos de mostraxe. 2. Caracterización de solos: composición e propiedades. 3. Balances hídricos. 4. Recollida de datos climáticos: caracterización e clasificación climática.

Planificación

	Class hours	Hours outside the classroom	Total hours
Lección maxistral	16	30	46
Prácticas de laboratorio	16	24	40
Seminario	3	12	15
Resolución de problemas de forma autónoma	0	2	2
Lección maxistral	14	30	44
Exame de preguntas obxectivas	2	0	2
Observación sistemática	0	1	1
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Metodoloxía docente

	Description
Lección maxistral	Explicación dos conceptos fundamentais do temario referente ao estudo do medio acuático e o clima co apoio de medios audiovisuais. Porase na plataforma Moovi toda a información da materia e o material didáctico utilizado durante as clases.
Prácticas de laboratorio	Estudo climático dunha zona e análise das características e propiedades dos solos. As prácticas son un complemento esencial das clases teóricas. Impartiranse no laboratorio e no campo e facilitarase un guion de cada unha delas. É obrigatoria a asistencia a todas as prácticas e a presentación dun informe/memoria.
Seminario	Casos prácticos relacionados co temario, resolución de exercicios etc... É obrigatoria a asistencia a todos os seminarios.
Resolución de problemas de forma autónoma	Exercicios de autoevaluación. Periodicamente poranse na plataforma MOOVI exercicios de autoevaluación co obxectivo de que o estudante evalúe os coñecementos adquiridos despois de estudar os temas.
Lección maxistral	Explicación dos conceptos referentes ao estudo dos solos co apoio de medios audiovisuais. Porase na plataforma Moovi toda a información da materia e o material didáctico utilizado durante as clases.

Atención personalizada

Methodologies	Description
Lección maxistral	Orientación e resolución de dúbidas sobre as actividades propostas ao longo do curso e sobre os conceptos teóricos da materia.
Prácticas de laboratorio	Orientación e resolución de dúbidas sobre o traballo de prácticas a desenvolver polos alumnos
Seminario	Orientación e resolución de dúbidas sobre os informes a desenvolver polos alumnos
Lección maxistral	

Avaliación

Description	Qualification	Training and Learning Results

Lección maxistral	Proba escrita (preguntas tipo test e/ou preguntas curtas) sobre os contidos fundamentais da materia referentes ao estudo do medio acuático e do clima	29	A1	B2	C7 C8	
Prácticas de laboratorio	Cuestionario sobre as prácticas. Avaliación do informe/memoria das prácticas realizadas. Valorarase a estrutura do traballo, contido, resultados obtidos, análise dos datos e interpretación de resultados.	24	A3	B1 B2	C7 C8	D3 D5
Seminario	Avaliarase a participación activa e os informes presentados	19	A3	B2 B6	C7 C8	D5
Lección maxistral	Proba escrita (preguntas tipo test e/ou preguntas curtas) sobre os contidos fundamentais da materia referente ao estudo dos solos	24	A1	B2	C7 C8	
Observación sistemática	Avaliarase a asistencia e participación activa durante as sesións presenciais da materia	4		B1 B6		D5

Other comments on the Evaluation

Os contidos da materia abarcan aspectos básicos sobre tres elementos do medio físico (solo, media acuático e clima) e a súa relación coa Bioloxía.

Na avaliación contínua a ponderación da materia é a seguinte: Solo (60%), Medio Acuático (20%) e Clima (20%). Cada unha das actividades valorarase nunha escala de 1 ao 10 que logo será ponderada para obter a puntuación final. A materia considerarase aprobada sempre que a nota final ponderada sexa igual ou superior a 5 e se obtuvese nas distintas probas escritas polo menos un 5. Copiar nas probas escritas ou nos informes supón a obtención de cero puntos na proba na que se copiou. Para que un alumno sexa cualificado como " Non Presentado" non ten que ser avaliado en ningunha proba escrita ao longo do curso.

Na convocatoria de xullo o alumno só terá que recuperar os módulos suspensos (cualificación módulo < 5). Non haberá posibilidade de repetir os informes das prácticas e seminarios pero os alumnos suspensos poderán recuperar esa parte mediante unha proba específica no exame. Os criterios de valoración serán os mesmos que para a primeira convocatoria. Os alumnos repetidores que teñan aprobadas as prácticas e os seminarios, non terán que repetilos de novo, conservándose nese caso a cualificación do curso anterior.

No caso de que o alumno opte pola **avaliación global,** deberá solicitar este tipo de avaliación no prazo indicado polo centro. Neste caso, realizará un exame do contido de toda a materia, mantendo na ponderación os porcentaxes por módulos empregados na evaluación contínua. Para poder aprobar mediante este tipo de avaliacion, o alumno deberá realizar obrigatoriamente as prácticas da materia.

Pódense consultar as datas dos exames no seguinte enlace: http://bioloxia.uvigo.es/gl/docencia/exames. Pódense consultar os horarios da materia no seguinte enlace: http://bioloxia.uvigo.es/gl/docencia/horarios

Bibliografía. Fontes de información

Basic Bibliography

BARRY RG & CHORLEY RJ, **Atmósfera, tiempo y clima**, 9788428211826, 7ª edición, Omega, 1999

DOBSON M & FRID C, **Ecology of Aquatic Systems.**, 9780199297542, 2th edition, Oxford University Press, 2009

ODUM EP, BARRET GW, **Fundamentos de Ecología**, 9789706864703, 5ª edición, Thomson, 2006

PORTA J, LOPEZ ACEVEDO M, POCH RM, **Edafología: Uso y protección del suelo**, 978-84-8476-661-2, 3ª edición, Mundi-Prensa, 2014

RODRÍGUEZ, J, **Ecología**, 9788436835915, 4ª edición, Pirámide, 2016

STRAHLER AN, STRAHLER AH, **Geografía física**, 9788428208475, 3ª edición, Omega, 1997

SMITH TM, SMITH RL, **Ecología**, 978-8478290840, 6ª edición, Pearson, 2007

Weil RR & Brady NC, **The nature and properties of soils**, 978-1-292-16223-2, 15th edition, Pearson Education, 2017

Dorronsoro C., **Curso: Introducción a la Edafología**, http://www.edafologia.net/introeda/tema00/progr.htm,

Ciclo hidrológico: págs 156-162; Ecosistemas marinos y de agua dulce: págs. 413-432, http://www.cengage.com/brookscole/, Thomson, 2006

Complementary Bibliography

LAL R, **Encyclopedia of Soil Science**, 978-1-4987-8699-7, Third Edition, Taylor & Francis, 2017

PORTA J, LOPEZ ACEVEDO M, ROQUERO, C, **Edafología para la agricultura y el medio ambiente.**, 84-7114-468-9, 3ª edición, Mundi-Prensa, 2003

García Navarro A., **Curso: Edafología. Universidad de Extremadura**, http://www.unex.es/edafo/,

Recomendacións

Subjects that continue the syllabus

Análise e diagnóstico medioambiental/V02G030V01902
Biodiversidade: Xestión e conservación/V02G030V01905

Contaminación/V02G030V01906
Xestión e conservación de espazos/V02G030V01910

Subjects that it is recommended to have taken before

Física: Física dos procesos biolóxicos/V02G031V01102
Xeoloxía: Xeoloxía/V02G031V01103
Química: Química aplicada á bioloxía/V02G031V01105

IDENTIFYING DATA				
Statistics: Biostatistics				
Subject	Statistics: Biostatistics			
Code	V02G031V01107			
Study programme	Grado en Biología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	2nd
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	Sánchez Rodríguez, María Estela			
Lecturers	Sánchez Rodríguez, María Estela			
E-mail	esanchez@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	English Friendly subject: International students may request from the teachers: a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.			

Training and Learning Results	
Code	
A2	Students should know how to apply their knowledge to their work or vocation in a professional way. They also should have the competences that are usually proved through the elaboration and defence of arguments and the resolution of problems within their study field.
A3	Students should prove ability for information-gathering and interpret important data (usually within their study field) to judge relevant social, scientific or ethical topics.
A4	Students should able to communicate information, ideas, issues and solutions to all audiences (specialist and unskilled audience).
B2	Manage scientific-technical information using diverse and reliable sources. Analyze data and documents and interpret them critically and rigorously, including considerations on their social relevance and in the professional field of Biology.
B4	Draft and write reports, documents and projects related to Biology. Proceed to their presentation and debate in the teaching and specialized areas, highlighting the competences of the degree.
B6	Develop analysis and synthesis, critical reasoning and argumentation skills, applying them in Biology and other scientific-technical disciplines.
C1	Solve problems by applying the scientific method, the concepts and terminology specific to biology, mathematical models and statistical and computer tools.
C12	Writing reports and technical dossiers, as well as directing and executing projects on topics related to biology and its applications.
D4	Collaborate and work in teams or multidisciplinary groups, promote negotiation skills and the ability to reach agreements.
D5	Communicate effectively and appropriately, including the use of computer tools and English.

Expected results from this subject	Training and Learning Results			
Present and interpret the main statistics of a data set.	A3		C1	
Study probability models		B2	C1	
Use random variables to model uncertainty.		B2	C1	
Identify the nature of the experimental variables for their subsequent analysis.	A4		C1	D4
Interpret hypothesis tests.	A2 A3	B4 B6	C12	
Use statistical techniques to perform biological analysis.	A2 A4	B4 B6	C1 C12	D4
Apply knowledge and technology related to statistics to design models of biological processes.	A3 A4	B4 B6	C1	D5
Obtain information, develop experiments and interpret the results.	A2 A3	B2 B6	C1 C12	D4 D5
To understand the social projection of Biostatistics and its repercussion in the professional practice of the biologist.	A2 A3 A4		C12	D4 D5
To know and handle the concepts, terminology and scientific-technical instrumentation related to statistical techniques.			C1 C12	D4

Contents	
Topic	
DATA EXPLORATORY ANALYSIS	Measures of central tendency, variability, skewness and kurtosis. Graphical representations. Biological variability. Linear and nonlinear transformations. Outliers and box plots. Mean and variance in subpopulations. Descriptive introduction to Anova.
PROBABILITY	Random experiments. Axiomatic definition of probability. Addition rule. Conditional probability. Total probabilities and Bayes' theorem. Independence of events. Assignment of probabilities. Applications: diagnostic test, relative risk and odds ratio.
MAIN DISTRIBUTIONS	Discrete and continuous random variables. Mean and variance. Main discrete and continuous distributions. Binomial and multinomial models. Other discrete models: hypergeometric, Poisson, negative binomial. Continuos models: Normal, log-normal, exponential, chi-square, t-student, F Fisher-Snedecor.
INTRODUCTION TO HYPOTHESIS TESTS. FREQUENCY TABLES: MEASURES AND TESTS	Introduction to hypothesis testing: type I error, type II error, significance level and p-value. Parametric and non-parametric statistical techniques. Tests for the mean and for the variance of a normal population. Confidence intervals. Frequency tables. Goodness-of-fit tests. Proportions, chi-square test. Independence and homogeneity tests. Normality test.
REGRESSION AND CORRELATION	Scatter plot. Least squares line. Correlation and determination coefficient. ANOVA and residual analysis. Other models: parabolic, exponential, potential. Introduction to multiple linear regression. Predictions.
INFERENCE TECHNIQUES TO COMPARE GROUPS	Comparisons between 2 groups. F test to compare variances. Student's t-test to compare means. Comparisons of more than 2 groups. ANOVA and multiple comparisons tests. Homogeneity of variances. Model hypothesis testing and alternative nonparametric techniques.
LABORATORY	EXCEL and open access software R: the Project for Statistical Computing

Planning			
	Class hours	Hours outside the classroom	Total hours
Seminars	5	12	17
Laboratory practical	15	12.5	27.5
Autonomous problem solving	0	33.5	33.5
Lecturing	28	30	58
Essay questions exam	2	12	14
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Seminars	Activities focused on working on specific topics of the program.
Laboratory practical	Use of statistical software to complement the theoretical classes and seminars.
Autonomous problem solving	Work with problems of the different topics.
Lecturing	Exposition of the theory of the corresponding topics, illustrated with exercises.

Personalized assistance	
Methodologies	**Description**
Autonomous problem solving	Any doubts that may arise at individual or group level will be answered. Students have a tutoring schedule.
Seminars	Any doubts that may arise at individual or group level will be answered. Students have a tutoring schedule.
Laboratory practical	Any doubts that may arise at individual or group level will be answered. Students have a tutoring schedule.

Assessment						
	Description	Qualification	Training and Learning Results			
Seminars	Written exam on topics 4, 5 and 6	30	A2 A3 A4	B2 B4 B6	C1	D4 D5

Laboratory practical	Data analysis with the statistical program R	30	A2 A3 A4	B2 B4 B6	C12	D5
Essay questions exam	Exam with exercises and questions on topics 1, 2 and 3.	40	A2 A3	B2	C1	

Other comments on the Evaluation

Continuous assessment system (AC first opportunity): 3 tests will be carried out throughout the course, with a weighting of 40% (Test of essay questions), 30% (Seminar Test) and 30% (Laboratory Test).

- AC qualification =0.4 Developmental questions test +0.3 Seminar test +0.3 Laboratory test.

In the case of not achieving a minimum mark of 5 points, the student will have to take the Final Examination:

- AC qualification =max{Final Exam, 0.5 Final Exam +0.5 Laboratory test}.

Continuous Assessment System (AC second opportunity):

- AC second opportunity qualification =max{Final Exam, 0.5 Final Exam +0.5 Laboratory test}.

Global assessment system (AG first and second opportunity):

- AG qualification = Final Exam

The calendar of final exams can be consulted at the following link: http://bioloxia.uvigo.es/es/docencia/examenes

Appointments for tutorials can be requested through the Online Secretaria or by filling in the form https://esanchez.webs8.uvigo.es/contacto/

Sources of information

Basic Bibliography

Mirás Calvo, M.A., Sánchez Rodríguez, E., **Técnicas estadísticas con hoja de cálculo y R. Azar y variabilidad en las ciencias naturales**, Servicio publicacións Universidad de Vigo, 2018

Complementary Bibliography

Delgado de la Torre, R., **Probabilidad y estadística para ciencias e ingenierías**, Delta, 2008
Devore, Jay L, **Probability and statistics for engineering and sciences**, Brooks/Cole, 2010
Susan Milton, J., **Estadística para Biología y Ciencias de la Salud**, Tercera, McGraw-Hill, 2007

Recommendations

Other comments

The timetable of the classes can be consulted at the following link:

http://bioloxia.uvigo.es/es/docencia/horarios/

IDENTIFYING DATA

Biology: Basic laboratory techniques

Subject	Biology: Basic laboratory techniques			
Code	V02G031V01108			
Study programme	Grado en Biología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	2nd
Teaching language	Spanish Galician			
Department				
Coordinator	Gil Martín, Emilio			
Lecturers	Barreal Modroño, M. Esther Covelo Fernández, Ana Gallardo Medina, Mercedes Gallego Veigas, Pedro Pablo Gil Martín, Emilio Lopez Patiño, Marcos Antonio Miguel Villegas, Encarnación de Míguez Miramontes, Jesús Manuel Pedrol Bonjoch, María Nuria San Juan Serrano, María Fuencisla			
E-mail	egil@uvigo.es			
Web				
General description	Experimental subject designed to reach specific skills of handling, extraction and processing of biological samples, as well as their morphological, structural, functional and analytical characterization in the laboratory. The acquisition of these scientific and technical specific competences will be achieved through the assimilation of scientific and technical knowledge and the development of instrumental routines of general application in experimental biology. Furthermore, they will also provide the students with essential skills (transversal competences), which are pivotal for understanding specific topics of subjects in subsequent courses.			

Training and Learning Results

Code	
A1	Students should prove understanding and knowledge in this study field that starts in the Secundary Education and with a level that, even though it is suppported in advanced books, also includes some aspects that involve knowledge from the vanguard of the study field.
A5	Students should develop the necessary learning skills to undertake further studies with a high degree of autonomy.
B1	Developing autonomous learning by identifying their own training need and organizing and planning tasks and time.
B3	Apply the knowledge acquired in the degree and use the scientific-technical instrumentation and CIT in contexts of Biology and/or related to the professional practice.
C1	Solve problems by applying the scientific method, the concepts and terminology specific to biology, mathematical models and statistical and computer tools.
C3	Perform and interpret molecular, physicochemical and biological analyses, including samples of human origin. Conduct assays and functional tests under normal and abnormal conditions.
C4	Isolate, identify and growth microorganisms, cells, tissues and organs, making easier their study and the assessment of their metabolic activity.
C10	Identify biological and biotechnological processes and their potential applications, in particular in health, agri-food and environmental fields.
D3	Commitment to sustainability and the environment. Equal, sensible and efficient use of resources.
D4	Collaborate and work in teams or multidisciplinary groups, promote negotiation skills and the ability to reach agreements.
D5	Communicate effectively and appropriately, including the use of computer tools and English.

Expected results from this subject

Expected results from this subject	Training and Learning Results			
Understanding the basic techniques for the collection, cultivation and breeding of living beings.	A1	B3	C4	D3
Understanding the basic techniques for obtaining and processing biological samples.	A1 A5	B3	C1 C10	D3 D4
To know and handle the basic techniques for observation, identification and analysis of biological samples.	A1 A5	B3	C1 C3 C10	D4 D5

Applying knowledge of Basic Laboratory Techniques to isolate, identify, handle and analyze specimens and samples of biological origin, including virus, as well as to characterize their cellular and molecular constituents.	A1 A5	B1 B3	C1 C3 C10	D3 D4 D5
Analyzing the functioning of living beings and interpret vital parameters.	A1 A5	B1 B3	C1 C3 C10	D4
To know and handle the concepts, terminology and scientific-technical instrumentation related to Basic Laboratory Techniques.	A1	B3	C1 C3	D3 D4 D5

Contents

Topic	
MODULE I. TECHNIQUES FOR THE PROCESSING AND OBSERVATION OF BIOLOGICAL SAMPLES	Unit 1. Fundamentals and types of optical microscopes and stereomicroscopy. Unit 2. Specimen fixation and inclusion. Unit 3. Fundamentals of microtomy. Types of microtomes and their handling. Unit 4. General staining techniques. Processing and observation of stained sections.
MODULE II. EXPERIMENTATION WITH MICROORGANISMS	Unit 1. Sterilization. Disinfection and asepsis. Unit 2. Elaboration of culture media. Unit 3. Culture of microorganisms and viruses. Unit 4. Biological risks.
MODULE III. EXPERIMENTATION WITH PLANTS IN THE LABORATORY	Unit 1. Germination. Unit 2. Plant cultivation. Unit 3. Analysis and interpretation of the results.
MODULE IV. EXPERIMENTATION WITH ANIMALS IN THE LABORATORY	Unit 1. Animals for research. Animal models and their basic characteristics. Unit 2. Legislation on experimentation with animals. Theoretical aspects about basic manipulation of living animals. Unit 3. Treatments administration and sampling in experimental animals.
MODULE V: PROCESSING AND ANALYTICAL TECHNIQUES OF BIOLOGICAL SAMPLES	Unit 1. Techniques for sample preparation. Unit 2. Techniques for sample separation I. Unit 3. Techniques for sample separation II. Unit 4. Techniques for sample analysis.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	16	32	48
Laboratory practical	38	52	90
Report of practices, practicum and external practices	0	1	1
Report of practices, practicum and external practices	0	1	1
Report of practices, practicum and external practices	0	1	1
Report of practices, practicum and external practices	0	1	1
Report of practices, practicum and external practices	0	1	1
Objective questions exam	2	5	7

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies

	Description

Lecturing	Teacher dissertation about the scientific concepts and technical guidelines needed for the acquisition of specific competences in manipulation, processing and analytical characterization of biological samples in the laboratory. The master sessions are complemented with individual and group activities to strengthen the more relevant learning objectives. Depending on the case, these activities may be carried out in the classroom or during the autonomous work time. All of them may be computed for evaluation.
Laboratory practical	Activities carried out in the laboratory. They involve the application to specific experimental goals of the knowledge and guidelines treated in the master sessions. In addition to the experimental work, laboratory practises include individual or group tasks aimed at promoting the acquisition of the specific and transversal competences of the subject. They can be performed either in the laboratory or as part of the student's autonomous work. Moreover, they will be computed for evaluation.

Personalized assistance

Methodologies	Description
Lecturing	The master sessions will be dynamical discussions open to the active participation of students, and incorporate test and other examination modalities to check the learning progress of each student and thus advise, if necessary, personalized reinforcement actions. It also contemplates the possibility of monitoring autonomous work or solving doubts arising by e-mail. On the other hand, it is established a reserve of 6 h/week/professor for tutoring and management of requests and/or learning problems they are encountering. The timetable of these tutorials will be announced by the responsible (coordinator) in the initial conference (Introductory activities) of the subject, and will be also available online, both in Moovi and the website of the Faculty.
Laboratory practical	Teachers will provide individualized attention to each student during laboratory practises, providing the support they need for a correct understanding of the experimental objectives, the methodology required or the specific techniques to be carried out. Once the experimental procedures have been completed, each student or work-group will be supervised and will receive ad hoc feedback based on the results obtained.

Assessment

	Description	Qualification	Training and Learning Results
Report of practices, practicum and external practices	CONTINUOUS ASSESSMENT MODULE I. The contents and skills acquired in the theoretical seminars and laboratory activities will be evaluated through the preparation of tests, which will be developed on the dates indicated in the four-month schedule. In addition, the systematic observation of students, their involvement, attitude and work quality will also be taken into account for evaluation. In case of not reaching a minimum score corresponding to 40%, the subject will be considered failed. The notes corresponding to the continuous evaluation will be made public by the staff within 15 days after the end of the teaching activity.	15	A1 B1 C1 D3 A5 B3 C3 D4 C4 D5 C10
Report of practices, practicum and external practices	CONTINUOUS ASSESSMENT MODULE II. The contents and skills acquired in the theoretical seminars and laboratory activities will be evaluated through the preparation of tests, which will be developed on the dates indicated in the four-month schedule. In addition, the systematic observation of students, their involvement, attitude and work quality will also be taken into account for evaluation. In case of not reaching a minimum score corresponding to 40%, the subject will be considered failed. The notes corresponding to the continuous evaluation will be made public by the staff within 15 days after the end of the teaching activity.	15	A1 B1 C1 D3 A5 B3 C3 D4 C4 D5 C10

Report of practices, practicum and external practices	CONTINUOUS ASSESSMENT MODULE III. The contents and skills acquired in the theoretical seminars and laboratory activities will be evaluated through the preparation of tests, which will be developed on the dates indicated in the four-month schedule. In addition, the systematic observation of students, their involvement, attitude and work quality will also be taken into account for evaluation. In case of not reaching a minimum score corresponding to 40%, the subject will be considered failed. The notes corresponding to the continuous evaluation will be made public by the staff within 15 days after the end of the teaching activity.	15	A1 B1 C1 D3 A5 B3 C3 D4 C4 D5 C10
Report of practices, practicum and external practices	CONTINUOUS ASSESSMENT MODULE IV. The contents and skills acquired in the theoretical seminars and laboratory activities will be evaluated through the preparation of tests, which will be developed on the dates indicated in the four-month schedule. In addition, the systematic observation of students, their involvement, attitude and work quality will also be taken into account for evaluation. In case of not reaching a minimum score corresponding to 40%, the subject will be considered failed. The notes corresponding to the continuous evaluation will be made public by the staff within 15 days after the end of the teaching activity.	5	A1 B1 C1 D3 A5 B3 C3 D4 C4 D5 C10
Report of practices, practicum and external practices	CONTINUOUS ASSESSMENT MODULE V. The contents and skills acquired in the theoretical seminars and laboratory activities will be evaluated through the preparation of tests, which will be developed on the dates indicated in the four-month schedule. In addition, the systematic observation of students, their involvement, attitude and work quality will also be taken into account for evaluation. In case of not reaching a minimum score corresponding to 40%, the subject will be considered failed. The notes corresponding to the continuous evaluation will be made public by the staff within 15 days after the end of the teaching activity.	20	A1 B1 C1 D3 A5 B3 C3 D4 C4 D5 C10
Objective questions exam	FINAL INTEGRATING TEST (FIT) The fundamental contents and aptitudes of the subject will be evaluated in an obligatory, written examination. By means of several types of questions and exercises, the degree to which each student, relating and integrating the theoretical and applied knowledge acquired in the different modules, is able solving a real experimental case, will be evaluated. If FIT's score does not reach the 40% of maximum, the subject will be considered suspended.	30	A1 B1 C1 D3 A5 B3 C3 D4 C4 D5 C10

Other comments on the Evaluation

CONTINUOUS EVALUATION

The academic calendar for the different modules and experimental groups, as well as the presentation of the subject by the coordinator can be consulted on the website of the Faculty (http://bioloxia.uvigo.es/en/teaching/timetables). The official dates for the Final Integrating Test of the different calls can also be consulted on the this website (http://bioloxia.uvigo.es/en/teaching/exams).

The continuous assessment itinerary requires thestudent to carry out ALL the learning and evaluation activities established ineach experimental module, unless justified absence by reasons officially established; illness or federated sport competitions. If this requirement is not reached, the student willbe governed by the global assessment system (see below). Cobsequently, attendance at all classrooms is MANDATORY to APPROVE THE SUBJECT .

The student suspended in TBL will receive as final score the lowest obtained in Continuous Assessment or Final Integrating Test.

In order to be evaluated as "Not presented", it will be necessary to have no evidence of attendance to the classes nor to have performed Continuous Assessment and Final Integrating Test tests.

The different modules that have been approved,will be kept for the academic year.

FINAL EVALUATION

Students who withdraw or do not meet the requirements for continuous assessment will be assessed by a **SINGLE EXAM** consisting of theoretical content and practical activities from all modules of the subject, to be carried out on the dates established in the official calendar.

Sources of information

Basic Bibliography

Bancroft, J.D. & Gamble, M., **Bancroft's theory and practice of histological techniques**, 7th, Churchill Livingstone-Elservier Corp, 2013

Madigan, M.T., Bender, K.S., Buckley, D.H., Sattley, W.M., Stahl, D.A., **Brock Biology of microorganisms**, 16th, Pearson Corp, 2022

Taiz, L. & Zeiger, E., **Plant Physiology**, 6th, Sinauer Associates, Inc., Publishers, 2015

Zúñiga, J., Tur J.A., Milocco, S.N. & Piñeiro R., **Ciencia y tecnología en protección y experimentación animal**, McGraw-Hill Interamericana, 2001

Hofmann, A. & Clokie, S., **Wilson and Walker's Principles and Techniques of Biochemistry and Molecular Biology**, 8th, Cambridge University Press, 2018

Complementary Bibliography

MÓDULO I,

Kiernan, J.A., **Histological and Histochemical Methods: Theory and Practice**, 4th, Scion Publishing, 2008

MÓDULO II,

Capuccino, J.G., Weish, C., **Microbiology. A laboratory manual**, 12th, Pearson, 2019

MÓDULO III,

Azcón-Bieto, J. & Talón, M., **Fundamentos de Fisiología Vegetal**, 2nd, McGraw-Hill Interamericana, 2008

MÓDULO IV,

Rodríguez Martínez J., Hernández Lorente MD. & Costa Ruiz J., **Introducción a la experimentación con animales**, Servicio de Publicaciones de la Universidad de Murcia, 2001

MÓDULO V,

Pingoud A., Urbanke C., Hoggett J. & Jeltsch A., **Biochemical methods**, Wiley□VCH, 2002

Recommendations

Subjects that continue the syllabus

Biochemistry I/V02G031V01201
Biochemistry II/V02G031V01206

Subjects that are recommended to be taken simultaneously

Biology: Basic field techniques/V02G031V01109
Statistics: Biostatistics/V02G031V01107

Subjects that it is recommended to have taken before

Physics: Physics of biological processes/V02G031V01102
Mathematics: Mathematics applied to Biology/V02G031V01104
Chemistry: Chemistry applied to biology/V02G031V01105

IDENTIFYING DATA				
Bioloxía: Técnicas básicas de campo				
Subject	Bioloxía: Técnicas básicas de campo			
Code	V02G031V01109			
Study programme	Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1	2c
Teaching language	Castelán Galego			
Department	Bioloxía vexetal e ciencias do solo Ecoloxía e bioloxía animal			
Coordinator	Serret Ituarte, Pablo			
Lecturers	García Moreiras, Iria Gomez Brandon, Maria Hernando Morales, Víctor Quintela Sabarís, Celestino Serret Ituarte, Pablo			
E-mail	pserret@uvigo.es			
Web				
General description	Aproximación metodológica aos estudos de campo en Bioloxía.			

Resultados de Formación e Aprendizaxe	
Code	
A3	Que os estudantes teñan a capacidade de reunir e interpretar datos relevantes (normalmente dentro da súa área de estudo) para emitir xuízos que inclúan unha reflexión sobre temas relevantes de índole social, científica ou ética.
A5	Que os estudantes desenvolvesen aquelas habilidades de aprendizaxe necesarias para emprender estudos posteriores cun alto grao de autonomía.
B1	Desenvolver a aprendizaxe autónoma, identificando as súas propias necesidades formativas e organizando e planificando as tarefas e o tempo.
B6	Desenvolver as capacidades de análises e síntese, de razoamento crítico e argumentación, aplicándoas en contextos propios da Bioloxía e outras disciplinas científico-técnicas.
C1	Resolver problemas aplicando o método científico, os conceptos e a terminoloxía específica da Bioloxía, os modelos matemáticos e as ferramentas estatísticas e informáticas.
C7	Muestrear, caracterizar, catalogar e xestionar recursos naturais e biolóxicos (poboacións, comunidades e ecosistemas).
D1	Comprender o significado e aplicación da perspectiva de xénero nos distintos ámbitos de coñecemento e na práctica profesional co obxectivo de alcanzar unha sociedade máis xusta e igualitaria.
D3	Comprometerse coa sustentabilidade e medio ambiente. Uso de forma equitativa, responsable e eficiente dos recursos.
D4	Colaborar e traballar en equipo ou en grupos multidisciplinares, fomentar a capacidade de negociación e de alcanzar acordos.
D5	Comunicar de maneira eficaz e adecuada, incluíndo o uso de ferramentas dixitais e o inglés.

Resultados previstos na materia				
Expected results from this subject	Training and Learning Results			
Recoñecer e describir o proceso de obtención de mostras no campo, desde o deseño da mostraxe até a recolección e conservación das mostras.	A3 A5	B1	C1 C7	D1 D3 D4 D5
Identificar, recoñecer e manexar a instrumentación aplicable a estudos de campo en estudos biolóxicos.	A3 A5		C7	
Interpretar e inferir o significado de distintos parámetros biolóxicos relacionados coa estrutura e funcionamento de poboacións, comunidades e ecosistemas.	A3 A5	B6	C1	D1 D3 D4 D5
Interpretar os datos de certos parámetros ambientais utilizados como *descriptores de ecosistemas.	A3 A5	B1 B6	C1 C7	D1 D3 D4 D5

Contidos
Topic

Descrición do medio.	Solos. Intermareal rochoso. Hidromorfología de ríos.
Toma de mostras no campo (deseño de mostraxes e métodos de extracción, recolección, transporte e conservación de mostras).	Determinación do tamaño de mostra estatístico. Abundancia de animais e algas no intermareal. Mostraxe de artrópodos en vexetación. Vexetación ripícola, bosque y matorral. Biomasa de produtores primarios acuáticos. Biodiversidade e distribución de especies. Mostraxe de invertebrados en solos. Mostraxe de macroinvertebrados en augas doces.
Manexo de diferentes tipos de sensores e sondas de campo.	Sondas multiparamétricas para medir variables físicoquímicas en ríos (pH, O2, Temperatura, conductividad). Correntímetros. Sensor PAR.
Manexo de guías, claves de identificación e material cartográfico.	Macroalgas. Invertebrados intermareales. Invertebrados terrestres. Vexetación ripícola, de bosque y matorral.
Estudos de demografía (observación, identificación, marcaxe e censos).	Tamaño poblacional (densidad y cobertura) de macroalgas y plantas.
Aplicación de biometría (medidas de lonxitude, perímetros, etc.).	Realizaranse medicións en distintas prácticas.

Planificación

	Class hours	Hours outside the classroom	Total hours
Lección maxistral	6	3	9
Seminario	2	0	2
Prácticas de campo	45	22	67
Informe de prácticas, prácticum e prácticas externas	0	48	48
Exame de preguntas obxectivas	2	16	18
Resolución de problemas e/ou exercicios	0	6	6

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Metodoloxía docente

	Description
Lección maxistral	Explicación de conceptos fundamentais de Botánica, Ecoloxía e Zooloxía e planificación do traballo de campo. Método científico e mostraxe en Botánica, Ecoloxía e Zooloxía.
Seminario	Cálculos, dúbidas e normas de redacción de informes.
Prácticas de campo	Saída aos distintos ecosistemas, observación e caracterización de comunidades, determinación de biomasa de distintos compartimentos tróficos, recolección de mostras e datos relativos aos organismos vivos e medio físico analizados.

Atención personalizada

Methodologies	**Description**
Prácticas de campo	O alumnado recibirá atención personalizada para calquera dúbida relativa ao cálculo de resultados e análises de datos.
Tests	**Description**
Informe de prácticas, prácticum e prácticas externas	O alumnado recibirirá atención presonalizada para calquera dúbida xurdida na realización da memoria de prácticas
Exame de preguntas obxectivas	O alumnado recibirá atención personalizada para calquera dúbida xurdida na preparación do exame.

Avaliación

	Description	Qualification	Training and Learning Results		
Lección maxistral	Avaliarase como parte do exame	5		B6 C1	D3 D5
Prácticas de campo	Valorarase o rigor no traballo realizado durante as saídas de campo e nas prácticas de laboratorio. Avaliarase como parte da Resolución de problemas e/ou exercicios.	5	A3	C1 C7	D1 D3 D4

Informe de prácticas, prácticum e prácticas externas	Avaliarase mediante memorias que introduzan, presenten, analicen e discutan os resultados obtidos durante o traballo de campo.	40	A3 A5		C1 C7	D1 D3 D4 D5
Exame de preguntas obxectivas	Avaliaranse os coñecementos adquiridos mediante un exame de preguntas curtas e resolución de casos.	35	A3 A5	B1 B6	C1	D5
Resolución de problemas e/ou exercicios	Avaliarase a resolución de exercicios baseados nos resultados obtidos no campo e laboratorio.	15	A3 A5	B1	C1	D4 D5

Other comments on the Evaluation

Os horarios da materia e calendarios de exames poden ser consultados na páxina web da Facultade:http://bioloxia.uvigo.es/é/docencia/horarios e http://bioloxia.uvigo.es/gl/docencia/exames.

AVALIACIÓN CONTINUA

A avaliación é continua ao longo do curso. Para poder ser avaliado/a de forma continua, o alumnado deberá realizar todas as actividades planificadas.

As prácticas de laboratorio son complementarias ás de campo, e avaliaranse conxuntamente con estas.

Para poder concurrir as probas de avaliación continua é obrigatoria a participación en polo menos o 80 % das prácticas.

Si un/unha estudante copia na proba teórica e/ou nos informes suspendará automaticamente dita proba nesa convocatoria.

2ª OPORTUNIDAD

O alumnado que non superase a materia en primeira convocatoria poderá ser examinado na parte suspensa na segunda convocatoria. Si non se supera a materia o matricularse de novo no seguinte curso, implicará repetir todas as actividades avaliables.

AVALIACIÓN GLOBAL

Os/as estudantes que renuncien a avaliación continua, poderán solicitar avaliación global no período establecido polo centro. Dicha avaliación levarase a cabo nas datas oficiais de primeira e segunda oportunidade.

Para poder concurrir as probas de avaliación global é obrigatoria a participación en polo menos o 80 % das prácticas.

As probas de evaluación global consistirán na entrega de informes de prácticas que introduzan, presenten, analicen e discutan os resultados obtidos durante o traballo de campo (50%) e de un examen de preguntas obxectivas (50%).

Bibliografía. Fontes de información

Basic Bibliography

Complementary Bibliography

Barrientos, J.A., **Curso práctico de entomología**, 1984

Bennet, D.P. & Humphries, D.A., **Introducción a la ecología de campo**, 1978

Campbell, A.C., **Guía de campo de la flora y fauna de las costas de España**, 1979

Castro, M. e outros, **Guía micolóxica dos ecosistemas galegos**, 2005

Castro, M. e outros, **Guía das árbores autóctonas e ornamentais de Galicia**, 2007

Chinery, M., **Guía de los insectos de Europa**, 2007

Díaz González, T.E e outros, **Curso de Botánica**, 2004

Font Quer, P., **Diccionario de Botánica**, 2009

García, X.R., **Guía das plantas de Galicia**, 2008

Otero, J. e outros, **Guía das macroalgas de Galicia**, 2002

Pérez Valcárcel, C e outros, **Guía dos liques de Galicia**, 2003

Samo Lumbreras, A.J. e outros, **Introducción práctica a la Ecología**, 2008

Sanson, G., **Atlante per il riconoscimento del macroinvertebrati dei cori d'acqua italiani**, 1992

Southwood, T.R.E. & Henderson, P., **Ecological methods**, 2000

Sutherland, W.J., **Ecological Census Techniques: A handbook**, 2006

Recomendacións

Subjects that continue the syllabus

Botánica I: Algas e fungos/V02G031V01202

Botánica II: Arquegoniadas/V02G031V01207

Zooloxía I: Invertebrados non artrópodos/V02G031V01205

Zooloxía II: Invertebrados artrópodos e cordados/V02G031V01210
Ecoloxía I/V02G031V01301
Ecoloxía II/V02G031V01306

Subjects that are recommended to be taken simultaneously

Bioloxía: Ferramentas informáticas en bioloxía/V02G031V01110
Bioloxía: Solo, medio acuático e clima/V02G031V01106
Bioloxía: Técnicas básicas de laboratorio/V02G031V01108

Other comments

1. Para un mellor desenvolvemento da materia, aconséllase LER CON ATENCIÓN a Guía Docente (metodoloxía e avaliación), así como as informacións presentadas en MOOVI de forma continua polo profesorado e/ou coordinador.

2. O material didáctico publicado en MOOVI, facilitará a comprensión das explicacións, mellorará a resolución de cuestións e dúbidas e permitirá rendibilizar o tempo das clases maxistrais, seminarios, prácticas e tutorías, polo que debe ser lido polo alumnado previamente á realización das prácticas. NON PREPARAR ANTES A PRÁCTICA IMPLICA QUE NON CONTABILICE A ASISTENCA Á MESMA, e a inasistencia ao 80 % das actividades implica non poder presentarse á materia nese ano académico.

3. No laboratorio é INDISPENSABLE o uso de bata e nas saídas ao campo, o calzado e a roupa serán ADECUADAS ás características da zona visitada e á climatoloxía do momento. O incumprimento destas normas implica non poder realizar a práctica correspondente e a inasistencia ao 80 % das actividades implica non poder presentarse á materia nese ano académico.

4. En prácticas de campo rexen as mesmas normas de comportamento que na aula e/ou no laboratorio.

IDENTIFYING DATA				
Biology: Informatic tools in biology				
Subject	Biology: Informatic tools in biology			
Code	V02G031V01110			
Study programme	Grado en Biología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	2nd
Teaching language	Spanish			
Department				
Coordinator	Carvajal Rodríguez, Antonio			
Lecturers	Carvajal Rodríguez, Antonio González Vázquez, Luis Daniel Rey Rodríguez, Iván Torres Palenzuela, Jesús Manuel Varela González, Sara			
E-mail	acraaj@uvigo.es			
Web				
General description	The aim of the subject is to enter to the student in the importance of the computational appearance in the modern Biology showing him a map of applications in the diverse fields of the same. The student will see and will practise examples that go from the use of teledetection, the systems of geographic information and mapping of territories, digital treatment of the image, the importance of the biological databases, etc. The student also will purchase notions on computer programming given his to current importance for the exert of the biologist to professional level and scientist.			

Training and Learning Results	
Code	
A1	Students should prove understanding and knowledge in this study field that starts in the Secundary Education and with a level that, even though it is suppported in advanced books, also includes some aspects that involve knowledge from the vanguard of the study field.
A3	Students should prove ability for information-gathering and interpret important data (usually within their study field) to judge relevant social, scientific or ethical topics.
A5	Students should develop the necessary learning skills to undertake further studies with a high degree of autonomy.
B1	Developing autonomous learning by identifying their own training need and organizing and planning tasks and time.
B4	Draft and write reports, documents and projects related to Biology. Proceed to their presentation and debate in the teaching and specialized areas, highlighting the competences of the degree.
C1	Solve problems by applying the scientific method, the concepts and terminology specific to biology, mathematical models and statistical and computer tools.
D1	Understand the meaning and use of the gender perspective in the different fields of knowledge and in professional practice with the aim of achieving a fairer and more equal society.
D2	Communicate speaking and in writing in Galician.
D3	Commitment to sustainability and the environment. Equal, sensible and efficient use of resources.

Expected results from this subject	Training and Learning Results			
Know handle tools of research of information in Biology.	A1 A3 A5	B4	C1	D1 D2 D3
Know handle databases and extract useful information.	A1 A3 A5	B4		D1 D2 D3
Know technicians of teledetection and analysis of image and his application for the study of ecosystems.	A1 A3 A5	B1 B4	C1	
Know basic technicians of systems of geographic information (GIS). Cartography, use of information georeferenced, vectorial analysis, environmental maps.	A1 A3 A5	B4	C1	
Know employ technicians of basic programming in Biology.	A1 A3 A5	B1 B4	C1	

Know tools for the analysis of data in Biology.	A1 A3 A5	B1 B4	C1	D1 D2 D3

Contents	
Topic	
Research of information in Biology.	Concept of database. Main biological databases. Applications of databases in biology. Creation and management of databases.
Technicians and physical principles of the teledetection.	Teledetection, spectrum EM, processes of interaction with the matter. Resolutions, orbits and sources of data of teledetection. Spectral behaviour of the covers, measurable parameters and indexes of interest in biology.
Visual and digital treatment of image.	Corrections, Improvements and Transformations
Systems of geographic information (*GIS).	Systems of Geographic Information, Systems of Coordinates and Projections. Conservation and management of the territory. GIS In R, vectorial formats and raster, operations with layers GIS.
Notions of programming.	The computer as a working tool in biology. Biology and the programming. What is to program? What is a programming language? Reasons for programming in Biology? Introduction to programming.
Free software for the programming and the treatment of data in Biology.	Tools for an open science

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	3	6	9
Lecturing	3	6	9
Lecturing	4	8	12
Practices through ICT	16	5	21
Practices through ICT	12	5	17
Practices through ICT	12	5	17
Problem solving	0	65	65
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Lecturing	Classes are organised in 50-minute sessions. In most cases they will be devoted to explaining basic concepts and methods. Due to time constraints, students will be asked to do autonomous work.
Lecturing	
Lecturing	
Practices through ICT	The aim of the practical sessions on the computer is to show some of the most important computational applications in Biology, as well as to introduce the student to basic aspects of database management and programming applied to Biology.
Practices through ICT	
Practices through ICT	
Problem solving	Problem solving and exercises complement and reinforce what has been seen in theoretical and practical classes. In the learning of the different uses of computer tools for Biology, problem solving is a very important pedagogical resource.

Personalized assistance	
Methodologies	**Description**
Problem solving	The student's learning process, which complements the lectures and practicals, will be carried out through the development of non face-to-face activities and through the Moovi distance learning platform. On this platform the student will find some of the following resources: the material with the presentations of the theory classes, complementary readings, useful documents to study and complete the theory classes, the practice scripts, lists of problems and exercises to be completed in a given period of time, and self-assessment exams. The lecturers will set aside time to attend to and resolve students' doubts, both for the lectures and for the practical classes. In these activities, the teacher's function is to orient and guide the students' learning process and help them to successfully complete the corresponding autonomous work. On the first days of class, the teaching staff indicate the procedure for carrying out this personalised attention.

Assessment			
	Description	Qualification	Training and Learning Results

Lecturing	- Examination block 1 (TD) - Attendance to the face-to-face activities	14	A1 A3 A5	B1	C1	D1 D2 D3
Lecturing	- Examination block 2 (R) - Attendance to the face-to-face activities	13	A1 A3 A5	B1	C1	D1 D2 D3
Lecturing	- Examination block 3 (Python) - Attendance to the face-to-face activities	13	A1 A3 A5	B1	C1	D1 D2 D3
Practices through ICT	Teledetection (TD): - Attendance and achievement - Examination - Report -Resolution of problems/exercises	20	A1 A3 A5	B1 B4	C1	D1 D2 D3
Practices through ICT	R: - Attendance and achievement - Examination - Report -Resolution of problems/exercises	20	A1 A3 A5	B1 B4	C1	D1 D2 D3
Practices through ICT	Python: - Attendance and achievement - Examination - Report -Resolution of problems/exercises	20	A1 A3 A5	B1 B4	C1	D1 D2 D3

Other comments on the Evaluation

The subject consists of three differentiated thematic blocks, which constitute per se important tools for the performance of modern Biology:

Thematic block-1: Remote sensing and geographic information systems (TD)

Thematic block-2: Data analysis and R programming language

Thematic block-3: Introduction to programming with Python

CONTINUOUS ASSESSMENT

It is the default evaluation mode. The detailed evaluation is:

Master lesson:

Face-to-face exam block 1: 14%

Face-to-face exam block 2: 13%

Face-to-face exam block 3: 13%

Assistance to face-to-face activities

ICT-supported practices:

Block 1: 20%

Block 2: 20%

Block 3: 20%

Attendance and use

Memory

Problem solving and exercises

Presentation of exercises on the virtual platform within the established period

Control at the end of each practice

Final exam

To pass the subject it is necessary

1) Obtain a minimum final grade of 4 out of 10 (40%) in each block, both in its practical part and in the final exam. If the minimum of each block is not exceeded, the subject will not be approved.

2) Attendance at all face-to-face activities (including practices) is MANDATORY to PASS the subject, except duly justified absence for any of the officially considered reasons for exemption (illness or federated sports commitments).

3) In the practical part, the student must take a test at the end of each practice of each group. Passing this test (or completing a project if the teacher so decides because the student has not passed the practical part) will be necessary to pass the subject in addition to the final exam. The practical part (attendance to practices plus passing the test or work if applicable) will account for 20% of the total final mark in each block.

4) The final exam is broken down into three independent tests, one per block, and each block accounts for 13% (14% in block 1) of the final grade, and it is necessary to obtain a minimum of 5 points out of 10 in said exam.

5) If, and only if, the minimum grade for each block has been exceeded, the final grade for the subject is calculated as the weighted average of the grades for each block according to the formula:

FIB final mark = block 1 (0.2 practical note + 0.14 exam) + block 2 (0.2 practical note + 0.13 exam) + block 3 (0.2 practical note + 0.13 exam).

If the minimum grade is not reached in any block, the final grade is failed.

That is to say, the minimum mark of each block must be reached to calculate the final mark in the indicated way. Note that the delivery of the memory, work and / or practical exercises required by the teacher in each block is mandatory so that the non-presentation of it prevents passing the subject (the minimum grade per block will not be reached).

Students who do not take the final exam will be recorded as Not Present.

Second opportunity

All grades, except for the final exam, will be saved for the second chance in July. Therefore, if a student has not completed the practical part (does not reach the minimum grade) they will not be able to pass the second chance exam. In the case of the final exam, if a student has passed a block, it is at the discretion of the teacher to save the note for the second opportunity. In any case, the student can always present himself to raise the grade.

GLOBAL EVALUATION

The request for this evaluation option must be submitted at the time and in the manner determined by the Center, which will be published prior to the academic start.

Given the experimental nature of all the activities, attendance at them is mandatory to be eligible for this evaluation option.

Failure to attend practices, compulsory classes and seminars, without justified cause, invalidates this possibility, as well as the opportunity for extraordinary evaluation (2nd opportunity).

In the case of the global exam, if the student has attended all the activities. The overall test is divided into two parts for each thematic block: a practical part (60% of the mark) and a theoretical part (40%) of the mark.

OTHER CONSIDERATIONS

Any attempt to carry out illegal activities in the exams (copying, etc.), as well as plagiarism in the activities carried out will result in a failing in the matter.

TEACHING TIMETABLE: http://bioloxia.uvigo.es/es/docencia/horarios

EXAM TIMETABLE: http://bioloxia.uvigo.es/es/docencia/examenes

TIPS TO FACILITATE THE SUBJECT

1) For a better development of the subject, it is advisable to CAREFULLY READ the Teaching Guide (methodology and evaluation), as well as the information presented on the Moovi platform continuously by the teaching staff and/or coordinator.

2) The didactic material published on the Moovi platform will facilitate the understanding of the explanations, will improve the resolution of questions and doubts and will make it possible to make profitable the time of the master classes, practices and tutorials, so it must be read by the student.

Sources of information

Basic Bibliography

Emilio Chuvieco, **Teledetección ambiental : la observación de la Tierra desde el espacio**, 2010

Hoboken, NJ, **QGIS and generic tools**, John Wiley and Sons, Inc, 2018

Hadley Wickham and Jenny Bryan, **R-packages**, O Reilly, 2015

Complementary Bibliography

David Roldán Martínez, **Bioinformática. El ADN A Un Solo Clic**, 2015

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Dr. Martin Jones, **Python for Biologists: A complete programming course for beginners**, 2013

Paruelo, J.M, **La caracterización funcional de ecosistemas mediante sensores remotos**, Ecosistemas 17(3):4-22, 2008

Kerr, J., Ostrovsky, M, **From space to species: ecological applications for remote sensing**, Trends in Ecology and Evolution 18:299-305, 2003

Rodríguez-Sánchez, F., Pérez-Luque, A.J. Bartomeus, I., Varela, S, **Ciencia reproducible: qué, por qué, cómo.**, Ecosistemas 25(2): 83-92. Doi.: 10.7818/ECOS.2016., 2016

Carey MA, Papin JA., **Ten simple rules for biologists learning to program**, Computational Biology 14:e1005871, 2018

Himelblau E., **A cartoon guide to bioinformatics by a novice coder.**, Nature [Internet]. Available from: https://www.nat, 2021

Recommendations

Subjects that are recommended to be taken simultaneously

Statistics: Biostatistics/V02G031V01107

Subjects that it is recommended to have taken before

Biology: Evolution/V02G031V01101
Physics: Physics of biological processes/V02G031V01102
Geology: Geology/V02G031V01103
Mathematics: Mathematics applied to Biology/V02G031V01104

IDENTIFYING DATA

Biochemistry I

Subject	Biochemistry I			
Code	V02G031V01201			
Study programme	Grado en Biología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2nd	1st
Teaching language	Spanish			
Department				
Coordinator	Suárez Alonso, María del Pilar			
Lecturers	Suárez Alonso, María del Pilar			
E-mail	psuarez@uvigo.es			
Web	http://moovi.uvigo.es			
General description	The subject Biochemistry aims to provide students with basic knowledge about the structure and function of biomolecules, as well as their corresponding routes of biosynthesis and degradation. It also enables them to analyze and identify biomolecules.			

Training and Learning Results

Code	
A1	Students should prove understanding and knowledge in this study field that starts in the Secundary Education and with a level that, even though it is suppported in advanced books, also includes some aspects that involve knowledge from the vanguard of the study field.
A2	Students should know how to apply their knowledge to their work or vocation in a professional way. They also should have the competences that are usually proved through the elaboration and defence of arguments and the resolution of problems within their study field.
A3	Students should prove ability for information-gathering and interpret important data (usually within their study field) to judge relevant social, scientific or ethical topics.
B2	Manage scientific-technical information using diverse and reliable sources. Analyze data and documents and interpret them critically and rigorously, including considerations on their social relevance and in the professional field of Biology.
B3	Apply the knowledge acquired in the degree and use the scientific-technical instrumentation and CIT in contexts of Biology and/or related to the professional practice.
B6	Develop analysis and synthesis, critical reasoning and argumentation skills, applying them in Biology and other scientific-technical disciplines.
C3	Perform and interpret molecular, physicochemical and biological analyses, including samples of human origin. Conduct assays and functional tests under normal and abnormal conditions.
C4	Isolate, identify and growth microorganisms, cells, tissues and organs, making easier their study and the assessment of their metabolic activity.
C6	Understanding and integrate the functioning of living beings (cellular, tissue, organ and individual level), explaining their homeostatic and adaptive responses.
D1	Understand the meaning and use of the gender perspective in the different fields of knowledge and in professional practice with the aim of achieving a fairer and more equal society.
D2	Communicate speaking and in writing in Galician.
D3	Commitment to sustainability and the environment. Equal, sensible and efficient use of resources.
D4	Collaborate and work in teams or multidisciplinary groups, promote negotiation skills and the ability to reach agreements.

Expected results from this subject

Expected results from this subject	Training and Learning Results			
Recognize the structure, properties and function of biomolecules.	A1 B2 B3 B6	C3	D1 D2	
Understand and know the fundamentals of bioenergetics.	A1 A2 A3	B2 B3 B6	C3 C6	D1 D2
Identify the mechanisms of action and regulation of enzymes.	A1 A2 A3	B2 B3 B6	C3 C4 C6	D1 D2
Know the general organization of metabolism.	A1 A2 A3	B2 B3 B6	C3 C4 C6	D1 D2
Apply biochemical knowledge to isolate, identify, handle, and analyze specimens and samples of biological origin, including viruses, as well as to characterize their cellular and molecular constituents.	A1 A2 A3	B2 B3 B6	C3 C4 C6	D1 D2

Apply knowledge and technology related to biochemistry in aspects related to the production, exploitation, analysis and diagnosis of biological processes and resources.	A1 A2 A3	B2 B3 B6	C3 C4 C6	D1 D2 D3
Contrast information, develop experiments and interpret results.	A1 A2 A3	B2 B3 B6	C3 C6	D1 D2
Understand the social projection of biochemistry and its repercussions on professional practice, as well as know how to use its contents for teaching and dissemination.	A1 A2 A3	B2 B3 B6	C6	D2 D4
Handle the concepts, terminology and scientific-technical instrumentation related to biochemistry.	A1 A2 A3	B2 B3 B6	C3 C4 C6	

Contents

Topic	
(*)Topic 1. Introduction to Biochemistry	(*) Inorganic components of living organisms. Nature of molecular interactions. The role of water in biological processes: ionic product of water and the concept of pH. Ionic balance: Henderson-Hasselbalch equation, pKa concept and buffer solutions. Ionic strength concept.
(*) Topic 2: amino acids and peptides	(*) Amino acids : structure and classification. the peptide bond. Natural peptides of biological interest
(*) Topic 3: Proteins	(*) General concepts. Main functions of proteins. Levels of structural organization of proteins.
(*) Topic 4: Enzymes and enzymatic catalysis	(*) Enzymes: concept and chemical nature. Active center concept. Nomenclature and classification of enzymes. Enzymatic catalysis: concepts and mechanisms.
(*) Topic 5: Enzymatic catalysis	(*) Kinetics of enzymatic reactions. Kinetics of allosteric enzymes. Other mechanisms of modulation of enzymatic activity.
(*) Topic 6: Structure and properties of monosaccharides	(*) Monosaccharides: aldoses and ketoses. linear structure. Cyclic structure and spatial conformations. Monosaccharides of biological interest.
(*) Topic 7: Oligosaccharides and polysaccharides	(*) General characteristics, properties and structure of the main oligosaccharides, polysaccharides and heterosides.
(*) Topic 8: Simple and complex lipids, and isoprenoids.	(*) General characteristics and biological importance of lipids. General ranking. Fatty acids and alcohols. simple lipids. complex lipids. Isoprenoid lipids.
(*) Topic 9: Nucleotides: structure and function	(*) Purine and pyrimidine bases. Structure and function of nucleosides and nucleotides.
(*) Topic 10. Introduction to metabolism	(*) Metabolism concept. General characteristics of metabolic pathways. Anabolic, catabolic and amphibolic pathways. General aspects of metabolic regulation.
(*) Topic 11. Carbohydrate Catabolism	(*) Glycolysis: description of enzymatic reactions. Incorporation of other monosaccharides to the glycolytic pathway. Pentose phosphate pathway: general concepts and biological significance.
(*) Topic 12. Metabolic fates of pyruvate	(*) Anaerobic destination: alcoholic and lactic fermentation. Aerobic fate: formation of acetyl-CoA by oxidative decarboxylation. Study of the pyruvate dehydrogenase enzyme complex.
(*) Topic 13.Cycle of tricarboxylic acids.	(*) Position of acetyl-CoA in intermediary metabolism. Overview of the cycle and sequence of reactions.
(*) Topic 14. Electronic transport chain and oxidative phosphorylation.	(*) Shuttle systems. Electronic transport chain: components, location and sequence of electronic transport. Oxidative phosphorylation and coupling to electron transport. ATP synthase enzyme complex.
(*) Topic 15. Gluconeogenesis.	(*) Gluconeogenesis: overview and main substrates. Description of the route. Specific reactions of gluconeogenesis.
(*) Topic 16. Glycogen metabolism	(*) Degradation of dietary glycogen. Lysosomal breakdown of glycogen. Glycogenolysis: enzymatic reactions. Glycogenogenesis: enzymatic reactions.
(*) Topic 17. Degradation of lipids and fatty acids.	(*) Digestion, absorption and transport of dietary lipids and endogenous lipids. Activation and intracellular transport of fatty acids. The beta-oxidation of saturated fatty acids with an even number of carbon atoms. Cetogenesis.
(*) Topic 18. Biosynthesis of fatty acids and lipids	(*) Biosynthesis of saturated fatty acids. Acetyl-CoA carboxylase reaction. Fatty acid synthase enzyme complex. Biosynthesis of the alcoholic components of lipids and triacylglycerols.

(*) Topic 19. Proteolysis, amino acid degradation and fate of the ammonium ion	(*) Digestion of dietary proteins. intracellular proteolysis. Overview of amino acid catabolism. Transamination and deamination. Decarboxylation reactions. Fate of the carbon skeleton of amino acids. Forms of ammonium nitrogen excretion. Urea cycle: enzymatic reactions.
(*) Topic 20. Biosynthesis of amino acids	(*) Nitrogen cycle in nature. Incorporation of the ammonium ion in amino acids: glutamate and glutamine pathways. Study of the different biosynthetic families.
(*) Topic 21. Nucleotide metabolism	(*) General aspects of the catabolism of nucleic acids and nucleotides. Degradation of purine and pyrimidine nucleotides. Biosynthesis of ribonucleotides and deoxynucleotides
PROGRAM OF PRACTICAL CLASSES PRACTICE 1	Elaboration of a serum albumin standard line by the Lowry method.
PRACTICE 2	Determination of protein concentration in rat liver supernatant.
PRACTICE 3	Determination of beta-D-galactosidase activity in rat liver supernatant. Calculation of the enzymatic activity (U/min ml) taking into account the molar extinction coefficient of p-nitrophenol of the previous enzyme. Calculation of the specific activity (U/mg protein) of the above enzyme.
PRACTICE 4	Determination of the optimal pH of beta-D-galactosidase activity.
PRACTICE 5	Effect of substrate concentration on beta-D-galactosidase activity. Calculation of kinetic parameters.

Planning

	Class hours	Hours outside the classroom	Total hours
Laboratory practical	10	10	20
Lecturing	35	52.5	87.5
Seminars	3	4.5	7.5
Objective questions exam	1	14	15
Essay questions exam	2	18	20

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies

	Description
Laboratory practical	They will take place in the Biochemistry teaching laboratory. Attendance to the practical classes is compulsory. During the practical sessions, students will follow a practical script prepared by the lecturer to develop the experimental protocols. During the course of the practicals, students must present the results obtained and answer a series of questions. At the end of the practicals, they must write a report on them
Lecturing	The lecturer will explain the contents of the subject in lectures, with slide projections. Students will be provided with supporting copies of figures, diagrams and tables. The classes will be developed interactively with the students. The Moovi platform will be used as a support tool.
Seminars	In the seminars, students will deal with topics under the supervision of the teacher and will solve questionnaires on the material explained in the theoretical classes.

Personalized assistance

Methodologies	**Description**
Lecturing	In order to resolve any doubts that may arise in relation to the lectures, students have at their disposal personal tutorials that will take place in the teacher's office PILAR SUÁREZ ALONSO (office 9, 3rd floor, Block B, Experimental Sciences Building).
Laboratory practical	The small size of the practical groups allows for personalized attention from the lecturer. Students will also have at their disposal personal tutorials that will take place in the teacher's office PILAR SUÁREZ ALONSO (office 9, 3rd floor, Block B, Experimental Sciences Building).
Seminars	To resolve any doubts that may arise in relation to the seminars, students have at their disposal personal tutorials that will take place in the teacher's officePILAR SUÁREZ ALONSO (office 9, 3rd floor, Block B, Experimental Sciences Building).
Tests	**Description**
Objective questions exam	To resolve any doubts that may arise during the preparation for the written exam, students have personalized tutorials available to them that will take place in the office of Professor PILAR SUÁREZ ALONSO (office 9, 3rd floor, Block B, Experimental Sciences Building).
Essay questions exam	To resolve any doubts that may arise during the preparation for the written exam, students have personalized tutorials available to them that will take place in the office of Professor PILAR SUÁREZ ALONSO (office 9, 3rd floor, Block B, Experimental Sciences Building).

Assessment			
	Description	Qualification	Training and Learning Results
Laboratory practical	Attendance is mandatory. The teacher will assess the experimental results, the student's responses and the conclusions about the experimentation carried out by presenting a practical report, which will account for 20% of the final grade for the Biochemistry I subject. It is essential to obtain a minimum score of 5 out of 10 in this section in order for it to count towards the final mark. In the event of failure, the student may review the report within the timeframe indicated by the teacher. This activity is not recoverable in the second opportunity (July) if the minimum required is not reached.	20	A1 B2 C3 D3 A2 B3 C4 D4 A3 B6 C6
Seminars	During the academic year, two seminars of 1.5 hours each will be programmed. Knowledge of the topics covered will be evaluated by solving exercises, which will be delivered on the date indicated by the teacher. Attendance at the seminars as well as the delivery of the corresponding exercise is mandatory. To pass this activity it is essential to have a 5 out of 10 to be able to weigh the final grade with the rest of the sections.In the event of failure, the student may review the exercises within the timeframe indicated by the teacher. This activity is not recoverable in the second opportunity (July) if the minimum required is not reached.	20	A1 B2 C6 D1 A2 B6 D3 A3
Objective questions exam	There will be a first written test corresponding to Structural Biochemistry (items 1-9). This test will consist of multiple choice questions and an exercise. It is essential to obtain a minimum score of 5.0 out of 10 to be able to weigh with the rest of the sections. This grade will account for 25% of the final grade.	25	A1 B2 C3 D1 A2 B6 C4 D2 A3 C6
Essay questions exam	There will be a second written test corresponding to Metabolic Biochemistry (items 10-21). This test will consist of multiple choice questions and a metabolism integration question that includes the calculation of energy output (ATP). It is essential to obtain a minimum score of 5.0 out of 10 to be able to weigh with the rest of the sections. This grade will account for 35% of the final grade.	35	A1 B2 C3 D1 A2 B3 C4 D2 A3 B6 C6

Other comments on the Evaluation

The assessment of the subject ***Biochemistry I*** is **continuous** throughout the academic year. To follow this system, the student must complete all proposed activities: laboratory practices, seminars, and two written exams.

Any specific situation that prevents participation in the laboratory practices or seminars (such as illness, employment contract, etc.) must be communicated to the instructor as soon as possible, in order to find an appropriate solution.

Attendance at seminars and laboratory practices is mandatory. Only one absence is allowed, which must be properly justified.

To **pass BIOCHEMISTRY I in the first examination session (January)**, it is necessary to obtain a minimum score of **5.0 out of 10** in **each** of the assessable activities. The final grade will be the sum of the weighted scores, but **only** if the minimum required grade is achieved in all components. Otherwise, the scores will not be added, and the grade recorded in the Biochemistry I transcript (January) will be the **highest weighted score obtained among the failed components**.

CONDITIONS FOR THE SECOND EXAMINATION SESSION (JULY)

Grades equal to or higher than the required minimum (5.0 out of 10) obtained in the first session (January) will be retained for the second session (July). Laboratory practices and seminars **cannot** be retaken in July; only the written exams that did not meet the minimum requirement in January may be retaken.

If the student did not pass both written exams in the first session (January), they must take a comprehensive exam in July. In this case, the final written exam will account for **60% of the final grade**, and will be considered passed if a minimum score of **5.0 out of 10** is achieved.

The final grade for Biochemistry I in this second session (July) will be the sum of the weighted grades of all assessable activities, **provided** that the minimum required score has been obtained in each of them. If the student fails to reach the required minimum in seminars or laboratory practices, this must be compensated with a higher score in the final written exam.

Failure to attend **all** assessable activities will automatically result in a **"Not Presented"** in the Biochemistry I transcript for both sessions (January and July). Conversely, completing **some but not all** assessable activities will result in a **fail** in both sessions.

If the student prefers to follow a **global assessment**, they must request it within the period established by the Dean's Office of the Biology Faculty. The global exam will include questions on laboratory practices, seminar exercises, and the entire theoretical content. However, **participation in laboratory practices is mandatory**, excluding the submission of the lab report. Students who do not carry out the laboratory practices will **not** be allowed to realize the final theoretical exam.

Students who do not pass Biochemistry I in either of the two sessions will have their grades for **laboratory practices and seminars** retained for the **following two academic years**, **provided** they have obtained the minimum required scores. Only failed components must be repeated. Approved activities **cannot** be reassessed.

The academic calendar can be consulted at the following link: http://bioloxia.uvigo.es/gl/docencia/horarios
The exam schedule can be consulted at the following link: http://bioloxia.uvigo.es/gl/docencia/exames
Dates of the final exams: http://bioloxia.uvigo.es/es/docencia/examenes

Sources of information

Basic Bibliography

STRYER, L.; BERG, J.M.; TYMOCZKO, J.L., **Bioquímica. Curso básico**, 1ª Edición, Reverté, 2014

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José Mª Teijón Rivera y col., **Fundamentos de la Bioquímica estructural**, 3ª Edición, Tebar, 2016

MATHEWS, C.K.; VAN HOLDE, K.E; APPLING, D.R. & ANTHONY-CAHILL, S.J., **Bioquímica**, 4ª Edición, Pearson, 2013

José Mª Teijón Rivera y Mª Dolores Blanco Gaitán, **Fundamentos de la Bioquímica metabólica**, 4ª edición, Tebar, 2016

Complementary Bibliography

Recommendations

Subjects that it is recommended to have taken before

Biology: Basic laboratory techniques/V02G031V01108
Physics: Physics of biological processes/V02G031V01102
Chemistry: Chemistry applied to biology/V02G031V01105

IDENTIFYING DATA				
Botánica I: Algas e fungos				
Subject	Botánica I: Algas e fungos			
Code	V02G031V01202			
Study programme	Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2	1c
Teaching language	Castelán			
Department	Bioloxía vexetal e ciencias do solo			
Coordinator	García Molares, Aida			
Lecturers	García Molares, Aida			
E-mail	molares@uvigo.es			
Web				
General description	- Introducción á Botánica - Sistemática, taxonomía e nomenclatura vexetal - Niveis de organización vexetal - Reproducción en vexetais. Ciclos biolóxicos - Biodiversidade de fungos, pseudofungos e algas - Simbiose fúnxicas - Aplicacións das algas e dos fungos. Usos e utilidade como bioindicadores			

Resultados de Formación e Aprendizaxe	
Code	
A1	Que os estudantes demostrasen posuír e comprender coñecementos nunha área de estudo que parte da base da educación secundaria xeral, e adóitase atopar a un nivel que, aínda que se apoia en libros de texto avanzados, inclúe tamén algúns aspectos que implican coñecementos procedentes da vangarda do seu campo de estudo.
A5	Que os estudantes desenvolvesen aquelas habilidades de aprendizaxe necesarias para emprender estudos posteriores cun alto grao de autonomía.
B1	Desenvolver a aprendizaxe autónoma, identificando as súas propias necesidades formativas e organizando e planificando as tarefas e o tempo.
B4	Elaborar e redactar informes, documentos e proxectos relacionados coa Bioloxía. Proceder á súa presentación e debate no ámbito docente e especializado, poñendo de manifesto as competencias da titulación
C1	Resolver problemas aplicando o método científico, os conceptos e a terminoloxía específica da Bioloxía, os modelos matemáticos e as ferramentas estatísticas e informáticas.
C2	Recoñecer os niveis de organización dos seres vivos mediante o estudo de especímenes actuais e fósiles. Realizar análise filoxenéticos e interpretar os mecanismos da herdanza, a evolución e a biodiversidade.
C7	Muestrear, caracterizar, catalogar e xestionar recursos naturais e biolóxicos (poboacións, comunidades e ecosistemas).
C9	Identificar recursos de orixe biolóxica e valorar a súa explotación eficiente e sostible para obter produtos de interese. Propoñer e implantar melloras nos sistemas produtivos.
D1	Comprender o significado e aplicación da perspectiva de xénero nos distintos ámbitos de coñecemento e na práctica profesional co obxectivo de alcanzar unha sociedade máis xusta e igualitaria.
D5	Comunicar de maneira eficaz e adecuada, incluíndo o uso de ferramentas dixitais e o inglés.

Resultados previstos na materia		
Expected results from this subject	Training and Learning Results	
Comprender os tipos e niveis de organización vexetal.	A1	C2 C9
Coñecer a diversidade de fungos e algas.		C1 C7 C9
Identificar os ciclos biolóxicos de cada un dos grupos.	A1	
Comprender as interaccións entre especies vexetais e o medio.	A1	C2 C7 C9
Coñecer as adaptacións ao medio dos vexetais.	A1	C2 C7 C9
Analizar e interpretar o comportamento das algas e os fungos e a súa adaptación ao medio.	A1 A5	C7
Aplicar coñecementos e técnicas propios da Botánica (algas e fungos) en diferentes procesos relacionados coa xestión do medio ambiente.		C1 C9

Aplicar coñecementos e tecnoloxía relativos á Botánica (algas e fungos) en aspectos relacionados coa produción, explotación, análise e diagnóstico de procesos e recursos biolóxicos.	A5	B4	C9	
Obter información, desenvolver experimentos e interpretar os resultados.		B4	C7	
Comprender a proxección social da Botánica e a súa repercusión no exercicio profesional, así como saber utilizar os seus contidos para impartir docencia e a divulgación.		B1 B4		D1 D5
Coñecer e manexar os conceptos, terminoloxía e instrumentación científico-técnica relativos á Botánica.	A5	B1	C1	
Desenvolver temas sobre as posibles aplicacións das algas e os fungos e presentalos publicamente.		B4		D5

Contidos	
Topic	
Lección 1- Lección 1- A Botánica como ciencia.	A Botánica e o seu obxecto de estudo. Antecedentes históricos. Plantas non vasculares.
Lección 2- Taxonomía vexetal.	Concepto de especie. Categorías e unidades taxonómicas. Caracteres taxonómicos. Sistemas de clasificación. Nomenclatura taxonómica.
Lección 3- Clasificación dos vexetais inferiores.	Diferentes reinos implicados e criterios para a determinación das divisións.
Lección 4- Bacterias fotosintetizadoras e algas procariotas.	Caracteres citolóxicos. Morfoloxía. Reproducción. Filoxenia.
Lección 5- Vexetais eucariotas.	Caracteres citolóxicos diferenciais. Niveis morfolóxicos de organización: protófitos e talófitos. Talo e cormo. Teorías acerca das súas relacións evolutivas.
Lección 6- Modalidades de reproducción asexual en vexetais inferiores.	Reproducción vexetativa. Esporulación. Estructuras de resistencia. Exemplos ilustrativos.
Lección 7- Modalidades de reproducción sexual en vexetais inferiores.	Hologamia. Cistogamia. Somatogamia. Merogamia. Esporulación meiótica. Fenómenos de diferenciación sexual. Fenómenos de incompatibilidade sexual. Degradación da reproducción sexual.
Lección 8- Ciclos vitais.	Concepto de xeneración botánica. Ciclo monoxenético haplofásico. Ciclo monoxenético diplofásico. Ciclo dixenético haplo-diplofásico. Ciclo trixenético haplo-diplofásico. Teorías acerca das súas relacións evolutivas. Exemplos ilustrativos.
Lección 9- ALGAS I. Introducción ao estudo das algas.	Tipos morfolóxicos. Reproducción. Ciclos vitais. Nutrición. Amplitude ecolóxica.
Lección 10- ALGAS II. Divisións Glaucophyta e Rhodophyta.	Caracteres bioquímicos, citolóxicos, morfolóxicos e reproductores. Sistemática. Ecoloxía e usos. Exemplos ilustrativos.
Lección 11- ALGAS III. Divisións Chlorophyta e Charophyta.	División Chlorophyta: Clases Prasinophyceae, Chlorophyceae e Ulvophyceae. División Charophyta (Streptophyta): Orixe dos cormófitos; Clases Coleochaetophyceae, Zygnematophyceae e Charophyceae. Caracteres bioquímicos, citolóxicos , morfolóxicos e reproductores. Ecoloxía. Exemplos ilustrativos.
Lección 12- ALGAS IV. Divisións Euglenophyta e Pyrrophyta (Dinophyta).	Caracteres bioquímicos, citolóxicos, morfolóxicos e reproductores. Sistemática. Ecoloxía. Exemplos ilustrativos.
Lección 13- ALGAS V. Divisións Cryptophyta e Prymnesiophyta (Haptophyta).	Caracteres bioquímicos, citolóxicos, morfolóxicos e reproductores. sistemática. Ecoloxía. Exemplos ilustrativos.
Lección 14- ALGAS VI. División Heterokontophyta I: Clases Chrysophyceae, Synurophyceae, Bacillariophyceae (Diatomeas), Pinguiophyceae, Dictyochophyceae e Pelagophyceae.	Caracteres bioquímicos, citolóxicos, morfolóxicos e reproductores. Sistemática. Ecoloxía e usos. Exemplos ilustrativos.
Lección 15- ALGAS VII. División Heterokontophyta II: Clases Raphidophyceae, Xanthophyceae, Phaeothamniophyceae e Phaeophyceae.	Caracteres bioquímicos, citolóxicos, morfolóxicos e reproductores. Esbozo da súa clasificación. Ecoloxía e usos. Exemplos ilustrativos.
Lección 16- PSEUDOFUNGOS E MOFOS MUCILAXINOSOS. Divisións Oomycota, Acrasiomycota e Myxomycota.	Caracteres xerais e reproductivos de cada grupo. Ciclos vitais. Exemplos ilustrativos.
Lección 17- FUNGOS I. Introducción ao estudo dos fungos verdadeiros. Divisións Cryptomycota, Chytridiomycota, Neocallismastigomycota e Blastocladiomycota.	Caracteres xerais e reproductivos de cada grupo. Ciclo vital. Ecoloxía. Exemplos ilustrativos.
Lección 18- FUNGOS II. Divisións Zoopagomycota e Mucoromycota.	Caracteres xerais e reproductivos de cada grupo. Ciclo vital. Ecoloxía. Usos. Exemplos ilustrativos.
Lección 19- FUNGOS III. Subreino Dikaya: Divisións Ascomycota e Basidiomycota.	Caracteres xerais e reprouctivos de cada grupo. Ciclo vital. Ecoloxía. Usos. Exemplos ilustrativos.
Lección 20- SIMBIOSE FÚNXICAS. Liques, micorrizas e micoficobiose.	Características dos diferentes tipos de simbiose fúnxicas. Importancia ecolóxica.
PROGRAMA DE CLASES PRÁCTICAS	
Práctica 1- Fitoplancton mariño e de auga doce.	Toma de mostras. Recoñecimento de xéneros e das especies máis frecuentes.

Práctica 2- Algas bentónicas macroscópicas mariñas.	Observación de estructuras vexetativas e reproductoras de Cianophyta, Chlorophyta, Rhodophyta e Phaeophyceae. Uso de claves de identificación.
Práctica 3- Fungos.	Observación de estructuras somáticas e reproductoras de Ascomycetes e Basidiomycetes. Uso de claves de identificación.
Práctica 4- Liques.	Observación de estructuras somáticas e reproductoras de liques. Uso de claves de identificación.

Planificación			
	Class hours	Hours outside the classroom	Total hours
Lección maxistral	30	45	75
Seminario	3	6	9
Prácticas de laboratorio	15	5	20
Resolución de problemas de forma autónoma	0	11	11
Práctica de laboratorio	1	0	1
Exame de preguntas obxectivas	2	15	17
Exame de preguntas obxectivas	2	15	17
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Metodoloxía docente	
	Description
Lección maxistral	O programa teórico da materia desenvolverase durante as sesións maxistrais. Os materiais didácticos utilizados durante as exposicións e o texto completo das leccións estarán anticipadamente a disposición dos alumnos na plataforma MOOVI, coa finalidade de dinamizar as clases, aclarar conceptos ou resolver posibles dúbidas. De xeito aleatorio ao longo das clases faranse preguntas para avaliar o grao de comprensión dos alumnos e o seu seguimento da materia.
Seminario	Levaranse a cabo ao longo de tres sesións nas que se tratarán os contidos máis relevantes do programa teórico, resolveranse as posibles dúbidas xurdidas na resolución dos cuestionarios de autoavaliación e os cuestionarios de preparación das titorías.
Prácticas de laboratorio	Tras unha breve descrición do procedemento de toma de mostras e das características dos organismos estudados, en cada sesión de prácticas procederase ao seu exame utilizando lupa e microscopio óptico. Utilizaranse claves para a identificación das especies. As explicacións relativas a cada práctica estarán dispoñibles na plataforma MOOVI. A asistencia a todas as sesións é preceptiva para superar a materia, salvo que a falta estea debidamente xustificada. Realizaranse no laboratorio LD4 (Sección A, Planta 1ª, Porta 1)
Resolución de problemas de forma autónoma	Na plataforma MOOVI, ademais dos contidos e presentacións do programa teórico, o alumno dispoñerá de cuestionarios para cada lección a fin de reforzar a correcta comprensión dos conceptos estudados. É imprescindible a súa resolución para acceder aos contidos da seguinte lección.

Atención personalizada	
Methodologies	**Description**
Lección maxistral	Previa cita, no horario de titorías, a profesora aclarará todas as dúbidas que non quedaran resoltas durante as sesión maxistrais. Tamén se atenderán cuestións relativas á docencia teórica a través do correo electrónico, o despacho virtual do Campus remoto e o foro de MOOVI.
Prácticas de laboratorio	Previa cita, no horario de titorías, a profesora aclarará todas as dúbidas que non quedaran resoltas durante as sesión prácticas. As consultas tamén se poderán facer a través do correo electrónico, o despacho virtual do Campus remoto e o foro de MOOVI.

Avaliación				
	Description	Qualification	Training and Learning Results	
Lección maxistral	A asistencia regular e o grao de atención durante o desenvolvemento das clases teóricas da materia avaliarase mediante a realización de pequenas probas distribuidas aleatoriamente ao longo do cuadrimestre.	10	A1 A5	C9 D1

Práctica de laboratorio	Á finalización das prácticas de laboratorio deberase superar un exame sobre as prácticas de laboratorio (nota mínima 5 puntos sobre 10). O resultado obtido supoñerá o 10 % da cualificación final. A superación deste exame é preceptivo para sumar os outros compoñentes da cualificación final da materia para os alumnos que opten por avaliación continua. Para os que opten por avaliación global o exame práctico representará o 20 % da cualificación final e tamén deberán obter unha nota mínima de 5 puntos sobre 10 para superar a materia.	10	A1 A5	B1	C1 C2 C7	D1		
Exame de preguntas obxectivas	O primeiro exame parcial versará sobre as oito primeiras leccións do programa teórico. A proba consistirá nun combinado de preguntas de resposta curta e preguntas tipo test. A cualificación mínima deberá ser igual ou superior a 4,5 puntos sobre 10.	40	A1 A5	B1	C1 C2 C9	D1 D5		
Exame de preguntas obxectivas	O segundo exame parcial tratará sobre as leccións 13 a 20, ámbalas dúas incluídas. A proba consistirá nun combinado de preguntas de resposta curta e preguntas de tipo test. A cualificación mínima para superar a materia deberá ser igual ou superior a 5 puntos sobre 10.	40	A1 A5	B1	C1 C2 C9	D1 D5		

Other comments on the Evaluation

Os horarios da materia figuran na páxina web da facultade:

§ GL: http://bioloxia.uvigo.es/gl/docencia/horarios

§ ES: http://bioloxia.uvigo.es/es/docencia/horarios

As datas de exame establecidas no calendario oficial pódense consultar nas seguintes ligazóns:

§ GL: http://bioloxia.uvigo.es/gl/docencia/exames

§ ES: http://bioloxia.uvigo.es/es/docencia/examenes

O método de avaliación establecido por defecto é a modalidade de avaliación continua; se algún alumno desexa acollerse á modalidade de avaliación global deberá indicalo mediante un documento asinado antes de que finalice o prazo sinalado polo decanato da facultade.

A asistencia ás clases prácticas de laboratorio é obrigatoria (salvo falta debidamente xustificada) nas dúas modalidades de avaliación; os alumnos que non cumpran este requisito figurarán nas actas como "non presentado". Á finalización das prácticas o alumno deberá superar un exame práctico, cunha cualificación igual o superior a 5 puntos sobre 10.

No caso de que o alumno se acolla á modalidade de avaliación continua deberá ter en conta o seguinte:

- Para superar a parte teórica da materia, a nota mínima obtida en cada un dos exames parciais deberá ser igual ou superior a 5 puntos sobre 10. A parte teórica na modalidade de avaliación continua supón o 80 % da cualificación final da materia. Cando a cualificación media das probas teóricas sexa inferior a 5 puntos sobre 10, o alumno figurará nas actas como "suspenso", coa puntuación obtida na proba teórica, aínda que superara o exame práctico.

- A cualificación final é o resultado da suma das porcentaxes asignadas aos distintos apartados avaliados. Para poder superar a materia na primeira convocatoria é necesario obter nas probas teóricas unha nota media igual ou superior a 5 puntos sobre 10, e no exame práctico unha cualificación mínima de 5 sobre 10 puntos. De non conseguir a puntuación mínima non se lle sumarán os apartados avaliados e a nota final que figurará nas actas será a cualificación máis baixa das obtidas nos apartados suspensos (exame teórico ou exame práctico).

- Na segunda convocatoria manteranse as notas anteriores e será posible recuperar o exame práctico (10 % da cualificación final); tamén se poderán recuperar os exames parciais suspensos, que en conxunto suporán un 80 % da cualificación final.

Na modalidade de avaliación global será requisito indispensable obter unha nota mínima de 5 puntos sobre 10 no exame teórico e no exame práctico da materia, que supoñerán o 80 % e o 20 % da cualificación final, respectivamente. Seguirase o mesmo criterio na segunda convocatoria.

A cualificación do exame práctico contemplaranse durante tres cursos académicos consecutivos.

Requírese do alumnado que curse esta materia unha conduta responsable e honesta. Considérase inadmisible calquera forma de fraude (copia e/ou plaxio) encaminado a falsear o nivel de coñecemento ou destreza alcanzado por un/unha alumno/a en calquera tipo de proba, informe ou traballo deseñado con este propósito. Esta conduta fraudulenta será sancionada coa firmeza e o rigor que establece a normativa vixente.

Bibliografía. Fontes de información

Basic Bibliography

Strasburger, E. et al., **Tratado de botánica**, Ed. Marín,

Izco, J. et al., **Botánica**, 2ª, McGraw-Hill-Interamericana,

Bold, H.C., Alexopoulos, C.J. & Develoryas, T., **Morfología de las plantas y hongos**, Ed. Omega,

Abbayes, H. des et al., **Vegetales inferiores**, Ed. Reverté,

Complementary Bibliography

Lee, R.E., **Phycology**, 4ª, Cambridge University Press,

Alexopoulos, C.J., Mims, C.W. & Blackwell, M., **Introductory Mycology**, Jhon Willey & Sons, Inc.,

Sze, P., **A Biology of the Algae**, WCB/McGraw-Hill, R.E.,

Carrión, J.S., **Evolución vegetal**, DM.,

Pérez Valcárcel, C. López Prado, M.C. & López de Silanes, M.E., **Guía dos liques de Galicia**, Baía Edicións,

Otero, J., Comesaña, P. & Castro, M., **Guía das macroalgas de Galicia**, Baía Edicións,

Bárbara, I. & Cremades, J., **Guía de las algas del litoral gallego**, Ayuntamiento de A Coruña,

Breitenbah, J. & Kränzhn, F., **Champignons de Suisse**, Societé de Mycologie de Lucerne,

Cabio'h, j. et al, **Guía de las algas del Atlántico y del Mediterráneo**, Omega,

Gayral, P., **Les algues del côtes françaises**, Éditions Doin,

Wirth, V. & Düll, R., **Guía de campo de los líquenes, musgos y hepáticas**, Omega,

Castro, M. et al., **Guía micolóxica dos ecosistemas galegos**, Baía Edicións,

Lange, J.E., Lange, D.M. & Llimona, X., **Guía de campo de los hongos de Europa**, Omega,

Recomendacións

Other comments

É importante repasar, alúmenos semanalmente, os contidos teóricos da materia, pois a terminoloxía utilizada é completamente descoñecida para o alumno e a súa correcta comprensión é fundamental para o aproveitamento da teoría e as prácticas.

IDENTIFYING DATA

Animal and plant histology and cytology I

Subject	Animal and plant histology and cytology I			
Code	V02G031V01203			
Study programme	Grado en Biología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2nd	1st
Teaching language	Spanish Galician English			
Department				
Coordinator	Pérez Fernández, Juan Megías Pacheco, Manuel			
Lecturers	Megías Pacheco, Manuel Molist García, María del Pilar Pérez Fernández, Juan Pombal Diego, Manuel Ángel			
E-mail	jperezf@uvigo.es mmegias@uvigo.es			
Web				
General description	Mandatory subject of the 2nd year of the Degree in Biology. The first part of the subject, the general characteristics of cells as well as their ultrastructural organization are presented. The second part focuses on cell division and the first stages of organism development.			

Training and Learning Results

Code	
A1	Students should prove understanding and knowledge in this study field that starts in the Secundary Education and with a level that, even though it is suppported in advanced books, also includes some aspects that involve knowledge from the vanguard of the study field.
A2	Students should know how to apply their knowledge to their work or vocation in a professional way. They also should have the competences that are usually proved through the elaboration and defence of arguments and the resolution of problems within their study field.
A3	Students should prove ability for information-gathering and interpret important data (usually within their study field) to judge relevant social, scientific or ethical topics.
A4	Students should able to communicate information, ideas, issues and solutions to all audiences (specialist and unskilled audience).
B1	Developing autonomous learning by identifying their own training need and organizing and planning tasks and time.
B3	Apply the knowledge acquired in the degree and use the scientific-technical instrumentation and CIT in contexts of Biology and/or related to the professional practice.
B6	Develop analysis and synthesis, critical reasoning and argumentation skills, applying them in Biology and other scientific-technical disciplines.
C1	Solve problems by applying the scientific method, the concepts and terminology specific to biology, mathematical models and statistical and computer tools.
C4	Isolate, identify and growth microorganisms, cells, tissues and organs, making easier their study and the assessment of their metabolic activity.
C6	Understanding and integrate the functioning of living beings (cellular, tissue, organ and individual level), explaining their homeostatic and adaptive responses.
D1	Understand the meaning and use of the gender perspective in the different fields of knowledge and in professional practice with the aim of achieving a fairer and more equal society.
D3	Commitment to sustainability and the environment. Equal, sensible and efficient use of resources.

Expected results from this subject

Expected results from this subject	Training and Learning Results			
Know the types and levels of organization	A1 A3	B3 B6	C4	
Know the structure and function of the eukaryotic cell	A1 A3	B3 B6	C4	
Understand the biology of animal and plant development	A1 A2 A4	B1 B3 B6	C1 C6	
Apply Cytology and Histology knowledge to isolate, identify and analyze specimens and samples of biological origin, as well as to characterize their cellular and molecular constituents	A2 A3	B3 B6	C4	D3

Apply knowledge and technology related to Cytology and Histology in aspects related to the production, exploitation, analysis and diagnosis of biological processes and resources	A3	B3 B6	C1 C4	
Obtain information, carry out experiments and interpret the results	A3 A4	B3 B6	C1 C4 C6	
Understand the social projection of Cytology and Histology and its impact on professional practice, as well as knowing how to use its contents to teach and disseminate	A2 A4		C6	D1 D3
Know and manage the concepts, terminology and scientific-technical instrumentation related to Cytology and Histology	A3 A4	B3 B6	C1 C4 C6	

Contents	
Topic	
CELL BIOLOGY	(*)
Introduction	Evolution of the cell concept Cell theory General organization of eukaryotic cells Differences and similarities between animal and plant cells.
Cell membrane and extracellular matrix	Structure, molecular composition and functions Membrane transport Cell adhesion.
Origin of membranes and intracellular trafficking	Endoplasmatic reticulum. Golgi apparatus. Vesicular trafficking. Endosomes.
Lysosomal system, peroxisomes and vacuoles	Cell digestion. Autophagy. Peroxisomes and glyoxysomes. Vacuoles: types, structure and functions.
Organelles involved in energy production	Mitochondrial structure and function. Chloroplast structure and function. Other plastids.
The Cytosol	Cytoplasmic inclusions. The Cytoskeleton: actin filaments, microtubules and intermediate filaments.
The nucleus	Nuclear envelop. Dynamic and structure of chromatin and chromosomes. The nucleolus.
DEVELOPMENTAL BIOLOGY	(*)
Cell cycle	Control of the cell cycle.
Cell division	Cell division Mitosis. Meiosis. Cell death: apoptosis and necrosis.
Gametogenesis and fertilization	Oogenesis and spermatogenesis. Fertilization.
Stages of the embryonic development	Early development. Determination and cell differentiation.
LAB SESSIONS	(*)
Session 1. Cell types and extracellular matrix	Observation of cell types and extracellular matrix at light microscopy.
Session 2. Organelles I	Identification of cell organelles at light microscopy
Session 3. Organelles II	Identification of cell organelles in electron microscopy images.
Session 4. Mitosis.	Observation and quantification of mitotic phases in animal and plant tissue
Session 5. Gonads.	Observation of spermatogenesis and oogenesis. Types of gonads.
Session 6. Early development.	Observation of the early development of invertebrates and vertebrates.

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	33	82	115
Laboratory practical	12	12	24
Seminars	3	5	8
Objective questions exam	1	0	1
Objective questions exam	1	0	1
Laboratory practice	0.5	0	0.5
Laboratory practice	0.5	0	0.5
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies

	Description
Lecturing	The contents of the subject will be explained with presentations and short videos.
Laboratory practical	Histology preparations related to different topics covered will be analyzed. In additon, a lab session will be dedicated to study the ultrastructure of the cell and another one to the early vertebrate development.
Seminars	Analysis and discussion of questions proposed by the students or by the instructor.

Personalized assistance

Methodologies	Description
Lecturing	Invidual support is offered during tutor hours. Students will be able to contact the teacher for tutorial sessions via telematic tools (e-mail, video-chat, forums of Moovi platform, etc.) in concerted appointments.
Laboratory practical	Invidual support is offered during tutor hours. Students will be able to contact the teacher for tutorial sessions via telematic tools (e-mail, video-chat, forums of Moovi platform, etc.) in concerted appointments.
Seminars	Some activities will be proposed for monitoring the evolution of each student.

Assessment

	Description	Qualification	Training and Learning Results			
Seminars	Evaluation of the work developed during the seminars	10	A1 A2 A4	B6	C1 C6	D1 D3
Objective questions exam	Exam evaluating the theoretic classes	40	A1 A2 A3	B1 B6	C1 C6	
Objective questions exam	Exam evaluating the theoretic classes	30	A1 A2 A3	B1 B6	C1 C6	
Laboratory practice	Exam evaluating the lab sessions	10		B3	C4	D1 D3
Laboratory practice	Exam evaluating the lab sessions	10		B3	C4	D1 D3

Other comments on the Evaluation

- Attendance to the theoretical, practical and seminar classes is compulsory unless absence is duly justified.
- To pass the course it is necessary to score higher than 40 % in both the theoretical part (sum of the two tests) and the practical part (sum of the two tests). Otherwise, the final grade will be the result of multiplying the total grade (theory + practical + seminars) by 0.5.
- If the final mark of the course does not reach 5 points, but exceeds 40 % of any of the parts (theory, practical or seminars), these scores will be maintained for the second exam opportunity (July), provided that the student requests it.
- Repeat students from other courses must take all the classroom and laboratory activities (seminars and lab sessions), of which they will be evaluated.
- Lectures. The first thematic block (Cellular Biology) will be evaluated over 4 points in a first exam of objective questions that will be established in the official calendar. The second thematic block (Developmental Biology) will be evaluated over 3 points in a second exam of objective questions to be held on the date of the final exam to be established by the faculty. The maximum score of the theoretical part in the final grade will be 7 points (4+3).
- Lab sessions. The lab sessions will be evaluated in two tests over 1 point each one. The first test will be assessed over 1 point by means of an exam of objective questions that will include the identification of microscopic structures in photomicrographs and will be carried out on the date established by the faculty. The second test will also be evaluated over 1 point by means of an exam of the same type as the first test and will be carried out on the date established by the faculty. Therefore, a maximum of 2 points of the total grade can be obtained with this evaluation.
- Seminars. They will be evaluated over 0.33 points each one, that will be carried out during the seminar itself.

Therefore, with this evaluation a maximum of 1 point of the total grade can be obtained.

- Students who do not follow the continuous evaluation will be evaluated in a single test over 10 points that will include objective questions on the content of the subject and will be held on the date of the final exam set by the faculty.

- Exam to improve the mark. Students who pass the subject in the first term, and wish to improve their mark, may take an exam to improve their grade, which will be held on a date and time to be determined in agreement with the professor.

- Absent. It will be considered when the student does not perform any activity that involves evaluation.

- Date of the final exam. The exam dates are available on the faculty□s website: http://bioloxia.uvigo.es/gl/docencia/exames

- Schedules of the subjects. The schedules of the subject are available at the following address: http://bioloxia.uvigo.es/gal/docencia/horarios

Sources of information

Basic Bibliography

Alberts, B.; Heald, R.; Johnson, A.; Morgan, D.; Raff, M.; Roberts, K.; Walter, P.; Wilson, J., **Molecular Biology of the Cell.**, 7th ed, . W. Norton & Company, 2022

Cooper, G. M. Adams, K. W., **The Cell: a Molecular Approach.**, 9th ed, OUP USA, 2023

Barresi, M. F. J.; Gilbert, S.F., **Developmental Biology.**, 13th ed, OUP USA, 2023

Complementary Bibliography

Hardin, J.; Lodolce, J. P., **Becker's World of the Cell**, 10th ed, Pearson, 2022

Lodish, H., Matsudaira, P., Baltimore, D., Berk, A., Zipursky S.L.; Darnell, J., **Molecular Cell Biology.**, (8th ed), W.H. Freeman and Company, 2016

Paniagua, R., Nistal, M., Sesma, P., Álvarez-Uría, M.; Fraile, B.; Anadón, R.; Sáez, F. J., **Biología Celular y Molecular**, 4th ed, McGraw Hill, 2017

Megías, M.; Molist, P.; Pombal, M.A., **Atlas de histología vegetal y animal, Recurso audiovisual. http://mmegias.webs.uvigo.es/inicio.html**,

Wolpert, L.; Tickle, Ch.; Martínez-Arias, A., **Principles of Development**, 6th ed, Oxford Univ Press, 2019

Browder, L.W.; Erickson, C.A.; Jeffery, W.R., **Developmental Biology.**, (3th ed), Saunders, 1991

Slack, J. M. W.; Dale, L., **Essential Developmental Biology**, 4th ed, Wiley-Blackwell, 2021

Alberts, B.; Hopkin, K.; Johnson, A.; Morgan, D.; Roberts, K.; Walter, P.; Heald, R., **Essential Cell Biology**, 6th ed, W. W. Norton & Company, 2023

Recommendations

Subjects that are recommended to be taken simultaneously

Biochemistry I/V02G031V01201
Botany I: Algae and fungi/V02G031V01202
Microbiology I/V02G031V01204
Zoology 1: Non-arthropod invertebrates/V02G031V01205

IDENTIFYING DATA				
Microbiology I				
Subject	Microbiology I			
Code	V02G031V01204			
Study programme	Grado en Biología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2nd	1st
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	Bodelón González, Gustavo			
Lecturers	Bodelón González, Gustavo Costas Ríos, Lara			
E-mail	gbodelon@uvigo.gal			
Web	http://bioloxia.uvigo.es			
General description	Object and field of study of the Microbiology. Levels of organisation in microorganisms. Structures and function in microorganisms and acelular agents. Methods no dependent of crop for the study of microorganisms and virus. Nutrition, growth and physiology of microorganisms. Genetic and metabolic processes exclusive of microorganisms			

Training and Learning Results	
Code	
A2	Students should know how to apply their knowledge to their work or vocation in a professional way. They also should have the competences that are usually proved through the elaboration and defence of arguments and the resolution of problems within their study field.
B3	Apply the knowledge acquired in the degree and use the scientific-technical instrumentation and CIT in contexts of Biology and/or related to the professional practice.
B4	Draft and write reports, documents and projects related to Biology. Proceed to their presentation and debate in the teaching and specialized areas, highlighting the competences of the degree.
B6	Develop analysis and synthesis, critical reasoning and argumentation skills, applying them in Biology and other scientific-technical disciplines.
C1	Solve problems by applying the scientific method, the concepts and terminology specific to biology, mathematical models and statistical and computer tools.
C2	Identify levels of organisation of living beings through the study of current specimens and fossils. Carry out phylogenetic analyses and study the mechanisms of heredity, evolution and biodiversity.
C3	Perform and interpret molecular, physicochemical and biological analyses, including samples of human origin. Conduct assays and functional tests under normal and abnormal conditions.
C4	Isolate, identify and growth microorganisms, cells, tissues and organs, making easier their study and the assessment of their metabolic activity.
C6	Understanding and integrate the functioning of living beings (cellular, tissue, organ and individual level), explaining their homeostatic and adaptive responses.
D5	Communicate effectively and appropriately, including the use of computer tools and English.

Expected results from this subject	Training and Learning Results
New	A2 C2 C6
New	C6
New	B3 C1 C4
New	C6
New	B6 C3 C6
New	B3 B4 D5

Contents
Topic

1. INTRODUCTION TO MICROBIOLOGY	1.1. Object and Field of study of the Microbiology. 1.2. Subdisciplines and Specialitys. 1.3. Historical development and perspectives. 1.4. Professional fields of the microbiologist.
2. THE MICROORGANISMS IN THE BIOLOGICAL SCALE	2.1. Concept of microorganism. 2.2. Form, size and Relation Surface/Volume. 2.3. Evolutionary origin of the microorganisms. 2.4. Levels of cellular organisation. 2.5. Microbial multicellular structures.
3. STRUCTURE AND FUNCTION OF VIRUS AND BACTERIOPHAGES	3.1. General characteristics of virus and bacteriophages. 3.2. Architecture of eukaryote viruses. 3.3. Architecture prokaryote viruses. 3.4. Infective cycle of virus and phages. 3.5. Subviral particles.
4. STRUCTURE AND FUNCTION OF THE PROKARYOTIC CELL	4.1. External structures and function in prokaryotes 4.2. Internal structures and function in prokaryotes 4.3. Exceptions to the prokaryotic cellular organization. 4.4. Differences between Bacteria, Archaea and Eukarya
5. GROWTH IN CULTURE MEDIA	5.1. Microbial growth and cellular division. 5.2. Measure of the growth: direct and indirect methods. 5.3. Mathematical expression of growth kinetics. 5.4. Discontinuous and Continuous Growth. Applications. 5.5. Environmental factors that affect microbial growth.
6. GROWTH IN NATURAL ENVIRONMENTS. CONTROL OF THE GROWTH	6.1. Characteristics of the growth in natural environments. 6.2. Processes of communication and multicellularity. 6.3. VBNC state. 6.4. Physical and chemical agents to control microbial growth. 6.5. Biological agents to control microbial growth. 6.6. Antimicrobial resistance.
7. EXCLUSIVE METABOLIC ACTIVITIES OF MICROORGANISMS	7.1. Elements and Nutritional Categories. 7.2. ATP generation in lithotrophic microorganisms. 7.3. ATP generation in phototrophic microorganisms. 7.4. Generation of ATP in organotrophic microorganisms. 7.5. Anabolic processes of microorganisms.
8. CULTURE NON-DEPENDENT METHODS FOR THE STUDY OF MICROORGANISMS AND VIRUSES	8.1. U.V. light microscopy: non-specific fluorescence. 8.2. Flow cytometry. 8.3. In situ hybridization techniques. 8.4. Selective Amplification and Sequencing: PCR; Denaturing Gradient Gel Electrophoresis; NGS Sequencing Techniques. 8.5. Principles of Metagenomic Analysis.
9. GENETICS OF MICROORGANISMS	9.1. Mechanisms of prokaryotic gene expression regulation. 9.2. Extrachromosomal elements.. 9.3. Genetic exchange in bacteria. 9.4. Virus replication: generalities. 9.5. Bacterial immunity against viruses: CRISPR-CAS system.
PROGRAM OF PRACTICES	TABLE OF CONTENTS
1. Test to determine the effect of culture conditions on microbial growth.	1.1. Trial design. 1.2. Calculation of the innoculum volume. 1.3. Construction of a Straight Pattern Optical Density/Cellular Density. 1.4. Mathematical expression of growth. 1.5. Determination of yield in biomass.
2. Study of the density and population diversity of the epibiont microbiota in biological samples	1.6. Quantification of the effect of culture conditions. 1.7. Representation and Analysis of results. 2.1. Sample processing. 2.2. Quantification of Viable Cell Diversity and Density. 23. Characterization of isolates and population dynamics. 2.4. Analysis of results.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	30.15	12	42.15
Laboratory practical	15	18	33
Seminars	3	0.8	3.8
Objective questions exam	0.15	10	10.15
Objective questions exam	0.15	10	10.15
Objective questions exam	0.15	10	10.15
Objective questions exam	0.15	10	10.15
Essay questions exam	0.15	10	10.15
Objective questions exam	0.15	10	10.15
Essay questions exam	0.15	10	10.15

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies

	Description

Lecturing	The teacher structures and/or explains the objectives and contents of each topic and responds to the questions raised by the students. At the end of each topic, students will have the presentations discussed in the classroom, demonstration videos, links to free access texts and self-assessment questionnaires on Moovi. During the semester the teacher will evaluate the students through 5 tests of a maximum of 25 minutes each, with objective and/or development questions.
Laboratory practical	The professor explains the foundations and protocols of each practice, supervises his execution, resolves doubts and drives the discussion of results and solution of exercises and practical cases. The student has in Moovi a hypertext that it will used as a guide of the practices, with detailed protocols, questionnaires for selftest and solved exercises. Also it has documents and videos to complement the laboratory explanations.
Seminars	In two sessions, the teacher organizes, advises and supervises the integrated collaborative learning activities to be carried out in groups of three or four students. The class calendars (Seminars, Practices and Theory) can be consulted at the following link: http://bioloxia.uvigo.es/es/docencia/horarios

Personalized assistance

Methodologies	Description
Seminars	Students will be able to resolve doubts with the teacher during the seminar.
Laboratory practical	Students will be able to resolve doubts with the teacher, during the practices or once they have finished, making an appointment by email for tutorials. To better optimize the procedure, students are requested to contact the teacher by email in advance, with reasonable notice.
Lecturing	Students will be able to resolve doubts with the teacher, during classes or outside of them, making an appointment by email for tutorials. To better optimize the procedure, students are requested to contact the teacher by email in advance, with reasonable notice.

Assessment

	Description	Qualification	Training and Learning Results		
Laboratory practical	1) Delivery of daily summaries, and report, of the practices carried out (5%) at the end of each session 2) Individual test of objective questions, development and resolution of exercises (28%), to be carried out on the last day of practices. The test failed, or not taken, will be recoverable in the Second Call only. The assistance to practic classes is obligatory. A single lack of attendance is allowed due to force majeure and documented documentation.	33		B3 B4	C1 C3 C4
Seminars	Seminar I (6%): delivery of a work done in group. Seminar II (6%): individual written test, with short development questions. Both the work and the test will be done during the seminars. Failed tests will not be recoverable in the final exam. Attendance at seminars is mandatory. A single lack of attendance is allowed due to force majeure and documented documentation.	12		B4 B6	D5
Objective questions exam	(*)Cuestionario de preguntas tipo test	11	A2		C1 C2 C4 C6
Objective questions exam	(*)Cuestionario de preguntas tipo test	11	A2		C1 C2 C4 C6
Objective questions exam	(*)Cuestionario de preguntas tipo test	11	A2		C1 C2 C4 C6
Objective questions exam	(*)Cuestionario de preguntas tipo test	8	A2		C1 C2 C4 C6

Essay questions exam	(*)Examen de 2 preguntas	3	A2	C1 C2 C4 C6
Objective questions exam	(*) Cuestionario de preguntas tipo test	8	A2	C1 C2 C4 C6
Essay questions exam	(*)Examen de 2 preguntas	3	A2	C1 C2 C4 C6

Other comments on the Evaluation

THEORY CLASSES AND EXAMS:

The teacher structures and/or explains the objectives and contents of each topic and responds to the questions raised by the students. At the end of each class, students will have in Moovi the presentations discussed in the classroom, demonstration videos, and links to free access texts. During the semester the teacher will evaluate the students through 5 tests of a maximum of 25 minutes each that will consist of objective and/or developmental questions. Failed or not completed tests may be recovered in the Second Call through an exam that will consist of objective and/or development questions. Self-assessment questionnaires will be made available to students.

Attendance is recommended. The material explained in class may not be included in its entirety in the presentations that will be made available to students. On the other hand, attendance will be assessed by completing assignments and attention tests that will be delivered in the classroom at the end of the class and can provide up to 1 additional point to the final grade for the subject.

Failed or not performed tests can be recovered in the Second Call.

The dates of the different tests will appear in the schedule that the Dean's Office makes available to the student.

CONTINUOUS ASSESSMENT :

Students must pass, with at least 5 points out of 10, each of the 5 partial Theory tests. To pass the practical part, the overall score must be at least 1.65 (percentage sum of the exam grade and the summaries). Example: (4.5 exam x 0.28) + (8.0 summary x 0.05) = 1.26+0.4 = 1.66 (pass). In the event of not reaching the minimum grade in any of the partial theory tests, or 1.66 in the practical part, the grade in Minutes (First Call) will be the highest grade of the failures. Only the partial theory tests and the failed practical tests may be recovered in the Second Call, preserving the grades of those passed during the semester. The grade for the seminars will not be recoverable in the Second Call.

OVERALL EVALUATION:

Exceptionally, students who waive the continuous evaluation may request the global evaluation and take the complete subject exam (theoretical and practical contents) in the period established by the center. Said evaluation will be carried out on the official dates of the first and second opportunity.

IN BOTH MODALITIES OF EVALUATION:

Students who, having failed the global test or any of the partial tests of the semester, do not appear for their retake in the Second Call will appear in the Minutes as "Not Presented".

EVALUATION OF STUDENTS ENROLLED FOR THE SECOND OR SUCCESSIVE TIMES

Continuous assessment:

The grades of the theoretical and practical part passed, as well as the seminars (for 2 years), will be saved. If they consider it so, they may voluntarily attend or not attend the practices.

Overall evaluation:

Exceptionally, students who waive the continuous evaluation may request the global evaluation and take the complete subject exam (theoretical and practical contents) in the period established by the center. Said evaluation will be carried out on the official dates of the first and second opportunity.

Other comments

Students may not have a mobile phone or other electronic device in class unless it is necessary to carry out an activity, which will be previously communicated by the teaching staff.

Final exam dates: bioloxia.uvigo.es/es/docencia/examenes

Responsible and honest behavior is required of students taking this subject. Any form of fraud (copying or plagiarism) aimed at falsifying the level of knowledge and skills achieved in any type of test, report or work is considered inadmissible. Fraudulent conduct may result in failing the subject for an entire course. An internal record of these actions will be kept in order, in the event of recidivism, to request the opening of a disciplinary file to the rectorate.

Sources of information

Basic Bibliography

M. Madigan, J.M. Martinco, Bender, K.S., Buckley, D.H. y Stahl, D.A., **Brock. Biología de los microorganismos**, 14ª edición, Pearson prentice Hall, 2014

Madigan, M.T. , K. S. Bender, D. H. Buckley, W.M. Sattley, D. A. Stahl, **Brock. Biology of microorganisms**, 16ª edición, Pearson prentice Hall, 2022

Willey, J.M., L.M. Sherwood, C.J. Woolverton, **PRESCOTT-Microbiología**, 10ª edición, MaGraw-Hill, 2016

Willey, J., K. Sandman, D. Wood, **PRESCOTT'S Microbiology**, 11ª edición, MaGraw-Hill, 2019

Complementary Bibliography

Tortora G.J., Funke B.R., Case C.L., **Microbiology: An Introduction**, 12ª edición, Pearson prentice Hall, 2015

Rigel, N, Izquierdo, J., **Laboratory Exercices in Microbiology**, 12ª edición, McGraw-Hill,

Recommendations

Subjects that it is recommended to have taken before

Biology: Basic laboratory techniques/V02G031V01108

Other comments

It is recommended to previously study Basic Laboratory Techniques.

It is important to have taken this course to be able to take the Microbiology II course later.

IDENTIFYING DATA

Zooloxía I: Invertebrados non artrópodos

Subject	Zooloxía I: Invertebrados non artrópodos			
Code	V02G031V01205			
Study programme	Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2	1c
Teaching language	Castelán Galego			
Department	Ecoloxía e bioloxía animal			
Coordinator	Mariño Callejo, María Fuencisla			
Lecturers	Galván Arcones, Sofía Lagoa Núñez, Aarón Mariño Callejo, María Fuencisla Noguera Amoros, Jose Carlos Velo Antón, Guillermo			
E-mail	mmarino@uvigo.gal			
Web				
General description	En función da súa denominación académica a materia ocúpase de todos os filos animais considerados nas clasificacións tradicionais como Invertebrados non Artrópodos.			

Resultados de Formación e Aprendizaxe

Code	
A2	Que os estudantes saiban aplicar os seus coñecementos ao seu traballo ou vocación dunha forma profesional e posúan as competencias que adoitan demostrarse por medio da elaboración e defensa de argumentos e a resolución de problemas dentro da súa área de estudo.
A3	Que os estudantes teñan a capacidade de reunir e interpretar datos relevantes (normalmente dentro da súa área de estudo) para emitir xuízos que inclúan unha reflexión sobre temas relevantes de índole social, científica ou ética.
A4	Que os estudantes poidan transmitir información, ideas, problemas e solucións a un público tanto especializado como non especializado.
B1	Desenvolver a aprendizaxe autónoma, identificando as súas propias necesidades formativas e organizando e planificando as tarefas e o tempo.
B3	Aplicar o coñecemento adquirido na titulación e empregar a instrumentación científico-técnica e as TIC en contextos propios da Bioloxía e/ou no exercicio da profesión.
B6	Desenvolver as capacidades de análises e síntese, de razoamento crítico e argumentación, aplicándoas en contextos propios da Bioloxía e outras disciplinas científico-técnicas.
C1	Resolver problemas aplicando o método científico, os conceptos e a terminoloxía específica da Bioloxía, os modelos matemáticos e as ferramentas estatísticas e informáticas.
C2	Recoñecer os niveis de organización dos seres vivos mediante o estudo de especímenes actuais e fósiles. Realizar análise filoxenéticos e interpretar os mecanismos da herdanza, a evolución e a biodiversidade.
C6	Comprender e integrar o funcionamento dos seres vivos (nivel celular, tisular, orgánico e individuo), interpretando as súas respostas homeostáticas e adaptativas.
C9	Identificar recursos de orixe biolóxica e valorar a súa explotación eficiente e sostible para obter produtos de interese. Propoñer e implantar melloras nos sistemas produtivos.
D1	Comprender o significado e aplicación da perspectiva de xénero nos distintos ámbitos de coñecemento e na práctica profesional co obxectivo de alcanzar unha sociedade máis xusta e igualitaria.
D4	Colaborar e traballar en equipo ou en grupos multidisciplinares, fomentar a capacidade de negociación e de alcanzar acordos.
D5	Comunicar de maneira eficaz e adecuada, incluíndo o uso de ferramentas dixitais e o inglés.

Resultados previstos na materia

Expected results from this subject	Training and Learning Results			
Recoñecer a orixe e evolución dos animais: os tipos e niveis de organización, os mecanismos e modelos evolutivos.	A2 A3 A4	B1 B3 B6	C2	D1
Recoñecer a biodiversidade e filoxenia: diversidade animal e plans corporais, posición dos distintos grupos na árbore evolutiva.	A2 A3 A4	B1 B3 B6	C2 C6	D5
Explicar a estrutura, desenvolvemento e organización dos animais: anatomía e morfoloxía animal; Bioloxía do desenvolvemento animal, ciclos biolóxicos.	A2 A3 A4	B1 B3 B6	C6	D5

Aplicar coñecemento da Zooloxía para illar, identificar, manexar e analizar espécimes e mostras de orixe biolóxica, así como para caracterizar os seus constituíntes celulares e moleculares.	A2 A3 A4	B1 B3 B6	C6	D5
Analizar e interpretar o comportamento dos animais e a súa adaptación ao medio.	A2 A3 A4	B1 B3 B6	C6	
Aplicar coñecementos e técnicas propios da Zooloxía en diferentes procesos relacionados coa xestión do medio ambiente.	A2 A3 A4	B1 B3 B6	C9	D5
Aplicar coñecementos e tecnoloxía relativos á Zooloxía en aspectos relacionados coa produción, explotación, análise e diagnóstico de procesos e recursos biolóxicos.	A2 A3 A4	B1 B3 B6	C6	D5
Comprender a proxección social da Zooloxía e a súa repercusión no exercicio profesional, así como saber utilizar os seus contidos para impartir docencia e a divulgación.	A2 A3 A4	B1 B3 B6	C9	D1 D4 D5
Coñecer e manexar os conceptos, terminoloxía e instrumentación científico-técnica relativos á Zooloxía.	A2 A3 A4	B1 B3 B6	C1	D5

Contidos

Topic	
PROGRAMA TEÓRICO	CONTIDOS
Tema 1. A ciencia zoolóxica. Introdución á Zooloxía	Introdución á Zooloxía. De onde veñen os animais? Onde viven? Definición de animal.
Tema 2. Sistemática, filoxenia e clasificación	Clasificación. Nomenclatura. Taxonomía e sistemática. Monofilia, parafilia e polifilia. Caracteres e concepto de homología. Plesiomorfía e apomorfía. Árbores filoxenéticos. Concepto de especie. Escolas sistemáticas.
Tema 3. Arquitectura animal e plans corporais	Organización da complexidade animal. Arquetipos dos animais.
Tema 4. Desenvolvemento, ciclos e orixe	Desenvolvemento animal. Ciclos de vida. Orixe dos Metazoos.
Tema 5. Esponxas e Placozoos	Poríferos: caracteres xerais, forma e función. Sistemática do grupo. Relacións filoxenéticas. Importancia do grupo. Placozoos: caracteres xerais.
Tema 6. Cnidarios e Ctenóforos	Cnidarios: caracteres xerais, forma e función. Sistemática do grupo. Relacións filoxenéticas. Importancia do grupo. Ctenóforos: caracteres xerais, forma e función. Relacións filoxenéticas.
Tema 7. Xenacelomorfos. Platizoos e Mesozoos	enacelomorfos: caracteres xerais. Platelmintos: caracteres xerais, forma e función, sistemática do filo, relacións filoxenéticas. Gastrotricos. Clado Gnatíferos: Gnatostomúlidos, Quetognatos, Micrognatozoos, Rotíferos e Acantocéfalos: caracteres xerais. Filoxenia dos grupos e importancia. Mesozoos: caracteres xerais, relacións filoxenéticas.
Tema 8. Polizoos e Trocozoos	Cicliófloros, Endoproctos: caracteres xerais. Ectoproctos, Braquiópodos, Foronídeos: caracteres xerais, forma e función. Nemertinos: caracteres xerais, forma e función. Filoxenia dos grupos e importancia.
Tema 9. Moluscos	Caracteres xerais. Morfoloxía do molusco ancestral. Forma e función. Clasificación e estudo das distintas clases de moluscos. Relacións filoxenéticas. Importancia do filo.
Tema 10. Anélidos e taxóns relacionados	Anélidos (Pogonóforos incluídos). Caracteres xerais. Forma e función. Sistemática do filo. Relacións filoxenéticas e importancia como grupo. Taxóns próximos a Anélidos: Sipuncúlidos e Equiúridos. Relacións filoxenéticas.
Tema 11. Ecdisozoos	Nematodos, Nematomorfos, Loricíferos, Quinorrincos, Priapúlidos: caracteres xerais, forma e función. Filoxenia dos grupos e importancia.
Tema 12. Equinodermos	Caracteres xerais. Forma e función. Clasificación e estudo das distintas clases de Equinodermos. Relacións filoxenéticas.
Tema 13. Hemicordados	Caracteres xerais. Forma e función. Sistemática do filo. Relacións filoxenéticas.

PROGRAMA PRÁCTICO	CONTIDOS
Práctica 1	Esponxas: observación de tipos xerais. Preparación e observación de distintos tipos de espículas.
Práctica 2	Cnidarios: observación e estudo de varios exemplares.
Práctica 3	Filos varios: observación e estudo de exemplares de Platelmintos, Nemertinos, Acantocéfalos, Rotíferos, Gastrotricos, Quinorrincos, Quetognatos, Sipuncúlidos, Equiúridos, Braquiópodos e Ectoproctos.
Práctica 4	Moluscos: estudo da morfoloxía externa de representantes das diferentes clases de Moluscos. Disección dun molusco bivalvo.
Práctica 5	Anélidos: estudo da morfoloxía externa de representantes das diferentes clases de Anélidos. Observación de Sipuncúlidos e Equiúridos. Disección dun anélido oligoqueto.
Práctica 6	Equinodermos: estudo da morfoloxía externa de exemplares das diferentes clases de Equinodermos. Disección dun equinodermo equinoideo.

Planificación

	Class hours	Hours outside the classroom	Total hours
Lección maxistral	30	0	30
Seminario	3	1	4
Prácticas de laboratorio	14.5	0	14.5
Traballo tutelado	1	20	21
Práctica de laboratorio	0.5	22	22.5
Estudo de casos	0	8	8
Exame de preguntas obxectivas	2	45	47
Observación sistemática	3	0	3

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Metodoloxía docente

	Description
Lección maxistral	Uso de material infográfico e documental para explicar conceptos zoolóxicos relacionados cos invertebrados non artrópodos incentivando a participación dos alumnos.
Seminario	Consulta de dúbidas e resolución de cuestións expostas polo profesor e polo alumno. Aclaración de conceptos en sesións planificadas e organizadas polo profesor. O alumnado levará a cabo distintas actividades deseñadas para os seminarios onde basicamente trabállase en grupo. Estas actividades están deseñadas para afianzar coñecementos e competencias basicamente transversais que o alumnado debe adquirir.
Prácticas de laboratorio	Actividade experimental no laboratorio, complemento das clases teóricas. O alumnado realizará 6 prácticas no laboratorio ao longo do curso onde se verán de forma práctica os contidos desenvolvidos na teoría. As prácticas da materia inclúen entre outras cousas, manexo, observación, identificación, estudo de morfoloxía externa e anatomía interna e disección de distintos exemplares da maioría dos fíos estudados.
Traballo tutelado	Explicación da metodoloxía para seguir para a realización de traballos relacionados coa zooloxía por parte do alumno. O alumnado o levará a cabo en grupos de 3, 4 ou 5 participantes en función dos alumnos matriculados.

Atención personalizada

Methodologies	Description
Prácticas de laboratorio	Durante a realización das prácticas de laboratorio e debido ao número reducido de alumnos, pode levarse a cabo unha atención personalizada resolvendo todas as dúbidas que xurdan durante o desenvolvemento das mesmas.
Traballo tutelado	A atención personalizada será durante as horas de titoría no despacho do profesor e durante as titorías incluídas na metodoloxía con grupos pequenos de alumnos.

Avaliación

Description	Qualification	Training and Learning Results

Traballo tutelado	Traballo en grupo (relacionado coa teoría).- o alumnado levará a cabo en grupos de 3, 4 ou 5 participante,s en función dos alumnos matriculados un traballo relacionado coa parte teórica (15 %) segundo normas que figurarán na plataforma Moovi. Traballo individual (relacionado coas prácticas).- o alumnado levará a cabo de forma individual a preparación dunha colección de 10 fichas sobre 10 especies elixidas da listaxe de especies do visu· seguindo as normas que figurarán na plataforma Moovi (10 % da nota). Con este traballo serán avaliadas parte das competencias transversais que debe adquirir o alumnado.	25	A2 B1 C1 D1 D4 D5
Práctica de laboratorio	A avaliación dos coñecementos e competencias alcanzados nesta parte levará a cabo no laboratorio mediante un exame e que incluirá ademais un recoñecemento de visu de 5 especies de invertebrados non artrópodos das que figuran na listaxe incluída na plataforma Moovi.	15	A2 B1 C2 D1 A3 B3 D4 A4 B6
Estudo de casos	Cuestionarios: parte dos contidos teóricos serán avaliados a través de 3 cuestionarios on- line (consultar datas de realización e entrega no calendario da materia dispoñible na plataforma Moovi).	15	
Exame de preguntas obxectivas	Os contidos teóricos da materia serán explicados na aula a través de sesións maxistrais. Para avaliar os coñecementos e competencias adquiridas polo alumnado sobre estes contidos teóricos realizaranse 2 probas escritas na aula que incluirán preguntas tipo test, de resposta curta, de relacionar, de desenvolvemento, etc.	40	A2 B1 C2 D5 A3 B3 C6 A4 B6
Observación sistemática	O alumnado levará a cabo distintas actividades deseñadas para os seminarios onde basicamente trabállase en grupo. Estas actividades están deseñadas para afianzar coñecementos e competencias que o alumnado debe adquirir. Valorarase a participación resolvendo cuestións expostas polo alumno e o profesor. Así mesmo valorarase a participación do alumnado nas clases teóricas.	5	A2 B1 C1 D1 A3 B3 C2 D4 A4 B6 C6 D5 C9

Other comments on the Evaluation

AVALIACIÓN CONTINUA

A avaliación é continua ao longo do curso. Para poder ser avaliado de forma continua, o alumnado deberá realizar todas as actividades planificadas para cada un dos bloques.

É obrigatorio incluír no perfil de usuario da plataforma Moovi, unha fotografía que debe permitir identificar á persoa (tipo DNI e actualizada) e a dirección de correo electrónico @alumnado. uvigo.gal. En ausencia da fotografía ou correo de UVigo, o alumno non será avaliado polo que non recibirá nin as cualificacións nin as correccións das distintas actividades. Só o alumnado con correo institucional (@ualumnado.uvigo.gal) recibirá o correo relacionado ca materia. Non se responderá ningún correo que non sea o institucional.

As situacións particulares que impidan participar nas actividades de forma regular, por exemplo ter un contrato de traballo, enfermidade, etc. deberán ser comunicadas á coordinadora da materia nos 5 días inmediatos á aparición do problema, co fin de buscar unha solución.

A asistencia ás prácticas e seminarios é obrigatoria para poder presentarse ás probas teóricas e/ou prácticas nas dúas convocatorias.

Para poder superar a materia é necesario superar teoría, prácticas e traballo tutelado por separado cunha nota igual ou superior á mínima esixida en cada parte. No caso de non ser así, non se fará suma e a nota que figurará na acta será a máis alta dos apartados suspensos.

Presentarse a dous das actividades avaliables independentemente de que o alumno realice ou non o resto figurará como suspenso na Acta. Só os alumnos que nunca asistisen ás clases teóricas, seminarios, prácticas ou non realicen ningunha das actividade avaliables figurarán na acta como non presentados.

Aínda que co sistema de avaliación continua resulta máis fácil aprobar unha materia, é máis difícil conseguir unha boa nota. Para non prexudicar ao alumnado, no caso de que se supere a materia sumaráselle entre un 5 e un 10 % da nota só na primeira convocatoria.

Confusións repetidas de conceptos básicos ou mala utilización da nomenclatura científica nas distintas probas, pode implicar un 0 no conxunto da proba.

Se en calquera das actividades detéctase copia, o alumno suspenderá automaticamente esa parte da materia.

Avaliación dos bloques

Bloque teórico

A avaliación dos contidos teóricos (55 %) será continuada ao longo do curso e consistirá en varias probas, 2 escritas sobre contidos impartidos nas clases de teoría (40 %) e 3 cuestionarios en liña (15 %). Para poder superar esta parte debe obterse como mínimo un 5 sobre 10 en cada unha das 2 probas escritas e un 4,5 en cada un dos 3 cuestionarios.

Bloque de prácticas

A parte práctica equivale ao 15 % da nota final. As prácticas de laboratorio son obrigatorias e avaliaranse a través dun exame práctico, que se realizará no laboratorio en horario de mañana o día seguinte da 2ª proba de teoría (ver data en http://bioloxia.uvigo.es/es/docencia/examenes).

Para poder superar esta parte debe obterse como mínimo un 5 sobre 10.

Seminarios e clases teóricas

A asistencia e participación nas clases teóricas e seminarios implica un 5 % da nota.

A asistencia a seminarios e obrigatoria.

A asistencia ás clases teóricas controlarase algúns días ao azar e terase en conta a participación dos alumnos en clase.

Traballo tutelado

A presentación dun traballo relacionado coa zooloxía valorarase cun 15 % da nota. Para poder superar esta parte debe obterse como mínimo un 4.5 sobre 10.

A presentación dunha colección de fichas valorarase cun 10 % da nota. Para poder superar esta parte debe obterse como mínimo un 4.5 sobre 10.

Só conservaranse as partes aprobadas por bloques, para o resto das convocatorias do mesmo curso. Matricularse de novo da materia implicará repetir todas as actividades.

2ª OPORTUNIDADE

As actividades avaliables superadas na primeira oportunidade gardaranse para a segunda oportunidade. Si non se supera a materia o matricularse de novo no seguinte curso, implicará repetir todas as actividades avaliables.

AVALIACIÓN GLOBAL

Os estudantes que renuncien a avaliación continua, poderán solicitar avaliación global no período establecido polo centro. Dicha avaliación levarase a cabo nas datas oficiais de primeira e segunda oportunidade. Esta avaliación permitirá alcanzar o 100 % da puntuación da materia nun exame desglosado en dúas partes:

Contidos teóricos (65 %)

Contidos prácticos (35 %)

Bibliografía. Fontes de información
Basic Bibliography
Brusca, R.C. y Brusca, G.J., **Invertebrados**, 2ª ed., McGraw-Hill., 2005
Brusca , R.C., Moore, W. y Shuster, S.M., **Invertebrates**, 1ª edición, Sinauer, 2017
Brusca, R.c., Giribert, G. y Moore, W., **Invertebrates**, 4ª ed., Sinauer, 2023
Ruppert E.E. y Barnes, R.D., **Zoología de los Invertebrados**, 6ª ed., McGraw-Hill., 1996
Hickman, C.P., Keen, S.L., Eisenhour D.J., Larson, A. y l´Anson, H., **Integrated Principles of Zoology**, 18ª ed., McGraw-Hill, 2020
Hickman, C.P., Keen, S.L., Eisenhour D.J., Larson, A. y l´Anson, H., **Principios Integrales de Zoología**, 18ª ed., McGraw-Hill, 2021
Complementary Bibliography
Calow, P. y Olive, P.J.W., **The invertebrates: a new synthesis**, 2ª ed., Blackwell Sc. Flub., 1993
Díaz, J.A. y santos T., **Zoología: aproximación evolutiva a la diversidad y organización de los animales**, Síntesis, 1998
Hickman, F.M. y Hickman, C.P., **Zoología: manual de laboratorio**, 8ª ed., McGraw-Hill, 1998
Hickman, Cl.P., Roberts, L.S., Keen, S.L., Larson, A., l´Anson, H., Eisenhour, D.J., **Principios integrales de Zoología**, 14ª ed., McGraw-Hill, 2009
Jessop, N.M., **Zoología: Invertebrados. Teoría y Problemas**, McGraw-Hill, 1981

Rodríguez Iglesias F. (ed): varios autores, **Galicia naturaleza: zoología (tomos XXXVII y XXXVIII)**, Hércules ediciones, 2002

Wallace, R.L. y Taylor, W.K., **Invertebrate zoology: a laboratory manual**, 6ª ed., Pearson Education, 2003

Hickman, C.P., Keen, S.L., Eisenhour, D.J., Larson, A. y l´Anson, H., **Integrated Principles of Zoology**, 978-1-266-26329-3, 19ª ed., McGraw-Hill, 2024

Recomendacións

Subjects that it is recommended to have taken before

Bioloxía: Evolución/V02G031V01101
Bioloxía: Técnicas básicas de campo/V02G031V01109

Other comments

O horario da materia pode consultarse en:
http://bioloxia.uvigo.es/es/docencia/horarios

As datas de exames teóricos poden consultarse en:
http://bioloxia.uvigo.es/es/docencia/horarios
e http://bioloxia.uvigo.es/es/docencia/examenes

As datas de entrega do resto de actividades indícanse na plataforma (horario da materia). Non se recollerá ningunha actividade solicitada fóra do prazo convido. As datas indicadas no horario da materia son inamovibles.

Non se pode cambiar de grupo de prácticas e/ou grupos de seminario salvo causas excepcionais e, previa solicitude á coordinadora da materia que decidirá se o cambio é factible ou non unha vez realizada a consulta co coordinador de 2º de grao.

A non asistencia a calquera das actividades obrigatorias só será xustificada en casos excepcionais (p.e. motivos de saúde, problemas familiares, esixencias dun contrato de traballo...) e non se xustificará ningunha ausencia debido a actividades extra curriculares (p.e. competicións deportivas non oficiais, obter o carné de conducir, irse de viaxe...).

Independentemente dos contidos transmitidos na aula, o material necesario para o correcto desenvolvemento da materia, así como a información, notas, avisos, etc. relacionados coa mesma faranse a través da plataforma Moovi.

Para un bo desenvolvemento da materia, é conveniente e aconsellable unha lectura detallada da guía docente da materia (metodoloxía e avaliación) así como toda a información que vaia aparecendo na plataforma Moovi.

Xa que o material necesario para o correcto desenvolvemento da materia figura na plataforma Moovi é recomendable imprimir e levar á aula os resumos de cada un dos temas. Isto facilitará a comprensión das explicacións, permitirá facer anotacións e resolver cuestións e dúbidas así como rendibilizarase o tempo nas clases maxistrais. En ningún caso ditaranse directa ou indirectamente apuntamentos xa que debido ao escaso número de horas presenciais e á densidade do programa, para poder traballar os conceptos é necesario axilizar as clases.

Non se permite o uso de computadores, teléfonos móbiles e outros aparellos parecidos durante as clases teóricas, prácticas e seminarios.

É OBRIGATORIO o uso de bata no laboratorio e o CUMPRIMENTO das normas de seguridade (atópanse dispoñibles na plataforma). A docencia práctica terá lugar no laboratorio de prácticas de Zooloxía (laboratorio de docencia LD10, pavillón B, 2º piso). O incumprimento das normas de riscos laborais implica non poder realizar a práctica correspondente.

O laboratorio debe quedar recolleito e organizado antes de marchar.

É recomendable ler o guión de prácticas antes da súa realización.

Rógase puntualidade.

LER atentamente a guía docente (metodoloxía e avaliación), así como a información presentada na plataforma Moovi.

CONDICIÓNS DE USO DO MATERIAL DEPOSITADO NA PLATAFORMA Moovi
O alumnado matriculado na materia NON PODERÁ DIFUNDIR, total ou parcialmente, ningunha das imaxes, vídeos, ou calquera outro contido do curso. Este material é para uso exclusivo da materia.

PARA UN MELLOR DESENVOLVEMENTO DA MATERIA RECOMÉNDASE:
- Realizar, para unha mellor comprensión da materia, os exercicios sobre os conceptos teóricos e as prácticas dispoñibles na plataforma tema.
- Consultar a bibliografía recomendada.
- Facer uso frecuente das titorías para resolver as dúbidas que se presenten ao longo do curso, tanto no que se refire a cuestións teóricas como prácticas da materia.

IDENTIFYING DATA

Biochemistry II

Subject	Biochemistry II			
Code	V02G031V01206			
Study programme	Grado en Biología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2nd	2nd
Teaching language	Spanish			
Department				
Coordinator	Suárez Alonso, María del Pilar			
Lecturers	Suárez Alonso, María del Pilar Zoni , Valeria			
E-mail	psuarez@uvigo.es			
Web	http://moovi.uvigo.es			
General description	English Friendly subject: International students may request from the teachers: a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English. The subject Biochemistry II complements and expands the knowledge acquired in Biochemistry I and aims to provide students with basic knowledge about cellular biosignaling, regulation and integration of intermediate metabolism of carbohydrates, lipids and proteins.			

Training and Learning Results

Code	
A1	Students should prove understanding and knowledge in this study field that starts in the Secundary Education and with a level that, even though it is suppported in advanced books, also includes some aspects that involve knowledge from the vanguard of the study field.
A2	Students should know how to apply their knowledge to their work or vocation in a professional way. They also should have the competences that are usually proved through the elaboration and defence of arguments and the resolution of problems within their study field.
B2	Manage scientific-technical information using diverse and reliable sources. Analyze data and documents and interpret them critically and rigorously, including considerations on their social relevance and in the professional field of Biology.
B3	Apply the knowledge acquired in the degree and use the scientific-technical instrumentation and CIT in contexts of Biology and/or related to the professional practice.
B6	Develop analysis and synthesis, critical reasoning and argumentation skills, applying them in Biology and other scientific-technical disciplines.
C1	Solve problems by applying the scientific method, the concepts and terminology specific to biology, mathematical models and statistical and computer tools.
C4	Isolate, identify and growth microorganisms, cells, tissues and organs, making easier their study and the assessment of their metabolic activity.
C6	Understanding and integrate the functioning of living beings (cellular, tissue, organ and individual level), explaining their homeostatic and adaptive responses.
C10	Identify biological and biotechnological processes and their potential applications, in particular in health, agri-food and environmental fields.
C11	Perform and interpret bioassays, identify chemical and biological agents, including pathogens, as well as their toxic products. Develop and apply biological control techniques.
C13	Provide training, participate in R+D+i projects, communicate results and disseminate knowledge. Contribute to the social projection of biology and to raising awareness of the environment.
D1	Understand the meaning and use of the gender perspective in the different fields of knowledge and in professional practice with the aim of achieving a fairer and more equal society.
D2	Communicate speaking and in writing in Galician.
D4	Collaborate and work in teams or multidisciplinary groups, promote negotiation skills and the ability to reach agreements.

Expected results from this subject

Expected results from this subject	Training and Learning Results			
Describe the regulation and integration of metabolism.	A1	B2	C4	D1
		B3	C6	D2
Identify metabolic specialization.	A1	B2	C4	D1
	A2	B3	C10	D2
		B6	C11	
Know and apply the molecular mechanisms of the processes responsible for the maintenance, modification and expression of genetic information.	A1	B2	C4	D1
	A2	B3	C6	D2
		B6	C10	

Know the fundamentals of molecular biology.	A1 A2	B2 B3 B6	C4 C6	D1 D2
Apply the knowledge of Biochemistry to isolate, identify, handle and analyze specimens and samples of biological origin, as well as to characterize their cellular and molecular constituents.	A1 A2	B2 B3 B6	C4 C6 C10 C11	D1 D2
Analyze and interpret the functioning of living beings and their adaptation to the environment.	A1 A2	B2 B3 B6	C4 C6 C10 C11	D1 D2
Apply knowledge and technology related to Biochemistry in aspects related to the production, exploitation, analysis and diagnosis of biological processes and resources.	A1 A2	B2 B3 B6	C1 C4 C6 C10 C11	D1 D2 D4
Obtain information, develop experiments and interpret the results. Understand the social projection of Biochemistry and its impact on professional practice, as well as know how to use its contents to teach and disseminate.	A1 A2	B2 B3 B6	C1 C4 C6 C10 C11 C13	D1 D2 D4
Application and management of the concepts, terminology and scientific-technical instrumentation related to Biochemistry.	A1 A2	B2 B3 B6	C1 C4 C6 C10 C11 C13	D1 D2 D4
New	A1 A2	B2 B3 B6	C1 C10 C13	D1 D2 D4

Contents

Topic	
1. Cell signalization.	Signaling systems. Intracellular receptors. Membrane receptors. Tyrosine kinase receptors . Receptors of cytokines. Receptors linked to protein G. Signaling routes.
2. Hormonal regulation.	Hormone regulation of metabolism. Main hormones involved in metabolism regulation.
3. Regulation of glycogen metabolism.	Regulation of glycogen degradation and synthesis: glycogen phosphorylase and glycogen synthase. Hormonal regulation of glycogen metabolism in muscle and liver.
4. Regulation of glucose metabolism.	Incorporation of carbohydrates from the diet to the glucidic metabolism. Uptake of glucose by tissues. Regulation of glycolysis. Regulation of gluconeogenesis. Regulation of the pentose phosphate route.
5. Regulation of lipidic metabolism.	Incorporation of lipids from the diet to lipid metabolism. Lipid transport: lipoproteins. Regulation of cholesterol synthesis and degradation. Regulation of the synthesis and degradation of triacylglycerols and fatty acids.
Integration and metabolism central route regulation	Regulation of the enzymatic complex pyruvate dehydrogenase. Regulation of the respiratory chain and oxidative phosphorylation.
Metabolic specialization of the main organs	Metabolic interrelations in various nutritional states. Metabolic specialization of the organs.
Metabolism of proteins.	Protein destinations. Degradation of proteins. Ubiquitin and proteasome. Metabolism of ammonium ion.
Practice 1	Determination of the activity of the enzyme pyruvate kinase.
Practice 2	Determination of the activity of the enzyme succinate dehydrogenase
Practice 3	Kinetics of a metabolic enzyme
Practice 4	Respiratory chain and oxidative phosphorylation. Theoretical experiments
Practice 5	Determination of the activity of the alkaline phosphatase enzyme.
Practice 6	Isolation of glycogen from liver and kidney
Practice 7	Quantification of glycogen concentration

Planning

	Class hours	Hours outside the classroom	Total hours

Laboratory practical	15	7.5	22.5
Lecturing	29	29	58
Seminars	3	1.5	4.5
Objective questions exam	1	14	15
Essay questions exam	2	48	50

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies

	Description
Laboratory practical	They will be carried out in the teaching laboratory of Biochemistry. The assistance to practic classes is obligatory. During the practices, the student will follow a practice script prepared by the teacher to develop the experimental protocols. The student makes a series of determinations of metabolites and enzymes and, according to his experimental results, he must identify organs and subcellular fractions with different metabolic functions. During the development of the practices, students must present the results obtained, answer a series of questions and and when they finish all the practices they will have to prepare their corresponding report.
Lecturing	The teacher will explain contents of the subject through master classes, with slide shows and videos. Students will have support copies with figures, diagrams and tables. The classes will be developed interactively with the students. The Moovi Platform will be used as a support tool.
Seminars	There will be different activities that allow the student to consolidate the knowledge of the subject. They will be done in the classroom and in the presence of the teacher. Students must answer questions raised by the teacher. Your assistance is also mandatory.

Personalized assistance

Methodologies	**Description**
Laboratory practical	Students will be attended individually in the tutoring hours. Attention to the student can be done electronically (email, videoconference, forums in Moovi, etc.) under the modality of prior agreement.
Lecturing	Students will be attended individually in the tutoring hours. Attention to the student can be done electronically (email, videoconference, forums in Moovi, etc.) under the modality of prior agreement.
Seminars	Students will be attended individually in the tutoring hours. Attention to the student can be done electronically (email, videoconference, forums in Moovi, etc.) under the modality of prior agreement.
Tests	**Description**
Objective questions exam	Students will be attended individually in tutoring hours. Attention to the student can be done electronically (email, videoconference, forums in Moovi, etc.) under the modality of prior agreement.
Essay questions exam	Students will be attended individually in tutoring hours. Attention to the student can be done electronically (email, videoconference, forums in Moovi, etc.) under the modality of prior agreement.

Assessment

	Description	Qualification	Training and Learning Results			
Laboratory practical	Mandatory attendance. The teacher will evaluate the realization of a practical report, in which the students must show the results obtained including a brief discussion. It is essential to obtain a minimum score of 5 out of 10 to be able to weigh with the rest of the sections. In the event of failure, the student may review the report within the timeframe indicated by the teacher. This activity is not recoverable if the required minimum is not reached.	20	A1 A2	B2 B3 B6	C1 C4 C6 C10 C11 C13	D1 D2 D4
Seminars	Knowledge of the topics covered will be assessed by solving exercises, which will be handed in on the date set by the teacher. Attendance and delivery of the exercises is mandatory. It is necessary to obtain a minimum grade of 5 out of 10 to be able to weigh the final grade with the rest of the sections. In the event of failure, the student may review the exercises within the timeframe indicated by the teacher. This activity is not recoverable if the required minimum is not reached.	20	A1 A2	B2 B3 B6	C1 C4 C6 C10 C11 C13	D1 D2 D4

Objective questions exam	A first written test corresponding to topics 1-3 will be carried out on the date approved by the Faculty Board (see the center's website). This test will consist of multiple choice questions. It is essential to obtain a minimum score of 5.0 out of 10 to be able to weigh with the rest of the sections. This grade will account for 25% of the final grade.	25	A1 A2	B2 B3 B6	C1 C4 C6 C10 C11 C13	D1 D2
Essay questions exam	A second written test corresponding to topics 4-8 will be carried out on the date approved by the Faculty Board (see the center's website). This test will consist of multiple choice questions and a question on the integration of metabolism regulation. It is essential to obtain a minimum score of 5.0 out of 10 to be able to weigh with the rest of the sections. This grade will account for 35% of the final grade.	35	A1 A2	B2 B3 B6	C1 C4 C6 C10 C11 C13	D1 D2

Other comments on the Evaluation

The assessment of the subject ***Biochemistry II*** is **continuous** throughout the academic year. To follow this system, the student must complete all proposed activities: laboratory practices, seminars, and two written exams.

Any specific situation that prevents participation in the laboratory practices or seminars (such as illness, employment contract, etc.) must be communicated to the instructor as soon as possible, in order to find an appropriate solution.

Attendance at seminars and laboratory practices is mandatory. Only one absence is allowed, which must be properly justified.

To **pass BIOCHEMISTRY II in the first examination session (January)**, it is necessary to obtain a minimum score of **5.0 out of 10** in **each** of the assessable activities. The final grade will be the sum of the weighted scores, but **only** if the minimum required grade is achieved in all components. Otherwise, the scores will not be added, and the grade recorded in the Biochemistry II transcript (January) will be the **highest weighted score obtained among the failed components**.

CONDITIONS FOR THE SECOND EXAMINATION SESSION (JULY)

Grades equal to or higher than the required minimum (5.0 out of 10) obtained in the first session (January) will be retained for the second session (July). Laboratory practices and seminars **cannot** be retaken in July; only the written exams that did not meet the minimum requirement in January may be retaken.

If the student did not pass both written exams in the first session (January), they must take a comprehensive exam in July. In this case, the final written exam will account for **60% of the final grade**, and will be considered passed if a minimum score of **5.0 out of 10** is achieved.

The final grade for Biochemistry II in this second session (July) will be the sum of the weighted grades of all assessable activities, **provided** that the minimum required score has been obtained in each of them. If the student fails to reach the required minimum in seminars or laboratory practices, this must be compensated with a higher score in the final written exam.

Failure to attend **all** assessable activities will automatically result in a **"Not Presented"** in the Biochemistry II transcript for both sessions (January and July). Conversely, completing **some but not all** assessable activities will result in a **fail** in both sessions.

If the student prefers to follow a **global assessment**, they must request it within the period established by the Dean□s Office of the Biology Faculty. The global exam will include questions on laboratory practices, seminar exercises, and the entire theoretical content. However, **participation in laboratory practices is mandatory**, excluding the submission of the lab report. Students who do not carry out the laboratory practices will **not** be allowed to realize the final theoretical exam.

Students who do not pass Biochemistry II in either of the two sessions will have their grades for **laboratory practices and seminars** retained for the **following two academic years**, **provided** they have obtained the minimum required scores. Only failed components must be repeated. Approved activities **cannot** be reassessed.

The academic calendar can be consulted at the following link: http://bioloxia.uvigo.es/gl/docencia/horariosThe exam schedule can be consulted at the following link: http://bioloxia.uvigo.es/gl/docencia/exames

Sources of information

Basic Bibliography

Stryer, L., Berg, J.M., Tymoczko, J. L., **Bioquímica**, 7ª edición., Reverté, 2013

Voet, D;Voet, J.G.; Pratt, C.W., **Fundamentos de Bioquímica. la vida a nivel molecular**, 4ª Edición, Editorial Médica Panamericana, 2016

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Complementary Bibliography

Recommendations

IDENTIFYING DATA				
Botánica II: Arquegoniadas				
Subject	Botánica II: Arquegoniadas			
Code	V02G031V01207			
Study programme	Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2	2c
Teaching language	Castelán Galego			
Department	Bioloxía vexetal e ciencias do solo			
Coordinator	García Molares, Aida			
Lecturers	García Molares, Aida Muñoz Sobrino, Castor			
E-mail	molares@uvigo.es			
Web				
General description	Biodiversidade e bioloxía de Briófitas, criptógamas vasculares e Espermatófitas. Nocións básicas sobre ecoloxía vexetal.			

Resultados de Formación e Aprendizaxe	
Code	
A1	Que os estudantes demostrasen posuír e comprender coñecementos nunha área de estudo que parte da base da educación secundaria xeral, e adóitase atopar a un nivel que, aínda que se apoia en libros de texto avanzados, inclúe tamén algúns aspectos que implican coñecementos procedentes da vangarda do seu campo de estudo.
A5	Que os estudantes desenvolvesen aquelas habilidades de aprendizaxe necesarias para emprender estudos posteriores cun alto grao de autonomía.
B1	Desenvolver a aprendizaxe autónoma, identificando as súas propias necesidades formativas e organizando e planificando as tarefas e o tempo.
B2	Xestionar información científico-técnica de calidade utilizando fontes diversas. Analizar datos e documentos e interpretalos de forma crítica e rigorosa, incluíndo reflexións sobre a súa relevancia social e no ámbito profesional da Bioloxía.
C1	Resolver problemas aplicando o método científico, os conceptos e a terminoloxía específica da Bioloxía, os modelos matemáticos e as ferramentas estatísticas e informáticas.
C2	Recoñecer os niveis de organización dos seres vivos mediante o estudo de especímenes actuais e fósiles. Realizar análise filoxenéticos e interpretar os mecanismos da herdanza, a evolución e a biodiversidade.
C7	Muestrear, caracterizar, catalogar e xestionar recursos naturais e biolóxicos (poboacións, comunidades e ecosistemas).
C9	Identificar recursos de orixe biolóxica e valorar a súa explotación eficiente e sostible para obter produtos de interese. Propoñer e implantar melloras nos sistemas produtivos.
D3	Comprometerse coa sustentabilidade e medio ambiente. Uso de forma equitativa, responsable e eficiente dos recursos.
D5	Comunicar de maneira eficaz e adecuada, incluíndo o uso de ferramentas dixitais e o inglés.

Resultados previstos na materia				
Expected results from this subject	Training and Learning Results			
Comprender os mecanismos de reprodución e ciclos biolóxicos das arquegoniadas.	A1 A5	B1 B2	C2	
Recoñecer a biodiversidade de briófitos, criptógamas vasculares e espermatófitos, e as súas relacións evolutivas.	A1 A5	B2	C1 C2 C9	D3 D5
Coñecer e manexar os conceptos, terminoloxía e instrumentación científico-técnica relativos á Botánica.	A1 A5	B1 B2	C1	
Ser capaz de describir e identificar espécimes mediante a utilización de claves ao uso.	A1 A5	B1 B2	C1 C7 C9	D3 D5
Manexar conceptos básicos utilizados no estudo da vexetación.	A1		C7 C9	D3
Comprender a proxección social da Botánica e a súa repercusión no exercicio profesional, así como saber utilizar os seus contidos para impartir docencia e a súa divulgación.			C9	D3 D5

Contidos
Topic
BLOQUE I: INTRODUCIÓN

Lección 1: NIVEL DE ORGANIZACIÓN CORMÓFITOS	Caracteres que determinan a adaptación ao medio terrestre dos embriófitos: aparello vexetativo, reproducción e alternancia de xeneracións. Filoxenia e clasificación.
BLOQUE II: BRIÓFITAS	
Lección 2: BRIÓFITAS	División Bryophyta. Carateres xerais e reprodutivos. Ciclo vital. Sistemática: clases Hepaticae, Musci e Anthocerotae. Filoxenia.
BLOQUE III: ESTRUCTURA E ORGANIZACIÓN DAS PLANTAS VASCULARES	
Lección 3: A RAÍZ	Concepto e función. Estrutura primaria e secundaria. Morfoloxía do sistema radicular. Tipos de raíces. Simbiose con bacterias, cianobacterias e fungos.
Lección 4: O CAULE	Concepto e función. Estrutura primaria e secundaria. Teoría estélica. Desenvolvemento. Estrutura externa do eixo caulinar. Diversidade de tipos caulinares. Formas vitais.
Lección 5: AS FOLLAS	Concepto e función. Estrutura anatómica. Vernación e filotaxe. Morfoloxía foliar. Polimorfismo foliar. Adaptacións especiais.
BLOQUE IV: CRIPTÓGAMAS VASCULARES	
Lección 6: CARACTERES XERAIS DAS CRIPTÓGAMAS VASCULARES	Ciclo vital. Caracteres xerais do gametófito e do esporófito. Órganos reprodutores. Anomalías espontáneas do ciclo sexual. Filoxenia. Clasificación.
Lección 7: DIVERSIDADE DE CRIPTÓGAMAS VASCULARES	División Lycophyta: clases Zosterophyllopsida e Lycopsida. División Monilophyta: clases Equisetopsida, Psilotopsida, Marattiopsida e Polypodiopsida.
BLOQUE V: ESPERMATÓFITAS	
Lección 8: CARACTERES XERAIS DAS PLANTAS CON SEMENTE	Caracteres do aparello vexetativo. Reprodución asexual. Reprodución sexual; ciclo vital xeral. Concepto de flor, semente e froito. Clasificación das espermatófitas.
Lección 9: XIMNOSPERMAS I.	Os precursores das ximnospermas: clases Progymnospermopsida e Pteridospermopsida. Características xerais das ximnospermas. Clasificación. Caracteres vexetativos e reprodutores das subclases Cycadidae e Ginkgoidae.
Lección 10: XIMNOSPERMAS II	Caracteres vexetativos e reprodutores da Subclase Pinidae; esbozo da súa clasificación. Principais familias do orden Pinales; representación na flora ibérica. Subclase Gnetidae: Gnetum, Ephedra e Welwitschia; caracteres vexetativos, reprodutores, ecoloxía e distribución.
Lección 11: ANXIOSPERMAS I: CARACTERES XERAIS DAS ANXIOSPERMAS	Caracteres xerais do aparello vexetativo. A flor das anxiospermas; fórmulas e diagramas florais. Inflorescencias. Polinización. Froitos e infrutescencias. Mecanismos de diseminación de froitos e sementes. Clasificación.
Lección 12. ANXIOSPERMAS II. ANXIOSPERMAS BASAIS, CLADO MAGNOLIIDAE E CLADO MONOCOTYLEDONEAE	Anxiospermas basáis: familias Amborellaceae e Nimphaeaceae. Clado Magnoliidae: Familia Magnoliaceae. Clado Monocotyledoneae: familias Liliaceae e Orchidaceae.
Lección 13: ANXIOSPERMAS III. CLADO EUDICOTYLEDONEAE	Eudicotiledóneas basáis: Familia Ranunculaceae. Clado Gunneridae. Clado Rosidae: familias Brassicaceae, Fabaceae, Fagaceae e Rosaceae. Clado Superasteridae: Familia Cayophyllaceae, Familia Asteraceae.
PROGRAMA DE CLASES PRÁCTICAS	
Práctica 1	Observación e identificación de briofitas.
Práctica 2	Observación e identificación de criptógamas vasculares e ximnospermas.
Prácticas 3, 4 e 5	Observación e identificación de anxiospermas.
SEMINARIOS	
Nos tres seminarios programados trataranse temas complementarios da materia	

Planificación

	Class hours	Hours outside the classroom	Total hours
Lección maxistral	30	40	70
Prácticas de laboratorio	15	15	30
Prácticas de campo	0	20	20
Seminario	3	0	3
Práctica de laboratorio	1	2	3
Autoavaliación	0	5	5
Exame de preguntas obxectivas	2	8	10
Exame de preguntas obxectivas	2	7	9

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Metodoloxía docente	
	Description
Lección maxistral	O programa teórico da materia se desenvolverá durante as sesións maxistrais. Os materiais didácticos utilizados nas exposicións estarán a disposición dos estudantes de xeito anticipado.
Prácticas de laboratorio	Procederase á observación dos caracteres taxonómicos de exemplares dos diferentes grupos de plantas utilizando a lupa binocular e o microscopio composto. Utilizaranse claves de identificación.
Prácticas de campo	Os alumnos, individualmente ou por parellas, confeccionarán un herbario virtual que debe incluír, polo menos, 30 especies distintas de árbores e arbustos espontáneos e ornamentais da súa contorna. Ademais da identificación e fotografías, deben indicar a súa posición taxonómica e os caracteres máis relevantes que os diferencian doutras especies próximas.
Seminario	Durante os seminarios tratarase de xeito monográfico algúns aspectos relacionados coa materia.

Atención personalizada	
Methodologies	**Description**
Lección maxistral	Mediante cita previa, no horario de titorías, a través do correo electrónico, o despacho virtual do Campus remoto ou o foro de MOOVI, a profesora atenderá todas aquelas cuestións que non quedaran resoltas durante as sesións maxistrais.
Prácticas de laboratorio	Mediante cita previa, no horario de titorías, a través do correo electrónio, o despacho virtual do Campus remoto ou o foro de MOOVI, os profesores atenderán todas aquelas cuestións que non quedaran resoltas durante as práctiicas.
Seminario	No horario de titorías, ou previa cita, a través do correo electrónico, o despacho virtual do Campus remoto ou o foro de MOOVI, a profesora encargada de impartilos atenderá todas aquelas cuestións que non quedaran resoltas durante as sesións de seminario.
Prácticas de campo	En horario de titorías, previa cita, por correo electrónico, a través do despacho virtual do Campus remoto ou o foro de MOOVI, o profesorado da materia liquidará as dúbidas que puideran xurdir durante a confección do herbario virtual
Tests	**Description**
Autoavaliación	En horario de titorías, previa cita, ou ben a través do correo electrónico, o despacho virtual do Campus remoto ou o foro de MOOVI, a profesora encargada da docencia teórica resolverá as dúbidas xurdidas durante a realización das probas de autoevaluación.

Avaliación			
	Description	Qualification	Training and Learning Results
Prácticas de campo	Para a avaliación do herbario virtual de, polo menos, 30 pliegos de árbores e arbustos autóctonos e ornamentais, terase en conta a orixinalidade das fotografías, a precisión da identificación e a idoneidade dos caracteres taxonómicos destacados no texto, a precisión dos datos de localización, así como a orde e coidado da súa presentación. Pódese facer individualmente ou por parellas. A elaboración do herbario fotográfico é unha actividade obrigatoria para os alumnos que opten pola modalidade de avaliación continua.	10	A1 B1 C1 D3 B2 C2 D5 C7 C9
Práctica de laboratorio	O examen práctico consistirá nunha proba de descrición e identificación dun exemplar utilizando as claves. É preceptivo superalo cunha cualificación igual ou superior a 5 puntos sobre 10 para superar a materia. Esta proba é obrigatoria para todos os alumnos, aínda que no caso dos alumnos que opten pola modalidade de avaliación global supoñerá o 20 % da cualificación final, mentres que no caso da avaliación continua a porcentaxe sobre a cualificación final será do 10 %.	10	A1 B1 C1 D5 A5 B2 C2 C7 C9
Exame de preguntas obxectivas	O primeiro exame parcial versará sobre as sete primeiras leccións do programa teórico. A cualificación obtida deberá ser igual ou superior a 5 sobre 10 puntos para superar a materia.	40	A1 B1 C1 D5 A5 B2 C2
Exame de preguntas obxectivas	O segundo exame parcial versará sobre os contidos das leccións 8 a 13, ambalas dúas incluidas. A cualificación obtida deberá ser igual ou superior a 5 puntos sobre 10 para superar a materia.	40	A1 B1 C1 D5 A5 B2 C2

Other comments on the Evaluation

Os horarios da materia figuran na páxina web da facultade:

§ GL: http://bioloxia.uvigo.es/gl/docencia/horarios

§ ES: http://bioloxia.uvigo.es/es/docencia/horarios

As datas de exame establecidas no calendario oficial pódense consultar nas seguintes ligazóns:

§ GL: http://bioloxia.uvigo.es/gl/docencia/exames

§ ES: http://bioloxia.uvigo.es/es/docencia/examenes

O método de avaliación establecido por defecto é a modalidade de avaliación continua; se algún alumno desexa acollerse á modalidade de avaliación global deberá indicalo mediante un documento asinado antes de que finalice o prazo sinalado polo decanato da facultade.

Os requisitos no caso da modalidade de avaliación continua son os seguintes:

- A asistencia ás clases prácticas de laboratorioo é obrigatoria (salvo falta debidamente xustificada); os alumnos que non cumpran este requisito figurarán en actas como "non presentado".

- Para superar a parte teórica da materia, a nota mínima obtida en cada un dos exames parciais deberá ser igual ou superior a 5 puntos sobre 10. A parte teórica na modalidade de avaliación continua supón o 80 % da cualificación final da materia.

- O exame práctico de laboratorio representa o 10 % da cualificación global da materia. Consistirá na descrición dun espécime, incuíndo a elaboración do diagrama e a fórmula floral, que deberá ser correctamente identificado coa axuda de claves. A superación desta proba cunha nota igual ou superior a 5 puntos sobre 10 é imprescindible para superar a materia.

- A elaboración do herbario virtual de forma individual ou por parellas, cun número mínimo de 30 pregos de plantas leñosas debidamente etiquetados e ordenados, supón o 10 % da cualificación global.

- A cualificación final é o resultado da suma das porcentaxes asignadas aos distintos apartados avaliados. Para poder superar a materia en primeira convocatoria é necesario obter nas probas teóricas unha nota media igual ou superior a 5 puntos sobre 10 e no exame práctico unha cualificación mínima de 5 puntos sobre 10. No caso de non conseguir estas puntuacións mínimas a nota final que figurará nas actas será a cualificación máis baixa das obtidas nos apartados suspensos (media exames teóricos ou exame práctico).

- Na segunda convocatoria manteranse as notas anteriores e será posible recuperar o exame práctico (10 % da cualificación final); tamén poderán recuperarse os exames teóricos suspensos e, no caso de superalos, a media de ambos representará o 80 % da cualificación final.

Na modalidade de avaliación global será requisito indispensable obter unha nota mínima de 5 puntos sobre 10 no examen teórico e no exame práctico da materia, que supoñerán o 80 % e o 20 % da cualificación final, respectivamente. Seguirase o mesmo criterio na segunda convocatoria.

A repetición da materia en cursos posteriores implica repetir a totalidade das actividades.

Bibliografía. Fontes de información

Basic Bibliography

Raven, P.H., Evert, R.F. Eichhorn, S.E., **Biología de las Plantas**, Editorial Reverté., 1991-1992

Carrión, J.S, **Evolución vegetal**, DM. Murcia, 2003

Heywood, V.H., **Las Plantas con Flores**, Editorial Reverté, 1985

Díaz González, T.E e outros, **Curso de Botánica**, Ediciones Trea, 2004

Izco, J., **Botánica**, McGraw-Hill, 2005

Complementary Bibliography

Font Quer, P., **Diccionario de Botánica**, Editorial Labor, 2009

Gómez-Manzaneque, F., **Los Bosques Ibéricos: una interpretación geobotánica**, Editorial Planeta, 2005

García, X.R., **Guía das plantas de Galicia**, Edicións Xerais, 2008

Castro, M. e outros, **Guía das árbores autóctonas e ornamentais de Galicia**, Edicións Xerais, 2007

Merino, B., **Flora descriptiva e ilustrada de Galicia**, La Voz de Galicia, 1980

Smith, A.J.E., **The moss flora of Britain and Ireland.**, Cambridge University Press, 2004

Smith, A.J.E., **The liverworts of Britain and Ireland**, Cambridge University Press, 1990

Castroviejo, S. et al., **Flora Ibérica**, Jardín Botánico de Madrid (CSIC), varios anos

Recomendacións

Subjects that continue the syllabus

Análise e diagnóstico medioambiental/V02G030V01902
Biodiversidade: Xestión e conservación/V02G030V01905
Avaliación de impacto ambiental/V02G030V01904

Other comments

Os horarios da materia figuran na páxina web da facultade:
http://bioloxia.uvigo.es/docs/docencia/horarios/hor_2grado_2sem1618.pdf

- É aconsellable repasar semanalmente os contidos teóricos da materia para asimilar de xeito adecuado os conceptos e a terminoloxía científica, o que redundará nun mellor aproveitamento das clases prácticas.
- O alumno debe asistir ás clases prácticas provisto dunha bata de laboratorio. Trátase dunha norma de obrigado cumprimento.

IDENTIFYING DATA

Animal and plant histology and cytology II

Subject	Animal and plant histology and cytology II			
Code	V02G031V01208			
Study programme	Grado en Biología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2nd	2nd
Teaching language	Spanish			
Department				
Coordinator	Molist García, María del Pilar			
Lecturers	Barandela González, Marta Miguel Villegas, Encarnación de Molist García, María del Pilar Núñez González, Carmen			
E-mail	pmolist@uvigo.es			
Web	http://https://mmegias.webs.uvigo.es			
General description	Cytology and plant and animal histology II is one of the mandatory subjects that is taught in the second semester of the 2nd year of the Degree of Biology. This course exposes the basic biological principles of microscopic organization of animal and plant tissues, and their assembly in the constitution of organs. It aims to know the anatomy and morphology of plant and animal tissues and organs and the various cell types that compose them.			

Training and Learning Results

Code	
A3	Students should prove ability for information-gathering and interpret important data (usually within their study field) to judge relevant social, scientific or ethical topics.
A4	Students should able to communicate information, ideas, issues and solutions to all audiences (specialist and unskilled audience).
B2	Manage scientific-technical information using diverse and reliable sources. Analyze data and documents and interpret them critically and rigorously, including considerations on their social relevance and in the professional field of Biology.
B3	Apply the knowledge acquired in the degree and use the scientific-technical instrumentation and CIT in contexts of Biology and/or related to the professional practice.
B6	Develop analysis and synthesis, critical reasoning and argumentation skills, applying them in Biology and other scientific-technical disciplines.
C1	Solve problems by applying the scientific method, the concepts and terminology specific to biology, mathematical models and statistical and computer tools.
C2	Identify levels of organisation of living beings through the study of current specimens and fossils. Carry out phylogenetic analyses and study the mechanisms of heredity, evolution and biodiversity.
C6	Understanding and integrate the functioning of living beings (cellular, tissue, organ and individual level), explaining their homeostatic and adaptive responses.
D1	Understand the meaning and use of the gender perspective in the different fields of knowledge and in professional practice with the aim of achieving a fairer and more equal society.
D2	Communicate speaking and in writing in Galician.
D3	Commitment to sustainability and the environment. Equal, sensible and efficient use of resources.

Expected results from this subject

Expected results from this subject	Training and Learning Results			
To know the histology and anatomy of animal and plant tissues and organs.	A4	B6	C2	D3
Knowledge of the different cell types that make up plant and animal tissues.	A3 A4	B6	C2 C6	D3
To apply knowledge of cytology and histology to isolate, identify, handle and analyze specimens and samples of biological origin, as well as to characterize their cellular and molecular constituents.	A4	B2 B3	C1	D1
To apply knowledge and technology related to Cytology and Histology in aspects related to the production, exploitation, analysis and diagnosis of biological processes and resources.	A3	B6	C1	D1
Obtaining information, carrying out experiments and interpreting the results.	A3	B3 B6	C6	D1 D3
Understanding the social projection of Cytology and Histology and its repercussions on professional practice. Be able to use its contents for teaching and dissemination.	A4	B3	C1	D2
Knowledge and handling of the concepts, terminology and scientific-technical instrumentation related to cytology and histology.	A3	B2 B6	C1	D3

Contents	
Topic	
I. Thematic block. Histology and microscopic animal Organography	Lesson 1.- INTRODUCTION TO THE ANIMAL TISSUES: COATED AND GLANDULAR EPITHELIA. Histogenesis and differentiation of animal tissues. General characteristics of the epithelia. Types of epithelial cells and functions. The basement membrane: location and composition. Histogenesis. Coating epithelia: classification and localization. Special types. Epithelial regeneration and regeneration. Glandular epithelia. Secretion: concept and types. Classification and function. Exocrine and endocrine glands. Control of secretion. Lesson 2.- THE CONNECTIVE TISSUE: VARIETIES. ADIPOSE TISSUE. General characteristics: cell types and extracellular matrix. Varieties of connective tissue: characteristics and location. Adipose tissue: types, morphological and functional characteristics. Histogenesis. Lesson 3.- SUPPORTING TISSUES: CARTILAGINOUS, BONE AND CORDAL TISSUES. Cartilage: general characters: cell types and extracellular matrix. Histogenesis and growth. Varieties. Degeneration and regeneration. Cordial tissue. Bone tissue: cell types and extracellular matrix. Types of bone and varieties. Ossification: intramembranous and endochondral. Functional aspects Lesson 4.- BLOOD AND LYMPH. THE IMMUNE RESPONSE. Blood: general characteristics. Plasma. Blood elements: types and functions. Agglutination and coagulation. Lymph: composition and formation. Hematopoiesis. Lymphopoiesis. Cellular bases of immunity. Humoral and cellular immunity. Lesson 5.- THE MUSCLE TISSUE. Generalities and classification. Skeletal, smooth and cardiac muscle: organization and structure, innervation and contraction. Histogenesis, growth and regeneration. Modifications of muscle tissue: the electrical organs. Lesson 6.- THE NERVOUS TISSUE. Generalities. Neurons: characteristics, classification and organization. Glia: types, characteristics and functions. Synapsis: types and classification. CNS: organization. PNS: organization. Clinical examples of synaptic function.

II. Thematic block. Histology and microscopic plant organography	Lesson 7.- THE VEGETABLE CELL AND THE VEGETABLE ORGANISM. Characteristics of the plant cell. The cell wall: structure, formation and growth. Specializations of the cell wall: plasmodesms and pits. Basic organization of the upper floors. Plant organs: general arrangement of tissue systems: Main features. Formation of the body of the plant. Lesson 8. MERISTEMS Concept. Cytological characteristics. Classification: primary and secondary meristems. Lesson 9.- PARENCHYMA AND nd FABRICS OF SUSTAIN. Parenchyma: structure, functions and types. Collenchyma: structure and varieties. Sclerenchyma: cellular types. Lesson 10.- VASCULAR TISSUES: XYLEM AND PHOEM. Characteristics and celular types of xylem. Organization of primary and secondary xylem. Phloem: organization and cell types. Function and structure. Vascular tissues in the primary and secondary growth of the plant: structure and differentiation. Lesson 11.- PROTECTION AND GLANDULAR TISSUES. Epidermis: cell types. The cuticle. Stomas: structure, function and differentiation. Trichomes. Periderm: structure. Lenticel. Activity of the phellogen: the rhytidom. External and internal secretory structures. Lesson 12.- VEGETATIVE ORGANS. Root, stem and leaves: tissues organization in primary and secondary growth. Lesson 13.- REPRODUCTIVE ORGANS. FLOWER, FRUIT AND SEED Structure of the flower. Histology of stamens: microsporogenesis and formation of pollen grain. Histology of carpels: megasporogenesis and development of the embryonic sac. Germination of pollen grain. Fertilization. The fruit and the seed.
III thematic Block: Practices	Practice 1. Tegument and associated glands. Hair follicle. Glands of the endocrine system: thyroid and adrenal. Practice 2. Digestive system: tongue, esophagus, stomach, intestine. Glands associated with digestive I: salivary. Practice 3. Glands associated with digestive II: pancreas and liver. Circulatory system: blood and heart. Practice 4. Respiratory system: trachea and lung. Excretory system: kidneys. Practice 5. Nervous system: spinal cord. Plant organography: root and leaves. Practical 6. Plant organography: stems.

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	33	76	109
Laboratory practical	12	18	30
Seminars	3	5	8
Objective questions exam	1	0	1
Objective questions exam	2	0	2

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies
Description

Lecturing	Presentation by the teacher of the basic concepts of the subject in order for the student to acquire the skills. Dialogue and discussion in class will be promoted based on some practical example. Questionnaires will be conducted after each topic or group of topics. The presentations will also have a percentage of slides in English to facilitate learning for foreign students.
Laboratory practical	Introduction of the practice by the teacher followed by the microscopic identification of tissues and organs, following the script that will be available on the Tema platform prior to its realization. Acquisition of basic skills associated with observation and histological description.
Seminars	In the seminars the teacher will give a general explanation of several topics, after which each student will have to expose with the support of two or three photographs the knowledge previously explained. In addition there will be problems that students will have to solve in small groups.

Personalized assistance

Methodologies	Description
Lecturing	In addition to the advice and clarifications that are made during the theory classes, students will be attended individually in the tutoring hours. Attention to the student can be done via telematics (email, videoconference, Moovi forums, etc.) under the modality of prior agreement.
Laboratory practical	Histological preparations related to the topics covered in the theoretical part will be analyzed. Histological studies will be carried out on the different organs where the different tissues are analyzed. The students will be able to ask the teacher and they can also support their analysis in a script that is sent to them before each practice. The script also presents a series of exercises that students will have to fill in during practice.

Assessment

	Description	Qualification	Training and Learning Results			
Lecturing	Throughout the development of the subject, 5 self-assessment questionnaires will be carried out using the Moovi platform. Each questionnaire will include questions corresponding to a group of theoretical lessons. They will be carried out in the classroom before the theoretical class.	15	A4	B6	C2	D3
Laboratory practical	The concepts acquired in the laboratory sessions will be evaluated in three follow-up tests carried out every two practices and a final test coinciding with the official examination of the subject. In all of them the student will have to identify different structures in images or schemes, such as cell types, tissues, organs, type of growth or group of plants, structures also explained in the classroom	24	A3 A4	B3 B6	C2	D2 D3
Seminars	The evaluation of the seminar will be made on a continuous basis throughout the course, based on the quality of the student's participation.	11	A3 A4	B2 B3	C1	D1 D2 D3
Objective questions exam	Written exam that includes the evaluation of the theoretical classes of animal histology.	35	A3	B6	C1 C6	D1 D3
Objective questions exam	Written exam that includes the evaluation of the theoretical classes of plant histology.	15	A3 A4	B6	C1 C6	D1 D3

Other comments on the Evaluation

Attendanceto theory classes, practices and seminars is mandatory for allstudents and will be subject to rigorous control in the second yearstudents. Continuous monitoring of attendance to theory and practice,as well as intervention in the seminar debates, will be used tomonitor the performance of the student. The student will have to haveat least 80% of attendance to the different activities to beevaluated.

The evaluation of the subject Cytology andHistology Animal and Plant II will combine written tests andcontinuous evaluation throughout the course.

A) Evaluation ofthe seminar.

The evaluation of the seminar (maximum value: 1,1 pointout of 10) will be carried out continuously during the course. Asthere are three seminars the value of each will be 0.3 points. This note is achieved by assessment of knowledge, and attendance at the three seminars will add the remaining 0.2. The inclusion of the value of theseminar in the final grade of the subject will be carried out if andonly if the student is submitted to the official examination of thesubject.

The qualification of the seminar will be kept within thecurrent course.

B) Practical Assessment

Throughout thepractices will be carried out three tests that will mainly consist ofthe identification of tissues and / or organs through the observationof slides. Each test will have a maximum value of 0.8 points over 10.Thequalification of the practices will remain within the currentcourse.

C) Theoretical valuation

There will be two written tests where the theoretical knowledge of the subject will be assessed. In these tests, questions

integrating theoretical and practical knowledge may be asked. The maximum value of both tests is 5 points out of 10, of which 3.5 points will correspond to the part of animal histology that will be carried out on the official date and the rest, 1.5 points will correspond to the part of plant histology, which will take place once that part is finished.. The format ofquestions will be varied and may include:
1) Short answerquestions.
2) Questions that link the identification of images /schemes with theoretical concepts.
3) Test questions (single /multiple answer), based on knowledge acquired in the classroom and inthe laboratory.

D) Assessment of the questionnaires (self-evaluation)
Throughout the development of the subject, 5 self-assessment questionnaires will be carried out using the Moovi platform. Each questionnaire will comprise questions corresponding to a group of theoretical lessons. They will take place in the classroom and each one will have a value of 0.3 points. Within the course schedule, a series of days will be assigned to complete the questionnaires. These days will be put in the subject's activity table so the student will know these dates well in advance. All this means that there will be no excuse not to take the questionnaire unless it is an emergency. In any case, the questionnaires only have a completion date.

E) Final grade of the subject.To pass thesubject, it is necessary to surpass 50% of the theoretical part (2,5)and 50% of the practical part (1,2). Otherwise, the final grade will bethe result of multiplying the total grade (theory + practices +seminars+ questionnaires) by 0.5.

Students who rejectthe continuous assessment may request the global assessment in the periodestablished by the center.The evaluation will be carried out on the officialdates of first and second opportunity. This evaluation will make it possible toachieve 100% of the score for the subject in an exam broken down into threeparts: theoretical content (5 points), practical content (3 points) andseminars (2 points).

Repeatingstudents from other courses must take the seminars and quizzes. If theyconsider and voluntarily, they may or may not attend the practices, but it ismandatory to take the exams that are carried out during the course.

According to the scaledetermined by the University of Vigo, the subject of Cytology andHistology Animal and Plant II will have numerical qualification withonly one decimal, with the following equivalence:
NOT SUBMITTED, will be the student who does not take the final exam.
NOT PASS:0-4,9
PASS: 5-6.9
NOTABLE: 7-8.9
OUTSTANDING: 9-10
HONORREGISTRY: Awarded to students who have obtained a grade of 9 orhigher. Their number may not exceed 5% of students enrolled in asubject in the corresponding academic year, unless the number ofstudents enrolled is less than 20 , In which case, a singleMatriculation of Honor may be granted.

The dates of the examsand the class schedules can be consulted in the web page of thefaculty being susceptible of modification in specialcircumstances.

http://bioloxia.uvigo.es/es/docencia/grado-en-biologia/horarios

Sources of information

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Complementary Bibliography

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LaDouceur E.E.B, **Invertebrate histology**, 1ª, Wiley, 2021

García-Garza, R., **Cuaderno de histologhía para colorear**, 1ª, Elsevier, 2023

Recommendations

Other comments

A responsible commitment to learning reflected in the attitude throughout the course and in the aptitude associated with the acquisition of knowledge, will enable the passing of the subject. Studying the subject in a continuous way will enable the student to participate actively in the course. Knowing, understanding, reflecting and reasoning about the basic knowledge of the course, with a mature attitude, will be useful to participate in the different activities proposed by the teaching staff and guarantee of success in the course

IDENTIFYING DATA				
Genetics I				
Subject	Genetics I			
Code	V02G031V01209			
Study programme	Grado en Biología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2nd	2nd
Teaching language	Spanish English			
Department				
Coordinator	Quesada Rodríguez, Humberto Carlos			
Lecturers	Canchaya Sanchez, Carlos Alberto Fernández Silva, Iria Galindo Dasilva, Juan García López, Alejandra Pérez Diz, Ángel Eduardo Quesada Rodríguez, Humberto Carlos			
E-mail	hquesada@uvigo.es			
Web				
General description	The contents of the Course Genetic I include: Mendelian Genetics. Linkage and recombination. Structure, replication and organisation of the DNA. Gene expression and its regulation. After taking Genetics I, the students will have to know and comprehend: - The mechanisms of the inheritance. - The structure and function of the nucleic acids. - The expression, replication, transmission and modification of the genetic material. - The genetic regulation and the genetic bases of development.			

Training and Learning Results	
Code	
A1	Students should prove understanding and knowledge in this study field that starts in the Secundary Education and with a level that, even though it is suppported in advanced books, also includes some aspects that involve knowledge from the vanguard of the study field.
A2	Students should know how to apply their knowledge to their work or vocation in a professional way. They also should have the competences that are usually proved through the elaboration and defence of arguments and the resolution of problems within their study field.
A3	Students should prove ability for information-gathering and interpret important data (usually within their study field) to judge relevant social, scientific or ethical topics.
B1	Developing autonomous learning by identifying their own training need and organizing and planning tasks and time.
B3	Apply the knowledge acquired in the degree and use the scientific-technical instrumentation and CIT in contexts of Biology and/or related to the professional practice.
B6	Develop analysis and synthesis, critical reasoning and argumentation skills, applying them in Biology and other scientific-technical disciplines.
C1	Solve problems by applying the scientific method, the concepts and terminology specific to biology, mathematical models and statistical and computer tools.
C2	Identify levels of organisation of living beings through the study of current specimens and fossils. Carry out phylogenetic analyses and study the mechanisms of heredity, evolution and biodiversity.
C5	Manipulate and analyse genetic material and determine its alterations and pathological implications. Knowing the applications of genetic engineering.
D5	Communicate effectively and appropriately, including the use of computer tools and English.

Expected results from this subject	Training and Learning Results			
To know and handle concepts, terminology and instrumentation related to Genetics.	A1 A2 A3	B1 B3 B6	C1 C2 C5	D5
Understanding the logic of the transmission of hereditary material.	A1 A2 A3	B1 B3 B6	C1 C2 C5	D5
To comprehend the techniques of genetic mapping.	A1 A2 A3	B1 B3 B6	C1 C5	
To know the structure, organization and replication of hereditary material.	A1 A2 A3	B1 B3 B6	C1 C2 C5	D5

Understanding how hereditary material functions and is expressed.	A1 A2 A3	B1 B3 B6	C1 C2 C5	D5
Understanding the basis of the regulation of gene expression.	A1 A2 A3	B1 B3 B6	C1 C2 C5	D5

Contents	
Topic	
Transmission of the hereditary material	Inheritance and chromosomes. Segregation and independent transmission. Gene interaction. Inheritance and environment.
Linkage and genetic maps	Genetic Linkage and recombination. Chromosomal cartography in eukaryotes.
Nature and replication of the hereditary material	Nature and structure of the hereditary material. The replication of the DNA. Organisation of the DNA in the chromosomes. Methods of study of the DNA.
Expression of the genetic information.	Gene transcription. Genetic code. Translation.
Regulation of the gene expression	Regulation of the gene expression in prokaryotes. Regulation of the gene expression in eukaryotes.

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	25	50.5	75.5
Problem solving	8	21	29
Laboratory practical	15	6	21
Practices through ICT	0	24.5	24.5
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Lecturing	They will follow the course schedule. They are organized in lessons, 50 minutes each. In most cases, it is dedicated to explain and develop the contents of the course (concepts and methodologies), but due to time constraints, students needs to complete them (before and after lectures), by self-study using textbooks, complementary readings, computer animations, and reference web pages.
Problem solving	The purpose of working through problems is to better understand the concepts covered during theoretical lectures. A number of problems (available in Moovi) will be assigned throughout the semester. Students may be called upon to solve examples of the completed problems (on the board on their corresponding due dates).
Laboratory practical	The aims of the laboratory sessions are to present to the student experimental procedures related to the course. Students are expected to read the corresponding lab material BEFOREHAND. The contents of the lab sessions are connected with the contents of the lectures both theoretical and problem-solving, so that their content is also part of the knowledge necessary to pass the course. There will be 5 practical sessions lasting 3 hours each.
Practices through ICT	One of the competences that the university student must achieve throughout his / her training is the ability to work autonomously. It is necessary to provide non-contact activities that guide this learning. In order for the learning to be carried out according to the progress of the course, the Moovi platform will be used. Students will take self-assessment tests and solve practical problems.

Personalized assistance	
Methodologies	**Description**
Lecturing	The students can interact with the professor in relation to any aspect of the discipline through personalized tutoring for the resolution of questions, or by mail through the Moovi platform. The tutorials can also be done through the virtual campus by agreeing dates and times previously with the students through email.

Problem solving	The students can interact with the professor respect to any subject related to the resolution of practical problems during the class, using personalized tutoring, or by mail trough the Moovi platform. The tutorials can also be done through the virtual campus by agreeing dates and times previously with the students through email.
Laboratory practical	The student will have access through the Moovi platform to all the documentation of each practice: script of practices, presentations used in class, and complementary information of each practice. Students can interact directly with the teacher during the development of each practical session to clarify questions or expand concepts, or through email through the Moovi platform. The tutorials can also be done through the virtual campus by agreeing dates and times previously with the students through email.
Practices through ICT	The learning process of the student that complements the master classes and the practices will be carried out through the development of non-contact activities through the teaching platform Moovi. In this platform the student will find the material with the presentations of the theory classes, complementary readings, useful documents to study, the script of practices, lists of problems and exercises that must realize in a given term, and self-assessment exams. The teachers will reserve a time to attend and resolve the doubts of the students. In these activities the teacher has as a function to guide and guide the process of student learning and help him to successfully complete the corresponding autonomous work. The teachers will indicate the first days of class the place, day and hours for that personalized attention.

Assessment

	Description	Qualification	Training and Learning Results			
Lecturing	SEE DETAILS IN OTHER COMMENTS ABOUT THE EVALUATION. - Two mid-term exams - One final exam	40	A2 A3	B6	C1 C2	D5
Problem solving	SEE DETAILS IN OTHER COMMENTS ABOUT THE EVALUATION. - Two mid-term exams - One final exam	35	A1 A2 A3	B1 B6	C1	D5
Laboratory practical	SEE DETAILS IN OTHER COMMENTS ABOUT THE EVALUATION. - Knowledgement and performance - A multiple choice test at the end of each laboratory session Attendance to laboratory sessions is mandatory. For repeating students, grade obtained on the previous year will be kept. So that, only for them attendance will be voluntary	15	A2 A3	B3 B6	C1 C2 C5	D5
Practices through ICT	SEE DETAILS IN OTHER COMMENTS ABOUT THE EVALUATION. - Online self-evaluations - Presentation of exercises within the established period	10	A1 A2 A3	B1 B3 B6	C1 C2	D5

Other comments on the Evaluation

Evaluation

The calendar of the tests is in this link: http://bioloxia.uvigo.es/en/teaching/exams

1. Evaluation in June

Option A (Continuous assessment):

- Two mid-term non-eliminatory tests (35% of the final grade). It involves theory and problem- solving material.
- One final exam (40% of the final grade). It involves theory and problem- solving material. It will be necessary to obtain at least 4 points (out of 10) to pass the exam. If this minimun grade is not obtained, the final mark in the subject will be obtained with the global qualifications if it is less than 5, or 4.5 if it is greater than 5.
- Knowledgement and performance in the laboratory session (15% of the final grade). A multiple choice type test will take place at the end of each laboratory session. Attendance to laboratory session is mandatory. For repeating students , grades obtained the previous year will be kept. So that, only for them, attendance will be voluntary.
- Work outside the classroom (10% of final grade). In order to obtain grading, each student must have their own set of completed problems to turn in before due dates and each student should follow the learning sequence in Moovi for all the units.

- To overcome the subject, it will be necessary to obtain 5 points out of 10 in the global qualification.

All grades, except the final exam, will be saved for the 2nd opportunity in July. For subsequent courses, only the qualification of practices will be saved.

Students who are absent from the final exam will not be graded

Option B (for students who waive continuous assessment within the period established by the Dean of the Faculty of Biology, and for students who attend extraordinary calls):

- One final exam (85% of final grade). It involves theory and problem- solving material. In this exam, it will be necessary to obtain at least 5 points to pass the subject.

- Knowledgement and performance in the laboratory sessions (15% of the final grade). A multiple choice type questions will take place at the end of each laboratory session. Attendance to laboratory sessions is mandatory. Practice grades will be saved for the 2nd opportunity in July. For repeating students, practice grade obtained on the previous year will be kept. So that, only for them attendance will be voluntary.

Students who are absent from the final exam will not be graded

Academic Ethics :

- Cheating in this course will not be tolerated.
- Cheating includes but is not limited to: plagiarism, copying during the exams,falsifying documentation related to absences, use of unauthorized electronic devices during an exam
- Penalties for cheating can include failing course

Teaching timetable: http://bioloxia.uvigo.es/es/docencia/horarios

Sources of information

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Recommendations

Other comments

It is recommended to study the subject continuously

IDENTIFYING DATA

Zoology 2: Arthropod invertebrates and chordates

Subject	Zoology 2: Arthropod invertebrates and chordates			
Code	V02G031V01210			
Study programme	Grado en Biología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2nd	2nd
Teaching language	#EnglishFriendly Spanish Galician English			
Department				
Coordinator	Iglesias Briones, Maria Jesús Mato de la Iglesia, Salustiano			
Lecturers	Iglesias Briones, Maria Jesús Kim , Sin-Yeon Lagoa Núñez, Aarón Mato de la Iglesia, Salustiano Noguera Amoros, Jose Carlos Velo Antón, Guillermo			
E-mail	mbriones@uvigo.es smato@uvigo.es			
Web	http://http://bioloxia.uvigo.es/es/docencia/horarios			
General description	According to its academical denomination this course deals with two animal phyla, phylum Arthropoda with joint appendages and phylum Chordata with an axial skeleton (notochorda), segmented muscles, pharyngeal slits, endostile or thyroid gland and postanal tail.			

Training and Learning Results

Code	
A3	Students should prove ability for information-gathering and interpret important data (usually within their study field) to judge relevant social, scientific or ethical topics.
A4	Students should able to communicate information, ideas, issues and solutions to all audiences (specialist and unskilled audience).
B1	Developing autonomous learning by identifying their own training need and organizing and planning tasks and time.
B6	Develop analysis and synthesis, critical reasoning and argumentation skills, applying them in Biology and other scientific-technical disciplines.
C1	Solve problems by applying the scientific method, the concepts and terminology specific to biology, mathematical models and statistical and computer tools.
C2	Identify levels of organisation of living beings through the study of current specimens and fossils. Carry out phylogenetic analyses and study the mechanisms of heredity, evolution and biodiversity.
C6	Understanding and integrate the functioning of living beings (cellular, tissue, organ and individual level), explaining their homeostatic and adaptive responses.
C7	Sampling, characterising, cataloguing and managing natural and biological resources (populations, communities and ecosystems).
C9	Identify resources of biological origin and assess their efficient and sustainable use in order to obtain products of interest. Propose and implement improvements in production systems.
D3	Commitment to sustainability and the environment. Equal, sensible and efficient use of resources.
D4	Collaborate and work in teams or multidisciplinary groups, promote negotiation skills and the ability to reach agreements.
D5	Communicate effectively and appropriately, including the use of computer tools and English.

Expected results from this subject

Expected results from this subject	Training and Learning Results			
To know the origin and evolution of animals: the body plans, the position of the distinct groups along the evolutionary tree and the rules of the zoological nomenclature.	A3 A4	B6	C2	D3
To know the biodiversity and the organisms' abilities to adapt to their environment: species identification (use of dichotomous keys) and analysis of animal behaviour	A3 A4	B1	C1 C2 C6 C7	D3

To know and compare the anatomy and physiology of the different animal groups: morphological adaptations, strategies of capture and food foraging, developmental biology and biological cycles	A3 A4	B6	C2 C6 C9	D3
To apply the acquired knowledge in zoology to manipulate and analyse specimens and samples of biological origin, with the aim of cataloging, evaluating, designing and interpreting biological models; to elaborate management measures for species control and for the dessign of adequate plans that could ensure their conservation and the restoration of their habitats.	A3 A4	B1 B6	C1 C7 C9	D3 D4 D5
To apply knowledge and techniques in those areas specialised in producing and exploitating resources of animal origin; awareness of animal welfare and ethical commitment when studying and using animals	A3 A4	B6	C1 C7 C9	D3 D4 D5
To understand the social projection of zoology and its impact in the professional world, as well as to know how to disseminate contents (orally and written) in academic and scientific fields and in any other forum of dissemination.	A3 A4	B6	C9	D3 D4 D5

Contents	
Topic	
Presentation: General organisation of the course	Organisation of the course. Introduction and justification of the phylogenetic scheme adopted.
I. Panarthropoda	Phylogenetic considerations of Panarthropoda Phylum Tardigrada. External and internal morphology. Phylum Onychophora. External and internal morphology.
II. Phylum Arthropoda	General characteristics Subphylum Chelicerata Suphylum Miriapoda Subphylum Crustacea Subphylum Hexapoda
III. Phylum Chordata	Exclusive characteristics Subphylum Cefalochordata Subphylum Urochordata Subphylum Vertebrata
IV. Phylum Chordata: Craneata	Subphylum Vertebrata (Vertebrates except Tetrapods) Class Mixini Class Petromizontidae Class Chondrichtyes Class Actinopterygii Class Sarcopteriygii
IV. Phylum Chordata: Craneata	Subphylum Vertebrata (Tetrapod Vertebrates) Class Amphybia Class non Avian Reptiles Class Aves Class Mammals
Laboratory Exercises	I. Morphological study of Arthropods I. II. Morphological study of Arthropods II. III. Morphological study of Vertebrates I. IV. Morphological study of Vertebrates II. V. Morphological study of Vertebrates III. VI. Field trip. Observation in situ of different groups of arthropods and chordates.

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	28	42	70
Laboratory practical	15	30	45
Case studies	0	16	16
Seminars	3	0	3
Objective questions exam	1	7	8
Objective questions exam	1	7	8
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Lecturing	Theorical contents related by the professor in the classroom. "Teaching starts in the classroom and ends in the books".

Laboratory practical	The practical exercises are complementary to the lectures and will provide a hands-on training to the diversity of arthropod invertebrates and chordates as well as their anatomy and how to identify them
Case studies	Resolution of problem-solving assignments and questionaires using the online learning platform. They are intended to evaluate the transversal competences acquired by students (i.e. synthesis, critical thinking, creativity) included in the sylllabus
Seminars	They can be used to solve any problems that could arise during the course. They will include complementary activities addressing some of the theoretical-practical aspects. Tasks aiming at acquiring academic English skills will be implemented.

Personalized assistance

Methodologies	Description
Lecturing	Group tutorials do not allow a personalized follow-up but they are a good mechanism to consult any doubts and enable the teacher to share the students' difficulties. In a system in which the burden of learning falls on the student, close follow-up is essential if learning and study are to be continuous and progressive. Therefore, individual tutorials (Monday, Tuesday and Wednesday 09:30-11:30) will also be used to monitor the development of the subject and resolution of any questions that may arise. Student tutorials could also be done vritually (email, videoconference) by mutual agreement between the lecturer and the student.
Laboratory practical	Tutorials (Monday, Tuesday and Wednesday 09:30-11:30) will be used to solve any questions that may arise.
Seminars	Tutorials (Monday and Tuesday 09:00-12:00) will be used to solve any questions that may arise.
Case studies	Tutorials (Monday, Tuesday and Wednesday 09:30-11:30) will be used to solve any questions that may arise.

Assessment

	Description	Qualification	Training and Learning Results
Laboratory practical	Attendance is compulsory and the students active participation will also be positively considered. These sessions will be evaluated based on a written examination of the practical contents at the end of each practical session.	20	A3 B1 C2 A4 C7
Case studies	There will be three problem-solving assignments altogether, which will consist of the resolution of theoretical and/or practical aspects related to each of the thematic units. Each one of them allows the teacher to evaluate the students efforts during the course. They will be available on the online learning platform for at least a week (exact dates will be agreed upon by the students and the teacher). Each of these activities will be evaluated on a scale from 1 to 10 and at the end of the course finally averaged to obtain the final score	10	A3 B1 C1 D3 A4 B6 D5
Seminars	Attendance and active participation in the debates during these sessions are mandatory. The seminars will be evaluated by the resolution of a case study. The content and the quality of the report will also be considered.	10	A3 B1 C1 D3 A4 B6 C9 D4 D5
Objective questions exam	The first assessment will be take place during the teaching period (30%). The student will have to answer several questions related to the phylum Arthropoda. It will cover the material provided during the lectures and aims at evaluating the extent of knowledge acquisition. The format of this exam will be short-answer questions, filling gaps with a few words or drawing a diagram to explain a particular structure or physiological function of a particular animal.	30	A3 B1 C1 D3 A4 B6 C2 D4 C6 D5 C7 C9
Objective questions exam	The second assessment (30%) will take place on the official date established by the Faculty. The student will have to answer several questions related to the phylum Chordata. It will cover the material provided during the lectures and aims at evaluating the extent of knowledge acquisition. The format of this exam will be short-answer questions, filling gaps with a few words or drawing a diagram to explain a particular structure or physiological function of a particular animal.	30	A3 B1 C1 D3 A4 B6 C2 D4 C6 D5 C7 C9

Other comments on the Evaluation

The dates for the written exams of the theoretical aspects of the course will coincide with the official dates stated in the assessment schedule of the Faculty (May and July attempts), which can be found on the faculty website: http://bioloxia.uvigo.es/en/teaching/exams

The written exams of the practical aspects of the subject will be done at the end of each of the practical classes. The scores obtained during the continuous evaluation (seminars, laboratory exercises, on-line activities) will be maintained for the second and extra attempts scheduled for the current academic year.

The final grade will be obtained as the sum of the different evaluation components (after calculating the percentages assigned), as long as each part of the total evaluation (theory, lab sessions, seminars and assignments) had been passed with a minimum value of 5.0. In the case of students not achieving the mark of 5 in either of these components, the score obtained in the failed component will become the numeric final grade**.**

In addition, the teacher may propose extra (voluntary) activities for those students willing to increase the average grade obtained. They will be announced throughout the semester and therefore, it is the student's obligation to stay informed throughout this period.

Students will also have the choice to take a final exam of 100% of the subject contents (instead of the continous evaluation procedure) as long as they have attended all the laboratory sessions. There will be a period to select this modality, which will be established by the faculty.

A student will receive a grade of "not presented" (NP) when he/she has not attended the final written exam that will be held in the two official calls (first and second call) and if he/she does not perform any of the other activities included in the continuous evaluation procedure (i.e., seminars, laboratory exercises, on-line assignments).

If a student fails some elements of the course, he/she may still be able to progress to the next year by repeating all those elements of the continuous evaluation procedure that were not passed first time. However, students need to consult with the professors if only failed elements will be re-taken/deferred and upon which conditions.

Cheating and plagiarism in any of the different activities of the evaluation could result in failing the activity and/or the entire course.

Sources of information
Basic Bibliography
Hickman C Jr. , Keen S, Eisenhour DJ, Larson A and I'nson H, **Integrated Principles of Zoology**, 978-1266584954, 19, McGraw-Hill, 2024
Brusca RC, Giribet G, Moore W, **Invertebrates**, 978-0197554418, 4, Sinauer, 2022
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Complementary Bibliography
Miller S and Tupper TA, **Zoology**, 978-1266113598, 12, McGraw-Hill, 2023
Miller S, **General Zoology: Laboratory Manual**, 978-0077479299, 7, McGraw-Hill, 2012

Recommendations
Subjects that continue the syllabus
Zoology 1: Non-arthropod invertebrates/V02G031V01205

IDENTIFYING DATA				
Ecoloxía I				
Subject	Ecoloxía I			
Code	V02G031V01301			
Study programme	Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	3	1c
Teaching language	Castelán Galego			
Department	Ecoloxía e bioloxía animal			
Coordinator	González Castro, Bernardino			
Lecturers	Blanco Cartagena, Andreu Fernández Román, Daniel González Castro, Bernardino Hernando Morales, Víctor Martínez García, Sandra			
E-mail	bcastro@uvigo.es			
Web				
General description	Esta materia, xunto coa de Ecoloxía II, serve de introdución á ciencia da Ecoloxía. Neste caso, abórdase o estudo dos principais factores ambientais de tipo físico-químico e biolóxico , a escala poboacional, que determinan a distribución e abundancia dos organismos na Natureza. Os horarios da materia pódense consultar na ligazón: http://bioloxia.uvigo.es/gl/docencia/grao-en-bioloxia/horarios.			

Resultados de Formación e Aprendizaxe	
Code	
A1	Que os estudantes demostrasen posuír e comprender coñecementos nunha área de estudo que parte da base da educación secundaria xeral, e adóitase atopar a un nivel que, aínda que se apoia en libros de texto avanzados, inclúe tamén algúns aspectos que implican coñecementos procedentes da vangarda do seu campo de estudo.
A2	Que os estudantes saiban aplicar os seus coñecementos ao seu traballo ou vocación dunha forma profesional e posúan as competencias que adoitan demostrarse por medio da elaboración e defensa de argumentos e a resolución de problemas dentro da súa área de estudo.
B3	Aplicar o coñecemento adquirido na titulación e empregar a instrumentación científico-técnica e as TIC en contextos propios da Bioloxía e/ou no exercicio da profesión.
B6	Desenvolver as capacidades de análises e síntese, de razoamento crítico e argumentación, aplicándoas en contextos propios da Bioloxía e outras disciplinas científico-técnicas.
C6	Comprender e integrar o funcionamento dos seres vivos (nivel celular, tisular, orgánico e individuo), interpretando as súas respostas homeostáticas e adaptativas.
C7	Muestrear, caracterizar, catalogar e xestionar recursos naturais e biolóxicos (poboacións, comunidades e ecosistemas).
C8	Describir, avaliar e planificar o medio físico, usar bioindicadores e identificar problemas ambientais. Achegar solucións para o control, seguimento e restauración dos ecosistemas.
C14	Asesorar, peritar e supervisar aspectos científico-técnicos, éticos, legais e socioeconómicos relacionados coa bioloxía e as súas aplicacións
D1	Comprender o significado e aplicación da perspectiva de xénero nos distintos ámbitos de coñecemento e na práctica profesional co obxectivo de alcanzar unha sociedade máis xusta e igualitaria.
D3	Comprometerse coa sustentabilidade e medio ambiente. Uso de forma equitativa, responsable e eficiente dos recursos.

Resultados previstos na materia				
Expected results from this subject	Training and Learning Results			
Identificar as diferentes aproximacións conceptuais e metodolóxicas da Ecoloxía.	A2			
Analizar a importancia dos factores ambientais abióticos e bióticos, e da súa interrelación, na distribución e abundancia dos organismos na natureza.		B3	C6 C8	
Recoñecer a importancia dos modelos matemáticos na identificación, explicación e predición de patróns e procesos ecolóxicos.	A1	B6	C7	
Aplicar modelos básicos de dinámica de poboacións.			C7 C14	D1
Comprender as bases da simulación dinámica de sistemas naturais.		B3		
Aplicar o método científico en Ecoloxía.	A2	B6		
Entender o papel da Ecoloxía, como ciencia, na posta de manifesto e na solución dos problemas ambientais aos que se enfronta a civilización actual.				D3

Contidos
Topic

1. Ecoloxía e crise ambiental	Límites do planeta e transformación antropoxénica. Niveis de organización e aproximacións metodolóxicas en ecoloxía. Conservación de materia e enerxía. Diversidade metabólica.
2. O medio físico e escalas de variabilidade	Particularidades na interacción de procesos físico-biolóxicos en ecosistemas terrestres e acuáticos. Extinción da radiación solar en ecosistemas terrestres e acuáticos. Procesos hidrodinámicos en ecosistemas acuáticos. Patróns de circulación oceánica. Biomas terrestres e acuáticos.
3. Organismos e factores ambientais	Tipos de factores ambientais. Principios xerais de acción dos factores ambientais. Curvas de superficies de resposta. Lei do mínimo. Lei da tolerancia e principios subsidiarios. Tipos de organismos segundo o grado de tolerancia. Interacción entre factores ambientais. Resposta dos organismos aos factores ambientais. Nicho ecolóxico.
4. Adaptacións en ambientes acuáticos	Propiedades da auga. Balance de humidade e salinidade. Difusión de gases. Temperatura.
5. Adaptacións en ambientes terrestres	Nutrientes e humidade. Enerxía do sol e fotosíntesis. Balance de humidade, salinidade e nutrientes. Temperatura.
6. Adaptación e cambio ambiental	Plasticidade fenotípica. Adaptacións á variabilidade das condicións bióticas e abióticas. Migración, acumulación, inactividade. Variabilidade na cantidade e calidade de alimento: teoría do aprovisionamento óptimo.
7. Estratexias de vida	Estratexias de vida, trazos principais e eficacia biolóxica. Tipos de individuos. Covariación entre trazos: Principio do reparto. Estratexias de vida e ambiente
8. Poboacións	Concepto de poboación. Parámetros poboacionais. Densidade poboacional. Distribución espacial. Estrutura poboacional. Tipos de poboacións.
9. Demografía	Táboas de vida: tipos. Curvas de supervivencia. Taxas específicas de supervivencia e mortalidade. Probabilidades de supervivencia e morte. Factores "K". Estrutura de idade. Esperanza de vida. Táboas de fecundidade. Fecundidade específica. Taxa neta de reprodución. Tempo de xeración. Valor reprodutivo.
10. Dinámica poboacional	Compoñentes da dinámica de poboacións naturais: densoindependencia, densodependencia (positiva e negativa) e estocasticidad. Descrición da dinámica poboacional: ecuación fundamental do crecemento poboacional, dinámicas discretas e continuas, taxas de cambio poboacional, modelos matemáticos de dinámica de poboacións.
11. Competencia interespecífica.	Diferenzas entre interaccións. Tipos de competencia interespecífica: efectos da competencia. Modelo de competencia de Lotka e Volterra: elementos, asuncións e solucións do modelo. Outros modelos de competencia. Competencia e nicho ecolóxico. Evidencias da existencia de competencia.
12. Depredación	Caracterización dos depredadores: tipos. Factores que determinan a dieta dun depredador. Respostas dos depredadores en función da abundancia das presas. Modelo de depredación de Lotka e Volterra: elementos, asuncións, solucións e modificacións. Evidencias da importancia da depredación.
13.Parasitismo	Caracterización dos parásitos. Tipos de parásitos e hospedadores. Efectos do parasitismo: medida e factores de influencia. Dinámica de poboacións do parasitismo. Evidencias da importancia do parasitismo.
14. Mutualismo	Tipos de mutualismo. Dinámica de poboacións do mutualismo. Evidencias da importancia do mutualismo.
15. Regulación poboacional	Factores ambientais e dinámica poblacional. Principios da regulación das poboacións naturais. Identificación de factores reguladores. Poboacións naturais e regulación.
Aproximacións metodológicas en Ecoloxía	Avaliación experimental do efecto dunha variable ambiental no crecemento poboacional de microorganismos. Análise de patróns de distribución espacial de plantas. Introdución á modelización de sistemas dinámicos. Introdución á ecoloxía cuantitativa.

Planificación			
	Class hours	Hours outside the classroom	Total hours
Lección maxistral	14	37	51
Lección maxistral	18	40	58
Prácticas de laboratorio	8	8	16
Resolución de problemas	3	6	9
Prácticas con apoio das TIC	4	8	12
Exame de preguntas de desenvolvemento	2	0	2

Exame de preguntas obxectivas	1	0	1
Resolución de problemas e/ou exercicios	1	0	1

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Metodoloxía docente	
	Description
Lección maxistral	Desenvolveranse os contidos dos sete primeiros temas do programa da materia mediante explicacións do profesor con axuda da lousa e presentacións en Power Point. Estas clases serán impartidas por Andreu Blanco y Víctor Morales (Véxase o calendario en https://bioloxia.uvigo.es/gl/docencia/horarios/).
Lección maxistral	Desenvolveranse os contidos dos oito últimos temas do programa da materia mediante explicacións do profesor con axuda da lousa e presentacións en Power Point. Estas clases serán impartidas por Bernardino González (Véxase o calendario en https://bioloxia.uvigo.es/gl/docencia/horarios/).
Prácticas de laboratorio	Realizaranse dúas prácticas: a primeira sobre o desenvolvemento e análise de resultados dun experimento de efectos de factores ambientais sobre o crecemento de organismos; a segunda, sobre a análise de datos (a partir dunha mostraxe no campo ou dun arquivo informático) para a estimación de parámetros poboacionais. As prácticas terán unha duración de 4 h por sesión . Estas prácticas serán impartidas por Sandra Martínez. (Véxase o calendario en https://bioloxia.uvigo.es/gl/docencia/horarios).
Resolución de problemas	Realizaranse problemas numéricos relacionados cos contidos teóricos da materia. Cada alumno deberá asistir a dúas sesións de 1:30 h cada unha. Estas clases serán impartidas por Bernardino González. (Véxase o calendario en https://bioloxia.uvigo.es/gl/docencia/horarios).
Prácticas con apoio das TIC	Introdución aos métodos de simulación dinámica de poboacións. Está práctica terá unha duración de 4 h. Será impartida por Sandra Martínez (Véxase o calendario en https://bioloxia.uvigo.es/gl/docencia/horarios).

Atención personalizada	
Methodologies	**Description**
Lección maxistral	Referido aos sete primeiros temas da materia: O alumnado que o desexe poderá acudir a tutorías presenciais para resolver dúbidas. O momento da tutoría establecerase pola canle da "tutoría concertada" mediante a súa solicitude a través do correo electrónico.
Prácticas de laboratorio	O alumnado que o desexe poderá acudir a tutorías presenciais para resolver dúbidas. O momento da tutoría establecerase pola canle da "tutoría concertada" mediante a súa solicitude a través do correo electrónico.
Resolución de problemas	O alumnado que o desexe poderá acudir a tutorías presenciais para resolver dúbidas. O momento da tutoría establecerase pola canle da "tutoría concertada" mediante a súa solicitude a través do correo electrónico.
Prácticas con apoio das TIC	Realizarase principalmente dentro do horario de titorías, salvo circunstancias sobrevindas. Contactar previamente co profesor sobre o momento para realizar a titoría. Horario de titorías: S. Martínez, luns e mércores de 11:00 a 14:00 h, A. Lasa, martes e xoves de 11:00 a 14:00 h. Fóra dese horario segundo dispoñibilidade do profesor.
Lección maxistral	Referido aos oito últimos temas da materia: O alumnado que o desexe poderá acudir a tutorías presenciais para resolver dúbidas. O momento da tutoría establecerase pola canle da "tutoría concertada" mediante a súa solicitude a través do correo electrónico.

Avaliación			
	Description	Qualification	Training and Learning Results
Lección maxistral	Avaliarase nun exame escrito correspondente aos sete primeiros temas da materia, realizarase nunha hora de clase de teoría, de acordo co cronograma de actividades do curso (Véxase https://bioloxia.uvigo.es/gl/docencia/exames/).	40	B6 C6 D1 C8 D3 C14
Lección maxistral	Avaliarase nun exame escrito correspondente aos oito últimos temas da materia, en data e hora coincidentes coas do exame global da Primeira Oportunidade, indicadas no calendario de exames da Facultade (Véase https://bioloxia.uvigo.es/gl/docencia/exames/).	25	B6 C6 D1 C8 D3 C14

Prácticas de laboratorio	Avaliaranse, unha vez complétense todas, xunto co resto das prácticas nun exame escrito; o exame realizarase na data e hora indicadas en https://bioloxia.uvigo.es/gl/docencia/horarios. Aínda que aparezan separadas das Prácticas en aulas de informática (por limitacións da aplicación de elaboración da guía docente), todas as Prácticas valorásense conxuntamente sobre un total do 20 %, é dicir, non haberá necesariamente unha valoración separada para as Prácticas de laboratorio e as de en aulas de informática. Aos alumnos que aproben o exame de prácticas conservaráselle a cualificación nas seguintes convocatorias da materia mentres se manteñan as mesmas prácticas e a súa forma de avalialas, tal como aparece nesta guía.	15	C7
Resolución de problemas	Avaliaranse nun exame escrito en data e hora, coincidentes coas do exame global da Primeira Oportunidade, indicadas no calendario de exames da Facultade (https://bioloxia.uvigo.es/gl/docencia/exames/).	15	A1 A2
Prácticas con apoio das TIC	Avaliaranse, xunto co resto de prácticas, nun exame escrito a celebrar na data e hora indicadas en https://bioloxia.uvigo.es/gl/docencia/horarios. Asígnaselle aquí un valor do 5 % por limitacións da aplicación, pero valoraranse conxuntamente coas Prácticas de laboratorio, dentro dun apartado xeral de Prácticas. O valor total destas Prácticas (laboratorio+informática) será do 20%.	5	B3

Other comments on the Evaluation

Os alumnos que elixan realizar a avaliación global non poderán realizar ningunha proba (de calquera parte da materia), correspondente á avaliación continua, que se faga nunha data posterior á sinalada polo Decanato para manifestar o tipo de avaliación elixida.

1) Avaliación continua

Un alumno considerarase "Presentado" se realiza algunha das probas que forman parte deste tipo de avaliación.

Para a cualificación final estableceranse 4 bloques:

Bloque 1: referido aos 7 primeiros temas de teoría, cunha cualificación máxima de 40%.

Bloque 2: referido aos temas restantes de teoría da materia, cunha cualificación máxima de 25%.

Bloque 3: referido ás prácticas ("Prácticas de laboratorio" e "Prácticas con apoio das TIC"), cunha cualificación máxima de 20%. Aos alumnos que aproben o exame de prácticas conservaráselles a cualificación nas seguintes convocatorias da materia mentres se manteñan as mesmas prácticas e a súa forma de avalialas, tal como aparece nesta guía. Os alumnos que teñan aprobadas as prácticas en cursos anteriores non necesitarán volvelas a realizar nin examinarse das mesmas; a cualificación obtida no seu día escalarase á total de prácticas nova.

Bloque 4: referido aos problemas ("Resolución de problemas"), cunha cualificación máxima de 15%. A materia considerarase aprobada se a suma das puntuacións dos diferentes bloques é igual ou maior de 5 puntos (50%), en caso contrario teranse que repetir as avaliacións dos bloques non aprobados (aqueles en que non se alcanzou a metade da nota máxima do bloque) no final da Segunda Oportunidade.

2) Avaliación global

Realizarase mediante un exame escrito dos bloques mencionados no apartado de avaliación continua: teorías (máxima puntuación=4.0+2.5), prácticas (máxima puntuación=2.0) e problemas (máxima puntuación =1.5). A materia considerarase aprobada si a suma das puntuacións das diferentes partes do exame é igual ou maior de 5 puntos. Na Primeira Oportunidade, só poderán levala a cabo aqueles alumnos que elixisen no seu momento este tipo de avaliación.

Na Segunda Oportunidade, poderana realizar todos os alumnos que non superasen a materia na Primeira Oportunidade (xa sexa na modalidade de avaliación continua ou global). Os alumnos que teñan pendente só parte dos bloques anteriores, e queiran facer a avaliación global nesta oportunidade, terán que comunicalo por escrito ao coordinador da materia unha semana antes da data da avaliación.

Datas dos exames finais: O calendario de exames finais pódese consultar na seguinte ligazón: https://bioloxia.uvigo.es/gl/docencia/exames.

Requírese do alumnado que curse esta materia unha conduta responsable e honesta. Considérase inadmisible calquera forma de fraude (copia ou plaxio) encamiñado a falsear o nivel de coñecementos e destrezas alcanzado en todo tipo de proba, informe ou traballo. As condutas fraudulentas poderán supoñer suspender a materia durante un curso completo. Levarase un rexistro interno destas actuacións para que, en caso de reincidencia, solicitar a apertura ao rectorado dun expediente disciplinario.

Bibliografía. Fontes de información

Basic Bibliography

Begon, M., Harper, J.L. y Townsend, C.R, **Ecología**, 978-84-282-1152-9, Omega, 1999

Gotelli, N. J., **A primer of ecology**, 978-0878933181, 4ª, Sinauer Associates, 2008

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Relyea, R.; Ricklefs, R.E, **Ecology:The economy of nature**, 978-1319187729, 8th, Macmillan education, 2018
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Begon, M. and Townsend, C.R, **Ecology**, 978-1119279358, 5ª, Willey, 2021
Donovan, T. M. ; Welden, C. W., **Spreadsheet Exercises in Ecology and Evolution**, 978-0878931569, Sinauer, 2001
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Hutchinson, G. E., **Introducción a la Ecología de Poblaciones**, 978-8470312878, 1ª, Blume, 1981
Margalef, R., **Ecología**, 978-8428204057, 2ª, Omega, 1974
Piñol, J.; Vilalta, J. M., **Ecología con números**, 978-8496553019, 1ª, Lynx, 2006
Valiela, **Marine Ecological Processes**, 978-0387790688, 3ª, Springer, 2015

Recomendacións

Subjects that continue the syllabus

Ecoloxía II/V02G031V01306
Biodiversidade: Xestión e conservación/V02G031V01415

Other comments

A información facilitada na plataforma Moovi deberá complementarse coas explicacións dadas nas clases respectivas.
Recoméndase asistir ás clases coas figuras e gráficos correspondentes, facilitados previamente a través de dita plataforma.

IDENTIFYING DATA				
Fisioloxía animal I				
Subject	Fisioloxía animal I			
Code	V02G031V01302			
Study programme	Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	3	1c
Teaching language	Castelán			
Department	Bioloxía funcional e ciencias da saúde			
Coordinator	Lamas Castro, José Antonio			
Lecturers	Lamas Castro, José Antonio Mallo Ferrer, Federico Rodríguez Castañeda, Manuela			
E-mail	antoniolamas@uvigo.es			
Web				
General description	A Fisiología Animal é unha materia obrigatoria no grao de Bioloxía, por tanto o seu coñecemento é fundamental na formación integral dun graduado en Bioloxía. Os contidos desta materia tratan de explicar os fundamentos básicos do funcionamento dun organismo animal, é dicir trata de coñecer todas as actividades (reaccións físico-químicas) das células, tecidos e órganos (cuxa estrutura e elementos constituíntes xa foron estudados anteriormente) que compón o corpo dos animais . Así mesmo a materia trata en detalle como eses sistemas serven aos distintos animais para adaptarse ao medio ambiente. Por ser os procesos fisiológicos extremadamente complexos, o estudo e o ensino da fisiología, hase de abordar considerando por separado os distintos sistemas funcionais, tendo en conta, con todo, que cada función representa unha parte parcial da unidade funcional que supón o ser vivo. Podense atopar os horarios en: http://bioloxia.uvigo.es/gl/docencia/horarios/			

Resultados de Formación e Aprendizaxe	
Code	
A2	Que os estudantes saiban aplicar os seus coñecementos ao seu traballo ou vocación dunha forma profesional e posúan as competencias que adoitan demostrarse por medio da elaboración e defensa de argumentos e a resolución de problemas dentro da súa área de estudo.
A3	Que os estudantes teñan a capacidade de reunir e interpretar datos relevantes (normalmente dentro da súa área de estudo) para emitir xuízos que inclúan unha reflexión sobre temas relevantes de índole social, científica ou ética.
B2	Xestionar información científico-técnica de calidade utilizando fontes diversas. Analizar datos e documentos e interpretalos de forma crítica e rigorosa, incluíndo reflexións sobre a súa relevancia social e no ámbito profesional da Bioloxía.
B3	Aplicar o coñecemento adquirido na titulación e empregar a instrumentación científico-técnica e as TIC en contextos propios da Bioloxía e/ou no exercicio da profesión.
B6	Desenvolver as capacidades de análises e síntese, de razoamento crítico e argumentación, aplicándoas en contextos propios da Bioloxía e outras disciplinas científico-técnicas.
C1	Resolver problemas aplicando o método científico, os conceptos e a terminoloxía específica da Bioloxía, os modelos matemáticos e as ferramentas estatísticas e informáticas.
C6	Comprender e integrar o funcionamento dos seres vivos (nivel celular, tisular, orgánico e individuo), interpretando as súas respostas homeostáticas e adaptativas.
C13	Impartir formación, participar en proxectos de I+D+i, comunicar resultados e divulgar coñecementos. Contribuír á proxección social da Bioloxía e á sensibilización polo medio ambiente
D1	Comprender o significado e aplicación da perspectiva de xénero nos distintos ámbitos de coñecemento e na práctica profesional co obxectivo de alcanzar unha sociedade máis xusta e igualitaria.
D2	Comunicarse por oral e por escrito en lingua galega.
D3	Comprometerse coa sustentabilidade e medio ambiente. Uso de forma equitativa, responsable e eficiente dos recursos.

Resultados previstos na materia				
Expected results from this subject	Training and Learning Results			
Dar a coñecer a importancia do medio interno e fluídos corporais no mantemento da homeostasia e funcionamento dos animais.		B2 B6	C1 C6	D3
Identificar os mecanismos e funcións dos sistemas nervioso motor e sensorial.	A2	B2 B6	C6	
Identificar os elementos do sistema endocrino, a súa regulación e as funcións hormonais.	A3	B2	C1 C6	D1
Comprender o mecanismo de funcionamento dos diferentes tipos de músculos e as bases do control motor.		B2 B3	C1	

Recoñecer o funcionamento do animal como un todo integrado, reforzando o papel dos sistemas de coordinación e integración.	A2	B6	C1 C6 C13	D1 D2

Contidos	
Topic	
Capítulo 1. Introdución	Tema 1. Concepto e significado de Fisioloxía
Capítulo 2. Permeabilidade e excitabilidad celular.	Tema 2. Permeabilidade e mecanismos de transporte pola membrana plasmática. Tema 3. Potencial de membrana. Tema 4. Potencial de acción
Capítulo 3.- Comunicación neuronal	Tema 5. Sinapsis e neurotransmisores Tema 6. Integración sináptica
Capítulo 4. Fisioloxía sensorial	Tema 7. Propiedades xerais dos sistemas sensoriais. Sensibilidade somatovisceral. Tema 8. Sensibilidade química Tema 9. Sensibilidade auditiva e vestibular Tema 10. Sensibilidade visual.
Capítulo 5. Fisioloxía Motora	Tema 11. Reflexos espinais. Tema 12. Control voluntario do movemento.
Capítulo 6. Fisioloxía muscular	Tema 13. Relación estrutura función no músculo Tema 14. Acoplamento excitación-contración Tema 15. Mecánica e enerxética muscular Tema 16. Músculo liso
Capítulo 7. Medio interno	Tema 17. Conceto de medio interno e compartimentos líquidos. O sange. Tema 18. Compoñente celular sanguíneo Tema 19. Homeostasia e coagulación
Capítulo 8. Fisioloxía endocrina	Tema 20. Hormonas e órganos endocrinos. Tema 21. Hipotálamo e hipófisis. Hormonas neurohipofisarias. Crecemento e latancia. Tema 22. Tiroides Tema 23. Adrenal Tema 24. Gónadas e endocrinoloxía da reprodución Tema 25. Páncreas endocrino Tema 26. Vitohormonas e metabolismo óseo

Planificación			
	Class hours	Hours outside the classroom	Total hours
Lección maxistral	32	72	104
Prácticas de laboratorio	12	6	18
Seminario	2	22	24
Exame de preguntas obxectivas	2	0	2
Exame de preguntas obxectivas	1	0	1
Exame de preguntas obxectivas	1	0	1
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Metodoloxía docente	
	Description
Lección maxistral	Realizaranse na aula, co total dos alumnos matriculados presentes, nelas exporanse, coa axuda de presentacións en power point, os fundamentos teóricos da materia. Utilizarase a Plataforma Moovi como sistema de comunicación e contacto cos alumnos.

Prácticas de laboratorio	Unha materia experimental como a Fisiología require a realización de prácticas de laboratorio para mostrar moitos dos mecanismos e conceptos que se explican na materia teórica. Os alumnos deben aprender o manexo do material de laboratorio, incluído animais de experimentación, aprender o fundamento das técnicas empregadas en experimentación fisiológica, adquirir habilidades e destreza manual, interpretar resultados, etc. A utilización de animais en prácticas docentes está permitida e lexislada pola Unión Europea, con todo, téndese cada vez máis á procura de métodos alternativos que reduzan o excesivo sacrificio ou manipulación de animais de experimentación. Un dos métodos alternativos é a utilización de programas informáticos que simulan procesos fisiológicos. Neste primeiro contacto dos alumnos coa materia de Fisiología, as prácticas que realizarán serán na súa maioría, simulacións de procesos fisiológicos. As prácticas realizaranse en grupos como máximo de 20 alumnos. O lugar de realización será a aula de informática da Facultade de Bioloxía (practicas de simulación de procesos fisiológicos con programas informáticos). Unha das catro prácticas será con mostras biolóxicas e realizarase no laboratorio de practicas de Fisiología Animal (Bloque A 2ª Planta). Cada grupo terá 4 sesións de prácticas de 3 horas de duración , en sesións de mañá ou de tarde segundo o grupo (ver o calendario). A temática a desenvolver será a seguinte: Ensaios do potencial de membrana e potencial de acción. Permeabilidade celular: Difusión pasiva, difusión activa, ósmosis. Ensaios de contración muscular. Función endocrina: efectos de hormonas tiroideas sobre o metabolismo basal. Osmolaridade e tonicidade con sangue de rata (laboratorio).
Seminario	Os seminarios consistirán en realizar actividades enfocadas ao traballo sobre un tema específico, que permitan profundar ou complementar os contidos da materia. Pódense empregar como complemento das clases teóricas. Haberá cinco grupos de alumnos confeccionados pola Facultade que poderán ser divididos en grupos máis pequenos si o traballo requíreo.

Atención personalizada

Methodologies	Description
Lección maxistral	Os alumnos teñen liberdade para facer preguntas ou comentarios durante a lección maxistral. Aquelas cuestións que por razóns de tempo non se poidan responder en clase, pásanse ás tutorías.
Prácticas de laboratorio	Nas prácticas de laboratorio (ao ser grupos reducidos) o profesor está dispoñible para respostar calquera cuestión que o alumno pregunte. Tutorias: Os alumnos poderán asistir ás tutorias nos días fixados no horario. Tamén se admiten preguntas e dúbidas por e-mail (antoniolamas@uvigo.es e fmallo@uvigo.es). Seminarios: durante o tempo de seminario tamén se poderá consultar calquera cuestión a desenvolver na materia.
Seminario	Os alumnos teñen liberdade para facer preguntas ou comentarios durante os seminarios. Aquelas cuestións que por razóns de tempo non se poidan responder en clase, pásanse ás tutorías.

Avaliación

	Description	Qualification	Training and Learning Results			
Prácticas de laboratorio	PRÁCTICAS A asistencia a todas as prácticas é obrigatoria para superar a materia. A ausencia xustificada documentalmente en base ás normativas vixentes permitirá realizar a práctica noutro grupo si isto é posible. Puntuarase unha pequena memoria de prácticas, que conterá os aspectos máis relevantes aprendidos e as principais conclusións obtidas. Esta memoria será individual. Este apartado constitúe o 10% da avaliación final, avaliarase en base a 1 punto para sumalo aos outros dous apartados.	10	A2 A3	B2 B3 B6	C1 C13	D1 D2 D3

Seminario	SEMINARIOS A asistencia a todos os seminarios é obrigatoria para superar a materia. A ausencia xustificada documentalmente, en base ás normativas vixentes, permitirá realizar o seminario noutro grupo si isto é posible. Os contidos desenrrolados nos seminarios serán avaliables, de xeito análogo a materia desenvolvida nas leccións maxistrais. Este apartado constitúe o 10% da avaliación final, avaliarase en base a 1 punto para sumalo aos outros dous apartados.	10	A3	B2 B3 B6		
Exame de preguntas obxectivas	PROBA 1 A materia está dividida en dúas metades, a primeira parte inclúe principalmente contidos de Neurofisiología e será avaliada cunha proba tipo test. A proba 1 suporá o 40% da nota total de modo que se puntuará cun máximo de 4 puntos sobre 10.	40	A2	B2	C6	D3
Exame de preguntas obxectivas	PROBA 2 A materia está dividida en dúas metades, a segunda parte inclúe principalmente contidos de Endocrinoloxía e será avaliada cunha proba tipo test. A proba 2 suporá o 40% da nota total de modo que se puntuará cun máximo de 4 puntos sobre 10.	40	A2	B2	C6	D3

Other comments on the Evaluation

As notas dos exámenes, prácticas e seminarios se mantendránn dentro do mesmo curso. En caso de non superar a materia en devandito curso, ao seguinte se *considerará como un alumno novo.

PROBAS 1 e 2

A aqueles alumnos que superen as dúas probas (2 puntos ou máis en cada unha) se lle sumara á nota de prácticas e a nota dos seminarios para obter a nota final. Si a suma é igual ou maior que 5, superouse a materia.

Para superar a materia han de superarse as dúas probas. Si non é así a súa nota será a que obteña na proba suspensa e non se lle sumará a nota da outra proba nin a de prácticas, nin a de seminarios.

FINAIS 1 e 2

Si o alumno non superou algunha das probas, pode recuperar aquela ou aquelas probas que suspenda presentándose ao exame final oficial 1 (primeira oportunidade).

Si segue tendo algunha proba suspensa pode presentarse ao exame final 2 (segunda oportunidade) para recuperala.

As prácticas e os seminarios son obrigatorios para superar a materia. Si o alumno non realiza algunha destas actividades, a súa nota pasará a ser de "Non Presentado" independentemente da nota que poida obter nas probas 1 e 2.

Para aprobar a materia sera necesario obter un mínimo de 5 puntos, sobre un máximo de 10, ao sumar catro valores: Proba 1 (4) + Proba 2 (4) + Prácticas (1) + Seminarios (1).

EVALUACIÓN GLOBAL

Si algán alumno elije a evaluación global pode examinarse conxuntamente das probas 1 e 2 nas dúas oportunidades oficiais (Finais 1 e 2) e debe ter en conta que a realizaciónn das prácticas e dos seminarios segue sendo obrigatorio.

As datas de todas as probas e exámenes finais poden consultarse nos seguintes enlaces:

http://bioloxia.uvigo.es/gl/docencia/horarios

http://bioloxia.uvigo.es/gl/docencia/exam

Bibliografía. Fontes de información

Basic Bibliography

Bear, Connors, Paradiso., **Neurociencia: la exploración del cerebro**, 4ª, Wolters Kluver, 2016

Silverthorn., **Fisiología humana. Un enfoque integrado**, 8ª, Panamericana, 2019

Kandel, Schwartz, Jessell, **Principios de Neurociencia**, 4ª, McGrawHill, 2000

Moyes, Schultz, **Principiods de fisiología animal**, Pearson/Addison, 2013

Koeppen, Stanton, **Berne Levy FISIOLOGÏA**, 7ª, Elsevier, 2018

Purves et al., **Neurociencia**, 5ª, Panamericana, 2015

Rhoades, Tanner., **Fisiología Médica**, 5ª, Little Brown, 2018

Constanzo., **Fisiología**, 7ª, Lippincot, 2020

Hall, Hall., **Guyton y Hall: Tratado de Fisiología Médica**, 14ª, Elsevier,

Barret, Barman, Bortano, Brooks., **Fisiología Médica de Ganong**, 25, McGraw Hill, 2017

Complementary Bibliography

Morris, Carr., **Vertebrate Endocrinology**, 5ª, Elsevier, 2013

Jara, **Endocrinología**, 2ª, Panamericana, 2010

Arce, Catalina, Mallo, **Endocrinología**, USC-UVIGO, 2006

Recomendacións

IDENTIFYING DATA				
Fisioloxía vexetal I				
Subject	Fisioloxía vexetal I			
Code	V02G031V01303			
Study programme	Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	3	1c
Teaching language	Castelán Galego			
Department	Bioloxía vexetal e ciencias do solo			
Coordinator	González Rodríguez, Luis			
Lecturers	Bott Vázquez, Sarah González Rodríguez, Luis Pedrol Bonjoch, María Nuria			
E-mail	luis@uvigo.gal			
Web	http://webs.uvigo.es/agrobiologia/index.html			
General description	Fisioloxía Vexetal I convida ao alumnado a mergullarse no fascinante mundo do funcionamento das plantas desde unha perspectiva científica actual. O obxectivo é que adquiran os coñecementos teóricos e prácticos fundamentais para entender como viven, medran e responden ao medio as plantas. Esta base será clave para abordar con éxito materias máis especializadas no ámbito das ciencias vexetais.			

Resultados de Formación e Aprendizaxe	
Code	
A1	Que os estudantes demostrasen posuír e comprender coñecementos nunha área de estudo que parte da base da educación secundaria xeral, e adóitase atopar a un nivel que, aínda que se apoia en libros de texto avanzados, inclúe tamén algúns aspectos que implican coñecementos procedentes da vangarda do seu campo de estudo.
A4	Que os estudantes poidan transmitir información, ideas, problemas e solucións a un público tanto especializado como non especializado.
B1	Desenvolver a aprendizaxe autónoma, identificando as súas propias necesidades formativas e organizando e planificando as tarefas e o tempo.
B2	Xestionar información científico-técnica de calidade utilizando fontes diversas. Analizar datos e documentos e interpretalos de forma crítica e rigorosa, incluíndo reflexións sobre a súa relevancia social e no ámbito profesional da Bioloxía.
C3	Realizar e interpretar análises moleculares, físico-químicos e biolóxicos, incluíndo mostras de orixe humana. Realizar ensaios e probas funcionais en condicións normais e anómalas.
C6	Comprender e integrar o funcionamento dos seres vivos (nivel celular, tisular, orgánico e individuo), interpretando as súas respostas homeostáticas e adaptativas.
C8	Describir, avaliar e planificar o medio físico, usar bioindicadores e identificar problemas ambientais. Achegar solucións para o control, seguimento e restauración dos ecosistemas.
C9	Identificar recursos de orixe biolóxica e valorar a súa explotación eficiente e sostible para obter produtos de interese. Propoñer e implantar melloras nos sistemas produtivos.
D1	Comprender o significado e aplicación da perspectiva de xénero nos distintos ámbitos de coñecemento e na práctica profesional co obxectivo de alcanzar unha sociedade máis xusta e igualitaria.
D3	Comprometerse coa sustentabilidade e medio ambiente. Uso de forma equitativa, responsable e eficiente dos recursos.
D4	Colaborar e traballar en equipo ou en grupos multidisciplinares, fomentar a capacidade de negociación e de alcanzar acordos.

Resultados previstos na materia				
Expected results from this subject	Training and Learning Results			
Obter unha visión integral de todos os procesos fisiolóxicos das plantas, o seu comportamento e as súas respostas adaptativas ao medio.	A1 A4		C3 C6 C8	D1 D3
Coñecer e manexar os conceptos, terminoloxía e instrumentación científico-técnica relativos á Fisioloxía Vexetal.	A1 A4	B1 B2	C3 C8 C9	
Aplicar coñecementos da Fisioloxía Vexetal para identificar problemas no medio natural e agrario.	A1		C6 C8 C9	D3
Manexar e analizar espécimes e mostras de orixe vexetal, así como para caracterizar constituíntes celulares e actividades metabólicas.		B2	C3 C6	
Obter información dos ecosistemas naturais e agrarios, desenvolver experimentos e interpretar os resultados.	A1 A4	B1 B2	C3 C6 C8 C9	D3

Comprender a proxección social da Fisioloxía Vexetal e a súa repercusión no exercicio profesional, así como saber utilizar os seus contidos para impartir docencia e divulgar contidos científicos.	A1 A4		D1 D3 D4
Utilizar coñecementos da materia para supervisar e asesorar sobre todos os aspectos relacionados co benestar dos vexetais.	A4	B2	C3 C6 C8 C9

Contidos	
Topic	
Fisioloxía da célula vexetal	Introdución á Fisioloxía Vexetal. As células vexetáis: compartimentación, membranas e parede celular. Mecanismo de extensión da parede celular.
Relacións hídricas e transporte	- Relacións hídricas da célula vexetal. Potencial hídrico. Plasmolise. Turxencia. - Absorción de auga polas plantas. A auga no solo. Absorción da auga polas raíces. Movemento da auga a través da raíz. - Movemento da auga a través da planta. Mecanismo de transporte ascendente. - Transpiración. Estomas. Mecanismo de apertura e peche. Balance hídrico. - Absorción de ións polas plantas. Os elementos minerais no solo: complexo de cambio. Absorción pola raíz. Movemento de ións na planta. - Translocación de solutos. Caracterización do transporte. Hipótese do fluxo de presión.
Fotosíntese	- Fotosíntese. Ecuación xeral. Magnitude da fotosíntese. - Cloroplastos. Estrutura. Pigmentos fotosintéticos. Ultraestrutura do sistema lamelar. - Captación da enerxía luminosa. Estrutura dos fotosistemas: centros de reacción e complexos LHC. - Transducción da enerxía. Transporte de electróns. Formación de poder reductor. - Fotofosforilación. Hipótese quimiosmótica. Complexo ATP-sintasa. Síntese de ATP. - Fixación fotosintética do CO2. Ciclo de redución fotosintética do Carbono. Estequiometría do ciclo. Regulación. - Fotorrespiración. Mecanismo bioquímico. Localización intracelular. Significado biolóxico. - Plantas C-4. Estrutura da folla. Bioquímica da ruta C-4. Tipos de plantas C-4. - Metabolismo acedo das crasuláceas (CAM). Bioquímica da fixación de CO2. Regulación. - Produtividade fotosintética. Concepto de punto de compensación. Factores que afectan á fotosíntese: luz, CO2, auga. - Utilización do Carbono fixado. Síntese de almidón e sacarosa. Intercambio de sustancias entre o cloroplasto e o citoplasma.
Metabolismo secundario	- Características do metabolismo secundario - Flavonoides - Terpenoides - Compostos nitroxenados
Prácticas de laboratorio	1. Determinación do potencial hídrico dun tecido vexetal 2. Fisioloxía dos estomas. Observación dos estomas e valoración da apertura e peche estomáticos. 3. Extracción, separación e cuantificación de pigmentos fotosintéticos de plantas superiores 4. Metabolismo acedo das crasuláceas 5. Efecto da temperatura na respiración aerobia 6. Realización do manual de prácticas

Planificación			
	Class hours	Hours outside the classroom	Total hours
Lección maxistral	8	8	16
Seminario	3	30	33
Prácticas de laboratorio	15	30	45
Resolución de problemas	1	0	1
Estudo de casos	10	20	30
Metodoloxías baseadas en investigación	2	15	17

Debate	2	4	6
Exame de preguntas de desenvolvemento	2	0	2

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Metodoloxía docente	
	Description
Lección maxistral	As leccións maxistrais da programación docente están organizadas en leccións de 50 min de duración. Dedícanse a explicar e desenvolver os conceptos e metodoloxías básicas en Fisioloxía Vexetal. Deben ser completadas con traballo autónomo do alumnado mediante libros de texto, lecturas complementarias, páxinas web de referencia. Suscitaranse tamén estudo de casos que o alumnado deberá resolver pola súa conta entregando na data establecida.
Seminario	As tutorías de 6-8 estudantes permiten dirixir ao grupo na realización dun traballo bibliográfico no que prime a organización do traballo do grupo que se comprobará en diferentes entregas solicitadas polos docentes. O traballo final desembocará na redación dun resume científico e dunha presentación, por calquera medio audiovisual, que permita a trasmisión de coñecemento e que será avaliado.
Prácticas de laboratorio	As prácticas de laboratorio están deseñadas co obxectivo de complementar as sesións maxistrais, familiarizar ao alumnado coas técnicas de laboratorio en Fisioloxía Vexetal e realizar experimentos concretos que o estudante deberá desenvolver entregando un caderno de prácticas
Resolución de problemas	Resolución colaborativa de problemas numéricos e interpretación de gráficas relacionados co potencial hídrico das plantas.
Estudo de casos	Cada 5-10 días suscitarase un caso en clase que o alumnado deberá resolver de maneira individual coa axuda de material docente especializado.
Metodoloxías baseadas en investigación	Formación crítica das ideas principais do tema a través da búsqueda estruturada de información.
Debate	Discusión puntual sobre actividades xurdidas no área na búsqueda da solución correcta a unha cuestión científica.

Atención personalizada	
Methodologies	**Description**
Lección maxistral	O alumnado debe aprender a traballar de forma autónoma realizando as actividades non presenciais que se indican nas sesións maxistrais e estudando os temas propostos. Tamén debe aprender a traballar en equipo para o que, baixo a supervisión dos docentes, realizarán un traballo con presentación pública. Así mesmo poderán resolver dúbidas da materia durante os horarios de titoría personalizada
Seminario	Además das titorías personalizadas, as titorías en grupo permitirán traballar tanto no estudo de casos, cando así se indiquen, como no desenvolvemento da memoria de prácticas e da exposición do traballo procedente dos seminarios.
Prácticas de laboratorio	Serán participativas e permitirán establecer accións personalizadas de reforzo. Durante a realización das prácticas de laboratorio os profesores darán atención personalizada ao alumnado para a correcta comprensión dos obxectivos experimentais e da metodoloxía ou técnica utilizada. O estudantado debe aprender a traballar en equipo. Unha vez finalizada a práctica, o grupo de estudantes será supervisado no seu traballo por un docente. Contémplase tamén a resolución de dúbidas e problemas a través da plataforma TEMA ou nos horarios de titorías
Estudo de casos	O alumnado debe aprender a traballar de forma autónoma realizando as actividades non presenciais que se indican nas sesións maxistrais e estudando os temas propostos. Tamén deben aprender a traballar en equipo para o que, baixo a supervisión dos docente, realizarán un traballo con presentación pública. Estes traballos terán supervisión en titorías en grupo, e poderán formar parte asemade de titorías personalizadas.
Resolución de problemas	Haberá tempo destinado nas actividades da aula para resolución dos problemas, onde o estudantado pode consultar as dúbidas.
Metodoloxías baseadas en investigación	O alumnado poderá resolver dúbidas deste apartado da materia durante os horarios de titoría personalizada.
Tests	**Description**
Exame de preguntas de desenvolvemento	O alumnado poderá resolver dúbidas da materia durante os horarios de titoría personalizada

Avaliación

	Description	Qualification	Training and Learning Results			
Seminario	Seminario en grupo no que se elaborará e se exporá un traballo sobre un tema determinado	20	A1 A4	B1 B2		
Prácticas de laboratorio	Avaliación da participación nas prácticas de laboratorio e da capacidade de crítica en función do desenvolvemento do guión de prácticas entregado.	20	A1	B1	C3 C6	D3 D4
Resolución de problemas	Avalíase a resolución dun problema tipo proposto na aula.	5	A1 A4	B1 B2	C8 C9	D4
Estudo de casos	Solución e análise de supostos. Avaliaranse as respostas ás preguntas planteaxadas na aula.	5	A1 A4	B1 B2	C8 C9	D4
Metodoloxías baseadas en investigación	Avalíase a entrega por parte do alumnado da resolución e camiño seguido para resolver a actividade proposta na aula.	10	A1 A4	B1 B2	C8 C9	D4
Exame de preguntas de desenvolvemento	Onde se valorarán os coñecementos adquiridos nas sesións maxistrais	40	A1 A4		C3 C6	D1 D3

Other comments on the Evaluation

A calificación mínima en cada unha das partes (exame teórico, seminarios e prácticas de laboratorio) ten que ser de 4 sobre 10 para poder facer a avaliación de forma continua. Existe tamén a posibilidade de superar a materia mediante unha proba final única que incluirá cuestións sobre as diferentes partes metodolóxicas.

A proba teórica avaliarase mediante un exame que incluirá preguntas de definición e interpretación de gráficas. Podedes consultar as características particulares destas probas co profesorado encargado da materia.

Para as partes nas que se obtivera máis dun 4/10 na convocatoria de Xaneiro, gardarase a nota ata a convocatoria de Xullo, na que o alumnado deberá examinarse unicamente das partes non aprobadas.

Horarios de clases: poden consultarse no seguinte enlace:

http://bioloxia.uvigo.es/gl/docencia/horarios

Datas de exame

http://bioloxia.uvigo.es/gl/docencia/exames

Bibliografía. Fontes de información

Basic Bibliography

Azcón-Bieto, J.; Talón, M, **Fundamentos de Fisiología Vegetal**, 2013

Taiz, L.; Zeiger, E, **Fisiología Vegetal**, 2010

Buchanan, B.B.; Gruissem, W.; Jones, R.L., **Biochemistry and Molecular Biology of Plants.**, 2015

Salisbury, F.B.; Ross, R., **Fisiología de las Plantas.**, 2000

Complementary Bibliography

Díaz de la Guardia, M., **Fisiología de las plantas.**, 2004

Pineda, M., **Resúmenes de Fisiología Vegetal.**, 2004

Recomendacións

Subjects that continue the syllabus

Produción vexetal/V02G030V01909

IDENTIFYING DATA

Genetics II

Subject	Genetics II			
Code	V02G031V01304			
Study programme	Grado en Biología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	3rd	1st
Teaching language	Spanish Galician English			
Department				
Coordinator	Caballero Rúa, Armando Canchaya Sanchez, Carlos Alberto			
Lecturers	Arenas Busto, Miguel Caballero Rúa, Armando Canchaya Sanchez, Carlos Alberto Fernández Silva, Iria Galindo Dasilva, Juan			
E-mail	armando@uvigo.es canchaya@uvigo.es			
Web				
General description	The subject Genetics II is an extension of the specific contents of Genetics taught in Genetics I. The topics covered in this subject include the structure of genomes, mutation and repair of genetic material, recombinant DNA technology, population genetics, evolution, and the inheritance of quantitative traits. The lectures will be complemented by practical sessions in which students will be able to apply the knowledge acquired in the theoretical classes. As a complement to face-to-face training, this course includes an online learning platform that incorporates new learning and knowledge technologies into the functioning of the subject, facilitating personalised work and the integration of different sources of information.			

Training and Learning Results

Code	
A1	Students should prove understanding and knowledge in this study field that starts in the Secundary Education and with a level that, even though it is suppported in advanced books, also includes some aspects that involve knowledge from the vanguard of the study field.
A2	Students should know how to apply their knowledge to their work or vocation in a professional way. They also should have the competences that are usually proved through the elaboration and defence of arguments and the resolution of problems within their study field.
A3	Students should prove ability for information-gathering and interpret important data (usually within their study field) to judge relevant social, scientific or ethical topics.
B1	Developing autonomous learning by identifying their own training need and organizing and planning tasks and time.
B3	Apply the knowledge acquired in the degree and use the scientific-technical instrumentation and CIT in contexts of Biology and/or related to the professional practice.
C1	Solve problems by applying the scientific method, the concepts and terminology specific to biology, mathematical models and statistical and computer tools.
C2	Identify levels of organisation of living beings through the study of current specimens and fossils. Carry out phylogenetic analyses and study the mechanisms of heredity, evolution and biodiversity.
C5	Manipulate and analyse genetic material and determine its alterations and pathological implications. Knowing the applications of genetic engineering.
C7	Sampling, characterising, cataloguing and managing natural and biological resources (populations, communities and ecosystems).
D5	Communicate effectively and appropriately, including the use of computer tools and English.

Expected results from this subject

Expected results from this subject	Training and Learning Results			
To understand the mechanisms of mutation and recombination and their implications. To know the methods and applications of genetic engineering.	A1 A2 A3	B1 B3	C1 C2	D5
To know the structures of genomes of genetic engineering.	A1 A2 A3	B1 B3	C5	D5
To know the structures of genomes and understand their functions.	A1 A2 A3	B1 B3	C2	D5

Be able to analyze the genetic structure of populations and understand the evolutionary forces acting on them.	A1 A2 A3	B1 B3	C1 C2 C7	D5
Understanding the genetic basis of quantitative traits and the applications of genetics in animal and plant breeding.	A1 A2 A3	B1 B3	C1 C2 C7	D5

Contents	
Topic	
Mutation and recombination	The Molecular basis of mutation and repair Chromosomal mutations Recombination Transposable elements
Genetic engineering	Cloning Molecular markers Applications of recombinant DNA technology
Genomics	Genome organization and structure Genome evolution Functional genomics
Population genetics	Hardy-Weinberg equilibrium Linkage disequilibrium Genetic drift and inbreeding Mutation and migration
Evolutionary genetics	Natural selection Molecular evolution Speciation
Quantitative genetics	Quantitative trait analysis Artificial selection

Planning			
	Class hours	Hours outside the classroom	Total hours
Introductory activities	1	0	1
Lecturing	23	40	63
Problem solving	8	24	32
Practices through ICT	15	6	21
Autonomous problem solving	0	31	31
Essay questions exam	2	0	2
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Introductory activities	The objective is to define and focus on the subject Genetics II, describing the working method to be followed.
Lecturing	The lecture sessions of the programme are organised into 50-minute classes. In most cases, they are devoted to explaining and developing basic concepts and methodologies, but due to time limitations, they must be complemented by the student□s independent work.
Problem solving	Problem-solving and exercise classes have as their main aim the integration and application of knowledge acquired in theoretical lectures. In an experimental science such as Genetics, problem-based learning is an essential educational resource.
Practices through ICT	The aim of the computer-based practical sessions is to provide an overview of the various contents of the subject. There will be five sessions, each lasting three hours, in which activities will be carried out on the following topics: Mutation Luria-Delbrück fluctuation experiment; sequence similarity search and annotation; genome database queries; genetic drift; estimation of population diversity; selection and differentiation.
Autonomous problem solving	One of the competences that university students should acquire during their academic training is the ability to work independently. It is necessary to provide remote activities that guide them in this learning process. To ensure that learning progresses in step with the course, the MooVi distance learning platform will be used.

Personalized assistance	
Methodologies	**Description**

Autonomous problem solving	The student's learning process, which complements lectures and practical sessions, will take place through the development of independent activities via the MooVi distance learning platform. On this platform, students will find materials including the lecture presentations, complementary readings, useful documents for studying and consolidating the theoretical classes, practical guidelines, lists of problems and exercises to be completed within a specific time frame, and self-assessment tests. Lecturers will set aside time to address and resolve students questions, whether related to lectures, seminars, or practical sessions. In these activities, the lecturer's role is to guide and support the students' learning process and help them successfully carry out the required independent work. The procedure for accessing this personalised academic support will be explained during the first days of class.

Assessment

	Description	Qualification	Training and Learning Results			
Lecturing	- Two tests during the course - Final examination - Attendance at face-to-face activities	40	A1 A2 A3	B1	C2 C5 C7	D5
Problem solving	- Two tests during the course - Final examination - Attendance at face-to-face activities - Problem solving	35	A1 A2 A3	B3	C1	D5
Practices through ICT	- Attendance and academic engagement - Written examination	15	A1 A2 A3	B3	C1 C2 C5 C7	D5
Autonomous problem solving	- Online self-assessments and other exercises - Submission of exercises via TEMA within the established deadline	10	A1 A2 A3	B1 B3	C1	D5

Other comments on the Evaluation

Assessment of the subject will be carried out as follows:

GLOBAL ASSESSMENT

Applications for this assessment option must be submitted at the time and in the manner established by the Centre, which will be published prior to the start of the academic beginning.

For this type of evaluation, there will be a final exam that will cover the entire subject, with theory questions and problems. In addition, to be eligible for this evaluation option, attendance at practicals and passing the exam at the end of each one of them will be mandatory.

CONTINUOUS EVALUATION

control-1: 17.5%

control-2: 17.5%

practices: 15%

activities: 10%

final exam: 40%

-**Final exam** will account for 40% of the final mark. A minimum of 5 out of 10 points must be obtained in this exam in order to pass the subject. If this minimum mark is not reached, the final mark for the subject will be that obtained with the overall mark if it is less than 5, or 4.5 if it is greater than 5. The exam will consist of theoretical questions and problems. The final exam dates can be consulted at the following link: http://bioloxia.uvigo.es/es/docencia/examenes

- **Two tests** will be taken during the course, each accounting for 17.5% of the final mark, and will consist of theory questions and problems.

- **Attendance and engagement** during the computer room practical sessions will be assessed. A written exam will be held at the end of each practical. This complete activity will account for 15% of the final qualification.

- **Online self-assessments and other exercises**, accounting for 10% of the final mark. At the end of each topic, students will be given a deadline to complete the exercises via the MooVi platform.

To pass the subject it will be necessary to obtain 5 points out of 10 in the overall weighted evaluations. All marks, except the final exam, will be retained for the second exam session in July and for future academic years. Students who do not attend the final exam will be recorded as *Not Present*. Any attempt to commit academic dishonesty in exams (e.g. cheating), or plagiarism in the activities, will result in failure of the subject.

TEACHING SCHEDULE: http://bioloxia.uvigo.es/en/teaching/schedules

EXAMS SCHEDULE: http://bioloxia.uvigo.es/en/teaching/exams

Sources of information

Basic Bibliography

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L.E. Hartwell, M.L. Goldberg, J.A. Fischer, L. Hood, **Genetics. From Genes to Genomes**, 6, McGraw Hill, 2018

Complementary Bibliography

Recommendations

Subjects that it is recommended to have taken before

Biochemistry I/V02G031V01201
Biochemistry II/V02G031V01206
Genetics I/V02G031V01209

IDENTIFYING DATA

Inmunoloxía e parasitoloxía

Subject	Inmunoloxía e parasitoloxía			
Code	V02G031V01305			
Study programme	Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	3	1c
Teaching language	Castelán			
Department	Bioloxía funcional e ciencias da saúde Bioquímica, xenética e inmunoloxía			
Coordinator	González Fernández, María África García Estévez, José Manuel			
Lecturers	García Estévez, José Manuel González Fernández, María África Magadán Mompo, Susana Osorio Novas, Elisa			
E-mail	jestevez@uvigo.es africa@uvigo.es			
Web	http://http://bioloxia.uvigo.es/es/			
General description	Materia teórico-experimental na que se adquirirán coñecementos sobre Inmunoloxía e Parasitoloxía. Por unha banda permitirá coñecer ás bases fisiolóxicas da actividade do sistema inmunitario innato e adaptativo) do vertebrados. Coñecer os conceptos básicos en inmunoloxía, o orixe e diversidade de receptores específicos de antíxeno, correceptores, factores humorais (citocinas) e os seus receptores e interaccións celulares e complexidade dos mecanismos de acción en saúde e enfermidade. Por outra banda, permitirá coñecer os conceptos básicos en Parasitoloxía (termos específicos). Coñecer a relación interespecífica negativa denominada Parasitismo. A súa maior e menor afinidade con outras relacións interespecíficas. Coñecer os distintos tipos de parasitos, a súa morfoloxía, anatomía, ultraestructura, así como os seus ciclos biolóxicos e ciclos epidemiolóxicos. Coñecemento dos hospedadores, hábitos, hábitats, mecanismos de infección e infestación, etc.			

Resultados de Formación e Aprendizaxe

Code	
A2	Que os estudantes saiban aplicar os seus coñecementos ao seu traballo ou vocación dunha forma profesional e posúan as competencias que adoitan demostrarse por medio da elaboración e defensa de argumentos e a resolución de problemas dentro da súa área de estudo.
A3	Que os estudantes teñan a capacidade de reunir e interpretar datos relevantes (normalmente dentro da súa área de estudo) para emitir xuízos que inclúan unha reflexión sobre temas relevantes de índole social, científica ou ética.
B2	Xestionar información científico-técnica de calidade utilizando fontes diversas. Analizar datos e documentos e interpretalos de forma crítica e rigorosa, incluíndo reflexións sobre a súa relevancia social e no ámbito profesional da Bioloxía.
B3	Aplicar o coñecemento adquirido na titulación e empregar a instrumentación científico-técnica e as TIC en contextos propios da Bioloxía e/ou no exercicio da profesión.
B6	Desenvolver as capacidades de análises e sínteses, de razoamento crítico e argumentación, aplicándoas en contextos propios da Bioloxía e outras disciplinas científico-técnicas.
C1	Resolver problemas aplicando o método científico, os conceptos e a terminoloxía específica da Bioloxía, os modelos matemáticos e as ferramentas estatísticas e informáticas.
C3	Realizar e interpretar análises moleculares, físico-químicos e biolóxicos, incluíndo mostras de orixe humana. Realizar ensaios e probas funcionais en condicións normais e anómalas.
C6	Comprender e integrar o funcionamento dos seres vivos (nivel celular, tisular, orgánico e individuo), interpretando as súas respostas homeostáticas e adaptativas.
C10	Identificar procesos biolóxicos e biotecnolóxicos e a súa posible aplicabilidade, en particular nos ámbitos sanitario, agroalimentario e ambiental.
C11	Realizar e interpretar bioensaios, identificar axentes químicos e biolóxicos, incluíndo os patógenos, así como os seus produtos tóxicos. Desenvolver e aplicar técnicas de control biolóxico
D1	Comprender o significado e aplicación da perspectiva de xénero nos distintos ámbitos de coñecemento e na práctica profesional co obxectivo de alcanzar unha sociedade máis xusta e igualitaria.
D4	Colaborar e traballar en equipo ou en grupos multidisciplinares, fomentar a capacidade de negociación e de alcanzar acordos.
D5	Comunicar de maneira eficaz e adecuada, incluíndo o uso de ferramentas dixitais e o inglés.

Resultados previstos na materia

Expected results from this subject	Training and Learning Results			
Coñecer as bases orgánicas e tisulares do sistema inmunitario, os seus compoñentes celulares e humorales, diversidade de receptores, interaccións e complexidade.	A3	B2	C3	
Relacionar o funcionamento integrado do sistema inmunitario.	A2 A3	B6	C1 C3 C6 C11	
Identificar as bases da inmunoterapia.	A2 A3	B2 B3 B6	C6 C10	
Aplicar o coñecemento da Parasitoloxía para illar, identificar, manexar e analizar espécimes e mostras de orixe biolóxica, incluíndo virus.	A2 A3	B6	C3 C10 C11	D1
Coñecer os constituíntes celulares e moleculares, o concepto de parasitismo e os aspectos básicos das relacións parasito- hospedador, a diversidade de organismos parasitos e a complexidade dos seus ciclos biolóxicos, as adaptacións funcionais dos parasitos ao medio (hospedadores e medio externo).	A2 A3	B2 B3 B6	C6	D1
Obter unha visión xeral da importancia sanitaria dos parasitos con relevancia das zoonosis.	A2 A3	B2 B3 B6	C6 C11	D1 D4
Coñecer e manexar os conceptos, terminoloxía e instrumentación científico-técnica relativos á Inmunoloxía e a Parasitoloxía.	A2 A3	B3	C6 C10 C11	D4 D5
Comprender a proxección social da Inmunoloxía e da Parasitoloxía e a súa repercusión no exercicio profesional.	A2 A3	B3	C11	D1 D4 D5

Contidos	
Topic	
Bases orgánicas e tisulares e compoñentes celulares e humorales do Sistema Inmunitario nos vertebrados.	Órganos Tecidos Células Xeneralidades de receptores e compoñentes humoráis
A diversidade de receptores, interaccións e complexidade do sistema inmunitario	Leucocitos Células presentadoras de antíxeno. Linfocitos T e B. Subtipos Receptores específicos de antíxeno: estrutura molecular e xenética Correceptores Citocinas e receptores Complemento
Funcionamento do sistema inmunitario en condicións de saúde e enfermidade	Resposta inmune a patóxenos (bacterias extracelulares, intracelulares, virus, fungos, parásitos). Vacinas Inmunovixilancia anti tumoral Xeneralidades de patoloxías inmunitarias
Inmunoterapia e Técnicas inmunolóxicas	Conceptos básicos de inmunoterapia e introducción a técnicas inmunológicas
Concepto de parasitismo e aspectos básicos das relacións parásito-hospedador	Parasitismo e Parasitosis. Orixen e evolución do Parasitismo. Tipos de hóspedes Accións dos parásitos sobre os hospedadores e accións dos hospedadores sobre os parásitos. Vectores de parásitos. Índices ecoparasitolóxicos.
A diversidade de organismos parásitos e a complexidade dos seus ciclos biolóxicos. As adaptacións funcionais dos parásitos ao medio (hospedadores e medio externo)	Grupos de parásitos. Tipos de Ciclos Biolóxicos. Epidemioloxía: Ciclos Epidemiolóxicos. Distribución Xeográfica dos Parasitismos e Parasitosis: Zoas Endémicas; Epidémicas e Pandémicas. Adaptacions dos parásitos.
Importancia sanitaria dos parásitos	Concepto e desenvolvemento da enfermedade parasitaria. Zoonosis. Problemas na saúde dos animais. Problemas na saúde Humana.

Planificación			
	Class hours	Hours outside the classroom	Total hours
Seminario	4	4	8

Prácticas de laboratorio	12	3	15
Lección maxistral	18	42	60
Lección maxistral	14	35	49
Exame de preguntas obxectivas	1	6	7
Exame de preguntas obxectivas	1	10	11

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Metodoloxía docente

	Description
Seminario	Impartiranse seminarios da parte de Inmunoloxía e da parte de Parasitoloxía. O obxectivo principal desta actividade é que os alumnos adquiran formación sobre determinados aspectos relevantes e aplicados da Inmunoloxía e da Parasitoloxía. É obrigatoria a asistencia a todos os seminarios. A falta de asistencia sen xustificación fará que os seminarios se suspendan, e polo tanto a materia.
Prácticas de laboratorio	Para facer as prácticas de laboratorio, os alumnos distribuiranse en grupos. Cada grupo terá un número reducido de alumnos. É obrigatoria a asistencia a todas as clases prácticas. La falta de asistencia sen xustificación fará que las prácticas se suspendan, e por tanto la materia. As sesións de prácticas estarán dirixidas á aprendizaxe dunha serie de técnicas de inmunoquimica e identificación morfolóxica e diagnóstico de parásitos e tamén a resolución de problemas de ecoparasitoloxía.
Lección maxistral	Impartiranse clases teóricas da materia de Parasitoloxía (14 horas). Clases nas que o alumno aprenderá os conceptos básicos da Parasitoloxía e tamén, a súa importancia nas Ciencias da Natureza, Bioloxía e Ciencias da Saúde.
Lección maxistral	Impartiranse clases teóricas da materia de Inmunoloxía (18 horas). Clases nas que o alumno aprenderá os conceptos básicos da Inmunoloxía e tamén, a súa importancia nas Ciencias da Natureza, Bioloxía e Ciencias da Saúde

Atención personalizada

Methodologies	Description
Seminario	Realizaranse por grupos, onde se pretende que os alumnos interaccionen e discutan determinados temas
Lección maxistral	Resolución de dúbidas de forma personalizada aos alumnos durante as tutorías
Prácticas de laboratorio	Realizaranse por grupos de alumnos baixo a supervisión do profesor

Avaliación

	Description	Qualification	Training and Learning Results			
Seminario	Avaliarase a capacidade dos alumnos de cada grupo para resolver con éxito os supostos prácticos expostos, e de responder de forma clara a os interrogantes que se les expoñan. (Inmunoloxia 5%; Parasitoloxía 5%) Asistencia y entrega de cuestionarios son obrigatorios. A asistencia os seminarios é obrigatoria. A falta de asistencia sen xustificación, supoñerá non superar a materia.	10	A2 A3	B2 B3 B6	C1 C3 C6 C11	D1 D5
Prácticas de laboratorio	As prácticas de laboratorio son obrigatorias. A falta de asistencia sen xustificación, suporán un suspenso. Avaliarase a actitude e as capacidades e destrezas adquiridas polos alumnos durante as prácticas, así como a súa capacidade para dar resposta ás cuestións expostas polo profesor en relación coas actividades realizadas durante estas sesións (Inmunoloxía 5%; Parasitoloxía 15%)	20	A2		C1 C3 C10 C11	D1 D4
Exame de preguntas obxectivas	Parcial Módulo Inmunoloxía	40			C1 C3 C6 C10	D1 D4

Other comments on the Evaluation

- **EVALUACIÓN CONTINUA**

Módulo Inmunoloxía (50%) : máximo 5 puntos

- **Exame: ata 4 puntos**
- **Seminarios: ata 0,5 puntos.** A asistencia e entrega de cuestionarios de Inmunoloxía é obrigatoria. Os cuestionarios entregaranse o mesmo día do seminario.
- **Prácticas: ata 0,5 puntos.** A asistencia e entrega de cuestionarios de Inmunoloxía é obrigatoria. Os cuestionarios se realizarán o mesmo día da sesións prácticas.

  - Actitude e aptitude durante as sesións prácticas: ata 0,1 puntos

  - Cuestionario de prácticas: ata 0,4 puntos

Módulo Parasitoloxía (50%): máximo 5 puntos:

- **Examen: ata 3 puntos**
- **Seminarios: ata 0,5 puntos.** A asistencia é obrigatoria.
- **Prácticas: ata 1,5 puntos as prácticas.** A asistencia é obrigatoria. A cualificación práctica poderá incluír a oportuna presentación, realización e realización dunha memoria práctica, resolución de cuestións formuladas durante as clases e manexo do material durante as prácticas (ata 1 punto) e a actitude e aptitude durante as prácticas (ata 0,5 puntos).

La nota final de la asignatura, por tanto, estará compuesta por la suma de ambos módulos (nota máxima de 10 puntos).

PARA APROBAR LA ASIGNATURA es necesario:

1. Un mínimo de 4,5 puntos (sobre 10) en cada exame parcial para superar a materia e
2. Obter unha nota media mínima de 5, calculada a partir da nota media obtida nos dous exames.

O alumnado que suspenda só un módulo da materia (Inmunoloxía ou Parasitoloxía) non terá que cursar o módulo aprobado en posteriores oportunidades/convocatorias. Conservarase a nota do módulo aprobado (examen,seminario e prácticas). Terán dereito a repetir estas actividades sempre que renuncien por escrito á cualificación obtida no curso anterior (documento asinado e enviado ao coordinador). A dimisión ten que facerse antes de que comencen as actividades.

O alumnado que supere as prácticas non terá que repetilas en futuras oportunidades/convocatorias. Contra os que non superen, deberán repetir o exame práctico (solución de problemas), xunto coa proba.

- **AVALIACIÓN GLOBAL**

O alumno que opte por unha avaliación global terá que solicitala ao comezo do curso no prazo que estableza o centro,

segundo a normativa vixente. A avaliación global consiste nunha proba final completa con preguntas tipo test e preguntas curtas, na que se avaliarán os contidos das aulas, prácticas de laboratorio e seminarios. Para superar a materia, a nota global da proba deberá ser igual ou superior a 5. De non superar a proba final, a nota do alumno será a obtida na proba final comprensiva sobre 10 puntos.

Na segunda oportunidade do curso, o alumno que suspenda terá que ser avaliado de novo en todas as actividades mediante unha proba global. Se a materia non se supera nalgunha das oportunidades do curso académico, non terás que asistir de novo ás prácticas, senón que serás

avaliado de novo de todos os contidos (aulas expositivas, prácticas e seminarios), ben de forma continuada ou global.

- **AVALIACIÓN**

Importante: Independentemente da elección de AVALIACIÓN CONTINUA OU GLOBAL, a asistencia a todas as PRÁCTICAS e SEMINARIOS é OBRIGATORIO para SUPERAR a materia (salvo faltas de asistencia debidamente xustificadas).

INFORMACIÓN XERAL

O calendario definitivo de exames pódese consultar na seguinte ligazón: http://bioloxia.uvigo.es/gl/docencia/exames

O calendario de clases pódese consultar na seguinte ligazón: http://bioloxia.uvigo.es/gl/docencia/horarios

Bibliografía. Fontes de información

Basic Bibliography

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Sharon A. Stranford , Jenni Punt , Judith A. Owen, **Kubi Inmunología**, 978-145-6273798, 8ª edición, McGraw/Hill, 2020

Africa González Fernández et al., **Inmunogenética**, 978-849-1711551, 1ª edición, Síntesis, 2018

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Complementary Bibliography

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Recomendacións

Subjects that continue the syllabus

Técnicas en bioloxía celular e molecular/V02G031V01310

Subjects that are recommended to be taken simultaneously

Técnicas en bioloxía celular e molecular/V02G031V01310

Other comments

Os alumnos deben ter un nivel axeitado de inglés.

IDENTIFYING DATA				
Ecology II				
Subject	Ecology II			
Code	V02G031V01306			
Study programme	Grado en Biología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	3rd	2nd
Teaching language	Spanish			
Department				
Coordinator	Pardo Gamundi, Isabel María			
Lecturers	Clerencia Izquierdo, Mar Delgado Núñez, Cristina Hernando Morales, Víctor Pardo Gamundi, Isabel María Sobrino Garcia, Maria Cristina			
E-mail	ipardo@uvigo.es			
Web				
General description	Ecology is the science that studies the response of organisms to environmental variations and relationships to each other, from individuals to the ecosystem level. This course aims to provide basic knowledge of Ecology of communities and ecosystems. English Friendly subject: International students may request from the teachers: a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English. The schedules of the matter can be consulted in the link: https://bioloxia.uvigo.es/gl/docencia/horarios/			

Training and Learning Results	
Code	
A2	Students should know how to apply their knowledge to their work or vocation in a professional way. They also should have the competences that are usually proved through the elaboration and defence of arguments and the resolution of problems within their study field.
A3	Students should prove ability for information-gathering and interpret important data (usually within their study field) to judge relevant social, scientific or ethical topics.
A4	Students should able to communicate information, ideas, issues and solutions to all audiences (specialist and unskilled audience).
B2	Manage scientific-technical information using diverse and reliable sources. Analyze data and documents and interpret them critically and rigorously, including considerations on their social relevance and in the professional field of Biology.
B4	Draft and write reports, documents and projects related to Biology. Proceed to their presentation and debate in the teaching and specialized areas, highlighting the competences of the degree.
B6	Develop analysis and synthesis, critical reasoning and argumentation skills, applying them in Biology and other scientific-technical disciplines.
C7	Sampling, characterising, cataloguing and managing natural and biological resources (populations, communities and ecosystems).
C8	Describe, assess and plan the physical environment, use bio-indicators and identify environmental problems. Provide solutions for the control, monitoring and restoration of ecosystems.
C9	Identify resources of biological origin and assess their efficient and sustainable use in order to obtain products of interest. Propose and implement improvements in production systems.
C10	Identify biological and biotechnological processes and their potential applications, in particular in health, agri-food and environmental fields.
D3	Commitment to sustainability and the environment. Equal, sensible and efficient use of resources.
D5	Communicate effectively and appropriately, including the use of computer tools and English.

Expected results from this subject	Training and Learning Results			
Understand models of ecosystem development (ecological succession) and disturbance, stability and dynamic of ecosystems.	A3	B4 B6	C7 C8	D3
Apply the knowledge of the ecology to isolate, identify, handle and analyse specimens and environmental samples	A2 A3	B2 B4	C7 C10	D3
Apply knowledges and own methodologies of the ecology in different processes related with the management of the environment	A3 A4	B2 B4 B6	C8	D3 D5
Apply knowledges and relative methodologies to the ecology in appearances related with the production, exploitation, analysis and diagnostic of processes and biological resources	A3	B4 B6	C9 C10	D5

Obtain information, develop experiments and interpret results	A3	B2 B4 B6	C7 C8	D3
Comprise the social projection of the ecology and his repercussion in the professional exercise, as well as know use his contents to give teaching and do divulging	A4	B2 B4	C8	D3 D5
Know and handle the concepts, terminology and scientific instrumentation-technical relative to the ecology	A2	B4	C7 C8	D5

Contents

Topic	
I. Structure and organisation of communities	1. The nature of the community. 2. Physical structure. 3. Biological structure. 4. Effect of the perturbations on the composition and structure of the communities.
II. Flow of Energy and circulation of matter in the ecosystem	5. Introduction to the operation of the ecosystems. Trophic chains 6. Primary production. 7. Factors that limit the primary production. 8. Secondary production. 9. Decomposers and detritivores. 10. The circulation of matter in the ecosystems. 11. Biogeochemical cycles
III. Change in the ecosystem	12. Global change 13. Succession

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	31	64	95
Seminars	3	1	4
Debate	2	1	3
Laboratory practical	12	12	24
Report of practices, practicum and external practices	0	22	22
Objective questions exam	1	0	1
Objective questions exam	1	0	1

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies

	Description
Lecturing	Exhibition by part of the professor of the contents related with the matter.
Seminars	Face-to-face work guided by the destined professor to deepen in subjects related with the matter given in the lectures or complementary to this. They will study and they will analyse, by means of specific questions designed by the professor, 3 scientific articles classical of Ecology that will treat related or complementary subjects to the subjects given in the lectures. The articles are written in English. Seminars: 1. Trophic chains. 2. River Ecology: Introduction to practical classes 3. Ecological succession
Debate	Open talk between groups of students. Centred in a subject of the contents of the previously tackled matter in previous lectures. Debate on the climate change
Laboratory practical	Practical work allocated to familiarise to the student with some of the technicians and methodologies employed in Ecology. Practices: 1. Exit of field for the obtaining of data for practices. 2 and 3. Fluvial metabolism. Transport and retention of solutes and particuilate materials in rivers. Relation between consumers and resources.

Personalized assistance

Methodologies	Description
Lecturing	The assistance to students can be individualised and/or in groups either face-to-face or by telematic means (email, virtual campus, videoconference, Moovi forums, ...). Students have to request an apointment. Schedule of assistance: Isabel Pardo: Tuesday and Wednesday 11.00-13:00 h; Víctor Hernando Morales: Lunes y miércoles de 11:00-13:00h

Laboratory practical	The assistance to students can be individualised and/or in groups either face-to-face or by telematic means (email, virtual campus, videoconference, Moovi forums, ...). Students have to request an apointment. Schedule of assistance: Isabel Pardo: Tuesday and Wednesday of 11.00-13:00 pm; Cristina Delgado: Monday and Wednesday 11:00-13:00 h. Victor Hernando Morales: Monday and Wednesday 11:00-13:00h.
Seminars	The assistance to students can be individualised and/or in groups either face-to-face or by telematic means (email, virtual campus, videoconference, Moovi forums, ...). Students have to request an apointment. Schedule of Assistance: Cristina Sobrino: Tuesday and Thursday of 13:00-15:00 h. Cristina Delgado: Monday and Wednesday 11:00-13:00 h.
Debate	The assistance to students can be individualised and/or in groups either face-to-face or by telematic means (email, virtual campus, videoconference, Moovi forums, ...). Students have to request an apointment. Schedule of Assistance: Isabel Pardo: Tuesday and Wednesday 11.00-13:00 h.
Tests	**Description**
Report of practices, practicum and external practices	The assistance to students can be individualised and/or in groups either face-to-face or by telematic means (email, virtual campus, videoconference, Moovi forums, ...). Students have to request an apointment. Schedule of Assistance: Isabel Pardo: Tuesday and Wednesday 11.00-13:00 h; Cristina Delgado: Monday and Wednesday 11:00-13:00 h. Victor Hernando Morales: Monday and Wednesday 11:00-13:00h.

Assessment

	Description	Qualification	Training and Learning Results			
Seminars	Participation and preparation of the works proposed by the professor for the specific subject of each seminar.	7	A3	B2	C8	D5
Debate	Preparison, assistance and participation in the debate	5	A2 A3 A4	B2 B4 B6	C9	D5
Laboratory practical	Assessment of the performance in field and laboratory work, and of the methods employed during the practices as well as of the capacity for the work in group.	1	A3	B2	C7	D3
Report of practices, practicum and external practices	Written, defence and discussion of the results obtained in practices. It will be valued the quality and depth of the work and analysis of data, the graphic quality and clarity, and the participation in the discussions.	24	A2 A3	B2 B4 B6	C7 C8 C10	D3 D5
Objective questions exam	This first part, which will be done in writing in March, will consist of a series of objective questions related to the first part of content (Topics 1-7) taught during the master classes.	30	A2	B2 B6	C9 C10	D5
Objective questions exam	This second part, which will be carried out in writing at the end of the four-month period with classes, will consist of a series of objective questions related to the second part of the two contents (Topics 8-13) taught during the master classes.	33	A2	B2 B6	C9 C10	D5

Other comments on the Evaluation

Students who opt for continuous assessment must take two written midterm exams: the first in March (30% of the final grade) and the second in May (33% of the final grade). If the student fails the first and/or second midterm exams, they must take a second exam in July. The July exam (second opportunity) will be related to the theoretical material not passed during the first opportunity (first, second, or both midterms).

The practical exercises (including the presentation of the report), as well as the activities related to the Seminar and Debate, must be completed, regardless of the assessment method chosen.

Students who opt for the global assessment method, and who have attended and completed the practical exercises, the Seminar, and the Debate, must take a final exam in May. This exam will include questions related to the theoretical content assessed in the two midterms included in the continuous assessment.

The same criteria will be followed for all exams (first partial, second partial, and the July exam): students must achieve a grade of 5 on all of them to be able to add the grades for the other evaluable sections of the course (seminars, practical report, debate, etc.).

If the student fails the course on the second attempt, the practical and seminar grades will be retained for the following academic year, 2026/27.

Students will be marked as "not present" if they do not appear for the first and/or second written exams.

The final exam schedule can be found at the following link: http://bioloxia.uvigo.es/es/docencia/examenes

Sources of information

Basic Bibliography

Begon, M., Harper, J.L. y Townsend, C.R., **Ecología. Individuos, poblaciones y comunidades**, 0865421110, 1999, Blackwell Scientific Publications,

Krebs, C.J., **Ecología. Análisis experimental de la distribución y abundancia**, 8436803159, 1986, Ediciones Pirámide,

Molles, M.C., **Ecology: concepts and applications**, 007042716X, 1999, McGraw-Hill,

Schlesinger, W.H., **Biogeoquímica. Un análisis del cambio global**, 0-08-044642-6, 2000, Elsevier,

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Margalef, R, **Ecología**, 84-282-0405-5, 1974, Omega,

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Rodríguez, J., **Ecología**, 9788436829501, 2016, Piramide,

Recommendations

Subjects that continue the syllabus

Environmental analysis and diagnosis/V02G030V01902
Biodiversity: management and conservation/V02G030V01905
Management and Conservation of spaces/V02G030V01910

Subjects that it is recommended to have taken before

Ecology I/V02G031V01301

Other comments

Students who opt for continuous evaluation must take two partial written exams, the first in March (30% of the final grade) and the second in June (33% of the final grade). If you fail the first partial and/or the second, you must go to the July exam (2nd opportunity). The July exam (2nd opportunity) will be related to the theoretical subject not passed during the 1st opportunity (first, second or both partials).
The practices (including the presentation of the report), as well as the activities related to the Seminar and Debate, must be carried out compulsorily, regardless of the evaluation modality chosen.
Students who opt for the global evaluation modality, and who have attended and completed the Practices, the Seminar, and the Debate appropriately, must take a final test in June that will include questions related to the theoretical contents evaluated in the two midterms integrated into the continuous evaluation.
In all the exams (first partial, second partial and the July exam) the same criteria will be followed: the grade of 4.5 must be exceeded in all of them so that the grade from the other evaluable sections in the subject can be added (seminars, report of practices, debate...).
In case of failing the subject on the second opportunity, the notes from practices and seminars will be saved for the following academic year 2025/26.
A student will appear as "not presented" when she/he does not appear for the 1st and/or 2nd opportunity written exams.
The final exam schedule can be consulted at the following link: http:/Bioloxia.uvigo.es/es/docencia/examenes

IDENTIFYING DATA

Animal physiology II

Subject	Animal physiology II			
Code	V02G031V01307			
Study programme	Grado en Biología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	3rd	2nd
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	Soengas Fernández, José Luis			
Lecturers	Blanco Imperiali, Ayelén Melisa Covelo Fernández, Ana Ferreira Faro, Lilian Rosana Míguez Miramontes, Jesús Manuel Pérez Tierra, Gabriel Soengas Fernández, José Luis Velasco Rubial, Cristina			
E-mail	jsoengas@uvigo.es			
Web				
General description	English Friendly subject: International students may request from the teachers: a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English Animal Physiology is a compulsory subject in the Biology degree, therefore its knowledge is essential in the comprehensive training of a Biology graduate. The contents of this subject try to explain the basic fundamentals of the functioning of an animal organism, trying to know all the activities (physical-chemical reactions) of the cells, tissues and organs (whose structure and constituent elements have already been studied previously) that make up the body of animals. Likewise, the subject deals in detail with how these systems serve the different animals to adapt to the environment. Because physiological processes are extremely complex, the study and teaching of physiology must be approached considering the different functional systems separately, taking into account, however, that each function represents a partial part of the functional unit that the system conforming an animal. The time table of the subject can be consulted at the link: https://bioloxia.uvigo.es/gl/docencia/horarios/			

Training and Learning Results

Code	
A2	Students should know how to apply their knowledge to their work or vocation in a professional way. They also should have the competences that are usually proved through the elaboration and defence of arguments and the resolution of problems within their study field.
A3	Students should prove ability for information-gathering and interpret important data (usually within their study field) to judge relevant social, scientific or ethical topics.
B2	Manage scientific-technical information using diverse and reliable sources. Analyze data and documents and interpret them critically and rigorously, including considerations on their social relevance and in the professional field of Biology.
B3	Apply the knowledge acquired in the degree and use the scientific-technical instrumentation and CIT in contexts of Biology and/or related to the professional practice.
B4	Draft and write reports, documents and projects related to Biology. Proceed to their presentation and debate in the teaching and specialized areas, highlighting the competences of the degree.
C3	Perform and interpret molecular, physicochemical and biological analyses, including samples of human origin. Conduct assays and functional tests under normal and abnormal conditions.
C6	Understanding and integrate the functioning of living beings (cellular, tissue, organ and individual level), explaining their homeostatic and adaptive responses.
C9	Identify resources of biological origin and assess their efficient and sustainable use in order to obtain products of interest. Propose and implement improvements in production systems.
C10	Identify biological and biotechnological processes and their potential applications, in particular in health, agri-food and environmental fields.
D1	Understand the meaning and use of the gender perspective in the different fields of knowledge and in professional practice with the aim of achieving a fairer and more equal society.
D2	Communicate speaking and in writing in Galician.
D3	Commitment to sustainability and the environment. Equal, sensible and efficient use of resources.
D4	Collaborate and work in teams or multidisciplinary groups, promote negotiation skills and the ability to reach agreements.

Expected results from this subject

Expected results from this subject	Training and Learning Results			
Identify the mechanisms and functions of the cardiovascular, respiratory, excretory/osmoregulatory, digestive, and reproductive systems	A2 A3	B2 B3 B4	C3 C6 C9 C10	D1 D2 D3 D4
Identify the regulation and integration of animal functions, as well as functional adaptations to the environment in different groups of animals	A2 A3	B2 B3 B4	C3 C6 C9 C10	D1 D2 D3 D4
Recognize the functioning of the animal as an integrated whole, reinforcing the role of coordination and integration systems	A2 A3	B2 B3 B4	C3 C6 C9 C10	D1 D2 D3 D4

Contents	
Topic	
Chapter I: Cardiovascular Physiology (Professor Soengas)	Topic 1. General characteristics of cardiovascular systems Topic 2. The heart Topic 3. Regulation of cardiac activity. Topic 4. Arterial, venous and capillary circulation. Lymphatic system Topic 5. Regulation of blood pressure and circulation
Chapter II: Physiology of respiration (Professor Soengas)	Topic 6. General characteristics of breathing Topic 7. Aquatic breathing Topic 8. Air breathing Topic 9. Diffusion and transport of respiratory gases Topic 10. Regulation of breathing
Chapter III: Excretory function and osmoregulation (Professor Soengas)	Topic 11. General characteristics of excretion Topic 12. Formation of urine Topic 13. Osmoregulation Topic 14. Regulation of acid-base balance
Chapter IV: Digestive Physiology (Professor Míguez)	Topic 15. Functional anatomy of the digestive system of vertebrates Topic 16. Motility and digestive secretions Topic 17. Digestion and absorption Topic 18. Regulation of intake. hunger and satiety
Chapter V: Reproduction (Professor Míguez)	Topic 19. General characteristics of reproduction Topic 20. Male reproductive function in vertebrates Topic 21. Female reproductive function in vertebrates. Topic 22. Fertilization, gestation, birth and lactation

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	16	35	51
Lecturing	20	43	63
Seminars	2	16	18
Laboratory practical	12	6	18
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Lecturing	Lectures will be taught during the second semester until completing the scheduled hours. They will be held in the corresponding classroom, with the total number of registered students present. They will discuss, with the help of power point presentations, the theoretical foundations of the subject. Teaching materials will be available to students on the Tele-teaching Platform
Lecturing	Lectures will be taught during the second semester until completing the scheduled hours. They will be held in the corresponding classroom, with the total number of registered students present. They will discuss, with the help of power point presentations, the theoretical foundations of the subject. Teaching materials will be available to students on the Tele-teaching Platform
Seminars	-Topics related to the subject will be proposed for students to prepare, organized in groups of 2-3. -In the first face-to-face meeting with each seminar group, the planning of the elaboration of the different topics will be carried out. Before the last meeting, the groups will deliver a report with the topics covered. In the last meeting of each seminar group the students will present each topic (10 minutes).

Laboratory practical	Students will carry out 4 practical sessions in the laboratory of 3 hours each. Attendance at them is mandatory to pass the course. At the end of the practical classes, different groups will prepare a results report to be evaluated

Personalized assistance

Methodologies	Description
Lecturing	They will be interactive and will allow you to establish personalized reinforcement actions. Students may request individualized tutorials to resolve doubts and problems via email and/or the University's virtual classroom system
Laboratory practical	During the practical classes, the teachers will give individual attention to each student for the correct understanding of the experimental objectives and the methodology or techniques used. Once the task is completed, each student or group of students will see their work supervised by the teacher. Students may request individualized tutorials to resolve doubts and problems via email and/or the University's virtual classroom system
Seminars	Seminars will be interactive and will allow you to establish personalized reinforcement actions. Students may request individualized tutorials to resolve doubts and problems via email and/or the University's virtual classroom system
Lecturing	They will be interactive and will allow you to establish personalized reinforcement actions. Students may request individualized tutorials to resolve doubts and problems via email and/or the University's virtual classroom system

Assessment

	Description	Qualification	Training and Learning Results			
Lecturing	Partial exam 1 (25% of the score): chapters I and II The exam will be made up of: Objective questions Development questions To pass the exam, a minimum mark of 5 points (out of 10) must be obtained. A minimum mark of 4 points (out of 10) is required to pass the subject. Self-assessment test. The students will have several tests available on the tele-teaching platform in order to facilitate the self-assessment of knowledge and the completion of the exam. Its fulfilment by the students will be autonomous and totally voluntary. There will be 2 tests in relation to the following contents: Test 1. Chapter I (Circulation) Test 2. Chapter II (Breathing). The self-assessment tests DO NOT GIVE marks in the evaluation of the subject	25	A2 A3	B2	C6 C9 C10	D1 D2 D3 D4
Lecturing	Partial exam 2 (35% of the score): chapters III, IV and V The exam will be made up of: Objective questions Development questions To pass the exam, a minimum mark of 5 points (out of 10) must be obtained. A minimum mark of 4 points (out of 10) is required to pass the subject. Self-assessment test. The students will have several tests available on the tele-teaching platform in order to facilitate the self-assessment of knowledge and the completion of the exam. Its fulfilment by the students will be autonomous and totally voluntary. There will be 3 tests in relation to the following contents: Test 1. Chapter III (excretion-osmoregulation). Test 2: Chapter IV (digestive) Test 3: Chapter V (reproduction). The self-assessment tests DO NOT GIVE marks in the evaluation of the subject	35	A2 A3	B2	C6 C9 C10	D1 D2 D3 D4
Seminars	The topics developed will be sent to the teacher in charge before the last meeting of the tutorial group. On that day there will be a 10-minute presentation in which the following will be evaluated: -Quality of the written memory presented (organization, writing, adequacy of the bibliography, focus and depth adjusted to the subject) -Quality of the oral presentation (adequacy to the time , quality of the information presented in the figures, oral expression, ability to transmit information, mastery of technical language) -Answers to the questions presented	30	A2 A3	B3 B4	C6 C9 C10	D1 D2 D3 D4

Laboratory practical	Attendance to practical classes is mandatory. At the end of them, a practiccal classes report will be delivered by each of the subgroups that will be organized in each practical group.	10	A2 B3 C3 D1 A3 B4 C6 D2 C9 D3 C10 D4

Other comments on the Evaluation

1) Continuous evaluation

To pass the subject, students must carry out all the evaluable activities.

Practical classes and seminars: Attendance at scheduled practice sessions and seminars is mandatory and necessary to pass the subject. To pass these activities, a minimum score of 5/10 points must be achieved in each of them. The justification of non-attendance to the practical sessions and seminars will not exempt students from carrying them out in another group, provided that the calendar allows it.

Theory exam. To pass this part it will be necessary to obtain 5 points in each of the two scheduled exams. However, it will be possible to pass the subject if a minimum score of 4 is achieved in each one of the theory exams, offsetting the practical and seminar scores until reaching 5 points. In case of not reaching the minimum score (4) in the theory exams, the final score for the subject will correspond to that score (the scores for practices and seminar will not be taken into account).

Second opportunity and following courses. Activities passed on the first opportunity will be saved for the second opportunity. It will not be possible to recover the practices or the seminars. Thus, the scores of these parts will be those obtained during the period of their completion in the course.

Repeating students. They will only have to evaluate the activities (practices, seminar) not passed in the previous courses, keeping the scores obtained in said activities.

2) Overall evaluation

Students may request the global evaluation that will be carried out on the official dates of first and second opportunities. This evaluation will allow reaching 100% of the subject score and is structured into three parts:

- Score of practices carried out in the period established in the calendar. 10%

- Score of the seminar carried out in the period established in the calendar. 30%

- Score of the global theory exam, which will be carried out on the dates set in the academic calendar for the official exams of the subject. 60%

The academic calendar can be consulted at the following link:http://bioloxia.uvigo.es/gl/docencia/horarios

The exam calendar can be consulted at the following link: http://bioloxia.uvigo.es/gl/docencia/exam

Sources of information

Basic Bibliography

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Randall, D., French, K., **Eckert Animal Physiology 5ª edicion**, WH Freeman, 2021

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Butler, P., Brown, A., Stephenson, G., Speakman, J., **Animal Physiology, an environmental perspective**, Oxford University Press, 2021

Guyton, A.C. y Hall, J.E, **Tratado de Fisiología Médica edicion 14**, Interamericana-MacGraw-Hill, 2021

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Randall, D., Burggren, W., French, K., **Fisiología animal.**, McGraw-Hill/Interamericana, 1998

Silverthorn, **Fisiologia humana**, Médica Panamericana, 2021

Thibodeau, G.A. y Patton, K.T., **Anatomía y Fisiología**, Mosby-Doyma, 1995

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Willmer, P., Stone, G., Johnston, I, **Environmental physiology of animals, second edition**, Blackwell science, 2000

Sherwood, L., Klandorf, H, **Animal Physiology : From Genes to Organisms**, Cengage Learning, Inc, 2011

Berne, R.M., Levy, M.N, **Fisiología**, Harcourt-Mosby,
Dantzler, W .H, **Comparative physiology**, Oxford University Press,
Martín Cuenca, E, **Fundamentos de fisiología**, Thomson-Paraninfo,
Schmidt-Nielsen, K, **Animal physiology .Adaptation and Environment**, Cambridge University Press, 1997
Hall, J.E., Hall, M.E., **Guyton and Hall textbook of medical physiology 14th ed.**, Elsevier, 2021
Butler, P.J., **Animal physiology: an environmental perspective**, Oxford University Press, 2021

Recommendations

Subjects that continue the syllabus

Biotechnology applied to animal production/V02G031V01410

Other comments

For the correct follow-up of the subject, the student must register at the beginning of the course on the tele-teaching platform.
In the registration, it is important that you include the e-mail address that you use regularly, in order to receive information from your teaching staff in a personalized way

IDENTIFYING DATA				
Fisioloxía vexetal II				
Subject	Fisioloxía vexetal II			
Code	V02G031V01308			
Study programme	Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	3	2c
Teaching language	Castelán			
Department	Bioloxía vexetal e ciencias do solo			
Coordinator	Rey Fraile, Manuel Ángel			
Lecturers	Núñez González, Noa Rey Fraile, Manuel Ángel			
E-mail	mrey@uvigo.gal			
Web				
General description	Visión actual do coñecemento científico desenvolvido no campo da Fisioloxía Vexetal. Coñecemento teórico-práctico necesario para comprender a fisioloxía das plantas e fundamentos para a súa aplicación en materias máis específicas.			

Resultados de Formación e Aprendizaxe	
Code	
A3	Que os estudantes teñan a capacidade de reunir e interpretar datos relevantes (normalmente dentro da súa área de estudo) para emitir xuízos que inclúan unha reflexión sobre temas relevantes de índole social, científica ou ética.
A5	Que os estudantes desenvolvesen aquelas habilidades de aprendizaxe necesarias para emprender estudos posteriores cun alto grao de autonomía.
B2	Xestionar información científico-técnica de calidade utilizando fontes diversas. Analizar datos e documentos e interpretalos de forma crítica e rigorosa, incluíndo reflexións sobre a súa relevancia social e no ámbito profesional da Bioloxía.
B3	Aplicar o coñecemento adquirido na titulación e empregar a instrumentación científico-técnica e as TIC en contextos propios da Bioloxía e/ou no exercicio da profesión.
B4	Elaborar e redactar informes, documentos e proxectos relacionados coa Bioloxía. Proceder á súa presentación e debate no ámbito docente e especializado, poñendo de manifesto as competencias da titulación
C1	Resolver problemas aplicando o método científico, os conceptos e a terminoloxía específica da Bioloxía, os modelos matemáticos e as ferramentas estatísticas e informáticas.
C4	Illar, identificar e cultivar microorganismos, células, tecidos e órganos, facilitando o seu estudo e a valoración da súa actividade metabólica.
C6	Comprender e integrar o funcionamento dos seres vivos (nivel celular, tisular, orgánico e individuo), interpretando as súas respostas homeostáticas e adaptativas.
C9	Identificar recursos de orixe biolóxica e valorar a súa explotación eficiente e sostible para obter produtos de interese. Propoñer e implantar melloras nos sistemas produtivos.
C10	Identificar procesos biolóxicos e biotecnolóxicos e a súa posible aplicabilidade, en particular nos ámbitos sanitario, agroalimentario e ambiental.
D3	Comprometerse coa sustentabilidade e medio ambiente. Uso de forma equitativa, responsable e eficiente dos recursos.
D4	Colaborar e traballar en equipo ou en grupos multidisciplinares, fomentar a capacidade de negociación e de alcanzar acordos.
D5	Comunicar de maneira eficaz e adecuada, incluíndo o uso de ferramentas dixitais e o inglés.

Resultados previstos na materia				
Expected results from this subject	Training and Learning Results			
Coñecer as funcións vitais e específicas dos organismos vexetais e a súa transcendencia na Bioloxía.	A5	B2 B4	C1 C4 C6 C10	D3
Comprender a regulación e a integración das funcións dos vexetais, desde o nivel molecular ata a planta completa.	A5	B2 B4	C1 C4 C6	D3
Obter unha visión integral de todos os procesos fisiolóxicos das plantas, o seu comportamento e as súas respostas adaptativas ao medio.	A5	B2 B4	C1 C4 C6	D3
Aplicar coñecemento da Fisioloxía Vexetal para illar, identificar, manexar e analizar espécimes e mostras de orixe vexetal, así como para caracterizar os seus constituíntes celulares e actividades metabólicas.	A5	B2 B4	C1 C4 C6	D3

Obter información, desenvolver experimentos e interpretar os resultados relativos á Fisioloxía Vexetal.	A3	B2 B3 B4	C1 C9	D4
Coñecer e manexar os conceptos, terminoloxía e instrumentación científico-técnica relativos á Fisioloxía Vexetal.	A5	B2 B3	C1	D5

Contidos	
Topic	
Nutrición Mineral	Elementos esenciais. Fixación biolóxica do nitróxeno. Asimilación do nitróxeno e do xofre.
Fitohormonas e outros reguladores do crecemento vexetal.	Auxinas. Citoquininas. Xiberelinas. Etileno. Acido abscísico. Poliaminas. Xasmonatos e Salicilatos. Brasinosteroides e Estrigolactonas.
Crecemento e desenvolvemento.	Principios básicos do desenvolvemento das plantas. Fotomorfoxénese. Control da floración. Bioloxía reprodutiva e formación do froito. Dormición e xerminación de sementes. Senescencia e morte celular programada. Regulación in vitro do crecemento e desenvolvemento vexetal.
Fisioloxía do estrés vexetal.	Fisioloxía vexetal ambiental. O estrés nas plantas. Respostas xerais das plantas ó estrés. Estrés provocado por factores abióticos. Interaccións das plantas con outros organismos: estrés por factores bióticos.
Prácticas de laboratorio	1. Efecto das citoquininas sobre a senescencia foliar. 2. Efecto do ácido abscísico sobre a xerminación de sementes. 3. Efecto das xiberelinas sobre a mobilización de reservas das sementes. 4. Determinación da viabilidade das sementes.

Planificación			
	Class hours	Hours outside the classroom	Total hours
Lección maxistral	30	57	87
Prácticas de laboratorio	15	15	30
Seminario	3	28	31
Exame de preguntas obxectivas	1	0	1
Exame de preguntas obxectivas	1	0	1
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Metodoloxía docente	
	Description
Lección maxistral	As leccións maxistrais son leccións de 50 *min, para explicar e desenvolver os contidos, interaccións teóricas e exemplos de casos prácticos de *Fisiología Vexetal *II. Nestas sesións coexistirán materiais didácticos (presentacións de diapositivas) en castelán e inglés. Así mesmo, o material bibliográfico básico e complementario (libros, artigos científicos) de apoio (ver apartado de fontes de información desta guía) está redactado maioritariamente en inglés. As sesións maxistrais deben ser completadas con traballo autónomo do alumnado utilizando ditas fontes de información.
Prácticas de laboratorio	Complementan as sesións maxistrais, familiarizando ao alumnado coas técnicas de laboratorio e a recollida e tratamento de datos cuantitativos en *Fisiología Vexetal. Realizarán experimentos concretos (*v. contidos) cuxos resultados se avaliarán nun exame ao final das prácticas.
Seminario	En grupos estables dun máximo dun mínimo de 3 e un máximo de 4 estudantes, realizarase un traballo bibliográfico a elixir entre unha serie de temas relacionados cos contidos de *Fisiología Vexetal *II propostos polo profesor. Baixo a supervisión do profesor para verificar o seu *pertinencia, os estudantes poderán elixir tamén un tema de traballo do seu interese. O traballo consistirá na realización de dous resumos, un escrito e outro gráfico, que reflectirá os aspectos de *concordancia ou *discordancia entre dous artigos científicos proporcionados polo profesor. Os resumos serán realizados utilizando ferramentas informáticas, poderán ser revisados co apoio do profesor ao longo das sesións presenciais de seminarios, e será presentado en forma dun único arquivo en formato *pdf.

Atención personalizada	
Methodologies	**Description**
Lección maxistral	O alumno debe aprender a traballar de forma autónoma estudando os temas propostos, e realizar as actividades non presenciais que se indican nas sesións maxistrais e nas prácticas de laboratorio. Tamén deben aprender a traballar en equipo para o que, baixo a supervisión dos profesores, realizarán un traballo en grupo. Poderán resolver dúbidas sobre contidos e funcionamento das clases, traballos e avaliación durante as titorías no horario proposto.
Prácticas de laboratorio	Ver apartado anterior.
Seminario	Ver apartado anterior.

Avaliación

	Description	Qualification	Training and Learning Results
Prácticas de laboratorio	Asistencia e realización das prácticas de laboratorio obrigatorias. A avaliación das prácticas levará a cabo mediante un exame ao final das mesmas. A ausencia inxustificada ás prácticas e a falta de entrega do exame levará o suspenso na materia.	25	A3 B4 C1 C4 C9 C10 D4
Seminario	Seminarios. Asistencia e seguimento obrigatorios. Os contidos do traballo serán avaliados polo profesorado responsable de cada grupo. A ausencia inxustificada aos seminarios e a falta do traballo levarán o suspenso na materia.	15	A3 A5 B2 D3 D4 D5
Exame de preguntas obxectivas	Primeiro parcial, exame obrigatorio de 1 hora de duración. Avaliaranse os conceptos teóricos e as relacións entre os mesmos explicados nas sesións maxistrais impartidas até a data de realización da proba. Esta proba poderá incluír supostos prácticos baseados nos contidos teóricos explicados. A falta de entrega do exame levará o suspenso na materia. O calendario de exames pódese consultar no seguinte enlace: http://bioloxia.uvigo.es/gl/docencia/exames. As aulas onde se realizarán os exames serán fixadas polo decanato da facultade no seu momento.	30	B2 B3 C1 C6 C9 C10 D5
Exame de preguntas obxectivas	Segundo parcial, exame obrigatorio de 1 hora de duración. Avaliaranse os conceptos teóricos e as relacións entre os mesmos explicados nas sesións maxistrais impartidas desde a data de realización do primeiro parcial. Esta proba poderá incluír supostos prácticos baseados nos contidos teóricos explicados. A falta de entrega do exame levará o suspenso na materia. O calendario de exames pódese consultar no seguinte enlace: http://bioloxia.uvigo.es/gl/docencia/exames. As aulas onde se realizarán os exames serán fixadas polo decanato da facultade no seu momento.	30	B2 B3 C1 C6 C9 C10 D5

Other comments on the Evaluation

Os horarios das actividades docentes da materia están accesibles na web da Facultade no seguinte enlace:

http://bioloxia.uvigo.es/gl/docencia/horarios

Para superar a materia (cualificación global de 5 puntos sobre 10) mediante o itinerario de avaliación continua, as cualificacións mínimas nos exames de preguntas obxectivas, nos seminarios e nas prácticas de laboratorio terán que ser de 4 sobre 10 en todas e cada unha delas. Dada a obrigatoriedade de asistencia a prácticas e seminarios, indícase ao alumnado que a ausencia ás sesións destas actividades soamente pode ser xustificada por causa de forza maior, debidamente xustificada cun documento válido orixinal. A xustificación de calquera ausencia debe obrar en poder do profesorado como máximo 15 días despois do día de ausencia.

Existe un segundo itinerario coa posibilidade de superar a materia de forma global nunha proba final única escrita. A solicitude para acollerse a este segundo itinerario estará xestionada ao comezo do cuadrimestre polo Decanato da Facultade de Bioloxía.

No exame da segunda oportunidade o alumnado poderá mellorar as cualificacións dos distintos aspectos avaliados no caso de non alcanzar a nota mínima de 4. Si estivesen aprobadas, as cualificacións de prácticas e seminarios manteranse na segunda oportunidade no caso de ter que repetir unicamente as probas de preguntas obxectivas.

Advírtese que ao exame de segunda oportunidade soamente poderán presentarse aquel alumnado cuxa cualificación nas actas oficiais sexa de suspenso ou non presentado, dado que os aprobados xa non aparecerán nas actas da segunda oportunidade.

O alumnado repetidor poderá conservar as cualificacións das prácticas de laboratorio e das *tutorías en grupo (seminarios) durante dous anos, sempre que as aprobou. O alumnado repetidor que realice as prácticas e seminarios hai máis tempo deberá realizalas novamente para superar a materia.

Bibliografía. Fontes de información

Basic Bibliography

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Complementary Bibliography

Taiz, L.; Zeiger, E.; Moller, I.M.; Murphy, A., **Plant Physiology and Development**, 6, Sinauer Assoc. Inc, 2015

Azcón-Bieto, J.; Talón, M., **Fundamentos de Fisiología Vegetal**, McGraw-Hill Interamericana, 2010

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Smith, A.M.; Coupland, G.; Dolam, L.; Harberd, N.; Jones, J.; Martin, C.; Sablowski, R.; Amey, A., **Plant Biology**, Garland Science, 2009

Trigiano, R.N.; Gray, D.J., **Plant Tissue Culture Concepts and Laboratory Exercises**, CRC Press, 2000

Rao, K.V.M.; Raghavendra, A.S.; Reddy K.J., **Physiology and molecular biology of stress tolerance in plants**, Springer, 2006

Taiz, L.; Zeiger, E.; Moller, I.M.; Murphy, A., **Fundamentals of Plant Physiology**, Sinauer Assoc. Inc, 2018

Recomendacións

Subjects that continue the syllabus

Biotecnoloxía aplicada á produción vexetal/V02G031V01411

Subjects that are recommended to be taken simultaneously

Xenética II/V02G031V01304
Técnicas en bioloxía celular e molecular/V02G031V01310

Subjects that it is recommended to have taken before

Bioloxía: Técnicas básicas de laboratorio/V02G031V01108
Bioquímica I/V02G031V01201
Bioquímica II/V02G031V01206
Botánica II: Arquegoniadas/V02G031V01207

IDENTIFYING DATA				
Microbioloxía II				
Subject	Microbioloxía II			
Code	V02G031V01309			
Study programme	Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	3	2c
Teaching language	Castelán			
Department	Bioloxía funcional e ciencias da saúde			
Coordinator	González Abril, Ana			
Lecturers	Costas Ríos, Lara González Abril, Ana			
E-mail	ana.gonzalez.abril@uvigo.gal			
Web	http://bioloxia.uvigo.es/gl/docencia/horarios/			
General description	Estudio de bacterias, arqueas, virus e partículas subvirais: taxonomía e filoxenia, diversidade, características xerais, ecolóxicas e intereracións con outros organismos e co medio ambiente.			

Resultados de Formación e Aprendizaxe	
Code	
A2	Que os estudantes saiban aplicar os seus coñecementos ao seu traballo ou vocación dunha forma profesional e posúan as competencias que adoitan demostrarse por medio da elaboración e defensa de argumentos e a resolución de problemas dentro da súa área de estudo.
A3	Que os estudantes teñan a capacidade de reunir e interpretar datos relevantes (normalmente dentro da súa área de estudo) para emitir xuízos que inclúan unha reflexión sobre temas relevantes de índole social, científica ou ética.
A4	Que os estudantes poidan transmitir información, ideas, problemas e solucións a un público tanto especializado como non especializado.
B1	Desenvolver a aprendizaxe autónoma, identificando as súas propias necesidades formativas e organizando e planificando as tarefas e o tempo.
B6	Desenvolver as capacidades de análises e síntese, de razoamento crítico e argumentación, aplicándoas en contextos propios da Bioloxía e outras disciplinas científico-técnicas.
C2	Recoñecer os niveis de organización dos seres vivos mediante o estudo de especímenes actuais e fósiles. Realizar análise filoxenéticos e interpretar os mecanismos da herdanza, a evolución e a biodiversidade.
C4	Illar, identificar e cultivar microorganismos, células, tecidos e órganos, facilitando o seu estudo e a valoración da súa actividade metabólica.
C10	Identificar procesos biolóxicos e biotecnolóxicos e a súa posible aplicabilidade, en particular nos ámbitos sanitario, agroalimentario e ambiental.
C11	Realizar e interpretar bioensaios, identificar axentes químicos e biolóxicos, incluíndo os patógenos, así como os seus produtos tóxicos. Desenvolver e aplicar técnicas de control biolóxico
D4	Colaborar e traballar en equipo ou en grupos multidisciplinares, fomentar a capacidade de negociación e de alcanzar acordos.

Resultados previstos na materia			
Expected results from this subject	Training and Learning Results		
Comprender os principios, fundamentos e metodoloxía da taxonomía polifásica.	A2 A3 A4	B6	C2 C4 C10 C11
Coñecer a clasificación e sistemática de microorganismos.	A2 A3 A4	B6	C2 C4 C10 C11
Coñecer a biodiversidade de microorganismos, a súa distribución na biosfera e o seu papel nos procesos biolóxicos e/ou xeolóxicos.	A2 A3 A4	B6	C2 C4 C10 C11
Coñecer a estrutura, clasificación e distribución de virus, viroides e priones e as técnicas para a súa análise, cultivo, titulación e identificación.	A2 A3 A4	B6	C11
Coñecer os campos de aplicación da Microbioloxía e a súa interrelación con outras disciplinas	A2 A3 A4	B6	C10

Aplicar o coñecemento da Microbioloxía para illar, identificar, manexar e analizar espécimes e mostras de orixe biolóxica, incluíndo virus, así como para caracterizar os seus constituíntes celulares e moleculares.	A2 A3 A4	B1 B6	C4 C10 C11	D4
Coñecer e manexar os conceptos, terminoloxía e instrumentación científico-técnica relativos á Microbioloxía.	A2 A3 A4	B6	C2	

Contidos	
Topic	
Tema 1. Evolución e Filoxenia	Contexto molecular da diversidade microbiana. Cronómetros evolutivos. Filoxenia derivada do análise de secuencias de RNA ribosómicos: arbores filoxenéticas.
Tema 2. Taxonomía	Conceptos de Taxonomía e Sistemática. Sistemas de Clasificación. Categorías Taxonómicas. Nomenclatura. Técnicas empleadas en estudios taxonómicos e filoxenéticos.
Tema 3. Diversidade no Dominio Bacteria: Phylum Pseudomonadota y Campylobacterota	Características principais e xéneros representativos de Pseudomonadota y Campylobacterota fototrofas, quimiolitotrofas e organotrofas
Tema 4. Diversidade no Dominio Bacteria: Otros phyla Gram negativas	Características principais e xéneros representativos de otros phyla de bacterias Gram negativas.
Tema 5. Diversidade no Dominio Bacteria: Phyla Mycoplasmatota, Bacillota y Actinomycetota.	Características principais e xéneros representativos dos Phyla Mycoplasmatota, Bacillota y Actinomycetota.
Tema 6: Diversidade no Dominio Archaea	Características principais e xéneros representativos dos distintos phyla de Archaea.
Tema 7. Diversidade de virus	Taxonomía. Características xerais de replicación viral e efectos sobre as células hospedadoras. Principais tipos de virus: características, replicación e efectos sobre os seus hospedadores.
Tema 8. Diversidade de Partículas subvirais	Características principais de Viroides e Priones
Tema 9. Aspectos básicos da interacción dos microorganismos entre sí e con outros seres vivos.	Interaccións entre poboacións microbianas. Interaccións dos microorganismos con outros seres vivos.
Tema 10. Interacción dos microorganismos cos seres humanos	Microbiota normal.
Tema 11. Aspectos básicos da interacción dos microorganismos co medio ambiente	Intervención dos microorganismos nos ciclos bioxeoquímicos
Tema 12. Introducción ás aplicacións da microbioloxía	Análisis e diagnóstico clínico, agroalimentario e ambiental. Introducción á microbioloxía industrial e á biotecnoloxía microbiana.

Planificación			
	Class hours	Hours outside the classroom	Total hours
Lección maxistral	30	12	42
Prácticas de laboratorio	15	18	33
Seminario	3	0	3
Exame de preguntas obxectivas	1	35	36
Exame de preguntas obxectivas	1	35	36
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Metodoloxía docente	
	Description
Lección maxistral	Sesións de 50 minutos, nas que se expoñerán os fundamentos teóricos da materia. Al final de cada clase dispondrán en Moovi das presentacións utilizadas na aula. Non está permitida a difusión nin a súa reproducción. O alumnado non poderá ter en clase o teléfono móvil nin outro dispositivo electrónico, salvo que sexa necesario para realizar algunha actividade, o cal será previamente comunicado polo profesorado. Non está permitido grabar as clases.
Prácticas de laboratorio	As prácticas realizaranse no laboratorio de Microbioloxía e permitirán aplicar e desenvolver os coñecementos adquiridos nas ensinanzas teóricas. O alumno realizará as prácticas seguindo os protocolos e usando o material suministrado polo profesor, que explicará e supervisará o seu traballo. Os alumnos deberán presentar un informe dos resultados obtidos.
Seminario	Os alumnos profundarán no temario da materia desempeñando as actividades propostas polo profesor, a través dun seminario de aprendizaxe colaborativo de 2 h de duración. Noutro seminario, de 1 h de duración, trataranse aspectos complementarios aos tratados nalgunhas leccións maxistrais.

Atención personalizada

Methodologies	Description
Lección maxistral	Durante todo o proceso de aprendizaxe e especialmente en horas de titoría, atenderánse todas as dúbidas expostas en relación cos contidos teóricos da materia.
Seminario	Durante o desenvolvemento desta actividade atenderánse todas as dúbidas expostas polos alumnos.
Prácticas de laboratorio	Durante todo o proceso de aprendizaxe e tamén en horario de titoría, atenderánse todas as dúbidas expostas en relación cos contidos prácticos da materia.

Avaliación

	Description	Qualification	Training and Learning Results
Prácticas de laboratorio	Realizarase un exame escrito ao final das prácticas, sobre o fundamento e protocolos das prácticas realizadas, este exame poderá ser de varias modalidades: tipo test, preguntas curtas, exame de relacionar ou ben un exame que inclúa varias destas modalidades Para a cualificación global de prácticas teranse en conta as cualificacións obtidas no exame (80% da cualificación global de prácticas), informe de prácticas (15% da cualificación global de prácticas), así como a valoración das habilidades e destrezas adquiridas no laboratorio (5% da valoración global de prácticas). No exame e informe de prácticas avaliaranse o dominio do vocabulario, capacidade de expresión e síntese. A asistencia a todas as sesións de prácticas é obrigatoria para superar a materia, admitíndose un máximo de dúas ausencias debidamente xustificadas, condición que se manterá tanto na modalidade de avaliación global como no exame de segunda oportunidade (xullo).	25	A2 B1 C4 D4 A3 B6 C10 A4 C11
Seminario	No seminario de aprendizaxe colaborativa realizarase un exame teórico que poderá ser tipo test ou preguntas curtas sobre os contidos tratados. Avaliaranse o dominio do vocabulario, capacidade de expresión e síntese. Este exame supoñerá o 80% da cualificación global de seminarios. No seminario de taxonomía bacteriana valorarase a asistencia ao seminario que supoñerá un 20% da cualificación global de seminarios. Só en casos xustificados de ausencia aos seminarios, poderá realizarse alternativamente un traballo relacionado co seu contido Os alumnos que opten pola modalidade de avaliación global deberán realizar esta actividade nas mesmas condicións que na avaliación continua. No exame de segunda oportunidade (xullo) non se realizará recuperación de seminarios, e manterase a cualificación obtida na avaliación continua ou global.	5	A2 B1 D4 A3 B6 A4
Exame de preguntas obxectivas	Na primeira proba parcial, avaliaranse os contidos de aproximadamente a metade do impartido nas leccións maxistrais que se corresponde coa primeira parte do programa. O exame poderá ser de varias modalidades: tipo test, preguntas curtas, exame de relacionar ou ben un exame que inclúa varias destas modalidades. Avaliarase tamén o dominio do vocabulario, capacidade de expresión e síntese.	35	A2 B6 C2 A3 C4 A4 C10 C11
Exame de preguntas obxectivas	Na segunda proba parcial, avaliaranse os contidos de aproximadamente a metade do impartido nas leccións maxistrais que se corresponde coa segunda parte do programa. O exame poderá ser de varias modalidades: tipo test, preguntas curtas, exame de relacionar ou ben un exame que inclúa varias destas modalidades. Avaliarase tamén o dominio do vocabulario, capacidade de expresión e síntese.	35	A2 B6 C2 A3 C4 A4 C10 C11

Other comments on the Evaluation

1) Os coñecementos, habilidades e destrezas adquiridos nesta materia serán valorados sobre un total de 10 puntos.

2) Avaliación de alumnos que opten por avaliación continua:

- Na avaliación sobre o contido das leccións maxistrais, deberá obterse en cada exame unha cualificación mínima de 4 para poder facer a media, en caso contrario a materia considerarase suspensa.

- Para superar a materia debe obterse un mínimo de 5 puntos na cualificación final. A cualificación final será o sumatorio das distintas actividades que deberán estar superadas (contido das leccións maxistrais e prácticas de laboratorio) para poder facer a media. Deberá obterse un mínimo de 4,5 sobre 10 nas cualificacións globais correspondentes tanto ás leccións maxistrais como ás de prácticas de laboratorio, en caso contrario a cualificación será a media obtida de todas as actividades ata un máximo de 4,9.

- A data do exame correspondente ao segundo parcial terá lugar na data establecida para a proba final escrita.

- Os alumnos que suspendan algún dos parciais poderán recuperalos na data establecida para o exame de segunda oportunidade.

3) Avaliación de alumnos que opten por avaliación global:

- Os alumnos que opten por unha avaliación global deberán comunicalo ao profesor antes antes da data límite que fixe o Decanato.

- Para aprobar a materia deberán realizar as prácticas de laboratorio nas mesmas condicións que os que optan por unha avaliación continua.

- Deberán presentarse aos seminarios e a súa avaliación será nos mesmos termos que en caso de avaliación continua.

- Deberán realizar un exame final coincidente coa data do 2º parcial no que se examinarán dos contidos de ambos os parciais.

4) Para que un estudante figure na acta como Non Presentado será preciso que non realizase as prácticas de laboratorio ou que non se presentou aos exames correspondentes ás leccións maxistrais e/o prácticas de laboratorio.

5) No exame de segunda oportunidade (xullo), os alumnos poderán recuperar a actividades suspensas correspondentes ás leccións maxistrais e exame de prácticas, manténdose as mesmas condicións para superar estas probas que na avaliación continua. Non serán novamente avaliadas na convocatoria de segunda oportunidade os seminarios, os informes de prácticas de laboratorio nin as habilidades e destrezas adquiridas en laboratorio, manténdose nestes casos a cualificación obtida na avaliación continua. Estas condicións serán esixibles tamén a aqueles alumnos que optasen pola avaliación global.

6) Se recomenda a asistencia as leccións maxistrales. Por outra banda, a asistencia se valorará positivamente o profesorado poderá plantear durante as clases actividades adicionais voluntarias, sin que sexa necesario comunicalo con antelación, que permitirán o alumnado subir a nota final (ata 0,5 puntos).

7) Se guardarán as calificacións da parte práctica superadas, así como os seminarios durante os siguintes 2 cursos. O alumnado repetidor que realizara as prácticas e seminarios fai máis tempo deberá realizalas novamente para superar a materia.

8) A nota obtida no/nos exámenes de teoría e prácticas, e que sexan superadas para hacer a media con as demáis calificacións, no poderá subirse nota en exámenes extraordinarios nin en segunda convocatoria.

9) Se require do alumnado que curse esta materia unha conducta responsábel e honesta. Se considera inadmisible calquera forma de fraude (copia ou plaxio) encaminado a falsear o nivel de coñecementos e destrezas alcanzado en todo tipo de proba, informe ou traballo. As conductas fraudulentas poderán supoñer suspender a asignatura durante un curso completo.

As datas da proba final escrita pódense consultar na seguinte ligazón: http://bioloxia.uvigo.es/gl/docencia/exames

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Basic Bibliography

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P. M. Howley, D. M. Knipe, B.A. Damania, J.I Cohen, **Fields Virology Vol 2: DNA Viruses**, 7ª edición, Wolters Kluwer Health, 2021

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Leboffe, M.J., B.E. Pierce, **Microbiology Laboratory Theory & Applications**, 5ª edición, Morton Publishing Company, 2021

Murray, P.R., Rosenthal, K.S., Pfaller, M.A., **Medical Microbiology**, 9ª edición, Elsevier, 2020

Pommerville, J.C., **Fundamentals of Microbiology**, 12ª edición, Jones &Bartlett Learning, 2021

Recomendacións
Subjects that continue the syllabus
Análise e diagnóstico agroalimentario/V02G030V01901
Análise e diagnóstico medioambiental/V02G030V01902
Contaminación/V02G030V01906
Biotecnoloxía aplicada á produción microbiana/V02G031V01412
Microbioloxía e parasitoloxía sanitarias/V02G031V01406

IDENTIFYING DATA				
Technics in cellular and molecular biology				
Subject	Technics in cellular and molecular biology			
Code	V02G031V01310			
Study programme	Grado en Biología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	3rd	2nd
Teaching language	Spanish			
Department				
Coordinator	de Carlos Villamarín, Alejandro Leonides			
Lecturers	Barandela González, Marta de Carlos Villamarín, Alejandro Leonides Faro Rivas, Jose Manuel Galindo Dasilva, Juan Martínez Mariño, Víctor Morán Martínez, María Paloma Núñez González, Carmen Pérez Fernández, Juan Toucedo Rodríguez, Rocío Zoni , Valeria			
E-mail	adcarlos@uvigo.es			
Web				
General description	This is an eminently practical subject whose mission is the acquisition of experience in the use of advanced molecular, cellular and histological techniques. It is intended to show the possibilities of such techniques and to complete and extend the knowledge acquired by students in the basic laboratory techniques of the first year of the degree and in the laboratory practices of the second year of the degree. For this purpose, different experimental protocols will be performed in the laboratory, which are considered as advanced because of their technical and conceptual level. The different techniques will be grouped in modules according to their relation with different areas of Biology. The teaching method is mainly based on laboratory work, but also incorporates complementary readings and tools to achieve an integration of the knowledge of the different areas and to be able to apply them to the resolution of an experimental problem from different technical points of view. The schedules of the course and exam dates can be consulted in the official links of the faculty's web page: https://bioloxia.uvigo.es/gl/docencia/horarios/			

Training and Learning Results	
Code	
A1	Students should prove understanding and knowledge in this study field that starts in the Secundary Education and with a level that, even though it is suppported in advanced books, also includes some aspects that involve knowledge from the vanguard of the study field.
A2	Students should know how to apply their knowledge to their work or vocation in a professional way. They also should have the competences that are usually proved through the elaboration and defence of arguments and the resolution of problems within their study field.
A3	Students should prove ability for information-gathering and interpret important data (usually within their study field) to judge relevant social, scientific or ethical topics.
B2	Manage scientific-technical information using diverse and reliable sources. Analyze data and documents and interpret them critically and rigorously, including considerations on their social relevance and in the professional field of Biology.
B4	Draft and write reports, documents and projects related to Biology. Proceed to their presentation and debate in the teaching and specialized areas, highlighting the competences of the degree.
C2	Identify levels of organisation of living beings through the study of current specimens and fossils. Carry out phylogenetic analyses and study the mechanisms of heredity, evolution and biodiversity.
C4	Isolate, identify and growth microorganisms, cells, tissues and organs, making easier their study and the assessment of their metabolic activity.
C5	Manipulate and analyse genetic material and determine its alterations and pathological implications. Knowing the applications of genetic engineering.
C6	Understanding and integrate the functioning of living beings (cellular, tissue, organ and individual level), explaining their homeostatic and adaptive responses.
C10	Identify biological and biotechnological processes and their potential applications, in particular in health, agri-food and environmental fields.
C11	Perform and interpret bioassays, identify chemical and biological agents, including pathogens, as well as their toxic products. Develop and apply biological control techniques.
D4	Collaborate and work in teams or multidisciplinary groups, promote negotiation skills and the ability to reach agreements.

Expected results from this subject	Training and Learning Results			
Recognise the versatility, potentiality and limitations of the technicians applied to the Biology.	A1 A2 A3	B2 B4	C2 C4 C5 C6 C10 C11	D4
Know and handle the concepts, terminology and scientific instrumentation-technical relative to technicians of laboratory.	A1 A2 A3	B2 B4	C2 C4 C5 C6 C10 C11	D4
Know apply technicians to isolate, identify, handle and analyse specimens and samples of biological origin, as well as to characterise his cellular and molecular constituents.	A1 A2 A3	B2 B4	C2 C4 C5 C6 C10 C11	D4
Comprise the experimental base that bears the current knowledge on the molecular bases of the biological information and his expression.	A1 A2 A3	B2 B4	C2 C4 C5 C6 C10 C11	D4

Contents	
Topic	
Advanced microscopy techniques (Module I, Cell Biology) - 11 hours	Immunohistochemistry and immunofluorescence Fluorescence microscopy Electron microscopy
Purificaction and characterisation of proteins (Module II, Biochemistry) - 18 hours	Protein Mass Spectrometry Protein chromatography Protein electrophoresis Protein enzyme activity assays
Cellular and molecular analysis (Module III, Immunology) - 11 hours	Lymphoid organs, removal of lymphoid cells Cell separation Cell counting and viability Cell preservation ELISA
Recombinant DNA and sequencing (Module IV, Genetics) - 18 hours	Nucleic acid extraction PCR and quantification Cloning and transformation Gene expression Sequencing and analysis

Planning	Class hours	Hours outside the classroom	Total hours
Introductory activities	0.5	0	0.5
Laboratory practical	11	14	25
Laboratory practical	18	22	40
Laboratory practical	11	14	25
Laboratory practical	18	22	40
Objective questions exam	2	17.5	19.5

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies	Description
Introductory activities	It describes the method of work that goes to be followed
Laboratory practical	The student is introduced in the most realistic way to the experimental nature of Biology in relation to the techniques of Cell Biology (module I).
Laboratory practical	The student is introduced in the most realistic way to the experimental nature of Biology in relation to the techniques of Biochemistry (module II).

Laboratory practical	The student is introduced in the most realistic way to the experimental nature of Biology in relation to the techniques of Immunology (module III).
Laboratory practical	The student is introduced in the most realistic way to the experimental nature of Biology in relation to the techniques of Genetics (module IV).

Personalized assistance

Methodologies	Description
Laboratory practical	Personalized attention to resolve any doubts that have arisen during the teaching of Module I (Cell Biology). The doubts can be consulted during the weekly tutoring hours.
Laboratory practical	Personalized attention to resolve any doubts that have arisen during the teaching of Module II (Biochemistry). The doubts can be consulted during the weekly tutoring hours.
Laboratory practical	Personalized attention to resolve any doubts that have arisen during the teaching of Module III (Immunology). The doubts can be consulted during the weekly tutoring hours.
Laboratory practical	Personalized attention to resolve any doubts that have arisen during the teaching of Module IV (Genetics). The doubts can be consulted during the weekly tutoring hours.

Assessment

	Description	Qualification	Training and Learning Results
Laboratory practical	CONTINUOUS EVALUATION. Module I, Cellular Biology. The contents and competences acquired in the practices of the module will be evaluated by means of sufficiency tests developed on the dates indicated in the schedule of the four-month period. The integration and involvement of the student in the officially assigned group will also count in the grade of the module.	12	A1 B2 C2 D4 A2 B4 C4 A3 C5 C6 C10 C11
Laboratory practical	CONTINUOUS EVALUATION. Module II, Biochemistry. The contents and competences acquired in the practices of the module will be evaluated by means of sufficiency tests developed on the dates indicated in the schedule of the four-month period. The integration and involvement of the student in the officially assigned group will also count in the grade of the module.	18	A1 B2 C2 D4 A2 B4 C4 A3 C5 C6 C10 C11
Laboratory practical	CONTINUOUS EVALUATION. Module III, Immunology. The contents and competences acquired in the practices of the module will be evaluated by means of sufficiency tests developed on the dates indicated in the schedule of the four-month period. The integration and involvement of the student in the officially assigned group will also count in the grade of the module.	12	A1 B2 C2 D4 A2 B4 C4 A3 C5 C6 C10 C11
Laboratory practical	CONTINUOUS EVALUATION. Module IV, Genetics. The contents and competences acquired in the practices of the module will be evaluated by means of sufficiency tests developed on the dates indicated in the schedule of the four-month period. The integration and involvement of the student in the officially assigned group will also count in the grade of the module.	18	A1 B2 C2 D4 A2 B4 C4 A3 C5 C6 C10 C11
Objective questions exam	The knowledge acquired in the practices and complementary activities developed in the four modules of the subject are evaluated.	40	A1 A2 A3

Other comments on the Evaluation

TBCM is a course with compulsory practical sessions divided into four modules: I. Cell Biology; II. Biochemistry; III. Immunology; IV. Genetics. Unauthorised absence from one or more laboratory sessions will result in failure of the course. Justified absence (according to Article 15.2 of the Regulations on the assessment, grading and quality of teaching and the student learning process of the University of Vigo) from two or more laboratory practicals will prevent continuous assessment. In this case, students will have to undergo the overall assessment process.

CONTINUOUS ASSESSMENT (recommended)

60% of the grade is obtained from tests and reports submitted throughout the course, and the modules are weighted as follows: Cell Biology 12%, Biochemistry 18%, Immunology 12%, Genetics 18%. A minimum of 3.5 points out of 10 must be obtained in each module. Circumstances such as lack of punctuality, failure to integrate into the assigned group, or a demotivated or negligent attitude in the laboratories may reduce the final scores. In the event of a justified absence from a session, the corresponding assessment activity cannot be made up and the grade obtained will be 0 points.

The remaining 40% of the mark is obtained from the first or second opportunity exam, to be held on the dates scheduled by the Centre. In this case, a minimum of 3.5 points out of 10 must also be obtained in each of the four modules.

If 3.5 points are not achieved in any of the modules, the final numerical grade that will appear on the transcript will be a maximum of 4 points. Continuous assessment grades are only valid for the academic year in which they are obtained, including the extraordinary exam session. If the subject is not passed in the academic year, it will be necessary to repeat all the activities and assessments of the four modules in the following academic year.

OVERALL ASSESSMENT

The exam will account for 100% of the final grade and will consist of a theoretical part (50% of the final grade) including questions on the content of each of the four modules of the subject, weighted in the same way as in the continuous assessment, with a minimum of 3.5 points out of 10 required in each module to pass.

The practical part will account for the remaining 50% and will consist of the oral resolution of a practical case study from each module. Students will have one hour to prepare for the exam and then one hour to answer questions posed by a panel of teachers from the subject. A minimum of 3.5 points out of 10 in each module is also required to pass the subject.

USE OF ELECTRONIC DEVICES

The use or possession of mobile phones, smart watches or any other electronic device is not permitted during any assessment test. The mere possession of these devices will result in, in the case of exams, immediate expulsion and a fail mark in the corresponding exam session.

https://bioloxia.uvigo.es/es/docencia/examenes/

Sources of information

Basic Bibliography

Martín-Lacave I y García-Caballero T, **Atlas de inmunohistoquímica. Caracterización de células, tejidos y órganos normales.**, 1a, Editorial Díaz de Santos, 2012

Faro J (coordinador e editor), **Manual de técnicas experimentais en bioloxía molecular e celular**, 1a, Servizo de Publicacións da Universidade de Vigo, 2014

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Punt J, Stranford S, Jones P y Owen JA, **Kuby Immunology**, 8a, WH Freeman and Co, 2019

Real MD, Rausell C, Latorre A, **Técnicas de ingeniería genética**, 1a, Editorial Síntesis, 2017

Complementary Bibliography

Valverde D, Megías M y Morán P, **https://www.youtube.com/channel/UCCk6B5Y_qUD8T2a5OB7Ic-g/videos?shelf_id=0&view=0&sort=dd**,

Recommendations

Other comments

It is recommended to work on the subject continuously, review basic mathematics, including solving first degree equations, logarithms, exponentials, linear interpolation, and basic statistics, including least squares linear regression, and analysis of variance.

IDENTIFYING DATA

Quality management and control

Subject	Quality management and control			
Code	V02G031V01401			
Study programme	Grado en Biología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	1st
Teaching language	Spanish			
Department				
Coordinator	Gallardo Medina, Mercedes			
Lecturers	Cal Arca, Ángela María Gallardo Medina, Mercedes			
E-mail	medina@uvigo.gal			
Web				
General description	English Friendly subject: International students may request from the teachers: a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English. The aim of this course is for the student to know and understand the principles of quality management and of the environment, as well as the rules of organization and effective management of a laboratory. In this respect, may acquire competence in the application of the ISO 9000 quality management standard, ISO 14000 of environmental management and ISO 17025 for the management and technical competence of testing and calibration laboratories. The schedule of the subject is approved in the Faculty Board and can be consulted in the following link: http://bioloxia.uvigo.es/en/teaching/schedules			

Training and Learning Results

Code	
A2	Students should know how to apply their knowledge to their work or vocation in a professional way. They also should have the competences that are usually proved through the elaboration and defence of arguments and the resolution of problems within their study field.
A4	Students should able to communicate information, ideas, issues and solutions to all audiences (specialist and unskilled audience).
B4	Draft and write reports, documents and projects related to Biology. Proceed to their presentation and debate in the teaching and specialized areas, highlighting the competences of the degree.
B5	Develop capacities for creativity, innovation and entrepreneurship, in academic and social relevant fields as well as in interaction with the productive sector.
B7	To aim for quality objectives in the development of the activity done and incorporate ethical principles, which should prevail in the professional practice of Biology.
C9	Identify resources of biological origin and assess their efficient and sustainable use in order to obtain products of interest. Propose and implement improvements in production systems.
C12	Writing reports and technical dossiers, as well as directing and executing projects on topics related to biology and its applications.
C13	Provide training, participate in R+D+i projects, communicate results and disseminate knowledge. Contribute to the social projection of biology and to raising awareness of the environment.
C14	Advise, assess and supervise scientific-technical, ethical, legal and socio-economic aspects related to biology and its applications.
D3	Commitment to sustainability and the environment. Equal, sensible and efficient use of resources.
D4	Collaborate and work in teams or multidisciplinary groups, promote negotiation skills and the ability to reach agreements.
D5	Communicate effectively and appropriately, including the use of computer tools and English.

Expected results from this subject

Expected results from this subject	Training and Learning Results			
To know the standards of management and control of quality systems related to biology.	A2	B7	C9 C13	D3
To understand the concept of quality systems and their application. To manage and apply the most important quality systems.	A4	B4 B5	C9 C12	D3 D5
To know and become familiar with the methods of validation, calibration, uncertainty calculation, verification tests, quality standards and other quality parameters and systems.	A2 A4	B4 B7	C14	D3 D5

To assess, verify and accredit quality.	A2 A4	B4 B5	C12 C13 C14	D4 D5
To be aware of the importance and impact of the implementation of quality systems at professional and societal level.	A2 A4	B5 B7	C9 C13	D3 D4
Apply knowledge of quality management to advise, supervise and assess scientific-technical, ethical, legal and socio-economic aspects related to Biology.	A2 A4	B5 B7	C14	D4 D5

Contents	
Topic	
Block 1.- The Quality Management System	Subject 1. The Quality management: concept and historical evolution
	Subject 2. Design and implementation of a Quality Management System
Block 2.- Models and standards for the Quality management	Subject 3. Quality Management. UNE-EN-ISO 9000
	Subject 4. Environmental management: UNE-EN-ISO 14000. EMAS
	Subject 5. Quality management in the laboratory: standards and techniques. Regulation UNE-EN ISO/IEC 17025
Block 4.- Tools for the Quality management	Subject 6. Tools for the Quality management
	Subject 7. The continuous improvement and the participatory management of the quality
Seminars and ABPs	Develop in small groups a project for a company, organisation or institution on the implementation of an integrated quality and environment management system, applying the ISO 9000 and ISO 14000 standards.

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	20	0	20
Project based learning	5	20	25
Discussion Forum	2	0	2
Essay	20	60	80
Project	5	10	15
Objective questions exam	1	5	6
Presentation	0	2	2
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Lecturing	Exposure by the teachers of the contents on the subject of study, theoretical bases and/or guidelines of a work, exercise or project to be developed by the student
Project based learning	Carrying out activities that allow the integration of theoretical knowledge, management tools and formal standards and models of quality management. Students, working in small groups, will have to develop an integrated project on the application of Quality and Environmental management systems, using ISO 9000 and ISO 14000 standards as a tool. With this, students are expected to train, among others, the skills of analysis and synthesis, learning in cooperation, organization, information search, communication and strengthening of personal relationships.
Discussion Forum	Activity is carried out in a face-to-face environment in which various topics related to the academic and/or professional field are discussed with professionals of renowned prestige who carry out their main work activity in the field of quality

Personalized assistance	
Methodologies	**Description**
Lecturing	Students can ask any questions they may have during the lectures by e-mail. On the other hand, each lecturer sets aside 6 hours of tutoring per week for students who request it. The timetable for these tutorials will be announced by the subject coordinator, but will also be available to students in the subject area on the Moovi platform.

Project based learning	In these activities, the teacher has the function of guiding and orienting the students' learning process and helping them to successfully carry out the planned project. To this end, effective monitoring will be carried out focused on the equipment configured to carry it out. Likewise, all the material will be available on the Moovi Platform with a summary of the theoretical class presentations, some examples of previous projects that will be progressively uploaded to the platform throughout the course, as well as standards and other useful documents for carrying out the project. On the other hand, students will also be able to resolve their doubts individually in the hours allocated to tutorials, which, as indicated in the previous section, will be communicated through the subject coordinator and will be available on the subject's space in Moovi.

Assessment

	Description	Qualification	Training and Learning Results
Lecturing	Class attendance will be randomly checked throughout the course.	5	A2 B7 C9 C14 D3
Essay	The practical sessions will be complemented with the individual delivery through the Moovi platform of the tasks performed during each practical. These deliverables may be subsequently completed and improved within the deadline established for each delivery. This methodology is part of the continuous evaluation.	30	A2 B4 C12 D3 B7 C14 D4
Project	The project will be carried out in groups (2 to 3 students). On the established date (usually 10-15 days prior to the date of the final exam), each group of students will submit the written project as a result of the Project Based on Learning, carried out during the practical sessions. This methodology is part of the continuous evaluation.	30	A2 B4 C9 D3 A4 B5 C12 D4 B7 C13 D5 C14
Objective questions exam	It will be carried out in the final exam. It will allow to evaluate the theoretical knowledge imparted in the teaching sessions, as well as the acquired competences. They may include closed questions with different answer alternatives (true/false, multiple choice, matching of elements, etc.).	25	A2 B7 C9 C14 D3
Presentation	It will be carried out in the final exam. The group of students will carry out the presentation and defense of their project.	10	A2 B5 C13 D4 A4 D5

Other comments on the Evaluation

CONTINUOUS EVALUATION

In order to pass the subject, students mustcomplete the following activities: work, project, presentation, exam, andachieve a minimum grade of 5 points out of 10. Nevertheless, the differentactivities can be compensated if a minimum grade of 4/10 points is achieved onthem. In case of not reaching the minimum grade in the Project section (4/10)or in the exam of objective questions (4/10), the grade obtained will be theone that appearing as the subject final grade (the rest of the sections willnot be taken into account).
During the theoretical classes, four attendance controls will be carried outrandomly. Each control will value 0.125 points that will have an impact on thefinal grade of the subject.

Exam

In order to take the theoretical exam it is necessary to attend all training sessions. Non-attendance of a practical for justified reasons must be documented within 24 hours after the end of the practical.

Project

This is the final report ofthe project carried out during the practical sessions. The quality of the project presented, its originality, use fulness and possible practical application will be evaluated. In addition, it will also be taken into account:

- The inclusion of qualitative aspects of scientific rigor, bibliographical references and the use of scientific terminology.

- Formal appearance of the report: organization, format and style of writing, inclusion of logos, as well as spelling, grammatical and punctuation errors, bad expressions, etc.

Work

The work developed by the student will be evaluated inthe classroom during the practical sessions. This will be reflected in adeliverable that must be uploaded to the Moovi platform at the end of eachpractical session. In order to complete and improve each section of the projectcarried out during the internship, it will be valued the fact of uploading toMoovi an improvement of the work done in the practices (complete information,aspects of organization and format, etc.), within the deadlines assigned forthis purpose. On the other hand, the participation and interest shown by thestudent in the classroom

during the internship will also be valued.

Presentation

The evaluation of the presentation takes in account if it includes the key ideas of the project, the student's ability to convey a clear idea of the project to third parties and him/her fluenty in the presentation.

SECOND OPPORTUNITY

In the second opportunity the student will be able to recover the following activities of the subject: project, presentation and exam of objective questions. The 'work' part is not recoverable and therefore must be passed during the class period of the course.
In the case of the project, if it was not passed at the first opportunity, the student may correct and complete the corresponding parts or, if necessary, repeat the entire project.

GLOBAL EVALUATION

Students may request a global evaluation, according to the dates and procedure established by the center, and it will entail the waiver of the continuous evaluation. The global evaluation will allow obtaining 100 % of the score of the subject through a test on the official date set for the final exam of the subject, both in the first and second opportunity.
The test will include an exam of objective questions and the written and oral presentation of the Project.

Academic and Examination Calendars

The academic calendar can be consulted at: http://bioloxia.uvigo.es/es/docencia/horarios

The exam calendar can be consulted at: http://bioloxia.uvigo.es/es/docencia/examenes

Ethical aspects

Plagiarism in papers and the unjustified use of artificial intelligence programs will be prosecuted. Copying from other students during the evaluation tests may also be a reason for a grade reduction and a failure in the subject.

Sources of information

Basic Bibliography

Camisón C, **Gestión de la calidad: conceptos, enfoques, modelos y sistemas**, 2006

Cuatrecasas L; Gonzalez Babón J, **Gestión integral de la calidad. Implantación, control y certificación.**, 2017

Llorens Montes F.J., **Gestión de la Calidad Empresarial: fundamentos e implantación**, 2005

Complementary Bibliography

Valls, A. y Martínez Costa, M, **Gestión de la calidad. Fundamentos, herramientas y aplicaciones**, Pirámide, 2023

Croft, N.,, **ISO 9001:2015. Sistema de gestión de calidad. Principios y práctica**, AENOR, 2020

Jesús González Babón y Lluís Cuatrecasas Arbós, **GESTION INTEGRAL DE LA CALIDAD: IMPLANTACION, CONTROL Y CERTIFICACION**, Profit, 2017

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López Lemos, Paloma, **Como documentar un sistema de Gestión de calidad según ISO 9001:2015**, 2015

Vilar Barrio JF, **Las Siete nuevas herramientas para la mejora de la calidad**, 2017

Cláver Cortés E, **Gestión de la calidad y gestión medioambiental**, 2011

López Lemos, Paloma, **Novedades ISO 9001:2015**, 2015

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Enríquez Palomino, A. y sánchez Riovero, M., **ISO 14001:2015. Implantación de sistemas de gestión ambiental**, Confemental, 2018

Seoánez Calvo Mamp; Angulo Aguado L, **Manual de gestión medioambiental de la empresa: sistemas de gestión medioambiental, auditorías medioambientales, evaluaciones de impacto ambiental y otras estrategias**, 1999

Saldívar, J.C., **Calidad total en organizaciones de salud y laboratorio clínico**, El manual moderno, 2020

DeFeo, J.A, **Juran's Quality Handbook: The Complete Guide to Performance Excellence, 7ª edición**, McGraw-Hill, 2016

Recommendations

Subjects that continue the syllabus

Bioinformatics/V02G031V01403
Pollution/V02G031V01402
Internships/V02G031V01981
Drafting and execution of projects/V02G031V01404
Final Year Dissertation/V02G031V01991

Subjects that are recommended to be taken simultaneously

Agri-food analysis and diagnostic/V02G031V01409
Environmental analysis and diagnosis/V02G031V01413
Biodiversity: management and conservation/V02G031V01415
Integrative cell biology and physiology: Implications for health/V02G031V01407
Clinical biochemistry and inmunology/V02G031V01405
Biotechnology applied to animal production/V02G031V01410
Biotechnology applied to microbiological production/V02G031V01412
Biotechnology applied to plant production/V02G031V01411
Environmental impact evaluation/V02G031V01414
Human genetics and molecular pathology/V02G031V01408
Management and Conservation of spaces/V02G031V01416
Public health microbiology and parasitology/V02G031V01406

IDENTIFYING DATA				
Contaminación				
Subject	Contaminación			
Code	V02G031V01402			
Study programme	Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4	2c
Teaching language	Castelán Galego			
Department	Bioloxía funcional e ciencias da saúde Bioloxía vexetal e ciencias do solo Ecoloxía e bioloxía animal			
Coordinator	Fernández Covelo, Emma			
Lecturers	Fernández Covelo, Emma González Abril, Ana González Rodríguez, Luis Mariño Callejo, María Fuencisla			
E-mail	emmaf@uvigo.es			
Web				
General description	Coñecer de forma actualizada as distintas fontes e tipos de contaminantes que afectan ao medio e á biota Coñecer a dinámica dos contaminantes nos compartimentos do ecosistema Coñecer os procesos de reutilización de residuos e biorremediación para recuperación de ambientes contaminados http://bioloxia.uvigo.es/gl/docencia/horarios/ http://bioloxia.uvigo.es/gl/docencia/exames/#custom-tab-0-c24757e24fd7167961dbbcc2fe5bb29e			

Resultados de Formación e Aprendizaxe	
Code	
A3	Que os estudantes teñan a capacidade de reunir e interpretar datos relevantes (normalmente dentro da súa área de estudo) para emitir xuízos que inclúan unha reflexión sobre temas relevantes de índole social, científica ou ética.
B2	Xestionar información científico-técnica de calidade utilizando fontes diversas. Analizar datos e documentos e interpretalos de forma crítica e rigorosa, incluíndo reflexións sobre a súa relevancia social e no ámbito profesional da Bioloxía.
B4	Elaborar e redactar informes, documentos e proxectos relacionados coa Bioloxía. Proceder á súa presentación e debate no ámbito docente e especializado, poñendo de manifesto as competencias da titulación
B5	Desenvolver capacidades para a creatividade, a innovación e o emprendemento, en ámbitos académicos, de interese social e/ou en interacción co sector produtivo.
C1	Resolver problemas aplicando o método científico, os conceptos e a terminoloxía específica da Bioloxía, os modelos matemáticos e as ferramentas estatísticas e informáticas.
C7	Muestrear, caracterizar, catalogar e xestionar recursos naturais e biolóxicos (poboacións, comunidades e ecosistemas).
C8	Describir, avaliar e planificar o medio físico, usar bioindicadores e identificar problemas ambientais. Achegar solucións para o control, seguimento e restauración dos ecosistemas.
C10	Identificar procesos biolóxicos e biotecnolóxicos e a súa posible aplicabilidade, en particular nos ámbitos sanitario, agroalimentario e ambiental.
C12	Redactar informes e memorias técnicas, así como dirixir e executar proxectos en temas relacionados coa bioloxía e as súas aplicacións
D3	Comprometerse coa sustentabilidade e medio ambiente. Uso de forma equitativa, responsable e eficiente dos recursos.
D4	Colaborar e traballar en equipo ou en grupos multidisciplinares, fomentar a capacidade de negociación e de alcanzar acordos.
D5	Comunicar de maneira eficaz e adecuada, incluíndo o uso de ferramentas dixitais e o inglés.

Resultados previstos na materia				
Expected results from this subject	Training and Learning Results			
Coñecer as principais fontes, os diversos tipos e, sobre todo, a dinámica dos contaminantes máis importantes e a súa relación coa Bioloxía.	A3		C1 C10	D3
Comprender o concepto de contaminación ambiental e os seus efectos sobre os organismos É importante que entendan os procesos de tratamentos e biorremediación da Contaminación.	A3	B2	C1 C8 C10	D3
Coñecer os diversos tipos de residuos, os seus tratamentos e o seu uso en procesos de recuperación en ambientes degradados.	A3	B2 B5	C1 C8 C10	D3
Obter unha visión introdutoria de toxicoloxía ambiental, agroalimentaria e en seres vivos.	A3	B2	C1 C8	D3

Coñecer e entender en que casos debe ser aplicada a lexislación vixente e as normativas que a desenvolven.	A3	B2 B4 B5	C12	D3
Aplicar coñecementos e técnicas propios da Contaminación en diferentes procesos relacionados coa xestión do medio.	A3	B2 B5	C1 C7	D3
Aplicar coñecementos e tecnoloxía relativos á Contaminación en aspectos relacionados coa produción, explotación, análise e diagnóstico de procesos e recursos biolóxico.	A3	B2	C1 C8 C10	D3
Obter información, desenvolver experimentos e interpretar resultados.	A3	B4 B5	C7 C12	D4 D5
Comprender a proxección social da Contaminación e a súa repercusión no exercicio profesional.	A3	B5	C1 C8	D3
Coñecer e manexar os conceptos, terminoloxía e instrumentación científico-técnica relativos á Contaminación.	A3	B2 B5	C8	D3

Contidos	
Topic	
1. INTRODUCION Á CONTAMINACION	- Definición. Conceptos básicos. Tipos e categorías de contaminantes. - Fontes e vías de entrada ao medio ambiente e biota. - Dinámica de contaminantes: distribución e fluxo. - Bioindicadores, biomonitores. - Lexislación e normativas
2. RESIDUOS BIODEGRADABLES	-Materia orgánica -Petróleo e derivados
3. CONTAMINANTES ORGÁNICOS	-PAHs, Hidrocarburos haloxenados, PCBs
4. RESIDUOS SÓLIDOS Y QUE SE DISIPAN	- plásticos e outros residuos sólidos - calor
5. CONTAMINANTES INORGÁNICOS	-Acidez -Elementos potencialmente tóxicos
6. CONTAMINACIÓN MICROBIANA	-Concepto e fontes de contaminación de orixe microbiana -Microorganismos indicadores de contaminación -Dinámica de contaminación microbiana en atmosfera, solo e auga -Augas residuais e tratamento. Tratamento anóxico de lamas. -Impacto da contaminación no medio. -Lexislación e normativa sobre contaminación microbiolóxica
7. TRATAMENTO DE RESIDUOS E PROCESOS DE RECUPERACIÓN	- Biorremediación. - Compostaxe. - Reutilización de residuos a través do sistema solo-planta - Recuperación de solos contaminados
8. EFECTOS BIOLÓXICOS DOS CONTAMINANTES	-Exposición de organismos vivos a contaminantes. Rutas de entrada. Toxicocinética. Bioacumulación, Biotransformación. -Efextos dos contaminantes a nivel fisiolóxico. -Mecanismos moleculares e celulares de acción dos contaminantes. -Ensaios de toxicidade. -Efectos dos contaminantes a nivel poboacional e de comunidades de organismos. -Evolución de resistencia.

Planificación			
	Class hours	Hours outside the classroom	Total hours
Prácticas de laboratorio	20	10	30
Seminario	8	8	16
Traballo tutelado	0	63	63
Lección maxistral	20	10	30
Presentación	1	0	1
Exame de preguntas obxectivas	2	2	4
Informe de prácticas, prácticum e prácticas externas	1	2	3
Resolución de problemas e/ou exercicios	1	1	2
Práctica de laboratorio	0.5	0.5	1
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Metodoloxía docente
Description

Prácticas de laboratorio	Efecto dun contaminante no solo: estudarase o contido total e a disponibilidade. Efectos sobre xerminación, crecemento e outros parámetros fisiolóxicos de plantas. Efecto na reprodución de oligoquetos e integridad da membrana lisosomal. Análise microbiolóxico de auga: detección de indicadores microbiolóxicos de contaminación. A asistencia a todas as prácticas será obligatoria para poder superar a materia.
Seminario	Se complementará a parte teórica abordando aspectos que no quedasen claros o que sexa necesario complementar. Resolución de dúbidas, etc. A asistencia a seminarios é obligatoria para poder superar a materia.
Traballo tutelado	Os alumnos contarán coa axuda dos profesores da materia para a elaboración do traballo de prácticas.
Lección maxistral	Desenvolvemento teórico-práctico, presentación de obxectivos e marco conceptual de cada tema, presentando bibliografía específica e exemplos relacionados. Ao final da explicación de cada tema (temas 1, 2, 3, 4, 5, parte do 6 e 7), entregarase aos alumnos un cuestionario de preguntas referidas ao mesmo e que deberán entregar no prazo que sexa fixado oportunamente. Na parte de Microbioloxía (tema 5 e parte do 6), os alumnos cubrirán un test no aula ao terminar a explicación de cada un dos dos temas.
Presentación	

Atención personalizada

Methodologies	Description
Lección maxistral	Durante todo o proceso de aprendizaxe e especialmente en horas de tutorías, atenderanse todas as dúbidas expostas en relación cos contidos teóricos da materia
Prácticas de laboratorio	Durante todo o proceso de aprendizaxe e tamén en horario de tutoría atenderanse todas as dúbidas expostas en relación cos contidos prácticas da materia
Seminario	Durante o desenvolvemento desta actividade atenderanse todas as dúbidas expostas polos alumnos

Avaliación

	Description	Qualification	Training and Learning Results			
Prácticas de laboratorio	Entrega dun informe de prácticas cos resultados obtidos nas mesmas e os cálculos detallados	5	A3	B2 B4		
Presentación	Breve presentación do traballo de prácticas onde os alumnos responderán as preguntas expostas polo profesorado sobre o mesmo	25	A3	B2	C1	D4 D5
Exame de preguntas obxectivas	Control final da materia mediante un cuestionario de respostas curtas e/ou test. A avaliación deste control supoñerá un 30% da cualificación total da materia. É preciso alcanzar un 5 para facer promedio coa nota práctica.	25	A3	B2 B5	C10	D3
Informe de prácticas, prácticum e prácticas externas	O informe integrado das prácticas de edafología, microbioloxía, zoología e fisiología vegetal será realizado no formato de artigo científico segundo as normas do Environmental Pollution. Ao principio de curso e en cada unha das prácticas da materia realizaranse indicacións das esixencias do mesmo. Será necesario aprobar esta parte para superar a materia. A cualificación desta parte será do 30%	30	A3	B2 B4	C1 C7 C12	D4 D5
Resolución de problemas e/ou exercicios	Avaliación da participación do alumno nos seminarios, asistencia a clases teóricas, etc. (5%) O outro 10% corresponde os cuestionarios ou test sobre el contenido teórico	15	A3	B2 B5	C8 C10	D3 D4

Other comments on the Evaluation

A asistencia a prácticas e seminarios e obrigatoria en caso de evaluación continua

Para a convocatoria de xullo, conservaranse as partes aprobadas, xa que se presupón que as competencias, aptitudes e coñecementos adquiridos non se perden.

É preciso acadar un 5 en cada unha das partes da materia (teoría, prácticas y seminarios) para poder superar a materia. En el caso de que esto non se cumpla nalgunha das partes a calificación final da materia será a media ata un máximo de 4,9

http://bioloxia.uvigo.es/es/docencia/examenes

AVALIACIÓN GLOBAL

Os estudantes que renuncien a avaliación continua, poderán solicitar avaliación global no período establecido polo centro. Dicha avaliación levarase a cabo nas datas oficiais de primeira e segunda oportunidade. Esta avaliación permitirá alcanzar o

100 % da puntuación da materia nun exame desglosado en duas partes:

Contidos teóricos (65 %)

Contidos prácticos (35 %)

Bibliografía. Fontes de información
Basic Bibliography
Complementary Bibliography
Capó Martí, M., **Principios de Ecotoxicología**, Tébar,
Mason, C.F., **Biology of Freshwater Pollution**, Longman, 3ª ed.,
Clark, R.B., **Marine Pollution**, Oxford University, 5ª ed.,
Walker, C.H., Hopkin, S.P., Sibly, R.M., Peakall, D.B., **Principles of Toxicology**, Taylor & Francis, 3ª ed.,
Seoánez Calvo, M., **Tratado de la Contaminación atmosférica**, Mundi Prensa,
Lipps, W.C., Braun-Howland, E.B., Baxter, T.E., **Standard Methods for the Examination of Water and Wastewater. 34 ed.**, A.P.H.A., A.W.W.A. & W.E.F., 2022
Lagadic, L., Caquet, T., Amiard, J-C, Ramade, F., **Use of biomarkers for Environmental Quality Assessment**, Balkema,
DeCaprio, A.P. (ed.), **Toxicologic Biomarkers**, Ed. Taylor & Francis,
Mirshal, I., **Soil Pollution: Origin, Monitoring & Remediation.**, Springer Verlag,
Sparks, D.L., **Environmental Soil Chemistry**, Academic Press,
Tan, K., **Environmental Soil Science**, Marcel Dekker. New York,
McCutcheon S.C. , Schnoor J.L., **Phytoremediation: Transformation and Control of Contaminants.**, Wiley and Sons, Inc.,
Singh, A., Ward, O.P., **Applied Bioremediation and Phytoremediation.**, Springer-Verlag,
Benlloch, M., Sancho, E.,Tena, M. (eds.)., **Fitorremediación de suelos contaminados del área de Aznalcóllar**, Universidad de Córdoba,
Schmidt, T.M., Schaechter, M., **Topics in Ecological and Environmental Microbiology**, Academic Press,
Bertrand, J.C., P. Caumette, P. Lebaron, R. Matheron, P. Normand, T. Sime-Ngando, **Environmental Microbiology: Fundamentals and Applications: Microbial Ecology.**, Springer.,
Pepper, I.L., C.P. Gerba, T.J. Gentry., **Environmental Microbiology. 3º ed.**, Academic Press,
H.B. Bradl, **Heavy Metals in the Environment: Origin, Interaction and Remediation**, Elsevier,
Alina Kabata Pendias, **Trace Elements in Soils and Plants**, CRC Press,
Yates, M.V., J.M., C.H. Nakatu, R.V. Miller., **Manual of Environmental Microbiology. 4ª ed.**, ASM Press.,
Barton, L.L., McLean, R.JC., **Environmental Microbiology and Microbial Ecology.**, Wiley-Blackwel,
Beiras, R., **Marine Pollution: sources, fate and effects of pollutans in coastal ecosystems.**, Ed. Elsevier. UK., 2018
Lipp, W.C., E. B. Braun-Howland, T.E. Baxter (eds)., **tandard Methods for the Examination of Water and Wastewater.24 th., A.P.H.A., A.W.W.A. and W.E.F. Washington.**, 2023

Recomendacións
Subjects that continue the syllabus
Análise e diagnóstico medioambiental/V02G031V01413

Subjects that it is recommended to have taken before
Bioloxía: Solo, medio acuático e clima/V02G031V01106

IDENTIFYING DATA				
Bioinformatics				
Subject	Bioinformatics			
Code	V02G031V01403			
Study programme	Grado en Biología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	Posada González, David			
Lecturers	Arenas Busto, Miguel Posada González, David			
E-mail	dposada@uvigo.es			
Web	http://www.uvigo.gal/es/universidad/administracion-personal/pdi/david-posada-gonzalez			
General description	This subject is designed to provide students with an introduction to current bioinformatics. The approach will not consist of offering an overview of the various topics that bioinformatics contemplates today, which, by necessity, would imply a shallow perspective. On the contrary, we will focus on analyzing high-throughput sequencing data to identify genomic variants, decipher gene expression, assemble genomes, and characterize the microbiome through metagenomics. On the one hand, the analysis of high-throughput sequencing data is nowadays extremely popular and transversal in multiple areas of biology. On the other hand, to perform this type of analysis reliably, the student must first acquire a series of concepts and transversal skills that will significantly facilitate the subsequent learning of other aspects of bioinformatics. IMPORTANT: Using a laptop with Wi-Fi capability is essential for all sessions. Students who have difficulty meeting this requirement can visit the dean's office to borrow a computer. The teaching methodology will consist mainly of lectures, practical sessions dedicated to problem-solving, and problem-solving exercises outside the classroom, as well as the use of the forum on the Moovi platform. Apart from asynchronous communication with the teacher through the Moovi platform, students can arrange virtual or face-to-face tutoring with the teacher via email or in person at any time. To be qualified, the student must upload a photo to the platform Moovi. (*) English-friendly subject. International students may request from the teachers: a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.			

Training and Learning Results	
Code	
A2	Students should know how to apply their knowledge to their work or vocation in a professional way. They also should have the competences that are usually proved through the elaboration and defence of arguments and the resolution of problems within their study field.
A5	Students should develop the necessary learning skills to undertake further studies with a high degree of autonomy.
B1	Developing autonomous learning by identifying their own training need and organizing and planning tasks and time.
B3	Apply the knowledge acquired in the degree and use the scientific-technical instrumentation and CIT in contexts of Biology and/or related to the professional practice.
B6	Develop analysis and synthesis, critical reasoning and argumentation skills, applying them in Biology and other scientific-technical disciplines.
C1	Solve problems by applying the scientific method, the concepts and terminology specific to biology, mathematical models and statistical and computer tools.
C2	Identify levels of organisation of living beings through the study of current specimens and fossils. Carry out phylogenetic analyses and study the mechanisms of heredity, evolution and biodiversity.
C5	Manipulate and analyse genetic material and determine its alterations and pathological implications. Knowing the applications of genetic engineering.
D4	Collaborate and work in teams or multidisciplinary groups, promote negotiation skills and the ability to reach agreements.
D5	Communicate effectively and appropriately, including the use of computer tools and English.

Expected results from this subject	
Expected results from this subject	Training and Learning Results

To recognize the role of Bioinformatics in the analysis and generation of hypotheses in Biology.	A2	B3 B6	C2	D5
To describe and understand key computational concepts, such as algorithms and relational databases, and their applications in biology.	A2 A5	B1 B3 B6	C1	D5
To understand and apply statistical methods commonly used in bioinformatics.	A5	B1 B3 B6	C1 C5	D4
To find, retrieve and organize different types of biological data.	A2 A5	B1 B3	C1 C2 C5	D4
To design simple bioinformatics applications.	A2 A5	B1 B3 B6	C1 C5	D4 D5
To practice reproducibility in bioinformatics.	A5	B1 B3	C1	D4 D5

Contents

Topic	
Lesson 1. Unix for Bioinformatics	Unix environment and command line. Remote servers. File access and manipulation. Regular expressions. Bash utilities and scripts.
Lesson 2. High-throughput DNA sequencing.	Sequencing platforms. Libraries. Coverage. FASTQ format. Quality control.
Lesson 3. Sequence alignment	Alignment. Scoring. Alignment algorithms. Sequencing read mapping. SAM/BAM formats Post-processing.
Lesson 4. Variant calling	Types of variants. Identification. Calling strategies. VCF format. Structural variation. Filtering. Annotation
Lesson 5. Quantification of gene expression	RNA-seq. Experimental design. RNA-seq alignment. Quantification. Differential expression analysis.
Lesson 6. Genome assembly and annotation	Assembly. Algorithms. Evaluation. K-mer analysis. Genome annotation.
Lesson 7. Metagenomic analysis	Microbiome. Metagenomics. 16S analysis. Shotgun analysis. Alpha and beta diversity. Metagenomic annotation

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	14	14	28
Problem solving	30	82	112
Discussion Forum	0	4	4
Objective questions exam	0.5	0	0.5
Objective questions exam	0.5	0	0.5
Objective questions exam	0.5	0	0.5
Objective questions exam	0.5	0	0.5
Problem and/or exercise solving	1	0	1
Problem and/or exercise solving	1	0	1
Problem and/or exercise solving	1	0	1
Problem and/or exercise solving	1	0	1

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies

	Description
Lecturing	Basic concepts and methodologies of the subject will be explained and developed.
Problem solving	Practical sessions of a computational nature will be carried out in which students will apply the concepts and methodologies developed theoretically. Students are required to use their laptops. These practical sessions will cover the manipulation and transfer of files in Unix, the use of remote servers, bioinformatics programming, data quality control, read mapping, identification and annotation of genomic variants, quantification of gene expression, data representation in R, genome assembly, and metagenomic analysis. Furthermore, students will solve problems outside the classroom on the Moovi platform to strengthen the concepts and methodologies of the subject.
Discussion Forum	All students are expected to actively participate in the subject's discussion forum on the Moovi platform, raising their questions and responding to comments from the teacher and other students.

Personalized assistance

Methodologies	Description
Lecturing	Students will be able to interact directly with the teacher regarding the lectures through individualized tutorials to resolve any doubts. This personalized attention can be provided in the classroom, agreed upon through a date and time for a face-to-face or virtual meeting, via email, or the Moovi platform's messaging feature.
Problem solving	Students will be able to interact directly with the teacher to clarify their doubts through individualized tutorials, which will facilitate problem-solving. This personalized attention can be provided in the classroom, agreed upon through a date and time for a face-to-face or virtual meeting, via email, or the Moovi platform's messaging feature.

Assessment

	Description	Qualification	Training and Learning Results			
Objective questions exam	Unit 1: Lesson 1	5	A2 A5	B1 B3 B6	C1 C2 C5	D4 D5
Objective questions exam	Unit 2: Lessons 2-3	5	A2 A5	B1 B3 B6	C1 C2 C5	D4 D5
Objective questions exam	Unit 3: Lesson 4	5	A2 A5	B1 B3 B6	C1 C2 C5	D4 D5
Objective questions exam	Unit 4: Lessons 5-7	5	A2 A5	B1 B3 B6	C1 C2 C5	D4 D5
Problem and/or exercise solving	Unit 1: Problem-solving sessions 1-3	20	A2 A5	B1 B3 B6	C1 C2 C5	D4 D5
Problem and/or exercise solving	Unit 2: Problem-solving sessions 4-5	20	A2 A5	B1 B3 B6	C1 C2 C5	D4 D5
Problem and/or exercise solving	Unit 3: Problem-solving sessions 6-7	20	A2 A5	B1 B3 B6	C1 C2 C5	D4 D5
Problem and/or exercise solving	Unit 4: Problem-solving sessions 8-10	20	A2 A5	B1 B3 B6	C1 C2 C5	D4 D5

Other comments on the Evaluation

Throughout the course, there will be four eliminatory tests, corresponding with the four thematic units, each one with a weight of 25% of the final grade. Each test will contain objective questions (20% of the grade) and problems (80% of the grade).

In June and July, students may retake any of these unit tests.

Students who choose the global evaluation modality within the deadline established by the center may opt to take the four unit tests in June and/or July to receive 100% of the grade.

In all cases, to pass the subject, it will be necessary to obtain 5 points out of 10 in the final grade.

Students who take a test will be considered as having presented themselves.

Dishonest behavior (e.g., plagiarism, cheating during exams, falsification of documents) may result in a failure of the subject.

The exam schedule is available at http://bioloxia.uvigo.es/es/docencia/examenes.

Sources of information

Basic Bibliography

Kappelmann-Fenzl M (editor), **Next Generation Sequencing and Data Analysis**, 1, Springer, 2021

Kappelmann-Fenzl M (editor), **Next Generation Sequencing and Data Analysis**, 1, Springer, 2021

Lloyd L, Tammi M (editors), **Bioinformatics: A Practical Handbook of Next Generation Sequencing and Its Applications.**, 1, World Scientific, 2017

Lesk A, **Introduction to Bioinformatics**, 5, Oxford University Press,, 2019

Complementary Bibliography

Pevsner J, **Bioinformatics and Functional Genomics.**, 3, Wiley, 2015
Buffalo V, **Bioinformatics Data Skills**, 1, O'Reilly, 2015
Allesina S., Wilmes M., **Computing Skills for Biologists.**, 1, Princeton University Press, 2019

Recommendations

Subjects that it is recommended to have taken before

Biology: Informatic tools in biology/V02G031V01110
Statistics: Biostatistics/V02G031V01107
Mathematics: Mathematics applied to Biology/V02G031V01104
Genetics I/V02G031V01209
Genetics II/V02G031V01304

Other comments

Considerations before enrolling in Bioinformatics: https://darwin.uvigo.es/docencia/binf2425/matricula.html

This subject is almost entirely problem-solving based. It will imply a continuous effort of several hours throughout the weeks of the course. Learning is sequential and each new step depends on the previous ones, much like mathematics in that sense. You will have to work a lot on your own, repeating tasks and checking solutions. We have 100 non face-to-face hours available, and you will have to use them.

No prior knowledge of any programming language is required to take this course, but basic knowledge of the use of computer tools (e.g., operating a laptop; opening and closing programs; accessing the internet) is required.

IDENTIFYING DATA

Drafting and execution of projects

Subject	Drafting and execution of projects			
Code	V02G031V01404			
Study programme	Grado en Biología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	4th	2nd
Teaching language	Spanish			
Department				
Coordinator	Gallego Veigas, Pedro Pablo			
Lecturers	Díaz Vilariño, Lucía Gallego Veigas, Pedro Pablo González Cespón, José Luis Pedrol Bonjoch, María Nuria			
E-mail	pgallego@uvigo.es			
Web				
General description	This matter will enter to the student in the methodology, direction, management and organisation of projects of investigation/company in the field of the Biology. After cursar the matter, the student has to be able to draft, and schedule projects of investigation/company related with the Biology. Schedule of classes: Available in http://bioloxia.uvigo.es/es/docencia/horarios			

Training and Learning Results

Code	
A2	Students should know how to apply their knowledge to their work or vocation in a professional way. They also should have the competences that are usually proved through the elaboration and defence of arguments and the resolution of problems within their study field.
A3	Students should prove ability for information-gathering and interpret important data (usually within their study field) to judge relevant social, scientific or ethical topics.
A4	Students should able to communicate information, ideas, issues and solutions to all audiences (specialist and unskilled audience).
B2	Manage scientific-technical information using diverse and reliable sources. Analyze data and documents and interpret them critically and rigorously, including considerations on their social relevance and in the professional field of Biology.
B4	Draft and write reports, documents and projects related to Biology. Proceed to their presentation and debate in the teaching and specialized areas, highlighting the competences of the degree.
B5	Develop capacities for creativity, innovation and entrepreneurship, in academic and social relevant fields as well as in interaction with the productive sector.
B7	To aim for quality objectives in the development of the activity done and incorporate ethical principles, which should prevail in the professional practice of Biology.
C10	Identify biological and biotechnological processes and their potential applications, in particular in health, agri-food and environmental fields.
C12	Writing reports and technical dossiers, as well as directing and executing projects on topics related to biology and its applications.
C13	Provide training, participate in R+D+i projects, communicate results and disseminate knowledge. Contribute to the social projection of biology and to raising awareness of the environment.
C14	Advise, assess and supervise scientific-technical, ethical, legal and socio-economic aspects related to biology and its applications.
D3	Commitment to sustainability and the environment. Equal, sensible and efficient use of resources.
D4	Collaborate and work in teams or multidisciplinary groups, promote negotiation skills and the ability to reach agreements.

Expected results from this subject

Expected results from this subject	Training and Learning Results		
Know the professional competitions that the title and the legislation award to the Graduated in Biology.	A2	B7	C14
Know the typology of projects and own studies of the professional fields of the biologist.		B4 B5	
Know and handle the concepts and the relative terminology to the Editorial and Execution of Projects.		B2	C10 C13
Obtain information and interpret results of projects.	A3	B2	C13

Know the methods of management and evaluation of projects.		B2 B4		
Know, understand and apply the relative valid legislation to the management, evaluation and execution of projects.	A2	B2 B7		
Know use the general methodology for the editorial and preparation of projects and studies.	A4	B4	C12 C13	
Know the basic concepts of economy for the realisation of projects and studies.	A2			
Comprise the phases of development of a project elaborating cronogramas, studies of feasibility and of profitability.	A2		C10 C14	
Apply knowledges and relative technology to the Editorial and Execution of Projects in appearances related with the development and implantation of the systems of management.	A2		C14	
Participate in the direction, editorial and execution of projects.	A2 A3 A4	B4	C12 C13	
Comprise the social projection of the Editorial and Execution of Projects and his repercussion in the professional exercise.	A2 A4	B2	C10 C14	
Apply knowledges of Editorial and Execution of Projects to advise, supervise and *peritar on scientific appearances-technical, ethical, legal and partner-economic related with the Biology.			C14	D3 D4

Contents	
Topic	
Block 0	Presentation of the matter
Seminars. The profession of biologist: The Biology Profession Tools of research of employment: Job Search Tools Innovation, emprendimiento and autoempleo: Innovation, Entrepreneurship, and Self-Employment	Professional Competencies for Biologists Documents and Reports: Assessments and Public Bids in Biology Patent and Intellectual Property Rights: Technology-Based Companies Entrepreneurship, Innovation, and Self-Employment
Theoretical block 1. Projects and technical reports	Subject 1: Practical Methodology for the Preparation of Projects and Technical Studies: Projects: Definition, Structure, Organization, and Process Diagram The Biological Report Technical Report of a Biological Process Subject 2: Tools for Innovation: Design Thinking
Theoretical block 2.Graphic documentation	Subject 3: Fundamentals of Graphic Representation (Blueprint: a detailed technical drawing) Subject 4: Justification of Spatial Distribution
Theoretical block 3.- Planning and budget	Subject 5: Resource Planning Subject 6: Budget Preparation
Theoretical Block 4: Public Presentation (This block focuses on delivering presentations, such as PowerPoint presentations, before an evaluation panel or tribunal.)	Subject 7: Communication Techniques Subject 8: Project Presentations
Practical Sessions: Practice 1: Project Structure, Organization, and Process Diagram Practice 2: Graphic Representation Using CAD Practice 3: Project Management and Planning Practice 4: Presentation Design	Budget of machinery and equipment: Machinery and Equipment Budget Technicians of planning of projects: Project Planning Techniques Communication of results: oral and written: Results Communication: Oral and Written

Planning			
	Class hours	Hours outside the classroom	Total hours
Introductory activities	2	0	2
Lecturing	11	11	22
Practices through ICT	8	8	16
Collaborative Learning	8	16	24
Seminars	9	9	18
Project	0	20	20
Project	0	20	20

Objective questions exam	2	6	8
Presentation	6	14	20

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies

	Description
Introductory activities	Presentation of the educational guide, detailing the specialization of teachers and their relation with the thematic blocks. They expose the dynamics and ways of work. Creation of groups of work Explanation of the evaluation of the subject
Lecturing	Sessions of theoretical teaching where the/to professor/offers it an overview of the subject to treat, indicating the key concepts for his understanding.
Practices through ICT	Activity of acquisition of knowledges, basic skills and handle of specific programs of the different sections of the project.
Collaborative Learning	Description and running up of a multidisciplinary project (with students of other degrees when it was possible). They will employ methodologies like Design Thinking, Learning in Service, and Learning Based on Problems to design the project.
Seminars	Sessions of handle of real documents so that they know the typology of the main projects in the field of the biology.

Personalized assistance

Methodologies	Description
Seminars	They will make different seminars that will comprise a part of theory and another of work in groups. It will loan attention individualized for each case.
Practices through ICT	They will make different practicals in the classroom in individual formats and in small groups, mentored by the professors of the matter.

Assessment

	Description	Qualification	Training and Learning Results			
Project	Biological memory: The students of the matter, in small groups, made a report on the biological appearances of the project.	35	A2 A3 A4	B2 B4 B5 B7	C10 C12 C13 C14	D3 D4
Project	Memory and Technical Annexes: The students of the matter, in small groups, made a project of activity to design the productive activity related with the biological field	35	A3	B2 B4 B5	C12 C13 C14	D3 D4
Objective questions exam	Proofs for evaluation of the competitions purchased that include questions of short answer on theory and works made.	10		B5 B7	C10 C14	
Presentation	If projects are collaborative, students in multidisciplinary groups (including engineers) will present the complete project on a single day. This day will involve biology students, followed by a professional day with the engineers. Should there be no students from other degrees (i.e., no collaborative project), the presentation will occur on a single day, with a recovery day scheduled if necessary.	20	A2 A3 A4	B2 B4 B5 B7	C10 C12 C13 C14	D3 D4

Other comments on the Evaluation

Sources of information

Basic Bibliography

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Antinio Colmenar, **Gestión de proyectos con microsoft project 2010**, 2011,

Harold Kerzner, **Project management. A systems approach to planning, scheduling and controlling**, 2011,

Complementary Bibliography

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www.biologosdegalicia.org,

Correa, I., **Manual de licitaciones públicas**, 2002,

Palomar Olmeda, A., **Guia de concursos y licitaciones**, 2002,
PmBok Guide, **A guide to the Project Management Body of Knowledge**, 2014,
González Cespón, José Luis, **Apuntes de la materia**,

Recommendations

Subjects that continue the syllabus

Final Year Dissertation/V02G030V01991

Subjects that are recommended to be taken simultaneously

Final Year Dissertation/V02G030V01991

Subjects that it is recommended to have taken before

Quality management and control/V02G030V01911

Other comments

The *UVIGO, through the Area of Employment and *Emprendimiento (https://*www.*uvigo.*gal/ls/university/*administracion-personal/*organizacion-administrative/unit-employment-*emprendimiento) offers a serious of activities that form part of the cycle *EMPREGARte of 4 hours of length and allow to complete professional competitions:

□*Autocoñecemento: or *teu *proxecto professional□
□*Coñecemento *do labour market: as and *onde look for *emprego□
□Letter of presentation and preparation *dun CV□
□You processes of selection: psychotechnical test, dynamics of group and glimpsed of selection□
□Like understanding to payroll and labour information for *dummies□
□Look for and *atopar *traballo in Europe□

recommend You *encarecidamente make said workshops.

Also, it recommends assist to the fairs of employment *EMPREGOinCAMPUS that celebrate in the three campora of the *UVIGO:

□ Campus of Pontevedra: 23 - 27 September of 2024.
□ Campus of Vigo: February of 2025
□ Campora of *Ourense: February/March of 2025

These fairs serve so that have a first direct contact with them and can deliver your CV. Length between 4-8 *h.

IDENTIFYING DATA				
Bioquímica e inmunoloxía clínicas				
Subject	Bioquímica e inmunoloxía clínicas			
Code	V02G031V01405			
Study programme	Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4	1c
Teaching language	Castelán Galego			
Department	Bioquímica, xenética e inmunoloxía			
Coordinator	González Fernández, María África			
Lecturers	García Hevia, Lorena González Fernández, María África Verísimo García, Joel Zoni , Valeria			
E-mail	africa@uvigo.es			
Web				
General description	Materia de carácter teórico-práctico deseñada para desenvolver competencias e habilidades que permitan ao estudantado entender as bases dos procesos bioquímicos e Inmunológicos con maior impacto na saúde humana. Trataranse aspectos relativos á aplicación das determinacións bioquímicas e inmunolóxicas para o diagnóstico e seguimento de enfermidades humanas			

Resultados de Formación e Aprendizaxe	
Code	
A2	Que os estudantes saiban aplicar os seus coñecementos ao seu traballo ou vocación dunha forma profesional e posúan as competencias que adoitan demostrarse por medio da elaboración e defensa de argumentos e a resolución de problemas dentro da súa área de estudo.
A3	Que os estudantes teñan a capacidade de reunir e interpretar datos relevantes (normalmente dentro da súa área de estudo) para emitir xuízos que inclúan unha reflexión sobre temas relevantes de índole social, científica ou ética.
B2	Xestionar información científico-técnica de calidade utilizando fontes diversas. Analizar datos e documentos e interpretalos de forma crítica e rigorosa, incluíndo reflexións sobre a súa relevancia social e no ámbito profesional da Bioloxía.
B3	Aplicar o coñecemento adquirido na titulación e empregar a instrumentación científico-técnica e as TIC en contextos propios da Bioloxía e/ou no exercicio da profesión.
B4	Elaborar e redactar informes, documentos e proxectos relacionados coa Bioloxía. Proceder á súa presentación e debate no ámbito docente e especializado, poñendo de manifesto as competencias da titulación
C3	Realizar e interpretar análises moleculares, físico-químicos e biolóxicos, incluíndo mostras de orixe humana. Realizar ensaios e probas funcionais en condicións normais e anómalas.
C4	Illar, identificar e cultivar microorganismos, células, tecidos e órganos, facilitando o seu estudo e a valoración da súa actividade metabólica.
C6	Comprender e integrar o funcionamento dos seres vivos (nivel celular, tisular, orgánico e individuo), interpretando as súas respostas homeostáticas e adaptativas.
C10	Identificar procesos biolóxicos e biotecnolóxicos e a súa posible aplicabilidade, en particular nos ámbitos sanitario, agroalimentario e ambiental.
C15	Realizar e interpretar estudos e análises clínicos e sanitarios orientados ao diagnóstico e desenvolvemento de terapias fronte a patoloxías humanas, así como ao seu control desde a perspectiva epidemiolóxica e de saúde pública
C17	Comprender a proxección social da bioloxía aplicada á saúde nos seus diferentes niveis (analítico, patolóxico e de saúde pública) e a súa repercusión no exercicio profesional
D3	Comprometerse coa sustentabilidade e medio ambiente. Uso de forma equitativa, responsable e eficiente dos recursos.
D4	Colaborar e traballar en equipo ou en grupos multidisciplinares, fomentar a capacidade de negociación e de alcanzar acordos.

Resultados previstos na materia					
Expected results from this subject	Training and Learning Results				
Entender os fundamentos metodolóxicos e interpretación dos resultados das probas analíticas e inmunolóxicas para a emisión dun diagnóstico fiable.	A2 A3	B2 B3 B4	C3 C4 C6 C10 C15 C17	D3 D4	

Identificar os distintos tipos de mostras clínicas humanas, os métodos de procesado e as probas analíticas que se empregan nos laboratorios de Bioquímica e Inmunoloxía clínica.	A2	B3	C3 C4 C6 C15 C17	D3
Coñecer os fundamentos e as aplicacións da bioquímica clínica para o diagnóstico de enfermidades, analizando os factores que poden afectar o resultado dunha analítica.	A2 A3	B2 B3 B4	C3 C6 C10 C15 C17	D3 D4
Explicar os mecanismos de regulación da resposta inmunitaria humana, as súas alteracións en procesos patolóxicos e estratexias inmunoterapéuticas.	A2 A3	B2 B3 B4	C6 C10 C15 C17	
Comprender a proxección social das probas analíticas e a súa repercusión no exercicio profesional.	A2 A3	B2	C10 C17	D3 D4

Contidos	
Topic	
Tema 1. Fases do diagnóstico.	Fase preanalítica. Obtención de especímens. POCT.
Tema 2. Control de calidade no laboratorio clínico.	Selección e validación de métodos.
Tema 3. Valor diagnóstico das probas clínicas.	Valores de referencia e interpretación dos resultados.
Tema 4. Elementos básicos de Bioquímica Clínica.	Valor semiolóxico da determinación de magnitudes bioquímicas: analitos e metabolismo.
Tema 5. Diagnóstico clínico de alteracións de órganos e sistemas.	Paneis de probas diagnósticas e a súa interpretación.
Tema 6. Metabolismo	Metabolismo da glicosa. Metabolismo óseo. Metabolismo dos lípidos.
Tema 7. Función hepática, rin e corazón	Función hepática. Función do rin. Enfermidade cardíaca.
Tema 8. Introdución á Inmunoloxía clínica.	Introdución á sistema inmunitario Técnicas máis empregadas na Inmunoloxía clínica Anticorpos monoclonáis.
Tema 9. Inmunodeficiencias.	Técnicas de diagnóstico e estudo da evolución de inmunodeficiencias primarias e secundarias.
Tema 10. Enfermidades autoinflamatorias e autoinmunitarias.	Tipos, técnicas de diagnóstico, terapias e estudo da evolución.
Tema 11. Vacinación-resposta á vacina-Diagnóstico de infección.	Técnicas para avaliar resposta humoral (Acs) e celular.
Tema 12. Transplantes e rexeitamento inmunitario.	Ensaios para avaliar biocompatibilidade e evolución do Transplante.
Tema 13. Cancro. Inmunoensaios para o estudo de tumores do sangue e sólidos.	Enfermidade mínima residual. Inmunoterapias fronte ao cancro.
Tema 14. Fertilidade.	Aspectos inmunolóxicos que afectan ó embarazo. Ensaios para avaliar problemas de fertilidade de causa inmunolóxica.
Tema 15. Hipersensibilidade.	Tipos de hipersensibilidade e pseudoalerxia. Técnicas de diagnóstico e estudo de evolución da enfermidade.

Planificación			
	Class hours	Hours outside the classroom	Total hours
Lección maxistral	18	36	54
Prácticas de laboratorio	28	26	54
Seminario	2	8	10
Exame de preguntas obxectivas	1	6	7
Práctica de laboratorio	4	8	12
Estudo de casos	2	4	6
Exame de preguntas obxectivas	1	6	7
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Metodoloxía docente
Description

Lección maxistral	Exposición por parte do docente dos fundamentos e principios básicos da bioquímica e da inmunoloxía clínicas. Preténdese que o alumno adquira coñecementos básicos relacionados co control da calidade, probas diagnósticas, metodoloxías e interpretación de resultados. Como apoio ás explicacións teóricas, proporcionarase aos alumnos o material docente apropiado a través da plataforma Moovi do Campus Virtual.
Prácticas de laboratorio	O traballo no laboratorio está dirixido a conseguir competencias na realización das probas analíticas e interpretación dos resultados, co obxectivo de formar ao alumno nas actividades levadas a cabo nos laboratorios de Bioquímica ou Inmunoloxía clínica. Aos alumnos solicitaráselle a entrega dun informe de prácticas e/ou a solución de cuestións e/ou exercicios. Como apoio ás prácticas de laboratorio, proporcionarase aos alumnos o material docente apropiado a través da plataforma Moovi do Campus Virtual.
Seminario	Os seminarios realizaranse mediante estudo de casos. Con eles preténdese que o estudantado desenvolva a súa capacidade para integrar e interpretar as análises clínicas no seu conxunto, resolver problemas, contrastar datos, reflexionar, completar coñecementos e realizar diagnóstico en base aos datos dispoñibles, adestrándose así nas bases do diagnóstico clínico. O traballo de estudo de casos realizarase por grupos reducidos de alumnos e será exposto nas datas sinaladas no calendario de actividades. Ao comezo de curso informarase o alumnado do procedemento a seguir.

Atención personalizada

Methodologies	Description
Lección maxistral	As sesións expositivas serán participativas. A atención personalizada será realizada polos docentes responsables de cada tema nas correspondentes horas semanáis de tutoría.
Prácticas de laboratorio	Os/As docentes responsables proporcionarán atención individualizada a cada alumno durante a realización das prácticas de laboratorio e darán o soporte necesario para a comprensión dos obxectivos, metodoloxía, técnicas concretas a utilizar e interpretación de resultados.
Seminario	Os/As estudantes serán distribuídos en pequenos grupos que resolverán estudo de casos relacionados coa análise e diagnóstico clínico. A resolución dos casos, os argumentos e os criterios utilizados deberán ser expostos e defendidos nunha presentación oral na que intervirán todos os membros do grupo. O traballo será supervisado, e resoltas as dúbidas polos profesores responsables. Todas as consultas e orientacións serán nas horas de tutorías de cada docente.

Avaliación

	Description	Qualification	Training and Learning Results			
Exame de preguntas obxectivas	Realizarase unha proba escrita da parte de BIOQUÍMICA CLÍNICA. Suporá o 30% da nota final. Nas probas serán avaliados os contidos fundamentais da materia (clases maxistrais e prácticas) a través de preguntas obxectivas (tipo test e resposta curta-longa).	30	A2 A3	B2 B3	C3 C4 C6 C10 C15 C17	D3
Práctica de laboratorio	As capacidades e destrezas adquiridas durante as prácticas de laboratorio serán AVALIADAS DE FORMA CONTINUA. Suporá o 30% da nota final: 15% Bioquímica clínica y 15% Inmunoloxía clínica. A metodoloxía de avaliación e ponderación na nota final inclúe: 1- Implicación do alumno no desenvolvemento das prácticas. Bioquímica clínica: 1% Inmunoloxía clínica: 1% 2- Informes /Cuestionarios de prácticas de laboratorio: Bioquímica clínica: Memoria final (7%) + Cuestionarios (7%) Inmunoloxía clínica (serán entregados na mesma sesión práctica): Resolución de problemas / Cuestionarios (14%)	30	A2 A3	B2 B3 B4	C3 C4 C6 C10 C15	D3 D4
Estudo de casos	Resolución e presentación de casos clínicos, exposición e discusión do caso asignado. Suporá un 10% da cualificación final.	10	A2 A3	B2 B3 B4	C3 C6 C10 C15 C17	D4

Exame de preguntas obxectivas	Realizarase unha proba escrita da parte de INMUNOLOXÍA CLÍNICA. Suporá o 30% da nota final. Nas probas serán avaliados os contidos fundamentais da materia (clases maxistrais e prácticas) a través de preguntas obxectivas (tipo test e resposta curta-longa).	30	A2 A3	B2 B3	C3 C4 C6 C10 C15 C17	D3

Other comments on the Evaluation

Importante: Independentemente que o/a alumno/a escolla AVALIACIÓN CONTINUA OU GLOBAL a asistencia a todas as PRÁCTICAS DE LABORATORIO, VISITA A HOSPITAL E PRESENTACIÓN DE CASOS é OBRIGATORIA para APROBAR a materia (salvo as ausencias debidamente xustificadas).

Avaliación continua:

Para superar cada uno de los módulos (Bioquímica clínica e Inmunoloxía clínica) necesítase un mínimo de 5 puntos.

Para superar a materia:

A suma da nota media do examen de Bioquímica clínica e Inmunoloxía clínica (valor máximo 6 /10) + nota prácticas (valor máximo 3/10) + nota estudo de casos (valor máximo 1/10) ten que ser igual ou superior a 5 puntos sobre 10.

As actividades (proba parcial, prácticas e seminarios) superadas na primeira oportunidade dun curso se conservan para a segunda oportunidade. Na segunda oportunidade dun curso non se poden recuperar prácticas e estudo de casos, só se poden realizar os exames non superados na primeira oportunidade.

Aos alumnos/as repetidores/as conservaraselles a nota das prácticas. Terán dereito a repetirlas sempre e cando renuncien por escrito á cualificación obtida anteriormente (documento asinado e enviado ao coordinador/a). A renuncia ten que ser feita antes de que comencen as prácticas.

Avaliación global:

O/a alumno/a que escolla avaliación global terá que superar unha proba final integradora na que se avaliará dos contidos das aulas maxistráis, prácticas de laboratorio e estudos de caso. A proba consistirá en preguntas tipo test, preguntas curtas/longas e resolución de problemas/caso clínico.

Para superar a materia a nota da proba global terá que ser igual ou superior a 5. De non superarse a proba final, a calificación do/a alumno/a só será a obtida na proba final integradora sobre 10 puntos.

Na segunda oportunidade do curso, o/a alumno/a suspenso/a terá que ser novamente avaliado de todas as actividades mediante unha proba global.

Se non se supera a materia en ningunha das oportunidades do curso, o/a alumno/a non terá que facer as prácticas, pero sí será avaliado/a novamente de todos os contidos (aulas expositivas, prácticas e casos), xa sexa mediante avaliación continua ou global.

Información xeral

O calendario académico pódese consultar no seguinte enlace:

http://bioloxia.uvigo.es/gl/docencia/horarios

O calendario de exames pódese consultar no seguinte enlace:

http://bioloxia.uvigo.es/gl/docencia/exames

Bibliografía. Fontes de información

Basic Bibliography

Lieberman M.A, **Bioquímica médica básica: un enfoque clínico**, ISBN: 978-84-18892-97-4, 6ª edición, Wolters Kluwer,, 2023

Marshall, William J, **Bioquímica Clínica**, , ISBN : 978-84-9022-115-0, 7ª edición, Elsevier, 2013

Richard A. McPherson, Matthew R. Pincus, **Henry's clinical diagnosis and management by laboratory methods**, ISBN : 978-0-323-67320-4, 24ª edición, Elsevier, 2022

Robert R Rich et al, **Técnicas básicas de laboratorio en inmunología clínica,**, 1ª edición, Elsevier, 2020

Raif S. Geha, Luigi Notarangelo, **Case Studies in Immunology: A Clinical Companion**, 7ª edición, W. W. Norton & Company, 2016

Robert R Rich, **Inmunología clínica. Principios y práctica**, 5ª edición, Elsevier, 2019

Barbara Detrick, **Manual of molecular and clinical laboratory immunology**, 8ª edición, ASM Press, 2016
Male, D; Peebles, RS., et al, **Inmunología**, 9ª edición, Elsevier, 2021

Complementary Bibliography

González Hernández, Álvaro, **Principios de bioquímica clínica y patología molecular**, ISBN : 978-84-9113-389-6, 3ª edición, Elsevier, 2019
Michael Julian Murphy, Rajeev Srivastava, Kevin Deans., **Bioquímica Clínica. Texto y Atlas en color.**, 6ª edición, Elsevier, 2019
Baynes, John W, **Bioquímica médica**, ISBN : 9788491134060, 5ª edición, Elsevier, 2019
Bretscher Peter et al, **The foundations of Immunology and their Pertinence to Medicine**, 1ª edición, Friesen Press, 2016
Abul K. Abbas, Andrew H. Lichtman and Shiv Pillai, **Inmunología básica**, 7ª edición, Elsevier, 2024
Sharon Stranford; Judy Owen; Patricia Jones; Jenni Punt, **Kubi´s Immunology**, 8ª edición, McGraw/Hill, 2023
Africa González Fernández et al, **Inmunogenética**, 1ª edición, Síntesis, 2018
Toyos JR,et al, **Inmunotecnología y sus aplicaciones**, 1ª edición, Universidad de Oviedo, 2018
Regueiro, JR, et al,, **Inmunología: biología y patología del sistema inmunitario**, 5ª edición, Panamericana, 2021
https://www.inmunologia.org/revista/home.php,
https://www.sciencedirect.com/journal/clinical-immunology,

Recomendacións

Subjects that are recommended to be taken simultaneously

Bioloxía celular e fisioloxía integrativas: Implicacións na saúde/V02G031V01407
Xenética humana e pataloxía molecular/V02G031V01408
Microbioloxía e parasitoloxía sanitarias/V02G031V01406

Subjects that it is recommended to have taken before

Bioquímica I/V02G031V01201
Bioquímica II/V02G031V01206
Inmunoloxía e parasitoloxía/V02G031V01305
Técnicas en bioloxía celular e molecular/V02G031V01310

IDENTIFYING DATA				
Microbioloxía e parasitoloxía sanitarias				
Subject	Microbioloxía e parasitoloxía sanitarias			
Code	V02G031V01406			
Study programme	Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4	1c
Teaching language	Castelán Galego			
Department	Bioloxía funcional e ciencias da saúde			
Coordinator	González Abril, Ana			
Lecturers	González Abril, Ana Iglesias Blanco, Raúl Osorio Novas, Elisa Sieiro Vázquez, Carmen			
E-mail	ana.gonzalez.abril@uvigo.gal			
Web				
General description	Materia deseñada para que o alumnado poida recoñecer a etiología e importancia sanitaria das principais enfermidades infecciosas humanas, abordar o diagnóstico dos seus axentes causales en mostras clínicas, e identificar os factores craves na súa epidemioloxía e control desde unha perspectiva de saúde pública.			

Resultados de Formación e Aprendizaxe	
Code	
A4	Que os estudantes poidan transmitir información, ideas, problemas e solucións a un público tanto especializado como non especializado.
B1	Desenvolver a aprendizaxe autónoma, identificando as súas propias necesidades formativas e organizando e planificando as tarefas e o tempo.
B2	Xestionar información científico-técnica de calidade utilizando fontes diversas. Analizar datos e documentos e interpretalos de forma crítica e rigorosa, incluíndo reflexións sobre a súa relevancia social e no ámbito profesional da Bioloxía.
B6	Desenvolver as capacidades de análises e síntese, de razoamento crítico e argumentación, aplicándoas en contextos propios da Bioloxía e outras disciplinas científico-técnicas.
C3	Realizar e interpretar análises moleculares, físico-químicos e biolóxicos, incluíndo mostras de orixe humana. Realizar ensaios e probas funcionais en condicións normais e anómalas.
C11	Realizar e interpretar bioensaios, identificar axentes químicos e biolóxicos, incluíndo os patógenos, así como os seus produtos tóxicos. Desenvolver e aplicar técnicas de control biolóxico
C15	Realizar e interpretar estudos e análises clínicos e sanitarios orientados ao diagnóstico e desenvolvemento de terapias fronte a patoloxías humanas, así como ao seu control desde a perspectiva epidemiolóxica e de saúde pública
C17	Comprender a proxección social da bioloxía aplicada á saúde nos seus diferentes niveis (analítico, patolóxico e de saúde pública) e a súa repercusión no exercicio profesional
D3	Comprometerse coa sustentabilidade e medio ambiente. Uso de forma equitativa, responsable e eficiente dos recursos.
D4	Colaborar e traballar en equipo ou en grupos multidisciplinares, fomentar a capacidade de negociación e de alcanzar acordos.

Resultados previstos na materia				
Expected results from this subject	Training and Learning Results			
Recoñecer o alcance da Microbioloxía e Parasitoloxía sanitarias, a súa relación con outras disciplinas e a súa importancia no ámbito da saúde e o desenvolvemento económico e social dos países.	A4		C17	
Recoñecer a etioloxía e transcendencia sanitaria das principais enfermidades infecciosas humanas.	A4	B1 B2 B6	C17	D3 D4
Analizar e diagnosticar patóxenos en mostras clínicas de orixe humana e ambientais.	A4	B1 B2 B6	C3 C11 C15	D3 D4
Identificar os factores craves implicados na epidemioloxía e control das principais enfermidades infecciosas humanas desde a perspectiva da saúde pública.	A4	B1 B2 B6	C17	D4
Aplicar de forma integrada os coñecementos adquiridos para acometer a resolución de casos teórico-prácticos relacionados coas enfermidades infecciosas humanas.	A4	B1 B2 B6		D4

Contidos	
Topic	
Tema 1. Epidemioloxía	Terminoloxía e conceptos fundamentais. Natureza das epidemias. Factores que inflúen nas epidemias. Mecanismos de transmisión. Tipos de epidemias. Mecanismos de saúde pública para controlar epidemias. Enfermidades emerxentes.
Tema 2. Interaccións patóxeno- hospedador	Desenvolvemento dun proceso infeccioso. Mecanismos de patoxenicidad
Tema 3. Características dos axentes etiolóxicos, epidemioloxía, patogenia, cadro clínico, diagnóstico, tratamento e prevención das principais enfermidades de etiología bacteriana e vírica.	Enfermidades transmitidas por consumo de auga e alimentos. Enfermidades transmitidas polo aire. Enfermidades de transmisión sexual. Enfermidades transmitidas por contacto. Enfermidades transmitidas por animais.
Tema 4. Introdución ás parasitosis humanas	Impacto global das parasitosis humanas e conceptos clave en Parasitoloxía sanitaria
Tema 5. Características dos axentes etiológicos, epidemioloxía, patoxenia, cadro clínico, diagnóstico e prevención das principais enfermidades de etioloxía parasitaria	Enfermidades causadas por parasitos do aparello dixestivo. Enfermidades causadas por parasitos hemáticos, linfáticos e/ou tisulares. Enfermidades causadas por parasitos do aparello xenital. Enfermidades causadas por artrópodos

Planificación			
	Class hours	Hours outside the classroom	Total hours
Lección maxistral	25	25	50
Estudo de casos	3	15	18
Prácticas de laboratorio	20	20	40
Exame de preguntas obxectivas	1	25	26
Resolución de problemas e/ou exercicios	1	15	16
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Metodoloxía docente	
	Description
Lección maxistral	Sesións de 50 minutos nas que se expoñerán os fundamentos teóricos da materia. O alumnado non poderá ter en clase o teléfono móvil nin outro dispositivo electrónico, salvo que sexa necesario para realizar algunha actividade, o cal será previamente comunicado polo profesorado. Non está permitido grabar as clases.
Estudo de casos	Os estudantes recibirán as instrucións para a resolución mediante traballo en grupo dunha serie de casos prácticos relacionados co diagnóstico e control de diferentes enfermidades infecciosas, que deberán expoñerse con posterioridade.
Prácticas de laboratorio	As prácticas realizaranse nos laboratorios de Microbioloxía e Parasitoloxía e permitirán aplicar e desenvolver os coñecementos adquiridos nos ensinos teóricos. O alumno realizará as prácticas seguindo os protocolos e usando o material fornecido polo profesor, que explicará e supervisará o seu traballo. Os alumnos deberán presentar un informe dos resultados obtidos

Atención personalizada	
Methodologies	**Description**
Lección maxistral	Durante todo o proceso de aprendizaxe e especialmente en horas de titoría, atenderanse todas as dúbidas expostas en relación cos contidos teóricos da materia.
Estudo de casos	O profesorado orientará ao alumnado sobre as principais tarefas a realizar nesta actividade, e comprobará que o traballo en grupo vai na dirección adecuada e estase realizando sen problemas. Cando estes non sexa así, procederase a reconducir a situación.
Prácticas de laboratorio	Durante todo o proceso de aprendizaxe e tamén en horario de titorías, atenderanse todas as dúbidas expostas en relación cos contidos prácticos da materia. O profesorado supervisará o traballo de laboratorio dos alumnos de cada grupo, corrixindo os erros detectados no desempeño das técnicas e atendendo todas as cuestións que poidan xurdir ao longo das sesións prácticas e da elaboración dos correspondentes informes.

Avaliación				
	Description	Qualification	Training and Learning Results	
Estudo de casos	Avaliaranse a redacción, presentación e defensa final dos casos resoltos.	25	A4 B1 B2 B6	C3 C11 C15 C17 D4

Prácticas de laboratorio	Avaliaranse a actitude e as capacidades e destrezas adquiridas polos alumnos durante as prácticas, así como a capacidade para redactar informes e/o dar respostas adecuadas e ben argumentadas a cuestionarios expostos en relación coas actividades realizadas durante estas sesión	30	A4	B1 B2 B6	C3 C11 C15	D3 D4
Exame de preguntas obxectivas	Mediante esta proba avaliaranse coñecementos e habilidades adquiridos polos alumnos ao longo das sesións teóricas e prácticas da materia.	35	A4	B6	C3 C11 C15	
Resolución de problemas e/ou exercicios	Nesta proba avaliarase a capacidade do alumnado para resolver, de forma argumentada, unha serie de casos/situacións de tipo práctico relacionadas ca diagnose e control de certas enfermidades infecciosas.	10	A4	B6	C3 C11 C15 C17	

Other comments on the Evaluation

1. A asistencia e participación en todas as actividades programadas dentro das Sesións Prácticas e do Estudo de casos prácticos é obrigatoria, de tal maneira que a ausencia ou non realización inxustificada destas actividades impedirá superar a materia. Polo tanto, o alumnado que desee acollerse a modalidade de avaliación global, deberá realizar tamén obligatoriamente estas dúas actividades.

2. Para aprobar a materia será necesario alcanzar unha cualificación global final de 5,0 (sobre 10), unha vez sumadas as cualificacións ponderadas obtidas nas de Prácticas (30%), Estudo de casos (25%), Exame de preguntas obxectivas (35%) e Resolución de problemas e/ou exercicios (10%). Con todo, para poder superar a materia, e poder sumar as cualificacións obtidas nas actividades de Prácticas e Estudo de casos, deberá alcanzarse unha nota mínima de 4,0 (sobre 10) tanto no exame de preguntas obxectivas como na resolución de problemas e/o exercicios. Os alumnos que non cumpran este requisito na primeira oportunidade serán cualificados en actas con 4,9 (Suspenso), e deberán repetir na segunda oportunidade (xullo) a proba relativa á parte ou partes nas que non alcanzasen o 4,0. Os alumnos que se atopen nesta situación conservarán a nota da/s parte/s superada/s (≥4,0) en primeira oportunidade e das Prácticas e Estudo de casos, para telas en conta na nota final. Na segunda oportunidade, será tamén imprescindible alcanzar o 4,0 en todas as partes obxecto de recuperación. As datas da proba final escrita pódense consultar na seguinte ligazón: http://bioloxia.uvigo.es/es/docencia/examenes.

Bibliografía. Fontes de información

Basic Bibliography

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L.S. García, **Diagnostic Medical Parasitology**, 6ª, ASM Press, 2016

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P.G. Engelkirk, Duben-Engelkirk, J., R.G. Fader, **Burton□s Microbiology for the Health Sciences**, 20ª, Lippincontt Jones and Bartlett Learning, 2020

P. M. Howley, D. M. Knipe, S. Whelan,, **Fields Virology Vol 1: Emerging Viruses**, 7ª, Wolters Kluwer Health, 2020

P. M. Howley, D. M. Knipe, B.A. Damania, J.I Cohen,, **Fields Virology Vol 2: DNA Viruses**, 7ª, Wolters Kluwer Health, 2021

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J. Mensa, A. Soriano, **Guía terapeútica Antimicrobiana**, Antares, 2024

P.R. Murray, K. S. Rosenthal, M.A. Pfaller,, **Medical Microbiology**, 10ª, Elsevier, 2025

K.J. Ryan, N. Ahmad, J.A. Alspa, W. L. Drewugh, M.Lagunoff, P. Pottinger, L.B. Reller, M.E. Reller, **Medical Microbiology**, 8ª, McGraw Hill, 2022

Recomendacións

Subjects that continue the syllabus

Análise e diagnóstico agroalimentario/V02G031V01409

Subjects that are recommended to be taken simultaneously

Análise e diagnóstico agroalimentario/V02G031V01409

Subjects that it is recommended to have taken before

Microbioloxía I/V02G031V01204
Inmunoloxía e parasitoloxía/V02G031V01305

IDENTIFYING DATA

Integrative cell biology and physiology: Implications for health

Subject	Integrative cell biology and physiology: Implications for health			
Code	V02G031V01407			
Study programme	Grado en Biología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	1st
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	Míguez Miramontes, Jesús Manuel			
Lecturers	Blanco Imperiali, Ayelén Melisa Megías Pacheco, Manuel Míguez Miramontes, Jesús Manuel Núñez González, Carmen			
E-mail	jmmiguez@uvigo.es			
Web				
General description	English Friendly subject: International students may request from the teachers: a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English. The objective of the course is to deepen in the cellular bases and physiological responses that allow the organism to maintain homeostasis in normal situations, as well as in the alterations that are triggered by changes in the environment and with certain pathologies. The course deals with the contents that complement the formation previously acquired on the cytological and physiological bases of living beings, as well as their integrative functioning.			

Training and Learning Results

Code	
A2	Students should know how to apply their knowledge to their work or vocation in a professional way. They also should have the competences that are usually proved through the elaboration and defence of arguments and the resolution of problems within their study field.
A3	Students should prove ability for information-gathering and interpret important data (usually within their study field) to judge relevant social, scientific or ethical topics.
B2	Manage scientific-technical information using diverse and reliable sources. Analyze data and documents and interpret them critically and rigorously, including considerations on their social relevance and in the professional field of Biology.
B3	Apply the knowledge acquired in the degree and use the scientific-technical instrumentation and CIT in contexts of Biology and/or related to the professional practice.
B4	Draft and write reports, documents and projects related to Biology. Proceed to their presentation and debate in the teaching and specialized areas, highlighting the competences of the degree.
C3	Perform and interpret molecular, physicochemical and biological analyses, including samples of human origin. Conduct assays and functional tests under normal and abnormal conditions.
C6	Understanding and integrate the functioning of living beings (cellular, tissue, organ and individual level), explaining their homeostatic and adaptive responses.
C10	Identify biological and biotechnological processes and their potential applications, in particular in health, agri-food and environmental fields.
C16	The ability to identify the genetic and molecular bases of disease, advise on genetic counselling and genomic studies. Understand the control of cellular activity and integrated physiological responses, analysing their repercussions on health.
C17	Understanding the social projection of biology applied to health at its different levels (analytical, pathological and public health) and its repercussions on professional practice.
D1	Understand the meaning and use of the gender perspective in the different fields of knowledge and in professional practice with the aim of achieving a fairer and more equal society.
D2	Communicate speaking and in writing in Galician.
D3	Commitment to sustainability and the environment. Equal, sensible and efficient use of resources.
D4	Collaborate and work in teams or multidisciplinary groups, promote negotiation skills and the ability to reach agreements.

Expected results from this subject

Expected results from this subject	Training and Learning Results

To understand the importance of cellular compartments in the function of tissues and organs.	A2 A3	B2 B3	C3 C6 C16	D2
To understand the influence of the environment on the control of cellular activity.	A2 A3	B2	C3 C6 C16 C17	D1 D4
To know the cellular basis of major diseases.	A2	B3 B4	C3 C6 C16	D2 D4
To identify the mechanisms of integration of the different physiological systems.	A3	B3 B4	C3 C6 C10 C16	D1 D4
To understand the physiological basis of adaptive responses.	A3	B2	C3 C6 C16	D3
To know the physiological basis of cognitive functions and behaviour.	A2 A3	B2	C6 C17	D1 D2 D4

Contents

Topic	
THEORETICAL CONTENTS SECTION 1. Cellular homeostasis. Alterations and consequences in health.	Topic 1. Cellular stress. Causes of cellular stress and cell responses to maintain homeostasis. Apoptosis and autophagy. Topic 2. Aging. Cellular basis of aging. Topic 3. Cancer and microenvironment. Characteristics and behavior of tumor cells, and the influence of the environment. Topic 4. Cell differentiation and tissue engraftment. Sources of stem cells. Types of stem cells. Cell differentiation. Extracellular matrices, properties. Decellularization. Applications: advantages and disadvantages.
SECTION 2. Physiological homeostasis. Functional alterations and causes of disease.	Topic 5. Homeostasis, health and disease. Determinants, predisposing and conditioning factors. Physical, chemical, and biological causes of the disease. Adaptations to extreme conditions. Topic 6. General adaptation syndrome and specific organic responses. Physiology of stress. Inflammation. Fever. Pain. Topic 7. Energy homeostasis. Components of energy balance. Regulation of intake. Fasting and obesity. Topic 8. Functional alterations of special relevance. Diabetes, Atherosclerosis. Hypo- and hypertension, cardiopathies, etc.
SECTION 3. Behavior and higher functions.	Tema 9. Rhythmic physiology and chronobiology. Molecular and physiological bases of circadian rhythms. Topic 10. Nervous bases of behavior. Encephalic mechanisms: limbic system and hypothalamus. Reward systems. States of consciousness: sleep.
PRACTICAL CONTENTS Practical sessions that will be carried out in the laboratory and in which contents that reinforce and/or complement those provided in the other activities will be addressed.	Some of the possible activities that would be developed in the practical sessions are the following: - Alterations in cell lines. - Cytological and tissue characteristics of tumor tissue. Metastasis. - Blood cell count and leukocyte formula. Hematic parameters. - Blood pressure. Electrocardiogram. - Circadian rhythm monitoring.
SEMINARS Classroom sessions in which the resolution of experimental problems and case studies will be approached through work in small groups.	A list of topics and/or case studies will be provided for the students of each group to choose one and proceed to its development in the seminar sessions. Students will develop the skills of searching and categorizing information, as well presentation, defense and debate.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	24	36	60
Seminars	12	48	60
Laboratory practical	12	12	24
Objective questions exam	1	0	1

Essay questions exam	2	0	2
Essay	1	1	2
Objective questions exam	1	0	1

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies

	Description
Lecturing	The main concepts related to the contents will be presented, supported with images and videos. Participation will be encouraged and the topics and concepts covered will be discussed in class, as far as possible. Class attendance is mandatory.
Seminars	Students will be divided into groups and these in turn will be divided into pairs of groups. Each pair will be assigned an experimental problem that they will have to solve independently throughout the course. There will be periodic meetings that will coincide with the dates of the seminars in the calendar to check the progress of each group. At the end of the course each pair will present and defend their proposal, which will then be discussed to look for weaknesses and strengths. Attendance to the seminars is compulsory.
Laboratory practical	In laboratory sessions, samples will be analyzed and experiments related to cellular and systemic homeostasis will be carried out, as well as the monitoring of parameters indicative of functional status. Attendance to the practicals is mandatory.

Personalized assistance

Methodologies	Description
Lecturing	Classes will be interactive and will allow establishing personalized reinforcement actions. Students will be able to request individualized tutorials for the resolution of doubts and problems related to the theoretical contents of the subject.
Seminars	The sessions will be interactive and will allow to establish follow-up and reinforcement actions. Students may request individualized tutorials for the resolution of doubts and problems related to the seminar sessions.
Laboratory practical	During the realization of the practices the teachers will give individualized attention to each student for the correct understanding of the experimental objectives and the methodologies or techniques used.

Assessment

	Description	Qualification	Training and Learning Results			
Objective questions exam	There will be 3 short tests (10-15 min) throughout the term, which will be given during class time. These tests are aimed at evaluating theoretical knowledge taught in class sessions.	10	A2	B4	C6 C10 C16	D1
Essay questions exam	It will take place in the final test. It will allow evaluating theoretical and general knowledge of the subject. It will include short development questions and practical cases.	40	A2	B3	C6 C16	D2
Essay	Aimed at evaluating knowledge related to the seminar sessions. They are works done in groups (2-3 students) and in pairs of groups. They will involve the development of a short report, an exposition and a defense of the work in front of the class. Three aspects will be taken into account in the evaluation: 1. Performance during the realization of the work (20%). 2. Presentation and defense of the final proposal (5%). 3. Ability to argue the strong points of one's own project and the weak points of the opponent (5%).	30	A2 A3	B2 B4	C6 C10 C16 C17	D1 D2 D3 D4
Objective questions exam	It is aimed at the evaluation of the practical contents. It will be carried out in the last practical session of Cell Biology (first part of the test, 7%) and Physiology (second part of the test, 13%).	20	A3	B3 B4	C3 C6 C10 C16	D3 D4

Other comments on the Evaluation

Minimum grades and second chance evaluation

In order to pass the course, students must complete all the proposed activities and achieve a minimum grade of 5 points out of 10 (5/10) in each evaluable activity (theoretical contents, seminars, laboratory practices). However, it will be possible to compensate the different activities if a minimum grade of 4/10 points is reached in each of them. In case of not reaching the

minimum grade in the section of theoretical contents (4/10), that will be the grade that will appear in the final qualification of the subject (the grades of practices and seminars will not be taken into account).

The justification of non-attendance to the practical sessions and seminars does not exempt the student from taking them in another group, as long as the calendar allows it.

Second opportunity and next course

The activities passed in the first opportunity of the course will be retained for the second opportunity. In the case of practices and seminars, their recovery in the second opportunity will entail the realization of an alternative evaluation test.

Students who repeat the subject in the following course will keep the grades obtained in the activities passed in the previous course, having to repeat those not passed. Optionally they can repeat those activities even if they pass them, in this case participating in a new evaluation process.

Global assessment

Students may request a global assessment, which will entail the waiver of continuous assessment. The global evaluation will allow obtaining 100% of the score of the subject by means of a test on the official date set for the final exam of the subject, both in the first opportunity and in the second one.

The exam may include: - Objective development questions; - Development questions; - Practical cases, etc.

The global evaluation does not exempt from the realization of practices and seminars of the subject. in the case of not realization of these activities, the final grade in the subject will be of 0 points.

Academic and examination shedules

The academic calendar can be consulted at: http://bioloxia.uvigo.es/es/docencia/horarios

The exams calendar can be consulted at: http://bioloxia.uvigo.es/es/docencia/examenes

Ethical aspects.

Plagiarism will be prosecuted in the work, as well as copying from other students during the evaluation tests, which may be grounds for a reduction of the grade and even a failure in the subject.

Sources of information

Basic Bibliography

Alberts, B., **Molecular Biology of the Cell**, 6, Garlan Science, Taylor and Francis group, 2015

Fulda S., Gorman A.M., Samali A., **Cellular stress responses: cell survival and cell death**, Article ID 214074, 23 pages, Int. J. Cell Biol., 2010

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Caciopo J.T., Tassinary L.G., Berntson G.G., **Handbook of phsychophysiology**, Cambridge Univ. Press, 2007

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Gluck M.A., Mercado E., Myers C.E., **Learning and memory. From brain to behavior**, McMillan Higher Education, 2014

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Yudofsky S.C., Hales R.E., **Essentials of neuropsychiatry and behavioral neurosciences**, Americans Psychiatry Publishing, 2010

Recommendations

Subjects that are recommended to be taken simultaneously

Clinical biochemistry and inmunology/V02G031V01405
Human genetics and molecular pathology/V02G031V01408

Subjects that it is recommended to have taken before

Biochemistry I/V02G031V01201
Biochemistry II/V02G031V01206
Animal and plant histology and cytology I/V02G031V01203
Animal and plant histology and cytology II/V02G031V01208
Genetics I/V02G031V01209
Animal physiology I/V02G031V01302
Animal physiology II/V02G031V01307
Genetics II/V02G031V01304

IDENTIFYING DATA

Human genetics and molecular pathology

Subject	Human genetics and molecular pathology			
Code	V02G031V01408			
Study programme	Grado en Biología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	1st
Teaching language	Spanish			
Department				
Coordinator	Valverde Pérez, Diana			
Lecturers	Fernández Silva, Iria Valverde Pérez, Diana			
E-mail	dianaval@uvigo.es			
Web				
General description	This matter will help us to recognise the organisation of the human genome, know and understand the biochemical and genetic changes that occur in different pathologies, study the methodologies used in the diagnostic, follow-up and investigation of illnesses. Matter of the program English Friendly: The/ace international students will be able to request to the teacher: a) material and bibliographic references for the follow-up of the matter in English, b) attend the tutorials in English, c) proofs and evaluations in English.			

Training and Learning Results

Code	
A1	Students should prove understanding and knowledge in this study field that starts in the Secundary Education and with a level that, even though it is suppported in advanced books, also includes some aspects that involve knowledge from the vanguard of the study field.
A2	Students should know how to apply their knowledge to their work or vocation in a professional way. They also should have the competences that are usually proved through the elaboration and defence of arguments and the resolution of problems within their study field.
B1	Developing autonomous learning by identifying their own training need and organizing and planning tasks and time.
B2	Manage scientific-technical information using diverse and reliable sources. Analyze data and documents and interpret them critically and rigorously, including considerations on their social relevance and in the professional field of Biology.
B6	Develop analysis and synthesis, critical reasoning and argumentation skills, applying them in Biology and other scientific-technical disciplines.
C3	Perform and interpret molecular, physicochemical and biological analyses, including samples of human origin. Conduct assays and functional tests under normal and abnormal conditions.
C5	Manipulate and analyse genetic material and determine its alterations and pathological implications. Knowing the applications of genetic engineering.
C11	Perform and interpret bioassays, identify chemical and biological agents, including pathogens, as well as their toxic products. Develop and apply biological control techniques.
C12	Writing reports and technical dossiers, as well as directing and executing projects on topics related to biology and its applications.
C16	The ability to identify the genetic and molecular bases of disease, advise on genetic counselling and genomic studies. Understand the control of cellular activity and integrated physiological responses, analysing their repercussions on health.
C17	Understanding the social projection of biology applied to health at its different levels (analytical, pathological and public health) and its repercussions on professional practice.
D5	Communicate effectively and appropriately, including the use of computer tools and English.

Expected results from this subject

Expected results from this subject	Training and Learning Results
Recognise the organisation of the human genome.	A1 A2 B1 B2 B6 C16
Know and understand the biochemical and genetic changes that occur in a wide rank of pathologies.	A1 A2 B1 B2 B6 C3 C16 D5

Present the methodologies for the diagnostic, follow-up, and investigation of the illnesses.	A1 A2	B1 B2 B6	C5 C12 C16 C17	D5
Purchase basic skills of laboratory for the diagnostic of illnesses.	A1 A2	B1 B2	C3 C5 C11	D5

Contents	
Topic	
□ The human genome.	Technical analysis of the structure and expression of genes and genomes. Structure of the human genome, genic regulation and epigenome Genetic Variation Genetic of populations and human evolution
□ Citogenética Human.	Chromosomes, cellular division, and human or Technical karyotype of analysis citogenético and clinical diagnostic chromosomal Alterations
□ Genetic base of the human illnesses.	Or Connecting phenotypes and genotypes or Mapping and identification of genes for monogenic diseases
□ Multifactorial Inheritance.	Or Identification of factors of risk and molecular base in complex illnesses or Models of illness of multifactorial inheritance
□ Genetics of the cancer.	Or Genetic and environmental factors of cancer or Oncogenes and suppressors genes or Epigenetics
□ Molecular pathology of human illnesses.	Or Metabolopathies or Monogenic diseases or polygenic Inheritance
□ Molecular diagnostic.	Or Technical used or Indications for the proofs or Postnatal, prenatal and preimplantation diagnostic or Genetic counselling and ethics

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	30	30	60
Practices through ICT	12	48	60
Case studies	3	6	9
Objective questions exam	1	5	6
Objective questions exam	1	5	6
Case studies	1	1	2
Report of practices, practicum and external practices	0	4	4
Presentation	1	0	1
Problem and/or exercise solving	1	1	2

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies

	Description
Lecturing	Exhibition by part of the professor of the foundations and basic principles. Like support to the theoretical explanations, will provide to the educational material students adapted through the platform Moovi of the Virtual Campus
Practices through ICT	To the students will request them the delivery of a report of practice and/or resolution of questions and/or exercises. Like support to practise them, will provide the students with the appropriate educational material through the platform Moovi of the Virtual Campus
Case studies	To the start of the course will deliver them to the students a case so that it develop his capacity to integrate information and resolve problems. To the start of the course will inform to the students of the procedure to be followed

Personalized assistance

Methodologies	**Description**
Case studies	They will offer tutorías personalised to guide the development of the cases posed

Assessment

	Description	Qualification	Training and Learning Results			
Objective questions exam	Subjects 1 to the 4. In the proofs will be evaluated the fundamental contents of the matter (masterclasses and practical) through objective questions (type test and short answer).	25	A1 A2	B1 B2 B6	C3 C16	D5
Objective questions exam	Subjects 5 to the 7. In the proofs will be evaluated the fundamental contents of the matter (masterclasses and practical) through objective questions (type test and short answer).	25	A1 A2	B1 B2 B6	C3 C16	D5
Case studies	The students will have to present the resolution of the case presented attending to the scale that will facilitate them to principle of course	20	A1 A2	B1 B2 B6	C5 C11 C12 C17	D5
Report of practices, practicum and external practices	The capacities and skills purchased during practise them will be evaluated of continuous form. The methodology of evaluation and weighting in the final note includes: 1- Implication of the student in the development of the practices. It will suppose 10% of the final qualification. 2- Delivery of reports of practices of laboratory. The reports will be made by each one of the subgroups of students organised in each group of practices. The half note obtained inform us will suppose 15% of the final note.	25	A1 A2	B1 B2 B6	C3 C11 C12	D5
Presentation	The students owe to present of oral way to resolution of the case chosen	5	A1 A2	B1 B2 B6	C11 C12 C16 C17	D5

Other comments on the Evaluation

Important

: Independently that the/the student/to choose CONTINUOUS Or GLOBAL EVALUATION the assistance to all the PRACTICES OF LABORATORY is COMPULSORY to APPROVE the matter (except the properly justified absences).

The detection of plagiarism in the activities that make will suppose a qualification of 0 in the activity affected.

Continuous evaluation: 1) Two partial proofs: each one will suppose 25% of the note. TO SURPASS The MATTER demands : the) a minimum of 4 points (on 10) in each proof and b) obtain a minimum half note of 5, calculated from the note obtained in the two partial. 2) Practical of laboratory: Implication of the student (10% of the final note) + practical reports (15% of the final note). 3) Seminar /study of cases: 20% of the final note+ presentation 5%. To surpass the matter to sum: half note of the partial + practical note + notices case has to be equal or upper to 5. The activities (partial proof, practical and cases) surpassed at the earliest opportunity of a course conserve for the second opportunity. In the second opportunity of a course can not recover practical and seminars, only can make the partial examinations no surpassed at the earliest opportunity. To the repeatly students conserve them the note of the practices and the seminars. Will have right to repeat the said activities as long as they renounce by writing to the qualification obtained previously (document signed and envoy to the coordinator/the). The renunciation has to be done before they begin the practices.

Global evaluation: The/the student/to that it choose global evaluation will have to surpass a final integral proof in which it will evaluate of the contents of the classrooms, practices of laboratory and studies of case. The proof will consist in questions type test, short questions and resolution of problems/marry clinical. To surpass the matter to note of the global proof will have to be equal or upper to 5. Of not to surpass the final proof, the qualification of the/to student/to ONLY will be the obtained in the final integral proof on 10 points. In the second opportunity of the course, the/to student/to suspense/to will have to be again evaluated of all the activities by means of a global proof. If it does not surpass the matter in any of the opportunities of the course. The/to student/to will not have to do the practices, but yes will be evaluated/to again of all the contents (classrooms, practical and seminars), already was by means of continuous or global evaluation. General information The academic calendar can be consult in the following link: http://bioloxia.uvigo.es/gl/docencia/horarios The calendar of examinations can be consult in the following link: http://bioloxia.uvigo.es/gl/docencia/exámenes

Sources of information

Basic Bibliography

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Dr. Álvaro González Hernández, **Principios de bioquímica clínica y patología molecular** /, 3, Elsevier, 2019

William B. Coleman, Gregory J. Tsongalis, **Molecular pathology: the molecular basis of human disease**, 2, Academic Press, 2018
Strachan T., Read A., **Human Molecular Genetics**, 5, Garland Science, 2018
Arsham M.S., Barch M.J., Lawce H.J, **The AGT Cytogenetics Laboratory Manual**, 4, Wiley-Blackwell, 2017

Complementary Bibliography

Recommendations

Subjects that are recommended to be taken simultaneously

Integrative cell biology and physiology: Implications for health/V02G031V01407
Clinical biochemistry and inmunology/V02G031V01405
Public health microbiology and parasitology/V02G031V01406

Subjects that it is recommended to have taken before

Biochemistry I/V02G031V01201
Biochemistry II/V02G031V01206
Genetics I/V02G031V01209
Genetics II/V02G031V01304
Technics in cellular and molecular biology/V02G031V01310

IDENTIFYING DATA

Análise e diagnóstico agroalimentario

Subject	Análise e diagnóstico agroalimentario			
Code	V02G031V01409			
Study programme	Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4	1c
Teaching language	Castelán Galego			
Department	Bioloxía funcional e ciencias da saúde Química analítica e alimentaria			
Coordinator	Iglesias Blanco, Raúl			
Lecturers	Gago Martínez, Ana González Abril, Ana Iglesias Blanco, Raúl Leao Martins, Jose Manuel Osorio Novas, Elisa			
E-mail	rib@uvigo.es			
Web				
General description	Materia eminentemente práctica deseñada para que o alumno adquira as competencias básicas no campo da detección, identificación e control de riscos alimentarios de orixe biolóxica. Tras unha breve introdución teórica na que se presentarán os aspectos fundamentais e importancia da seguridade alimentaria e trazabilidade, se realizarán unha serie de técnicas de referencia empregadas na análise de riscos microbiolóxicos, parasitológicos e químicos (de orixe biolóxica) presentes en alimentos. A formación non presencial estará orientada á interpretación dos resultados analíticos obtidos durante as sesións prácticas, á resolución de casos prácticos similares aos que se poden presentar nun laboratorio de análise agroalimentaria, e/ou á busca de información complementaria que permita ao alumno ter unha visión integral da disciplina. O horario da materia pode consultarse no seguinte enlace: http://bioloxia.uvigo.es/gl/docencia/horarios			

Resultados de Formación e Aprendizaxe

Code	
A2	Que os estudantes saiban aplicar os seus coñecementos ao seu traballo ou vocación dunha forma profesional e posúan as competencias que adoitan demostrarse por medio da elaboración e defensa de argumentos e a resolución de problemas dentro da súa área de estudo.
B1	Desenvolver a aprendizaxe autónoma, identificando as súas propias necesidades formativas e organizando e planificando as tarefas e o tempo.
B2	Xestionar información científico-técnica de calidade utilizando fontes diversas. Analizar datos e documentos e interpretalos de forma crítica e rigorosa, incluíndo reflexións sobre a súa relevancia social e no ámbito profesional da Bioloxía.
B6	Desenvolver as capacidades de análises e síntese, de razoamento crítico e argumentación, aplicándoas en contextos propios da Bioloxía e outras disciplinas científico-técnicas.
C9	Identificar recursos de orixe biolóxica e valorar a súa explotación eficiente e sostible para obter produtos de interese. Propoñer e implantar melloras nos sistemas produtivos.
C10	Identificar procesos biolóxicos e biotecnolóxicos e a súa posible aplicabilidade, en particular nos ámbitos sanitario, agroalimentario e ambiental.
C11	Realizar e interpretar bioensaios, identificar axentes químicos e biolóxicos, incluíndo os patógenos, así como os seus produtos tóxicos. Desenvolver e aplicar técnicas de control biolóxico
C18	Desenvolver e aplicar metodoloxías analíticas e de control de produtos agroalimentarios, a súa manipulación e conservación. Identificar a seguridade e calidade na cadea alimentaria e avaliar riscos para a saúde e o medio ambiente
C20	Comprender a proxección social da bioloxía aplicada á produción nos seus diferentes niveis de aplicación (analítico, produtivo e de xestión) e a súa repercusión no exercicio profesional
D4	Colaborar e traballar en equipo ou en grupos multidisciplinares, fomentar a capacidade de negociación e de alcanzar acordos.
D5	Comunicar de maneira eficaz e adecuada, incluíndo o uso de ferramentas dixitais e o inglés.

Resultados previstos na materia

Expected results from this subject	Training and Learning Results		
Recoñecer os principais perigos, defectos e/ou riscos alimentarios, a importancia dos sistemas de rastrexabilidade, e as principais políticas de xestión no ámbito da Seguridade e Calidade Alimentaria.	A2	C9 C11 C18	D4 D5

Recoñecer os principios básicos da Análise e Diagnóstico Agroalimentario e os principais tipos de mostras agroalimentarias.	A2	B1 B2	C9 C10 C11 C18	D4 D5
Aplicar as técnicas de mostraxe e principais métodos analíticos que se empregan nos laboratorios de Análises e Diagnóstico Agroalimentario, e interpretar correctamente os seus resultados de acordo aos parámetros de referencia establecidos na lexislación vixente.	A2	B6	C9 C10 C11 C18	D4 D5
Aplicar coñecementos e técnicas propios da Análise e Diagnóstico Agroalimentario para asegurar a inocuidade dos alimentos en todas as etapas da cadea alimentaria, e mellorar a xestión do medio ambiente no que se refire ao control de determinados perigos biolóxicos.	A2	B6	C9 C10 C11 C18	D4 D5
Aplicar coñecementos de Análises e Diagnóstico Agroalimentario para o asesoramento, supervisión e/ou peritaxe de situacións ou problemas relacionados con seguridade e calidade alimentaria.	A2	B1 B2	C11 C18 C20	D4 D5
Recoñecer a importancia social da Análise e Diagnóstico Agroalimentario e a súa repercusión no exercicio profesional do biólogo.			C20	

Contidos	
Topic	
Introdución á análise e diagnóstico agroalimentario	Seguridade alimentaria e trazabilidade Perigos/riscos e defectos alimentarios O sistema APPCC O Codex Alimentarius
Riscos alimentarios biolóxicos (I)	Microorganismos patóxenos transmitidos por alimentos Microorganismos que condicionan a calidade alimentaria Técnicas de detección e identificación Lexislación
Riscos alimentarios biolóxicos (II)	Parásitos zoonóticos transmitidos por alimentos Parásitos que condicionan a calidade alimentaria Técnicas de detección e identificación Lexislación
Riscos alimentarios químicos	Contaminantes inorgánicos Contaminantes orgánicos (naturais e antropoxénicos) Técnicas de detección Lexislación

Planificación			
	Class hours	Hours outside the classroom	Total hours
Lección maxistral	6	8	14
Prácticas de laboratorio	38	38	76
Estudo de casos	4	30	34
Exame de preguntas obxectivas	1	16	17
Exame de preguntas de desenvolvemento	1	8	9
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Metodoloxía docente	
	Description
Lección maxistral	Clases de 50 min nas que se introducirá o alumno no campo da seguridade alimentaria, presentando os conceptos básicos relacionados coa detección e control de perigos/riscos e defectos de orixe biolóxica en alimentos
Prácticas de laboratorio	Sesións de prácticas en laboratorio orientadas á aprendizaxe dunha serie de técnicas analíticas que permiten a detección e identificación de microorganismos, parasitos e substancias contaminantes de orixe biolóxica en diversas mostras alimentarias. Durante, ou ao final das sesións prácticas, os alumnos deberán resolver, mediante traballo autónomo, unha serie de cuestións formuladas polos profesores en relación ás técnicas analíticas empregadas e aos riscos alimentarios detectados. A resolución de cuestionarios e/ou realización de breves informes permitirá ao alumno completar a súa formación presencial e adquirir unha visión integral da disciplina
Estudo de casos	Os estudantes recibirán instrucións e unha serie de casos prácticos relacionados coa análise de alimentos, que deberán resolver traballando en pequenos grupos. As sesións dedicadas para esta actividade utilizaranse para supervisar a evolución do traballo realizado polos diferentes grupos, e se é o caso, reorientar ao alumnado (sesión de control intermedia; 1 h), así como para a presentación e defensa dos casos, unha vez resoltos (3 h).

Atención personalizada

Methodologies	Description
Estudo de casos	O profesorado orientará ao alumnado sobre as principáis tarefas a realizar na actividade de seminarios, e comprobará que o traballo en grupo vai na dirección axeitada e estase a realizar sen problemas. Cando isto non sexa así, procederase a reconducir a situación.
Prácticas de laboratorio	O profesorado supervisará o traballo de laboratorio dos alumnos de cada grupo, correxindo os errores detectados no desempeño das técnicas e atendendo todas as cuestións que poidan surdir ao longo das sesións prácticas.
Lección maxistral	O profesorado tentará facer as clases maxistráis participativas para que os alumnos poidan plantexar preguntas e, incluso, breves debates.

Avaliación

	Description	Qualification	Training and Learning Results
Prácticas de laboratorio	Avaliaranse a actitude e as capacidades e destrezas adquiridas polos alumnos durante as prácticas, así como a capacidade para redactar breves informes e/ou dar respostas axeitadas e ben argumentadas a cuestionarios formulados en relación coas actividades realizadas durante estas sesións.	40	A2 B1 B2 B6 C9 C10 C11 C18 C20 D4 D5
Estudo de casos	Avaliaranse os avances alcanzados ata a sesión de control intermedia no que se refire á resolución dos casos prácticos expostos, e a adecuación, presentación e defensa dos casos resoltos durante o seminario final.	20	A2 B1 B2 B6 C9 C10 C20 D4 D5
Exame de preguntas obxectivas	Este exame, que incluirá preguntas obxectivas (preguntas tipo test e preguntas de resposta curta), será parte dunha Proba final integradora, que supoñerá un 40% da nota final da materia. Na devandita proba avaliaranse os coñecementos adquiridos polos alumnos ao longo das sesións teóricas e prácticas da materia, e a capacidade para interpretar e argumentar correctamente unha análise de alimentos.	26.8	A2 B2 B6 C9 C10 C11 C18
Exame de preguntas de desenvolvemento	Este exame, que tamén formará parte da Proba final integradora que supoñerá o 40% da nota final da materia, avaliará a capacidade do alumnado para resolver diversos casos ou situacións prácticas relacionadas coa análise agroalimentaria de forma argumentada.	13.2	A2 B2 B6 C9 C10 C11 C18 D5

Other comments on the Evaluation

1. Dado que as actividades de formación e avaliación continua programadas dentro das **Prácticas de Laboratorio** e do **Estudo de casos** (incluída a sesión de control intermedio) están deseñadas para formar ao alumnado en habilidades e competencias directamente relacionadas co exercicio da profesión no campo da análise e diagnóstico agroalimentario, **a asistencia e participación do alumnado en ambas as actividades avaliables é obrigatoria, de tal maneira que a ausencia ou non realización inxustificada destas actividades impedirá superar a materia**. Por tanto, considerando a natureza práctica e os resultados de formación e aprendizaxe que se perseguen alcanzar con ambas as metodoloxías, o alumnado que opte pola modalidade de **avaliación global** tamén deberá realizar obrigatoriamente estas actividades.

2. **Para aprobar a materia será necesario alcanzar unha cualificación global final de 5,0 (sobre 10)**, unha vez sumadas as cualificacións ponderadas obtidas nas de Prácticas (40%), Estudo de casos (20%) e Proba final integradora (40%). Con todo, **para poder superar a materia, e poder sumar as cualificacións obtidas nas actividades de Prácticas e Estudo de casos, deberá alcanzarse unha nota mínima de 4,0 (sobre 10) en cada unha das partes (Química Analítica, Microbiología e Parasitología) que integrarán a Proba final**. Os alumnos que non cumpran este requisito na primeira oportunidade serán cualificados na acta coa nota máis alta alcanzada nas partes suspensas, e deberán repetir na **segunda oportunidade (xullo)** a proba relativa á parte ou partes nas que non alcanzasen o 4,0. Loxicamente, os alumnos que se atopen nesta situación conservarán a nota da/s parte/s superada/s (≥4,0) en primeira oportunidade e das Prácticas e Estudo de casos, para telas en conta na nota final. Na segunda oportunidade, será tamén imprescindible alcanzar o 4,0 en todas as partes obxecto de recuperación.

As datas da proba final integradora pódense consultar na seguinte ligazón:http://bioloxia.uvigo.es/es/docencia/examenes.

Bibliografía. Fontes de información

Basic Bibliography

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Labbé, R.G., García, S., **Guide to Foodborne Pathogens**, 2nd ed., Willey, 2013

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Complementary Bibliography

Matthews, K.R. ,Kniel, K.E. Montville, T,, **Food Microbiology: an introduction**, 4th ed., ASM Press, 2019

Lawley, R., Curtis, L., Davies, J, **The food safety hazard guidebook**, 2nd Ed., RSC Publishing, 2012
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International Commision on Microbiological Specifications of Foods (ICMSF)., **Microorganisms in Food 1-8**, 1996
U.S. Food and Drug Administration, **FDA's Bacteriological Analytical Manual (BAM)**,
Ortega, Y.R., **Foodborne parasites**, Springer, 2009
Agencia Española de Seguridad Alimentaria y Nutrición (AECOSAN), **https://www.aesan.gob.es/AECOSAN/web/home/aecosan_inicio.htm**,
European Food Safety Authority (EFSA), **https://www.efsa.europa.eu/en**,
CODEX ALIMENTARIUS (International Food Standards), **http://www.fao.org/fao-who-codexalimentarius/es/**,
Gajadhar, A., **Foodborne parasites in the food supply web: Occurence and control**, 1st Ed., Woodhead Publishing, 2015
Ryan, K.J., N. Ahmad, J.A. Alspaugh, et al., **Sherris & Ryan□s Medical Microbiology**, 8th Ed., Mc Graw Hill, 2022
Hernández Urzúa, M.A., **Microbiología de los alimentos Fundamentos y aplicaciones en Ciencias de la Salud**, Panamericana, 2023

Recomendacións

Subjects that are recommended to be taken simultaneously

Análise e diagnóstico clínico/V02G030V01903
Análise e diagnóstico medioambiental/V02G030V01902

IDENTIFYING DATA

Biotecnoloxía aplicada á produción animal

Subject	Biotecnoloxía aplicada á produción animal			
Code	V02G031V01410			
Study programme	Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4	1c
Teaching language	#EnglishFriendly Castelán Galego			
Department	Bioloxía funcional e ciencias da saúde Bioquímica, xenética e inmunoloxía			
Coordinator	Velasco Rubial, Cristina			
Lecturers	Blanco Imperiali, Ayelén Melisa García Estévez, José Manuel Iglesias Blanco, Raúl Osorio Novas, Elisa Rolán Álvarez, Emilio Velasco Rubial, Cristina			
E-mail	cvrubial@uvigo.es			
Web				
General description	A materia Biotecnoloxía Aplicada á Produción Animal aborda as características básicas da devandita rama da ciencia, que se ocupa do estudo de como obter máximo rendemento, administrando os recursos adecuadamente baixo criterios de sustentabilidade para o mellor aproveitamento dos animais domésticos e silvestres que son útiles ao home para producir alimentos ou derivados (carne, ovos, leite, pel, etc) ou para cubrir outras necesidades (animais de experimentación, anticorpos, etc). Adicionalmente se abordan os aspectos biotecnolóxicos da mesma. O calendario académico se pode consultar en: http://bioloxia.uvigo.es/gl/docencia/horarios			

Resultados de Formación e Aprendizaxe

Code	
A2	Que os estudantes saiban aplicar os seus coñecementos ao seu traballo ou vocación dunha forma profesional e posúan as competencias que adoitan demostrarse por medio da elaboración e defensa de argumentos e a resolución de problemas dentro da súa área de estudo.
A3	Que os estudantes teñan a capacidade de reunir e interpretar datos relevantes (normalmente dentro da súa área de estudo) para emitir xuízos que inclúan unha reflexión sobre temas relevantes de índole social, científica ou ética.
B2	Xestionar información científico-técnica de calidade utilizando fontes diversas. Analizar datos e documentos e interpretalos de forma crítica e rigorosa, incluíndo reflexións sobre a súa relevancia social e no ámbito profesional da Bioloxía.
B3	Aplicar o coñecemento adquirido na titulación e empregar a instrumentación científico-técnica e as TIC en contextos propios da Bioloxía e/ou no exercicio da profesión.
B4	Elaborar e redactar informes, documentos e proxectos relacionados coa Bioloxía. Proceder á súa presentación e debate no ámbito docente e especializado, poñendo de manifesto as competencias da titulación
B7	Perseguir obxectivos de calidade no desenvolvemento da súa actividade e incorporar á súa conduta os principios éticos que deben rexer no exercicio profesional da Bioloxía.
C9	Identificar recursos de orixe biolóxica e valorar a súa explotación eficiente e sostible para obter produtos de interese. Propoñer e implantar melloras nos sistemas produtivos.
C10	Identificar procesos biolóxicos e biotecnolóxicos e a súa posible aplicabilidade, en particular nos ámbitos sanitario, agroalimentario e ambiental.
C12	Redactar informes e memorias técnicas, así como dirixir e executar proxectos en temas relacionados coa bioloxía e as súas aplicacións
C19	Xestionar procesos de produción animal, vexetal e microbiana, implementar ferramentas biolóxicas que melloren a eficiencia produtiva e identificar novos ámbitos de aplicación e oportunidades profesionais
C20	Comprender a proxección social da bioloxía aplicada á produción nos seus diferentes niveis de aplicación (analítico, produtivo e de xestión) e a súa repercusión no exercicio profesional
D2	Comunicarse por oral e por escrito en lingua galega.
D3	Comprometerse coa sustentabilidade e medio ambiente. Uso de forma equitativa, responsable e eficiente dos recursos.
D4	Colaborar e traballar en equipo ou en grupos multidisciplinares, fomentar a capacidade de negociación e de alcanzar acordos.

Resultados previstos na materia

Expected results from this subject	Training and Learning Results			
Identificar os sistemas de produción animal.	A2 A3	B2 B3 B4 B7	C9 C10 C12 C19 C20	D2 D3 D4
Coñecer as bases fisiolóxicas da produción animal.	A2 A3	B2 B3 B4 B7	C9 C10 C12 C19 C20	D2 D3 D4
Aplicar coñecementos biotecnolóxicos na reprodución e o benestar animal.	A2 A3	B2 B3 B4 B7	C9 C10 C12 C19 C20	D2 D3 D4
Coñecer as bases da alimentación e nutrición animal e a biotecnoloxía asociada.	A2 A3	B2 B3 B4 B7	C9 C10 C12 C19 C20	D2 D3 D4
Describir as condicións sanitarias e hixiénicas na produción animal.	A2 A3	B2 B3 B4 B7	C9 C10 C12 C19 C20	D2 D3 D4
Coñecer a lexislación e normativas da produción animal.	A2 A3	B2 B3 B4 B7	C9 C10 C12 C19 C20	D2 D3 D4
Comprender as técnicas de mellora en produción animal.	A2 A3	B2 B3 B4 B7	C9 C10 C12 C19 C20	D2 D3 D4

Contidos

Topic	
Capitulo I: Bases fisiolóxicas da produción animal (Profesora Velasco)	Tema 1. Sistemas produtivos Tema 2. Reprodución e crecemento Tema 3. Benestar animal
Capítulo II: Alimentación e nutrición animal (Profesora Velasco)	Tema 4. Alimentación animal Tema 5. Nutrición animal Tema 6. Formulación e procesamento de dietas
Capítulo III: Sanidade e hixiene (Profesor García)	Tema 7. Control de hixiene e sanidade da produción primaria gandeira Tema 8. Control da hixiene e sanidade da produción acuícola
Capítulo IV: Lexislación (Profesor García)	Tema 9. Lexislación en materia de produción animal
Capítulo V: Mellora animal (Profesor Rolán)	Tema 10. Base xenética dos caracteres cuantitativos Tema 11. Heredabilidade e a súa utilidade en producción animal Tema 12. Mellora por selección artificial Tema 13. Outras estratexias de mellora

Planificación

	Class hours	Hours outside the classroom	Total hours
Lección maxistral	11	28	39
Resolución de problemas	5	15	20
Seminario	3	24	27
Prácticas de laboratorio	16	8	24
Seminario	2	0	2
Lección maxistral	11	27	38

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Metodoloxía docente

	Description
Lección maxistral	Capítulos I e II (Fisioloxía) Realizaranse na aula correspondente, co total dos alumnos matriculados presentes. Nelas comentaranse, coa axuda de presentacións en power point, os fundamentos teóricos da materia. Os materiais docentes estarán a disposición dos alumnos na Plataforma de teledocencia.
Resolución de problemas	Realizaranse na aula correspondente, co total dos alumnos matriculados presentes. Nelas resolveranse problemas e casos prácticos.
Seminario	Elaboración e exposición por grupos de alumnos de temas integrativos sobre a produción de especies concretas: - Proporanse temas para que os preparen os alumnos organizados en grupos de 2-3 (dependendo do número de alumnos matriculados). Os temas que se propoñan abarcarán o máximo número de grupos de animais posibles incluíndo gandaría, produción de aves, acuicultura e produción doutras especies de interese. - Na primeira reunión con cada grupo tipo B realizarase a planificación da elaboración dos distintos temas. Na segunda reunión tipo B farase un seguimento da preparación dos temas. - Antes das datas de exposición cada grupo de alumnos deberá entregar unha memoria escrita do traballo realizado. - Nas tres últimas sesións de grupo A exporanse os temas por parte dos alumnos para a continuación debater sobre os mesmos.
Prácticas de laboratorio	A asistencia ás prácticas é obrigatoria para superar a materia. Os alumnos realizarán 16h de prácticas, das cales: - 8h corresponden a fisioloxía (avaliación de índices de crecemento e parámetros de composición nun modelo de produción a pequena escala). - 4h corresponden a sanidade e hixiene (diagnóstico). - 4h corresponden a mellora animal (simulación por computador dun proceso de selección artificial).
Seminario	Dedicaranse á planificación e seguimento dos temas elaborados polos distintos grupos de alumnos.
Lección maxistral	Capitulos III, IV e V (Sanidade e Mellora) Realizaranse na aula correspondente, co total dos alumnos matriculados presentes. Nelas comentaranse, coa axuda de presentacións en power point, os fundamentos teóricos da materia. Os materiais docentes estarán a disposición dos alumnos na Plataforma de teledocencia.

Atención personalizada

Methodologies	Description
Lección maxistral	Serán interactivas e permitirán establecer accións personalizadas de reforzo. Contémplase tamén a resolución de dúbidas e problemas a través do correo electrónico e o sistema de aula virtual de cada profesor.
Prácticas de laboratorio	Durante a realización das prácticas de laboratorio os profesores darán atención individualizada a cada alumno para a correcta comprensión dos obxectivos experimentais e da metodoloxía ou técnica utilizada. Unha vez rematada a tarefa, cada alumno ou grupo de alumnos verá supervisado o seu traballo polo profesor. Contémplase tamén a resolución de dúbidas e problemas a través do correo electrónico e o sistema de aula virtual de cada profesor.
Seminario	Serán interactivas e permitirán establecer accións personalizadas de reforzo. Contémplase tamén a resolución de dúbidas e problemas a través do correo electrónico e o sistema de aula virtual de cada profesor.
Resolución de problemas	Serán interactivas e permitirán establecer accións personalizadas de reforzo Contémplase tamén a resolución de dúbidas e problemas a través do correo electrónico e o sistema de aula virtual de cada profesor.
Lección maxistral	Serán interactivas e permitirán establecer accións personalizadas de reforzo. Contémplase tamén a resolución de dúbidas e problemas a través do correo electrónico e o sistema de aula virtual de cada profesor.

Avaliación

	Description	Qualification	Training and Learning Results
Lección maxistral	Exame de preguntas obxectivas e peguntas de desenvolvemento sobre os contidos do bloque de Fisioloxía. Para superar a materia esíxese un mínimo de 3 puntos (sobre 10) no exame.	30	A3 B3 C10 D2 C19 D3 C20

Seminario	Valorarase: -Calidade da memoria escrita presentada (organización, redacción, adecuación da bibliografía, enfoque e profundidade axietados ó tema). -Calidade da presentación oral (adecuación ó tempo, calidade da información presentada nas figuras, expresión oral, capacidade de transmisión de información, dominino da linguaxe técnica). -Respostas ás preguntas expostas.	30	A2 A3	B2 B7	C10 C19 C20	D2 D3 D4
Prácticas de laboratorio	A asistencia a prácticas é obrigatoria. Cada un do tres módulos de prácticas (fisioloxía, sanidade e mellora) avaliaranse por separado por asistencia, informe de prácticas (fisioloxía) ou preguntas (mellora e sanidade). O 50% da nota corresponde ao módulo de Fisioloxía animal. Os módulos de mellora e sanidade representan o 25% cada un.	10	A2 A3	B4	C10	D2 D3
Lección maxistral	Exame de preguntas obxectivas e peguntas de desenvolvemento sobre os contidos do bloque de sanidade e reolución de problema no bloque de mellora. Para superar a materia esíxese un mínimo de 3 puntos (sobre 10) no exame.	30	A3	B3	C10 C19 C20	D2 D3

Other comments on the Evaluation

1) Avaliación contínua

É obrigatorio realizar as prácticas da materia. A non realización das mesmas suporá un suspenso na calificación global ainda

que se superen o resto de actividades previstas.
Para superar a materia deberá realizar obrigatoriamente todas as actividades propostas.
Para poder superar a materia esíxese unha cualificación mínima en cada un dos exames de 3.

As actividades superadas na primeira oportunidade dun curso se conservan para a segunda oportunidade. Na segunda

oportunidade dun curso non se poden recuperar prácticas e seminarios, só se pode repetir o exame.

Aos alumnos repetidores conservaraselles dun curso para o seguinte as calificacións das actividades (prácticas e seminario) superadas no(s) curso(s) anterior(es). Se repetirán só as actividades suspensas. Non se pode repetir as actividades xa superadas.

2) Avaliación global

No prazo establecido polo decanato de Bioloxía os alumnos interesados o solicitarán. Non se aceptarán solicitudes fora de prazo.

É obrigatorio realizar as prácticas da materia. A non realización das mesmas suporá un suspenso na calificación global ainda que se superen o resto de actividades previstas.

Para superar a materia deberá realizar obrigatoriamente o seminario.

Na data de avaliación da primera ou segunda oportunidade fará un exame cun valor do 60% que incluirá todos os bloquesda materia.

O calendario académico pódese consultar no seguinte enlace: http://bioloxia.uvigo.es/gl/docencia/horarios

O calendario de exames pódese consultar no seguinte enlace: http://bioloxia.uvigo.es/gl/docencia/exames

Bibliografía. Fontes de información

Basic Bibliography

Caravaca, F.P., **Bases de la producción animal.**, Universidad de Sevilla, 2003

Damron, W.S, **Introduction to animal science**, Pearson, 2012

Wadsworth, J., **Análisis de los sistemas de producción animal**, FAO,

Caballero Rúa, Armando, **Genética cuantitativa**, Sintesis, 2017

Complementary Bibliography

Broom, D.M., **Farm animal behaviour and welfare**, CABI, 2006

Buxadé, C, **Zootecnia: bases de producción animal, vol I**, Mundi-Prensa,

Buxadé, C., **Zootecnia: bases de producción animal, vol II (reproducción y alimentación).**, Mundi-Prensa,

Cervera, C, **Bases biológicas de la producción animal: alimentación animal**, Editorial UPV,

Dryden, G, **Animal nutrition science**, CABI, 2008

Falconer, D.S., **Introducción a la genética cuantitativa**, Acribia, 2001

Fontdevila, A, **Introducción a la genética de poblaciones.**, Síntesis, 1999
Fraser, D, **Understanding animal welfare**, Blackwell science, 2008
Griffiths, A.J.F., **Genética moderna**, McGraw-Hill, Interamericana, 2000
Herranz,A., **Bienestar animal**, Ministerio de agricultura, 2003
Sainsbury, D., **Animal health: health, disease and welfare of farm livestock**, Cornell University, 1983
Sotillo, J.L, **Producción animal e higiene veterinaria**, Universidad de Murcia, 2000

Recomendacións

Subjects that it is recommended to have taken before

Fisioloxía animal I/V02G031V01302
Fisioloxía animal II/V02G031V01307
Xenética II/V02G031V01304
Inmunoloxía e parasitoloxía/V02G031V01305
Microbioloxía II/V02G031V01309

Other comments

Para o correcto seguimento da materia o alumno deberá inscribirse ao principio de curso na plataforma de teledocencia. Na inscrición, é importante que inclúa a dirección de correo-e que utiliza habitualmente, para poder recibir información do seu profesorado de forma persoalizada.

IDENTIFYING DATA

Biotechnology applied to plant production

Subject	Biotechnology applied to plant production			
Code	V02G031V01411			
Study programme	Grado en Biología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	1st
Teaching language	#EnglishFriendly			
Department				
Coordinator	Barreal Modroño, M. Esther			
Lecturers	Barreal Modroño, M. Esther Bott Vázquez, Sarah Galindo Dasilva, Juan Gallego Veigas, Pedro Pablo			
E-mail	edesther@uvigo.es			
Web	http://bioloxia.uvigo.es/es/			
General description	The subject will provide the student with skills in four areas: plant production systems and good practices, plant breeding and reproduction techniques (plant biotechnology), plant safety and health, legislation and regulations. The subject includes master classes, seminars, case studies in cooperative learning, and practical laboratory classes. English Friendly subject: International students may request from the teachers: a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English. http://bioloxia.uvigo.es/gl/docencia/horarios			

Training and Learning Results

Code	
A4	Students should able to communicate information, ideas, issues and solutions to all audiences (specialist and unskilled audience).
A5	Students should develop the necessary learning skills to undertake further studies with a high degree of autonomy.
B4	Draft and write reports, documents and projects related to Biology. Proceed to their presentation and debate in the teaching and specialized areas, highlighting the competences of the degree.
B5	Develop capacities for creativity, innovation and entrepreneurship, in academic and social relevant fields as well as in interaction with the productive sector.
B7	To aim for quality objectives in the development of the activity done and incorporate ethical principles, which should prevail in the professional practice of Biology.
C4	Isolate, identify and growth microorganisms, cells, tissues and organs, making easier their study and the assessment of their metabolic activity.
C9	Identify resources of biological origin and assess their efficient and sustainable use in order to obtain products of interest. Propose and implement improvements in production systems.
C10	Identify biological and biotechnological processes and their potential applications, in particular in health, agri-food and environmental fields.
C11	Perform and interpret bioassays, identify chemical and biological agents, including pathogens, as well as their toxic products. Develop and apply biological control techniques.
C12	Writing reports and technical dossiers, as well as directing and executing projects on topics related to biology and its applications.
C19	The ability to manage animal, plant and microbial production processes, implement biological tools that improve production efficiency and identify new areas of application and professional opportunities.
C20	Understanding the social projection of biology applied to production at its different levels of application (analytical, production and management) and its repercussions on professional practice.
D3	Commitment to sustainability and the environment. Equal, sensible and efficient use of resources.
D4	Collaborate and work in teams or multidisciplinary groups, promote negotiation skills and the ability to reach agreements.
D5	Communicate effectively and appropriately, including the use of computer tools and English.

Expected results from this subject

Expected results from this subject	Training and Learning Results			
To identify the main plant production systems.	A5	B4	C9 C10 C20	D3
To understand the basics of plant production from a biological and sustainable perspective.	A5	B7	C9 C20	D3

To understand plant breeding techniques and asexual reproduction.	A5	B4	C4 C9 C10	D5
To understand the genetic and biotechnological tools of plant breeding.	A5		C9 C10 C19	D5
Handling the scientific-technical instrumentation related to plant breeding in the laboratory.	A5	B7	C4 C11 C19	D4
Applying knowledge and technologies related to plant production in aspects of production, exploitation, analysis and diagnosis of plant biological processes and resources.	A4 A5	B4 B7	C12	D3 D4 D5
Applying knowledge related to plant production to advise, supervise and provide expertise on scientific-technical, ethical, legal and socio-economic aspects related to living beings and the environment.	A4	B4 B5 B7	C11 C12 C19 C20	D3 D4 D5
To obtain information, develop experiments and interpret results using the scientific method.	A5	B7	C11 C12 C19	D4 D5
To understand the social projection of plant production and its repercussions on professional practice.	A4 A5	B4 B5 B7	C12 C19 C20	D3 D4 D5

Contents	
Topic	
Block 1: Production systems (Plant Physiology Area).	Topic 1. Basis of Plant Production.
Block 1: Production systems (Plant Physiology Area).	Topic 2. Plant Production Techniques
Block 2: Plant Breeding (Genetic Area)	Topic 3. Fundamentals of Plant Breeding
Block 2: Plant Breeding (Genetic Area)	Topic 4. Fundamentals of Genomic Selection
Block 3: Plant Biotechnology (Plant Physiology Area)	Topic 5. Introduction to Plant Biotechnology
Block 3: Plant Biotechnology (Plant Physiology Area)	Topic 6. Genetic transformation of plants
Block 4: Plant health and legislation.(Plant Physiology Area)	Topic 7. Plant Health
Block 4: Plant health and legislation. (Plant Physiology Area)	Topic 8. Intellectual property and standards.
Practice	1. Water stress and plant production 2. Introduction to adventitious morphogenesis 3. Poor plant nutrition and its impact on yield

Planning			
	Class hours	Hours outside the classroom	Total hours
Introductory activities	1	0	1
Lecturing	23	45	68
Problem solving	6	6	12
Seminars	6	6	12
Laboratory practical	12	24	36
Objective questions exam	2	7	9
Report of practices, practicum and external practices	0	4	4
Case studies	0	8	8
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Introductory activities	A class will be dedicated to the presentation of the subject and the teaching guide, with an explanation of the evaluation procedure and indication of the deadlines for the work.
Lecturing	The master sessions are 50-minute lessons, to explain and develop the contents of Plant production. They must be completed with autonomous work of the student consulting books of text and further reading, mainly scientific articles.
Problem solving	Cooperative learning is formulated based on problems and cases.

Seminars	Seminar methodology is formulated with collaborative work and presentation of teamwork for the agricultural systems section.
Laboratory practical	These are mandatory laboratory practices consisting of familiarization of students with basic plant culture techniques and plant biotechnology.

Personalized assistance

Methodologies	Description
Lecturing	Throughout the term, teachers will be available in person at their offices during tutoring hours. It is recommended to make an appointment by mail to avoid crowds, you wait and/or the teacher has a busy schedule that day.
Problem solving	Consultations can be made by e-mail or through the MOOVI platform, in addition to being able to use face-to-face tutorials
Seminars	Tasks will be carried out to solve problems and exercises that will be dealt with in the same seminar.
Laboratory practical	The laboratory sessions will include a temporary space to perform tasks that will serve as training for the realization of the practice report.

Assessment

	Description	Qualification	Training and Learning Results			
Objective questions exam	The final exam will consist of objective questions related to the learning achieved.	30	A5	B4	C4 C19 C20	D3
Report of practices, practicum and external practices	Presentation of a final report in which the methodology, materials, data obtained, statistical analysis, graphic representation and discussion of the results obtained will be presented, including all the literature consulted.	40	A4 A5	B4 B7	C4 C10 C11 C12 C19 C20	D4 D5
Case studies	The evaluation of the seminars will be done through collaborative work (plant physiology) and problem solving of individual form (Genetics) together with the delivery of a small report or an objective test.	30	A4 A5	B5	C9 C11 C19	D3

Other comments on the Evaluation

Given that the training and continuous evaluation activities programmed within the Laboratory Practices and Seminars are designed to train students in skills and competences directly related to the exercise of the profession in the field of biotechnology applied to plant production, the **attendance and participation of students in both evaluable activities is mandatory**, in such a way that the absence or unjustified non-performance of these activities will prevent passing the subject. Therefore, considering the practical nature and the results of training and learning that are sought to achieve with both methodologies, students who opt for the global evaluation mode must also perform these activities.

It will be **essential to obtain in each of the parts**, at least **40% of the total evaluation,** to compensate.

Students who do not meet this requirement at the first opportunity will be graded on the transcript with the highest grade achieved in the failed parts, and must repeat at the second opportunity (July) the test related to the part or parts in which they have not reached the 4.0. Logically, students who find themselves in this situation will keep the grade of the part/s passed (≥4.0) in the first opportunity and of the Practicals and Seminars, to take them into account in the final grade. In the second opportunity, it will also be essential to reach 4.0 in all the parts subject to recovery. The reports of practices and seminars that must be passed in the **second call** will be done **individually**. In the case of internships, once passed, the grade will be kept for the following year.

Ethical aspects, plagiarism will be prosecuted in the works, as well as copying from other students during the evaluation tests, which may be cause for a reduction of the grade and even a failure in the subject. This fraudulent conduct will be sanctioned with the firmness and rigor established by current regulations and may result in the suspension of the course for an entire academic year.

The dates of the exams are indicated in the following link:

http://bioloxia.uvigo.es/es/docencia/examenes

Sources of information

Basic Bibliography

Ricroch, A., Chopra, S., Kuntz M., **Plant Biotechnology Experience and Future Prospects**, 2ª, Springer, 2021
Caballero, A., **Genética Cuantitativa**, 1ª, Editorial Síntesis, 2017
Altman A., Hasegawa P.M., **Plant Biotechnology and Agriculture**, 1ª, Academic Press, 2012

Complementary Bibliography

Parker, R, **La Ciencia de las Plantas**, 1ª, Editorial Paraninfo, 2000
Cubero, JL, **Introducción a la mejora genética vegetal**, 2ª, Ediciones Mundi Prensa, 2002
Ferreira, JJ; Ordás, A y Pérez M, **La genética de los caracteres cuantitativos en la mejora vegetal del siglo XXI**, 1ª, Sociedad Española de Genética y Sociedad Española, 2012
Varshney, RK y Tuberosa, R, **Genomics-Assisted Crop Improvement. Springer**, 1ª, Springer, 2007-2010
David P. Clarck y Nanette J. Pazdernik, **Biotechnology**, 2ª, Elsevier, 2016
Anis M. y Ahmad N., **Plant tissue culture: propagation, conservation and crop improvement**, 1ª, Springer, 2016

Recommendations

Subjects that continue the syllabus

Drafting and execution of projects/V02G030V01801
Final Year Dissertation/V02G030V01991

Subjects that are recommended to be taken simultaneously

Quality management and control/V02G030V01911
Agri-food analysis and diagnostic/V02G031V01409
Biotechnology applied to microbiological production/V02G031V01412

IDENTIFYING DATA

Biotechnology applied to microbiological production

Subject	Biotechnology applied to microbiological production			
Code	V02G031V01412			
Study programme	Grado en Biología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	1st
Teaching language	Others			
Department				
Coordinator	Sieiro Vázquez, Carmen			
Lecturers	Sieiro Vázquez, Carmen			
E-mail	mcsieiro@uvigo.es			
Web				
General description	Microbial biotechnology studies microorganisms, and the processes they carry out on a large scale, with the aim of producing products of applied and commercial interest in the health, agri-food and environmental fields. The subject covers the different knowledge, fundamental and applied, related to industrial production processes, as well as the search, selection and improvement of the microbial strains involved. The most relevant products currently being produced by micro-organisms and future prospects for new applications are examined. The schedule of the subject can be consulted at the following link: http://bioloxia.uvigo.es/es/docencia/horarios English Friendly subject: International students may request from the teachers: a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.			

Training and Learning Results

Code	
A5	Students should develop the necessary learning skills to undertake further studies with a high degree of autonomy.
B1	Developing autonomous learning by identifying their own training need and organizing and planning tasks and time.
B2	Manage scientific-technical information using diverse and reliable sources. Analyze data and documents and interpret them critically and rigorously, including considerations on their social relevance and in the professional field of Biology.
B4	Draft and write reports, documents and projects related to Biology. Proceed to their presentation and debate in the teaching and specialized areas, highlighting the competences of the degree.
C4	Isolate, identify and growth microorganisms, cells, tissues and organs, making easier their study and the assessment of their metabolic activity.
C5	Manipulate and analyse genetic material and determine its alterations and pathological implications. Knowing the applications of genetic engineering.
C9	Identify resources of biological origin and assess their efficient and sustainable use in order to obtain products of interest. Propose and implement improvements in production systems.
C10	Identify biological and biotechnological processes and their potential applications, in particular in health, agri-food and environmental fields.
C19	The ability to manage animal, plant and microbial production processes, implement biological tools that improve production efficiency and identify new areas of application and professional opportunities.
C20	Understanding the social projection of biology applied to production at its different levels of application (analytical, production and management) and its repercussions on professional practice.
D4	Collaborate and work in teams or multidisciplinary groups, promote negotiation skills and the ability to reach agreements.

Expected results from this subject

Expected results from this subject		Training and Learning Results
To identify microbial products of applied importance and demonstrate scientific criteria to find the most appropriate microorganisms for their production, according to their metabolic diversity.	A5	C4 C9
To apply the knowledge acquired to deal with the selection and improvement of microorganisms of biotechnological interest.	A5	C4 C5 C9
To differentiate the different types of industrial fermentations, identify the most important technological aspects for their implementation and recognize the role of environmental factors in the development of fermentation.	A5	C9 C10 C19

To apply in an integrated manner the knowledge acquired to design, optimize and control of profitable and sustainable fermentation processes, as well as the design of product purification processes.	A5	C10 C19 C20	
Knowing the legislation and regulations related to microbial production.		B2	
To compile and handle information and/or data related to the different aspects of microbial production and interpret them critically. Make reasoned judgements or assessments, apply them to innovation or transmit them in an academic or business context.		B1 B2 B4	D4

Contents
Topic
1-Introduction to Microbial Biotechnology: Historical Development, Socioeconomic Importance and Legislation
2-Microbial Metabolism and Production: Regulation and Metabolic Strategies for Hyperproduction
3-Production Technology (I): Culture media and industrial sterilization, industrial fermentation and product recovery and processing
4-Production Technology (II): Development of industrial strains (searching, selection and improvement of strains)
5-Microbial food production: alcoholic beverages, dairy products and novel foods obtained by fermentation
6-Microbial production of drugs: antimicrobials, vaccines, hormones and other products of therapeutic interest
7-Microbial production of enzymes, amino acids, pigments and vitamins
8-Microbial production of organic acids, solvents and biofuels
9-Microbial Polymers Production
10-Microbial Biomass Production as an Industrial Product: SCP, Probiotics, Bioinsecticides and Biofertilizers
PRACTICES The practical lessons will consist of laboratory sessions and/or case studies related to: The isolation, characterization, selection, typing and improvement of microorganisms of industrial interest

Planning

	Class hours	Hours outside the classroom	Total hours
Laboratory practical	14	3	17
Seminars	10	31.5	41.5
Lecturing	23	39	62
Objective questions exam	0.5	5	5.5
Objective questions exam	0.25	3	3.25
Objective questions exam	0.25	10	10.25
Objective questions exam	0.25	5	5.25
Objective questions exam	0.25	5	5.25

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies	
	Description

Laboratory practical	The students will get experience in the characterisation, selection and improvement of microorganisms of industrial interest, as well as in the study of the processes in which they are involved. Students will have at their disposal in Moovi the presentations and/or scripts used by the teachers to teach the practical classes. The reproduction or dissemination of this material is not allowed. Students will not be allowed to use their cell phones or any other electronic device in class unless it is necessary to carry out an activity, which will be previously communicated by the teacher. It is not allowed to record classes or use voice-to-text transcription applications.
Seminars	I. The students, guided by the teacher, will document (search, evaluate, classify and select information) on a topic or problem related to the program of the subject and, with the selected material, will prepare a report. II. The students, in the seminar, will work on the topic using the information gathered by them, as well as documents that may be provided by the teachers. With the knowledge acquired, they will prepare a summary of the topic and present it to their classmates and teachers. They will have a debate with the teacher and their classmates about the topic and will solve the questions that arise related to it.
Lecturing	Exhibition, by the professor, of the contents on the matter object of study, theoretical bases and/or guidelines of a work, exercise or project to develop by the student. Students will have at their disposal in Moovi the presentations used by the teachers to teach the class once the class is finished. The reproduction or dissemination of this material is not allowed. Students will not be allowed to use their cell phones or any other electronic device in class unless it is necessary to carry out an activity, which will be previously communicated by the teacher. It is not allowed to record classes or use voice-to-text transcription applications.

Personalized assistance

Methodologies	Description
Lecturing	Personalized attention will be given during tutorial hours.
Laboratory practical	Personalized attention will be given during tutorial hours.
Seminars	Personalized attention will be given during tutorial hours.

Assessment

	Description	Qualification	Training and Learning Results			
Seminars	BIBLIOGRAPHIC DOCUMENTATION (5%): Report considering the ability to search appraise, classify and select information. SUMMARY AND PRESENTATION (10%): -Summary sheet with the development of the points raised (5%). -Exposition of the topic (capacity to synthesize, explain and transmit the information) and the presentation (design and selection of the support material) used in such exposition. The ability to solve questions and issues that arise related to the topic will also be taken into account (5%). Students will be provided with a rubric detailing the aspects that will be evaluated. OBJECTIVE TEST on the contents of the seminars (10%)	25	A5	B1 B2 B4	C20	D4
Objective questions exam	Exam with objective questions about PRACTICAL SESIONS	15	A5	B1 B2	C4 C20	D4
Objective questions exam	Exam with objective questions on the theoretical concepts of the INTRODUCTION AND GENERAL ASPECTS OF THE SUBJECT	10	A5	B2	C4 C5 C9 C10 C19 C20	
Objective questions exam	Exam with objective questions on the theoretical aspects of PRODUCTION TECHNOLOGY	20	A5	B2	C4 C5 C9 C10 C19 C20	

Objective questions exam	Exam with objective questions on the theoretical aspects of MICROBIAL PRODUCTION (I)	15	A5	B2	C4 C5 C9 C10 C19 C20
Objective questions exam	Exam with objective questions on the theoretical aspects of MICROBIAL PRODUCTION (II)	15	A5	B2	C4 C5 C9 C10 C19 C20

Other comments on the Evaluation

1.- The evaluation will be preferably continuous according to the qualification of the activities/test above mentioned. It is essential to achieve a grade of 5/10 to pass the subject. It will be necessary to achieve a minimum grade of 4/10 in each of the activities/tests to pass the subject. In case of not achieving the minimum grade required in any of the activities/tests, the grade that will appear in the report card will be the highest failing grade achieved by the student.

The teacher may propose additional voluntary activities during the classes, without prior notice, which will allow students to increase their final grade (up to 0.5 points/activity).

Attendance to practicals and seminars is compulsory for all students, being allowed to miss only one session, due to force majeure, if the absence is duly justified. The non-attendance to the practicals sesions and/or seminars, as well as the non-submission of group work, is not recoverable in the second or successive calls, preventing also to pass the global evaluation (in the case of students who have opted for this mode of evaluation).

The grade obtained in the different continuous evaluation tests (practicals, seminars, lectures), as long as it reaches the minimum of 4/10, will be kept for the July exam, so in this exam the student will only take the tests that he/she has not passed in the first exam. In the case of continuous evaluation, the tests not passed during the course are not recuperable in the final exam.

2.- Alternatively, the student may opt for a single global evaluation test. The grades obtained in the practicals and seminars will be transferred to the final grade of this evaluation. The student must declare on the date established by the Center his or her intention to opt for the global evaluation, which will prevent him or her from taking the continuous evaluation.

Students who do not pass the subject will keep for two courses, if they so wish and opt for continuous assessment, the grade of the tests in which they have achieved a minimum grade of 4/10, so they will only have to take the exam of the tests not passed.

Students are expected to behave honestly and responsibly, refraining from using or cooperating in fraudulent procedures in evaluation tests and assignments, as well as inappropriate uses of artificial intelligence.

DATES OF EXAMINATIONS

They can be consulted in the following link:

http://bioloxia.uvigo.es/es/docencia/examenes

Sources of information

Basic Bibliography

Hutkins R.W., **Microbiology and Technology of Fermented Foods**, First ed., IFT Press. Blackwell Publishing, 2008.

Okator N. and Okeke B., **Modern Industrial Microbiology and Biotechnology**, 2nd ed., CRC Press, 2021

Wilson D.B., Sahm H., Stahmann K-P and Koffas M., **Industrial Microbiology**, First ed., Wiley, 2020

Complementary Bibliography

Bora S.K., Sarma K. and Das S., **An Approach to Microbial Biotechnology. A Laboratory Handbook**, First ed., LAP Lambert Academic Publishing, 2013.

Byong H. Lee, **Fundamentals of Food Biotechnology**, 2nd ed., Wiley-Blackwell, 2015.

Glazer A.N. and Nikaido H., **Microbial Biotechnology. Fundamentals of Applied Microbiology**, 2nd ed., Cambridge University Press, 2008.

Primrose S.B. and Twyman R.M., **Principles of gene manipulation and genomics**, 7th ed., Blackwell Science, 2014.

Singh V, **Microbial Cell Factories Engineering for Production of Biomolecules**, First ed., Elsevier, 2021

Recommendations

Subjects that it is recommended to have taken before

Microbiology I/V02G031V01204
Microbiology II/V02G031V01309

IDENTIFYING DATA				
Análise e diagnóstico medioambiental				
Subject	Análise e diagnóstico medioambiental			
Code	V02G031V01413			
Study programme	Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4	1c
Teaching language	Castelán			
Department	Bioloxía vexetal e ciencias do solo Ecoloxía e bioloxía animal			
Coordinator	Delgado Núñez, Cristina			
Lecturers	Calviño Cancela, María Delgado Núñez, Cristina Muñoz Sobrino, Castor Noguera Amoros, Jose Carlos Soto González, Benedicto			
E-mail	cdelgado.cristina@gmail.com			
Web	http://https://www.uvigo.gal/es/universidad/administracion-personal/pdi/cristina-delgado-nunez			
General description	Esta materia pretende suministrar os coñecementos necesarios e ferramentas básicas para a análise e diagnóstico do medioambiente. Horarios: http://bioloxia.uvigo.es/es/docencia/horarios/			

Resultados de Formación e Aprendizaxe	
Code	
A2	Que os estudantes saiban aplicar os seus coñecementos ao seu traballo ou vocación dunha forma profesional e posúan as competencias que adoitan demostrarse por medio da elaboración e defensa de argumentos e a resolución de problemas dentro da súa área de estudo.
A3	Que os estudantes teñan a capacidade de reunir e interpretar datos relevantes (normalmente dentro da súa área de estudo) para emitir xuízos que inclúan unha reflexión sobre temas relevantes de índole social, científica ou ética.
B2	Xestionar información científico-técnica de calidade utilizando fontes diversas. Analizar datos e documentos e interpretalos de forma crítica e rigorosa, incluíndo reflexións sobre a súa relevancia social e no ámbito profesional da Bioloxía.
B4	Elaborar e redactar informes, documentos e proxectos relacionados coa Bioloxía. Proceder á súa presentación e debate no ámbito docente e especializado, poñendo de manifesto as competencias da titulación
C1	Resolver problemas aplicando o método científico, os conceptos e a terminoloxía específica da Bioloxía, os modelos matemáticos e as ferramentas estatísticas e informáticas.
C7	Muestrear, caracterizar, catalogar e xestionar recursos naturais e biolóxicos (poboacións, comunidades e ecosistemas).
C8	Describir, avaliar e planificar o medio físico, usar bioindicadores e identificar problemas ambientais. Achegar solucións para o control, seguimento e restauración dos ecosistemas.
C10	Identificar procesos biolóxicos e biotecnolóxicos e a súa posible aplicabilidade, en particular nos ámbitos sanitario, agroalimentario e ambiental.
C12	Redactar informes e memorias técnicas, así como dirixir e executar proxectos en temas relacionados coa bioloxía e as súas aplicacións
C21	Aplicar técnicas de análises e diagnóstico ambiental e desenvolver estudos de impacto ambiental. Propoñer medidas de prevención, protección e mitigación de efectos negativos sobre o medioambiente e realizar informe.
C23	Comprender a proxección social da problemática ambiental nos seus diferentes niveis de aplicación (analítico, avaliación, xestión) e a súa repercusión no exercicio profesional
D1	Comprender o significado e aplicación da perspectiva de xénero nos distintos ámbitos de coñecemento e na práctica profesional co obxectivo de alcanzar unha sociedade máis xusta e igualitaria.
D2	Comunicarse por oral e por escrito en lingua galega.
D3	Comprometerse coa sustentabilidade e medio ambiente. Uso de forma equitativa, responsable e eficiente dos recursos.

Resultados previstos na materia				
Expected results from this subject	Training and Learning Results			
Listar e recoñecer os principios básicos da Análise e Diagnóstico Ambiental.			C12	
Identificar os distintos tipos de mostras ambientais, as técnicas de mostraxe e asociar aos principais métodos analíticos que se empregan en análises e diagnóstico ambiental.	A2 A3	B2 B4	C7	D1
Adquirir os coñecementos necesarios para interpretar correctamente as probas analíticas.	A2 A3		C1	D3
Recoñecer a lexislación relativa a saúde e protección ambiental e Análise e Diagnóstico Ambiental.	A3	B2	C10	

Aplicar o coñecemento de análise e diagnóstico ambiental para illar, identificar, manexar e analizar especímenes e mostras de orixe biolóxica.		B4	C1	D3
Analizar e interpretar o funcionamento dos seres vivos.		B2	C1 C7	D2
Seleccionar e aplicar coñecementos e técnicas propios da Análise e Diagnóstico Ambiental en diferentes procesos relacionados coa xestión do medio ambiente.	A2 A3	B2 B4	C7 C8	D3
Empregar coñecementos e tecnoloxía relativos á Análise e Diagnóstico Ambiental en aspectos relacionados coa análise e diagnóstico de procesos e recursos biolóxicos.	A3	B4	C10	D1 D3
Obter información, desenvolver experimentos e interpretar resultados.	A3		C7	D1 D3
Comprender a proxección social da Análise e Diagnóstico Ambiental e a súa repercusión no exercicio profesional.			C23	D1 D2 D3
Desenvolver coñecementos de Análises e Diagnóstico Ambiental para asesorar, supervisar e peritar sobre aspectos científico-técnicos, éticos, legais e socio-económicos relacionados cos seres vivos e medio ambiente.			C8 C21	
Coñecer e manexar os conceptos, terminoloxía e instrumentación científico-técnica relativos á Análise e Diagnóstico Ambiental.			C21	D1

Contidos	
Topic	
Tema 1. Introdución xeral.	Deterioro ambiental, crecemento demográfico e cambio global. Concienciación en materia de medioambiente e desenvolvemento da lexislación ambiental.
Tema 2. Programas e redes de seguemento ambiental.	Toma de datos ambientais. Programas e redes en funcionamento, ámbito territorial (Xunta, Europa, ...) e enfoques.
Tema 3. Ferramentas de análises.	Metodoloxías xerais de análises e diagnóstico ambiental. Teledetección. Inventarios. Toma de datos de campo e indicadores ecolóxicos.
Tema 4. Análise e diagnóstico da atmosfera, a auga e o solo.	Parámetros indicadores e estado da atmosfera, a auga e o solo. Atmosfera: liñas de actuación e normativa. Gases efecto invernadoiro e calidade do aire. Auga: xestión da auga, Directiva Marco da auga Europea. Demarcacións hidrográficas. Análises e diagnóstico ambiental. Calidade de solos: índices e indicadores
Tema 5. Análise e diagnóstico da biodiversidade e os hábitats.	Parámetros indicadores e estado da biodiversidade e os hábitats. Directiva hábitats. Seguemento e conservación. Biodiversidade e especies ameazadas.
Tema 6: Sistemas socioecolóxicos, servizos ecosistémicos e desenrolo sostible	Sistemas socioecolóxicos Tipos de servicios ecosistemicos Sistemas adaptativos complexos Obxetivos de desenrolo sostible Antropoceno
Prácticas	-Análise e diagnóstico de solos degradados. -Análise e diagnóstico de hábitats. -Análise e Diagnóstico Ambiental baseado en indicadores vexetais. -Análise e Diagnóstico Ambiental baseado en indicadores animais.

Planificación			
	Class hours	Hours outside the classroom	Total hours
Lección maxistral	12	36	48
Prácticas de laboratorio	45	9	54
Traballo tutelado	0	45	45
Debate	1	0	1
Resolución de problemas e/ou exercicios	2	0	2
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Metodoloxía docente	
	Description
Lección maxistral	Explicación dos conceptos fundamentais do temario co apoio de medios audiovisuais.
Prácticas de laboratorio	Os alumnos realizarán prácticas de laboratorio e de campo relacionadas coa mostraxe, tratamento e análise de diferentes mostras ambientais sometidas a diversas presións antropoxénicas, incluindo solos, auga e organismos vivos, e se realizarán analises estadísticas cando corresponda. Realizarán tamén visitas a laboratorios de referencia.

Traballo tutelado	Os alumnos realizarán un traballo tutelado por diferentes profesores da materia sobre estudos de investigación xa publicados que discutirán de forma crítica en relación co seu plantexamento e metodoloxía.
Debate	Os alumnos debatirán na aula sobre diferentes temas medioambientais incluindo os temas dos traballos tutelados, facendo preguntas os seus propios compañeiros sobre os temas escollidos

Atención personalizada

Methodologies	Description
Lección maxistral	Atenderanse todas as cuestións plantexadas polos alumnos relativas aos contidos das sesións maxistrais nas mesmas sesións ou en titorías.
Prácticas de laboratorio	Atenderanse todas as cuestións expostas polos alumnos relativas aos contidos das prácticas nas propias prácticas ou en tutorías.
Traballo tutelado	Atenderanse as cuestións expostas polos alumnos relativas aos contidos do traballo e en sesións explicativas sobre os mesmos desenvolvidas na aula ou en tutorías.

Avaliación

	Description	Qualification	Training and Learning Results			
Lección maxistral	Os contidos da lección maxistral evaluaranse mediante probas objetivas con preguntas tipo test e de resposta curta, nun exame final escrito.	40	A3	B2	C1 C10	D1 D3
Prácticas de laboratorio	Valoraranse mediante preguntas obxectivas os coñecementos adquiridos en prácticas mediante preguntas en cuestionarios que deberán ser entregados o profesorado.	30	A2	B4	C7 C8 C21	
Traballo tutelado	Os traballos tutelados evaluarase mediante a entrega dun primeiro borrador do traballo (con exposición oral) e dun traballo escrito. Valorarase a capacidade de análise, de síntese e de expresión, a relevancia da bibliografía consultada, así como o dominio dos temas tratados na asignatura.	20	A3	B2 B4	C7 C8 C10 C12	D2 D3
Debate	Debatirase na aula sobre diferentes temas de actualidade e sobre os traballos tutelados presentados polos diferentes grupos.	10		B2 B4	C8 C10 C23	D2

Other comments on the Evaluation

A asistencia a todas as sesións prácticas e a entrega das memorias de prácticas e obrigatoria. Precísase alcanzar unha nota mínima de 5 en cada unha das calificacións (exame final e traballo) para aprobar a asignatura. Se non se supera esa calificación nalgunha das partes, a nota final será a que obteña nesa parte limitante.

En convocatorias diferentes á ordinaria, a evaluación será mediante a nota dun exame escrito pero o alumno terá que ter asistido a todas as sesións prácticas e entregado todos os traballos de prácticas e ter nota de mais de un 5 no traballo para poder aprobar a materia.

Somentes se gardarán as notas do traballo e cuestionarios de prácticas para a segunda convocatoria. Considerarase un N.P. cando o alumno non se presente ao exame escrito, independientemente de que teña presentado o traballo e cuestionarios.

Datas de exames: Pódense consultar no seguinte enderezo: http://bioloxia.uvigo.es/es/docencia/examenes/

No caso de que non se pudera realizar os exames de maneira presencial optarase nesta materia, por unha avaliación non presencial con un exame escrito a realizar a través das plataformas da Universidade de Vigo ou un exame oral.

Bibliografía. Fontes de información

Basic Bibliography

Carretero Peña, A., **Aspectos ambientales. Identificación y evaluación**, 2ª edición, Aenor,

Capó, M., **Principios de ecotoxicología: Diagnóstico, tratamiento y gestión del medio ambiente**,

Darbra M., Ronza A., Casal J., Stojanovic T.A., Wooldridge C., **The Self Diagnosis Method: A new methodology to assess environmental management in sea ports**, Elsevier, 2004

Delgado C., Pardo I. & García L., **Diatom communities as indicators of ecological status in Mediterranean temporary streams (Balearic Islands, Spain)**, Elsevier, 2012

Complementary Bibliography

Aguiló Alonso, M. et al., **Guía para la elaboración de estudios del medio físico: contenido y metodologías.**, Ministerio de Medio Ambiente,

van de Bund, W.J. (ed.), **Water Framework Directive intercalibration technical report. Part 1: Rivers.**, JRC Scientific and Technical Reports,

Poikane, S. (ed.), **Water Framework Directive intercalibration technical report. Part 2: Lakes**, JRC Scientific and Technical Reports,
Newman, M.C., William Henry Clements, W. H. Boca Raton, **Ecotoxicology: a comprehensive treatment.**, CRC Press,
Sibly, R. M.; Walker, C. H, **Principles of ecotoxicology**, CRC,
Lal, R., **Soil Quality and Agricultural Sustainability**, Ann Arbor Press,
Sullivan, P., **El Manejo Sostenible de Suelos**, NCAT,

Recomendacións

Subjects that are recommended to be taken simultaneously

Biodiversidade: Xestión e conservación/V02G030V01905
Avaliación de impacto ambiental/V02G030V01904
Xestión e conservación de espazos/V02G030V01910

IDENTIFYING DATA

Environmental impact evaluation

Subject	Environmental impact evaluation			
Code	V02G031V01414			
Study programme	Grado en Biología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	1st
Teaching language	Spanish Galician			
Department				
Coordinator	Muñoz Sobrino, Castor			
Lecturers	Álvarez Jiménez, Maruxa Fernández Covelo, Emma Muñoz Sobrino, Castor Quintela Sabarís, Celestino Velo Antón, Guillermo			
E-mail	bvcastor@uvigo.es			
Web				
General description	The objective of this subject is developed each of the steps that compose the process of evaluation of environmental impact from different points of view: existing legislation, administrative procedure, and the different types of methodologies employed in the studies of environmental impact. Likewise, the student will learn the basic bases stop the realization of studies of environmental impact, #analyze critically diverse examples of studies and realizing a study of concrete environmental impact. English Friendly subject: International students may request from the teachers: a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English School calendar #http://bioloxia.uvigo.es/*gl/*docencia/schedules			

Training and Learning Results

Code	
A2	Students should know how to apply their knowledge to their work or vocation in a professional way. They also should have the competences that are usually proved through the elaboration and defence of arguments and the resolution of problems within their study field.
A4	Students should able to communicate information, ideas, issues and solutions to all audiences (specialist and unskilled audience).
B2	Manage scientific-technical information using diverse and reliable sources. Analyze data and documents and interpret them critically and rigorously, including considerations on their social relevance and in the professional field of Biology.
B6	Develop analysis and synthesis, critical reasoning and argumentation skills, applying them in Biology and other scientific-technical disciplines.
C1	Solve problems by applying the scientific method, the concepts and terminology specific to biology, mathematical models and statistical and computer tools.
C7	Sampling, characterising, cataloguing and managing natural and biological resources (populations, communities and ecosystems).
C8	Describe, assess and plan the physical environment, use bio-indicators and identify environmental problems. Provide solutions for the control, monitoring and restoration of ecosystems.
C9	Identify resources of biological origin and assess their efficient and sustainable use in order to obtain products of interest. Propose and implement improvements in production systems.
C12	Writing reports and technical dossiers, as well as directing and executing projects on topics related to biology and its applications.
C14	Advise, assess and supervise scientific-technical, ethical, legal and socio-economic aspects related to biology and its applications.
C21	The ability to apply environmental analysis and diagnosis techniques and develop environmental impact studies. Propose measures for the prevention, protection and mitigation of negative effects on the environment and draw up reports.
C23	Understanding the social projection of environmental problems at different levels of application (analysis, evaluation, management) and their repercussions on professional practice.
D4	Collaborate and work in teams or multidisciplinary groups, promote negotiation skills and the ability to reach agreements.
D5	Communicate effectively and appropriately, including the use of computer tools and English.

Expected results from this subject

Expected results from this subject	Training and Learning Results			
To know the administrative procedure of Environmental Impact Assessment as a technical instrument for environmental management.	A2 A4	B2	C7 C12 C14 C23	D4 D5
To identify, predict and assess in an integrated manner the impacts on ecosystems, their components, natural resources and the quality of human life in the execution of projects, works and installations, as well as their alternatives.	A2	B2	C7 C8 C9 C21 C23	D4
To identify the measures for the prevention, protection, correction and compensation of the negative effects on the environment of the execution of projects, works and installations.	A2	B2 B6	C1 C12 C14 C21	D5
Knowing the methods for monitoring environmental impacts and being able to assess the effectiveness of corrective measures of environmental impacts of projects, works and installations.	A2	B2 B6	C7 C21	D4 D5
Applying knowledge of Environmental Impact Assessment to identify, handle and analyze specimens and samples of biological origin.	A2 A4		C7	
Applying knowledge and techniques of Environmental Impact Assessment in different processes related to environmental management.	A4	B2 B6	C2 C5 C14 C21 C23	D3 D5
Applying knowledge and technology related to Environmental Impact Assessment in aspects related to the quality control of environmental impact studies, corrective measures projects and monitoring reports.	A2	B2	C9 C14 C23	D4
To obtain information, develop experiments and interpret results.	A2	B2 B6	C1 C9	D4
To understand the social projection of Environmental Impact Assessment and its repercussions on professional practice.	A4	B2	C23	D5
To know and use the concepts, terminology and scientific-technical instrumentation related to Environmental Impact Assessment.	A2	B2	C7 C8 C9 C21	D4 D5

Contents	
Topic	
Block A. Conceptual and practical bases professional of the Evaluation of environmental impact (EIA)	1. Conceptual and objective bases of the evaluation of environmental impact (EIA). The paper of the EIA in the management of the natural resources: environmental strategic evaluation (ESE), environmental auditing (EA). General concepts: environment, impact, evaluation. Typology of the impacts. Typology of the evaluations. (2 hours) 2. The study of environmental impact (EIS).- Objective and structure. Organisational aspects of the EIS: group interdisciplinar, group leader, management of the EIS. The challenge of the EIS stop the scientific disciplines: recommendations with information limited, multidisciplinarity, subjective assessment. Phases of the EIS. (2 hours)
Block B. Legislation and normative of EIA	3. Legislation and administrative procedure of the EIA.- History of the EIA. Legislation of reference: European directives, national legislation and legislation of the Galician Community. Projects that owe to be object of EIA. Agents involved: promoter, environmental organ, substantive organ, public opinion. Administrative procedure. Information and public participation. (1 hour)

Block C. Manufacture of studies of environmental Impact. Methods of identification, prediction and evaluation of impacts.	4. Phase 1 and 2 of the EIS.- Description of the project: antecedents, location, actions. Examination of alternatives technically viable. (2 hours) 5. Phases 3 and 4 of theEIS: environmental Inventory; identification and prediction of impacts.- The environmental inventory only requires to apply the already gained knowledges; relevant subjects for EIS. Scoping as a tool in the environmental inventory: lists of review, surveys, queries to experts. Methods of identification of impacts: matrices of Leopold interaction , of secondary effects, crossed; lists of simple and descriptive control; systems of flow charts; Battelle system; maps overlay. (2 hours) 6. Abiotic factors (floor and underground waters, superficial waters, geological processes, climate, noise and light).- Election of the relevant factors , calculation of abiotic environmental indexes, methodology of measurement of abiotic factors. Identification and prediction of impacts. (2 hours) 7. Biotic factors (flora and vegetation, fauna, ecological processes).- Election of the relevant factors , calculation of biotic environmental indexes , methodology of measurement of biotic factors. Identification and prediction of impacts. (2 hours) 8. Landscape factors (agricultural uses).- Election of the relevant factors, calculation of landscape environmental indexes, methodology of measurement of lanscape factors. Identification and prediction of impacts. (2 hours) 9. Socioeconomic factors (historical, archaeologic, employment, economic cost of the degradation).- Election of the relevant factors , calculation of socioeconomic environmental indexes, methodology of measurement of socioeconomic factors. Identification and prediction of impacts. (2 hours) 10. Phase 4 of the EIS (continuation): assessment of impacts.- Quantitative assessment, qualitative assessment. Uncertainty of the assessment. Integration of impacts (functions of transformation). (4 hours) 11. Phase 5 of the EIS.- Establishment of protective and corrective measures of the EIS.- Program of environmental surveillance. (1 hour) 13. Phase 7 of the EIS.- Document of synthesis. (1 hour)

Planning			
	Class hours	Hours outside the classroom	Total hours
Mentored work	0	26	26
Studies excursion	2.5	1.5	4
Laboratory practical	7.5	7.5	15
Lecturing	25	75	100
Problem and/or exercise solving	2	0	2
Essay	1	0	1
Systematic observation	1	0	1
Presentation	1	0	1
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Mentored work	The work consists in that the students in groups of reduced size (3-4) will carry out an environmental impact assessment study based on a real case study. This work includes the presentation of a written report and a brief oral defence (10 minutes) in front of the rest of students and lecturers.
Studies excursion	The field course will be around the lake at Campus Lagoas-Marcosende and in the Budiño Gandaras. Students will do a matrix to evaluate impacts. In addtion, there will be another field trip to visit the Centro Ictiogénico "O Veral" (Lugo).
Laboratory practical	In the laboratory practices or classroom the students will carry out diverse activities: 1- comparative analysis of diverse environmental impact studies (aeolian parks, road, mines, marine aquiculture, etc.). 2- Building of an impact matrix. 3- Analysis of alternatives in studies of environmental impact assessment.
Lecturing	In the lecture, lecturer will expose the basic concepts of the subject and valid legislation, employing diverse teaching resources such as the electronic blackboard, power point presentation and critical analysis of texts.

Personalized assistance	
Methodologies	**Description**

Lecturing	Lectures will be supported with teaching material presented in power point, scientific articles in Spanish and English that will be discussed in the classroom and legal texts.
Mentored work	An environmental impact assessment study based on a case study will be done. The case study will be choosen at the beginning of the course.
Studies excursion	An impact matrix based on a real practical case (Campus Lagoas-Marcosende or Gandaras de Budiño) will be done. In addition, students will answer a questionnaire after visiting the Centro Ictiogénico de "O Veral".
Laboratory practical	A critical analysis of an environmental impact statement will be done. Moreover, qualitative and quantitative environmental impact matrices will be done using real practical cases. Students will use these data to choose between different alternatives and to calculate and assess the final impact.

Assessment

	Description	Qualification	Training and Learning Results
Problem and/or exercise solving	The adquired knowledge in lectures will be evaluated using a short answer tests that include questions of critical reasoning and the resolution of problems and cases. Numerical final qualification of 0 to 10 according to valid legislation (RD 1125/2003 of 5 of September, BOE 18 of September).	35	A2 B2 C1 B6 C12
Essay	The written report will be evaluated. The written report (4 points, 40% of the final note) will be evaluated in three phases: first draft (5%), second draft (10%) and final report (25%).	40	A4 B2 C1 D4 B6 C7 D5 C8 C9 C12 C14 C21 C23
Systematic observation	The attendance and active participation of students in theoretical classes, demonstrations and seminars will be taken into account. The exercises proposed by the teachers will also be taken into account. Attendance at demonstrations is compulsory and students must attend at least 90% of the demonstrations and seminars so that this methodology can be evaluated.	5	B2 C1 D5 C7 C12
Presentation	The oral presentation will be evaluated (2 points, 20%). The oral defence of the written report will be done during 10 minutes in presence of the rest of the students and of the teaching staff of the subject.After the oral defence, there will be a turn of questions of 5 minutes.	20	A2 B2 C1 D4 A4 B6 C8 D5 C21

Other comments on the Evaluation

In order to pass the subject, the student must pass each of the parts independently, and for this they must obtain a score of at least half the value of each one of them. If the student fails any of the parts, the final grade is divided by 2. For the July call, the pass will be kept in each of the parts considered in the evaluation system (theory and essay). Once the course is finished, in the case of failing in the two available calls, enrolling in the new course requires repeating everything.

The qualification of **Not presented** is considered when the student body does not appear for the theory exam and/or does not participate in some of the phases of the essay (delivery of reports and/or oral presentation of the essay).

Assistance to laboratory demonstrations and field trip:

In the case of unjustified absences to these sessions, there will be no right to recover these methodologies in the second opportunity (July call).

Exam dates:

The official dates of the exams, updated and approved by the Xunta de Facultade, can be consulted at http://bioloxia.uvigo.es/es/docencia/examenes

Students who take this subject are required to show responsible and honest conduct. Any form of fraud (copying and/or plagiarism) intended to falsify the level of knowledge or skill reached by a student in any type of test, report or work designed for this purpose is considered inadmissible. This willful conduct will be penalized with the firmness and rigor established by current regulations and may lead to the suspension of the subject for an entire course. An internal record of these actions will be kept, therefore, in the event of recidivism, the rectory is requested to open a disciplinary file.

Sources of information

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Lozano Cutanda, B., **Ley 9/2018: análisis de las modificaciones de la Ley de Evaluación Ambiental**, 86, Actualidad Jurídica Ambiental, 2019

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Hawkins, A.D., Pembroke, A.E., Popper, A.N., **Information gaps in understanding the effects of noise on fishes and invertebrates**, 25, Review in Fish Biology and Fisheries, 2015

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Recommendations

Subjects that continue the syllabus

Drafting and execution of projects/V02G030V01801

Subjects that are recommended to be taken simultaneously

Environmental analysis and diagnosis/V02G030V01902

Pollution/V02G030V01906

Management and Conservation of spaces/V02G030V01910

IDENTIFYING DATA

Biodiversidade: Xestión e conservación

Subject	Biodiversidade: Xestión e conservación			
Code	V02G031V01415			
Study programme	Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4	1c
Teaching language	Inglés			
Department	Bioloxía vexetal e ciencias do solo Bioquímica, xenética e inmunoloxía Ecoloxía e bioloxía animal			
Coordinator	Garrido González, Josefa			
Lecturers	Caballero Rúa, Armando Garrido González, Josefa Gomez Brandon, Maria Lagoa Núñez, Aarón Navarro Echeverría, Luis			
E-mail	jgarrido@uvigo.es			
Web				
General description	Estudo dos conceptos básicos que implican coñecer a xestión e conservación da biodiversidade http://bioloxia.uvigo.es/gl/docencia/horarios			

Resultados de Formación e Aprendizaxe

Code	
A2	Que os estudantes saiban aplicar os seus coñecementos ao seu traballo ou vocación dunha forma profesional e posúan as competencias que adoitan demostrarse por medio da elaboración e defensa de argumentos e a resolución de problemas dentro da súa área de estudo.
A3	Que os estudantes teñan a capacidade de reunir e interpretar datos relevantes (normalmente dentro da súa área de estudo) para emitir xuízos que inclúan unha reflexión sobre temas relevantes de índole social, científica ou ética.
A5	Que os estudantes desenvolvesen aquelas habilidades de aprendizaxe necesarias para emprender estudos posteriores cun alto grao de autonomía.
B1	Desenvolver a aprendizaxe autónoma, identificando as súas propias necesidades formativas e organizando e planificando as tarefas e o tempo.
B3	Aplicar o coñecemento adquirido na titulación e empregar a instrumentación científico-técnica e as TIC en contextos propios da Bioloxía e/ou no exercicio da profesión.
B6	Desenvolver as capacidades de análises e síntese, de razoamento crítico e argumentación, aplicándoas en contextos propios da Bioloxía e outras disciplinas científico-técnicas.
C7	Muestrear, caracterizar, catalogar e xestionar recursos naturais e biolóxicos (poboacións, comunidades e ecosistemas).
C13	Impartir formación, participar en proxectos de I+D+i, comunicar resultados e divulgar coñecementos. Contribuír á proxección social da Bioloxía e á sensibilización polo medio ambiente
C22	Organizar e xestionar espazos naturais e realizar estudos de biodiversidade. Establecer criterios para a conservación e restauración de ecosistemas e planificar o uso sostible dos seus recursos
C23	Comprender a proxección social da problemática ambiental nos seus diferentes niveis de aplicación (analítico, avaliación, xestión) e a súa repercusión no exercicio profesional
D2	Comunicarse por oral e por escrito en lingua galega.
D3	Comprometerse coa sustentabilidade e medio ambiente. Uso de forma equitativa, responsable e eficiente dos recursos.
D4	Colaborar e traballar en equipo ou en grupos multidisciplinares, fomentar a capacidade de negociación e de alcanzar acordos.
D5	Comunicar de maneira eficaz e adecuada, incluíndo o uso de ferramentas dixitais e o inglés.

Resultados previstos na materia

Expected results from this subject	Training and Learning Results			
Coñecer as diferentes formas de expresión, avaliación e significado da diversidade biolóxica de diferentes niveis de organización (poboacións, ecosistemas, paisaxe).	A2 A3 A5	B1 B3 B6	C7 C13 C22 C23	D2 D3 D4 D5
Aprender a diferenciar os instrumentos técnicos de xestión e conservación de poboacións, especies e comunidades biolóxicas.	A3 A5	B1 B3 B6	C7 C22	D3 D4

Coñecer os factores de control e estratexias de conservación e uso da diversidade de especies dos ecosistemas.	A3 A5	B1 B3 B6	C7 C22 C23	D3
Comprender os efectos de especies invasoras e pragas sobre a conservación da biodiversidade e as técnicas de control biolóxico en ecosistemas naturais e explotados polo home.	A3 A5	B1 B3 B6	C7 C13 C22 C23	D3
Aplicar o coñecemento da biodiversidade para identificar, manexar e analizar especímenes e mostras de orixe biolóxica.	A3 A5	B1 B3 B6	C7 C23	D3 D5
Analizar e interpretar o comportamento dos seres vivos e a súa adaptación ao medio.	A5	B3	C7 C22	D3
Aplicar coñecementos e técnicas propios da biodiversidade en diferentes procesos relacionados coa xestión do medio.	A3 A5	B1 B3 B6	C7 C13 C22 C23	D3
Obter información, desenvolver experimentos e interpretar resultados.	A3 A5	B1 B6	C13 C23	D4 D5
Comprender a proxección social da biodiversidade e a súa repercusión no exercicio profesional.	A2 A3 A5	B1 B3 B6	C13 C23	D5
Coñecer e manexar os conceptos, terminoloxía e instrumentación científico-técnica relativos á biodiversidade.	A2 A3 A5	B3	C7 C23	D3 D4

Contidos	
Topic	
FUNDAMENTOS CONCEPTUAIS DA BIODIVERSIDADE	Biodiversidade: Conceptos básicos. Indicadores e medidas da biodiversidade. Biodiversidade e Ecosistemas
CAUSAS E CONSECUENCIAS DA PERDA DE BIODIVERSIDADE	Patróns de extinción e ameazas á Biodiversidade. Impacto biolóxico do cambio global.
XESTIÓN E CONSERVACIÓN DA DIVERSIDAD BIOLÓXICA	Conservación e seguimiento de poboacións e especies. Xenética da Conservación. Ferramentas para o inventario de flora e fauna. Seguimiento de poboacións de plantas e animais. Plans de conservación de especies. Biodiversidade e Sociedade.

Planificación			
	Class hours	Hours outside the classroom	Total hours
Prácticas con apoio das TIC	4	8	12
Traballo tutelado	3	24	27
Lección maxistral	23	46	69
Prácticas de campo	20	20	40
Exame de preguntas obxectivas	2	0	2
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Metodoloxía docente	
	Description
Prácticas con apoio das TIC	Analizaranse datos simulados e reais de genealogías e de marcadores moleculares e aplicaranse á xestión de programas de conservacion ex-situ.
Traballo tutelado	O alumno realizará un traballo tutelado que deberá expoñer no aula ao final do curso.
Lección maxistral	Exposición por parte do profesorado de cada un dos temas do programa, co apoio infográfico oportuno.
Prácticas de campo	As saídas realizaranse no entorno da Facultade, que se complementarán con identificacións no laboratorio.

Atención personalizada	
Methodologies	**Description**
Lección maxistral	A atención é en grupo e ten lugar na aula onde se realice a lección maxistral. Nesta actividade o docente ten como función orientar e guiar no proceso de aprendizaxe ao alumnado, tentando en todo momento que comprenda cada un dos temas do programa, co apoio informático oportuno.
Prácticas con apoio das TIC	A atención pode ser individual ou en grupos reducidos e ten lugar na aula de informática. Nesta actividade o docente ten como función orientar e guiar o proceso de aprendizaxe do alumnado e axudalo a realizar con éxito o correspondente traballo.

Traballo tutelado	Tempo reservado por cada docente para atender e resolver as dúbidas do alumnado. A atención pode ser individual ou en grupos reducidos e ten lugar normalmente no gabinete do docente ou na aula se é preciso. Nestas actividades o docente ten como función orientar e guiar o proceso de aprendizaxe do alumnado e axudalo a realizar con éxito o correspondente traballo autónomo. O profesorado indica os primeiros días de clase o lugar, día e horas para esa atención personalizada.
Prácticas de campo	A atención pode ser individual ou en grupos reducidos e realizarase nas saídas ao campo, así como no laboratorio no momento de realizar as identificacións da fauna e flora recollidas. Nestas actividades, a función do profesor é orientar no proceso de aprendizaxe do alumnado e axudalo a realizar con éxito o traballo autónomo correspondente.

Avaliación

	Description	Qualification	Training and Learning Results			
Prácticas con apoio das TIC	Avaliaranse as prácticas realizadas na Aula de Informática xunto coas prácticas de campo.	5	A2 A3 A5	B1 B3 B6	C7 C22 C23	D2 D4 D5
Traballo tutelado	O traballo realizado polo alumno será avaliado, ben individualmente ou en grupo, en función do número de alumnos matriculados.	20	A2 A3 A5	B1 B3 B6	C7 C22 C23	D2 D4 D5
Prácticas de campo	Avaliaranse as saídas de campo e os traballos no laboratorio (o valor é do 35% para as áreas de Zooloxía e Botánica).	35	A2 A3 A5	B1 B3 B6	C7 C13 C22 C23	D2 D3 D4 D5
Exame de preguntas obxectivas	O exame final consistirá en preguntas sobre os distintos conceptos ou tarefas desenvolvidas en calquera das actividades da materia. Computará o 40% da nota global.	40	A2 A3 A5	B1 B3 B6	C13	D2 D5

Other comments on the Evaluation

Proponse unha Avaliación Continua (EC) en función da asistencia a clase e da calidade dos resultados asociados ás tarefas propostas.

Avaliación global (EG): Aqueles alumnos que non poidan cumprir o método de avaliación continua (CE) descrito poderán acollerse a unha única avaliación global, entendendo como tal a que se realiza nun só acto académico, que poderá incluír tantas probas como necesario acreditar que o alumnado adquiriu todos os Resultados de Formación e Aprendizaxe descritos nesta Guía Docente.

O calendario de exames e horarios pódese consultar nas seguintes ligazóns:

http://bioloxia.uvigo.es/gl/docencia/horarios

http://bioloxia.uvigo.es/gl/docencia/exames

Bibliografía. Fontes de información

Basic Bibliography

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Gosling M.L. & Sutherland, W.J, **Behaviour and conservation. Conservation Biology Series 2**, Cambridge University Press, 2000
Hanski,I.A. & M.E.Gilpin, **Metapopulation biology**, Academic Press, 1997
Primack, R. B., **A Primer of Conservation Biology**, 3rd ed., Sinauer Associates, 2004
Sinclair, A. R.E., Fryxell, J. M. Caughley, G, **Wildlife ecology, conservation, and management**, 2nd ed, Blackwell Science, 2006

Recomendacións

Subjects that it is recommended to have taken before

Bioloxía: Ferramentas informáticas en bioloxía/V02G031V01110
Bioloxía: Técnicas básicas de campo/V02G031V01109
Estatística: Bioestatística/V02G031V01107
Botánica I: Algas e fungos/V02G031V01202
Botánica II: Arquegoniadas/V02G031V01207
Zooloxía I: Invertebrados non artrópodos/V02G031V01205
Zooloxía II: Invertebrados artrópodos e cordados/V02G031V01210
Ecoloxía I/V02G031V01301
Ecoloxía II/V02G031V01306
Xenética II/V02G031V01304

IDENTIFYING DATA

Management and Conservation of spaces

Subject	Management and Conservation of spaces			
Code	V02G031V01416			
Study programme	Grado en Biología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	1st
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	Calviño Cancela, María			
Lecturers	Calviño Cancela, María Soto González, Benedicto			
E-mail	maria@uvigo.es			
Web				
General description	This subject is focused on natural areas, their management and conservation, as a basis for an ecosystem-centered conservation of biodiversity, in contrast with the the more conventional approach of species-centered conservation. The subject encompasses general topics about natural areas, types of protected areas and general principles for their design and planning, their socio-economic context as well as planning and management tools. English Friendly subject: International students may request from the teachers: a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English. Schedules: http://bioloxia.uvigo.es/gl/docencia/horarios			

Training and Learning Results

Code	
A2	Students should know how to apply their knowledge to their work or vocation in a professional way. They also should have the competences that are usually proved through the elaboration and defence of arguments and the resolution of problems within their study field.
A3	Students should prove ability for information-gathering and interpret important data (usually within their study field) to judge relevant social, scientific or ethical topics.
A5	Students should develop the necessary learning skills to undertake further studies with a high degree of autonomy.
B1	Developing autonomous learning by identifying their own training need and organizing and planning tasks and time.
B4	Draft and write reports, documents and projects related to Biology. Proceed to their presentation and debate in the teaching and specialized areas, highlighting the competences of the degree.
B6	Develop analysis and synthesis, critical reasoning and argumentation skills, applying them in Biology and other scientific-technical disciplines.
C7	Sampling, characterising, cataloguing and managing natural and biological resources (populations, communities and ecosystems).
C8	Describe, assess and plan the physical environment, use bio-indicators and identify environmental problems. Provide solutions for the control, monitoring and restoration of ecosystems.
C12	Writing reports and technical dossiers, as well as directing and executing projects on topics related to biology and its applications.
C22	The ability to organise and manage natural spaces and carry out biodiversity studies. Establish criteria for the conservation and restoration of ecosystems and plan the sustainable use of their resources.
C23	Understanding the social projection of environmental problems at different levels of application (analysis, evaluation, management) and their repercussions on professional practice.
D1	Understand the meaning and use of the gender perspective in the different fields of knowledge and in professional practice with the aim of achieving a fairer and more equal society.
D2	Communicate speaking and in writing in Galician.
D3	Commitment to sustainability and the environment. Equal, sensible and efficient use of resources.

Expected results from this subject

Expected results from this subject	Training and Learning Results	
To know the principles of global sustainability and the importance of environmental management for sustainable development.	C23	D2
To know the ecological criteria and techniques for the management and restoration of ecosystems and the conservation of natural resources.	C22	D2

To be able to differentiate the control factors of landscape architecture and the instruments of protection and conservation.	A2 A3 A5		C8 C22	D2 D3
To know the instruments of territorial planning and the methods of evaluation of its aptitudes and management.	A2 A3 A5		C7 C8	D1 D2 D3
To be aware of how protected areas are selected, designed and managed.			C22	D1 D2 D3
Applying knowledge and techniques specific to the management and conservation of spaces in different processes related to environmental management.	A2		C8 C22	D1
To obtain information, develop experiments and interpret results.	A2 A3 A5	B1 B4 B6	C8	
Understanding the social projection of the management and conservation of spaces and its repercussions on professional practice.			C23	D1 D2 D3
To know and use the concepts, terminology and scientific-technical instruments related to the management and conservation of spaces.	A2 A3		C8 C12	

Contents	
Topic	
Part I. Soil and Water Conservation	Chapter 1. Soil degradation and loss. Chapter 2.Soil Conservation Methods. Chapter 3. Land planning tools. Chapter 4. Water Conservation. Chapter 5. River and Riverbank Restauration.
Part II. Habitat loss, biological integrity and ecosystem conservation.	Chapter 6. Habitat destruction, fragmentation and degradation. Chapter 7. Ecosystem-centred conservation.
Part III. Ecosystem Management and Restauration.	Chapter 8. Principles of ecosystem management, uncertainty, and adaptive management. Chapter 9. Replacement, rehabilitation, restauration and improvement of ecosystems.
Part IV. Selection, design and planning of protected areas.	Chapter 10. Selection of priority conservation areas. Chapter 11. Principles of protected area design. Chapter 12. Protected areas types and uses. Chapter 13. Socio-economic aspects of protected areas. Protected areas planning: planning tools in the Spanish legislation.
Field trip and computer session.	We will make a field trip to a protected natural area with diverse uses and aims in order to familiarize become familiar with its management. We will make one computer session to work with useful tools for management and planning of protected natural areas.

Planning			
	Class hours	Hours outside the classroom	Total hours
Seminars	3	0	3
Field practice	11	0	11
Practices through ICT	3	0	3
Problem solving	6	0	6
Mentored work	2	30	32
Lecturing	12	34	46
Lecturing	13	36	49
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Seminars	Critical discussions about controversies related with natural areas conservation and management.
Field practice	Field trip to a protected natural area with diverse uses and aims in order to familiarize become familiar with its management.
Practices through ICT	Computer session to work with useful tools for management and planning of protected natural areas.
Problem solving	Ploblems to familiarize students with concepts related to conservation and management of soil and water.
Mentored work	The students will prepare an assignment related to topics of interest for conservation and management of natural areas.

Lecturing	All subject chapters will be explained in the class.
Lecturing	Explanation by the teacher of the theoretical syllabus of Blocks II, III and IV, taught by the Area of Ecology.

Personalized assistance

Methodologies	Description
Lecturing	All the students queries related to this part will be attended in the class or tutorials, done by appointment requested by email to the teachers: maria@uvigo.es and edbene@uvigo.es, also available at https://moovi.uvigo.gal/.
Seminars	All the students queries related to this part will be attended in the class or tutorials, done by appointment requested by email to the teachers: maria@uvigo.es and edbene@uvigo.es, also available at https://moovi.uvigo.gal/.
Field practice	All the students queries related to this part will be attended in the class or tutorials, done by appointment requested by email to the teachers: maria@uvigo.es and edbene@uvigo.es, also available at https://moovi.uvigo.gal/.
Practices through ICT	All the students queries related to this part will be attended in the class or tutorials, done by appointment requested by email to the teachers: maria@uvigo.es and edbene@uvigo.es, also available at https://moovi.uvigo.gal/.
Mentored work	All the students queries related to this part will be attended in the class or tutorials, done by appointment requested by email to the teachers: maria@uvigo.es and edbene@uvigo.es, also available at https://moovi.uvigo.gal/.
Problem solving	All the students queries related to this part will be attended in the class or tutorials, done by appointment requested by email to the teachers: maria@uvigo.es and edbene@uvigo.es, also available at https://moovi.uvigo.gal/.
Lecturing	

Assessment

	Description	Qualification	Training and Learning Results			
Practices through ICT	The students will have to solve an exercise in the computer session that will be assessed.	5	A2 A3 A5		C12	
Problem solving	The approach used to solve the problem as well as the correction of the result will be assessed.	10	A2 A3 A5	B1 B4 B6	C8 C12	D1 D2 D3
Mentored work	The assessment of this part will be based on the ability for synthetize, analyse and correctly express in writing the contents of the topic chosen as well as knowledge on the topics relevant to the subject.	20	A2 A3 A5	B1 B4 B6	C7 C8 C12 C22 C23	
Lecturing	The assessment of this part will be based on the knowledge the student has acquired on the topics explained in the lectures regarding Part I, given by the Area of Edaphology, as demonstrated in a short-questions exam.	26	A2 A3 A5	B6	C7 C8	
Lecturing	The assessment of this part will be based on the knowledge the student has acquired on the topics explained in the lectures regarding Parts II, III and IV, given by the Area of Ecology, as demonstrated in a short-questions exam.	39	A2 A3 A5	B6	C7 C8	

Other comments on the Evaluation

It is required to obtain a minimum score of 5 (out f 10) in each of the main parts of the subject (final exam and mentored work) in order to pass the subject. In case this score is not reached in any of the parts, the final mark will be that of the lower score. Attendance to the practical classes (field trip, computer sessions and problem solving classes) is compulsory.

In calls other than the first the marks will be based on an exam only. The scores obtained in the assignments will only be kept for the second call.

Students that do not attend the exam will be considered as missing the call, regardless whether they completed the assignments.

The student may opt for a single global evaluation. The marks obtained in the practical tests and deliverables will be transferred to the final qualification of this evaluation. The student must state on the date established by the Center the intention to opt for the global evaluation, which will prevent having the continuous evaluation.

Exam dates: please check the following link: http://bioloxia.uvigo.es/es/docencia/examenes

Sources of information

Basic Bibliography

Complementary Bibliography

Ausden, Malcolm, **Habitat management for conservation : a handbook of techniques**, 2007,
Sodhi, Navjot S., Ehrlich, Paul R., **Conservation Biology for all**,
Sutherland, William; Hill, David, **Managing Habitats for Conservation**,

Recommendations

Subjects that are recommended to be taken simultaneously

Environmental analysis and diagnosis/V02G030V01902
Biodiversity: management and conservation/V02G030V01905
Environmental impact evaluation/V02G030V01904

IDENTIFYING DATA				
Internships				
Subject	Internships			
Code	V02G031V01981			
Study programme	Grado en Biología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	#EnglishFriendly Spanish Galician English			
Department				
Coordinator	Pérez Fernández, Juan			
Lecturers	Pérez Fernández, Juan			
E-mail	jperezf@uvigo.es			
Web	http://bioloxia.uvigo.es/gl/docencia/practicas-externas/			
General description	The internships will allow students to acquire skills related to the performance of the biologist's professional profiles. In addition, this subject will facilitate direct contact between the Faculty and the professional world, to which the graduates should be incorporated. English Friendly subject: International students may request from the teachers: a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.			

Training and Learning Results	
Code	
A2	Students should know how to apply their knowledge to their work or vocation in a professional way. They also should have the competences that are usually proved through the elaboration and defence of arguments and the resolution of problems within their study field.
A3	Students should prove ability for information-gathering and interpret important data (usually within their study field) to judge relevant social, scientific or ethical topics.
B2	Manage scientific-technical information using diverse and reliable sources. Analyze data and documents and interpret them critically and rigorously, including considerations on their social relevance and in the professional field of Biology.
B3	Apply the knowledge acquired in the degree and use the scientific-technical instrumentation and CIT in contexts of Biology and/or related to the professional practice.
B4	Draft and write reports, documents and projects related to Biology. Proceed to their presentation and debate in the teaching and specialized areas, highlighting the competences of the degree.
B5	Develop capacities for creativity, innovation and entrepreneurship, in academic and social relevant fields as well as in interaction with the productive sector.
B7	To aim for quality objectives in the development of the activity done and incorporate ethical principles, which should prevail in the professional practice of Biology.
C1	Solve problems by applying the scientific method, the concepts and terminology specific to biology, mathematical models and statistical and computer tools.
C12	Writing reports and technical dossiers, as well as directing and executing projects on topics related to biology and its applications.
C13	Provide training, participate in R+D+i projects, communicate results and disseminate knowledge. Contribute to the social projection of biology and to raising awareness of the environment.
D1	Understand the meaning and use of the gender perspective in the different fields of knowledge and in professional practice with the aim of achieving a fairer and more equal society.
D5	Communicate effectively and appropriately, including the use of computer tools and English.

Expected results from this subject	Training and Learning Results			
To gain experience of the socio-occupational environment related to the fields of Biology and understand the applicability of the knowledge acquired throughout the degree.	A2 A3	B2 B5 B7		
To obtain information, develop experiments and interpret results.	A3	B2 B3	C1	
To take part in the execution of projects related to Biology.	A3	B2 B3 B4 B5 B7	C1 C12 C13	D5
Understanding the social projection of External Internships and their repercussions on professional practice.		B7	C13	D1

To know and use the concepts, terminology and scientific-technical instrumentation related to External Internships.	B3	C1

Contents

Topic	
The student will carry out an internship in some labour and professional real environments related with any of the fields in Biology (environment, production, health, research, development and innovation, etc), under the supervision of a tutor in the host institution and a tutor in the Faculty.	-

Planning

	Class hours	Hours outside the classroom	Total hours
Practicum, External practices and clinical practices	120	0	120
Report of practices, practicum and external practices	0	30	30
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies

	Description
Practicum, External practices and clinical practices	The student will carry out an internship in the host institution for a minimum of 120 hours. In addition, 30 hours of work will be dedicated to the preparation of the final memory of the internship, which has to be elaborated following the rules of external practices for the Degree in Biology.

Personalized assistance

Methodologies	Description
Practicum, External practices and clinical practices	Each student will have a tutor in the external institution (external tutor) who will supervise the correct development of the practices.

Tests	Description
Report of practices, practicum and external practices	Each student will have a tutor in the faculty (academic tutor) who will guide the student with the practice management and the drafting of the internship memory.

Assessment

	Description	Qualification	Training and Learning Results			
Practicum, External practices and clinical practices	Daily follow-up by the tutor of the receptor institution ("external" tutor) of the activity developed by the student during the period of the internship. Then, the "external" tutor will evaluate the activity developed by the student during the period of the internship.	75	A2 A3	B2 B3 B4 B5 B7	C1 C13	D1 D5
Report of practices, practicum and external practices	The "academic" tutor will review and evaluate the memory of the internship drafted by the student. The "academic" tutor will estabish the final grade of the internship by considering the report of the tutor of the receptor institution (75 %) and the final memory drafted by the student (25 %).	25	A2	B2 B4	C12 C13	D5

Other comments on the Evaluation

The adjudication of honours will be between those students coursing the curricular internship and having the best qualifications. For this, those that wish to opt to the honour will have to do an oral presentation and defence of the internship memory in front of a committe

The instructions to prepare the memory of the internship will are available on the web page of the faculty in the following link:

http://bioloxia.uvigo.es/en/teaching/external-internships/

The student has to fill out and deliver a report on the company.

Sources of information

Basic Bibliography

Complementary Bibliography

Recommendations

Other comments

- The steps to follow and detailed information will be uploaded in the online plarform Moovi.

IDENTIFYING DATA				
Final Year Dissertation				
Subject	Final Year Dissertation			
Code	V02G031V01991			
Study programme	Grado en Biología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	12	Mandatory	4th	2nd
Teaching language	Spanish Galician			
Department				
Coordinator	Míguez Miramontes, Jesús Manuel			
Lecturers	Míguez Miramontes, Jesús Manuel			
E-mail	jmmiguez@uvigo.es			
Web	http://http://bioloxia.uvigo.es/gl/docencia/traballo-fin-de-grao			
General description	The Final Degree Project is part of the module called as Work and Project End of Degree, which is completed in the last year of the degree program in Biology. The subject Final Degree Project consists of a work that each student will carry out autonomously under teacher tutoring, and will allow to demonstrate in an integrated way the acquisition of competences and skills associated with the title. Compliance with the regulations approved for the project is mandatory for all students of this subject. The management of all the processes corresponds to the Final Degree Project Committee, which has been appointed for this proposal by the Faculty. The subject does not have a fixed schedule in the academic calendar since all the activities can be develop throughout the second semester of the academic year.			

Training and Learning Results	
Code	
A2	Students should know how to apply their knowledge to their work or vocation in a professional way. They also should have the competences that are usually proved through the elaboration and defence of arguments and the resolution of problems within their study field.
A3	Students should prove ability for information-gathering and interpret important data (usually within their study field) to judge relevant social, scientific or ethical topics.
A4	Students should able to communicate information, ideas, issues and solutions to all audiences (specialist and unskilled audience).
B1	Developing autonomous learning by identifying their own training need and organizing and planning tasks and time.
B2	Manage scientific-technical information using diverse and reliable sources. Analyze data and documents and interpret them critically and rigorously, including considerations on their social relevance and in the professional field of Biology.
B3	Apply the knowledge acquired in the degree and use the scientific-technical instrumentation and CIT in contexts of Biology and/or related to the professional practice.
B4	Draft and write reports, documents and projects related to Biology. Proceed to their presentation and debate in the teaching and specialized areas, highlighting the competences of the degree.
B6	Develop analysis and synthesis, critical reasoning and argumentation skills, applying them in Biology and other scientific-technical disciplines.
B7	To aim for quality objectives in the development of the activity done and incorporate ethical principles, which should prevail in the professional practice of Biology.
C1	Solve problems by applying the scientific method, the concepts and terminology specific to biology, mathematical models and statistical and computer tools.
C10	Identify biological and biotechnological processes and their potential applications, in particular in health, agri-food and environmental fields.
C12	Writing reports and technical dossiers, as well as directing and executing projects on topics related to biology and its applications.
C13	Provide training, participate in R+D+i projects, communicate results and disseminate knowledge. Contribute to the social projection of biology and to raising awareness of the environment.
C14	Advise, assess and supervise scientific-technical, ethical, legal and socio-economic aspects related to biology and its applications.
D1	Understand the meaning and use of the gender perspective in the different fields of knowledge and in professional practice with the aim of achieving a fairer and more equal society.
D3	Commitment to sustainability and the environment. Equal, sensible and efficient use of resources.
D5	Communicate effectively and appropriately, including the use of computer tools and English.

Expected results from this subject	
Expected results from this subject	Training and Learning Results

To display the knowledge acquired in the degree and apply it to develop a project in the field of biology.	A2	B3 B4	C1 C10	D3
To apply the principles of the scientific method in the planning of a project and in work habits.	A2	B2	C1	D1
To manage ICT, carry out bibliographic searches and organize information on a project topic.	A3	B2 B3	C1	D3 D5
Ability to plan the work by adapting to previously stipulated objectives and deadlines.	A2	B1 B7		D3 D5
Working autonomously and following guidelines agreed with the supervisor.	A2	B1		
To interpret the results achieved in a project and write reports.	A3 A4	B2 B4	C10 C12 C14	D3 D5
To expose results publicly and debate them using scientific arguments.	A4	B2 B4 B6	C13	D5
To understand the social projection of Biology and its impact on the exercise of the profession.	A2 A4	B6 B7	C10 C12 C13 C14	D1 D3 D5

Contents

Topic	
The subject Final Project will be organized on the basis of three activities that the student must perform properly:	(*)
1. Development of an original work related to one of the multiple fields of the working world of a biologist. The works will be done under the supervision of a professor (tutor) assigned to the subject. There are different types of final degree project for which students can choose: -Type A: offered by professors of the degree. At the beginning of the academic year students should opt for a project theme among those offered. The Final Degree Project Committee will establish the norms and terms that will govern the award to the students of the topics proposed by the professors. - Type B: proposed by students and agreed with a professor of the degree who will supervise the work. -Type C: proposed by students to be carried out in institutions other than the UVIGO with which there is an agreement. This type of work will imply the existence of an academic tutor from the institution and a person from the external entity who will act as a co-tutor. -Type D: subject to students with special educational needs. -Type E: developed by students within the framework of a mobility program. The particular characteristics of each of these types of work, as well as the rules that govern them, are included in the regulations of the Final Degree Project in Biology.	The type of project should be limited to these sections: -Experimental work that is developed in the laboratories of the center or in other research centers of the UVIGO of biological scope. -Theoretical development (design, planning, applicability) of a project of economic, social, environmental, educational interest, etc., related to the field of biology, or technology based on biology. -Review and bibliographical research work whose objective is a possible practical application (initial study for a project, innovative case, etc.) -Other works corresponding to the offer of professors that do not specifically comply with the above modalities. They must be approved by the Final Degree Project Committee. - Work applied to biology carried out in external public and private institutions.
2. Delivery of a written report in time. It will be focus on the project carried out by the student.	The characteristics of the report and the deadlines for delivery will be established sufficiently in advance by the Final Degree Project Committee.
3. Presentation and defense of the work before an evaluation tribunal that will evaluate and qualify it.	The rules of presentation and defense of the project will be established by the Final Degree Project Committee, in agreement with the approved regulations.

Planning			
	Class hours	Hours outside the classroom	Total hours
Mentored work	20	240	260
Project	1	29	30
Presentation	1	9	10

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies	
	Description
Mentored work	The final degree project will be carried out under the supervision and direction of a professor (tutor). The supervisor will guide the student in the subject, methodology, elaboration, presentation and any other academic aspect related to the final project, and will assisst the student in the management and the whole process until the presentation and defense of the final project. The rules governing the tutorial function within the final degree project are included in the Regulation of the Final Degree Project of the University of Vigo and in the Final Degree Project of the Faculty of Biology.

Personalized assistance	
Methodologies	**Description**
Mentored work	An academic supervisor will guide the student during the completion of the final project. He will monitor the work and participate in its evaluation, in agreement with the regulations approved for this subject.
Tests	**Description**
Project	The student will develop an original project autonomously and under the supervision of the tutor, in which he/she will implement the skills acquired throughout the degree. At the end of the project, the student must present the results of the project in a report, according to the rules established for it. The student will also make a presentation of the report in front of the examining board, the project and the presentation constituting the highest percentage of the grade obtained in the subject. The report and the presentation will also be supervised at various stages by the tutor

Assessment			
	Description	Qualification	Training and Learning Results
Mentored work	The supervisor will issue a tutorial evaluation report that includes different items aimed at assessing the acquisition of competences and skills by the student. The tutor's rubric model is approved by the Final Degree Project committee. The following link address to a model used in the 2023-24 academic course, which can serve as a reference for the 2024-25 academic course. http://bioloxia.uvigo.es/docs/docencia/grado/tfg/TFG_informe_tutor.pdf	25	A2 B1 C1 D1 A3 B2 C10 D3 B3 C12 D5 B4 C14 B6 B7
Project	The student must submit a report of the project in which the main details of the work done are included. In the following link it is possible to check the rules for the elaboration of the report in force in the academic year 2023-24, which can be used as a reference for the academic year 2024-25. https://bioloxia.uvigo.es/gl/docencia/traballo-fin-de-grao/ will be 0 points.	35	A2 B1 C1 D1 A3 B2 C10 B3 C12 B4 C14 B6 B7
Presentation	The student must make a presentation of the project before the tribunal and discuss with its members about the aspects of the work done.	40	A4 B1 C1 D5 B4 C13 B7

Other comments on the Evaluation

End of Degree Project Evaluation Board

It will consist of three professors of the degree and will be appointed at the proposal of the Final Degree Project Committee. As many boards as necessary will be set up, with their corresponding alternate members, to guarantee the proper conduct of the evaluation process.

End of Degree Project report

With sufficient time in advance, the TFG Committee will establish the deadlines for the submission of the defense application and the TFG report. Failure to submit the TFG report within the established deadlines will result in the non submission to the evaluation process of the subject. The guidelines included in the norms for the preparation of the TFG report, which will be published on the faculty website and on the teaching platform, will be followed.

Presentation and defense of the Final Degree Project

The Evaluating Board will publish in advance the score criteria, the exhibition order, place and time of celebration, being available to all students.

Ratings

At the end of the evaluation process, the Evaluation Board will publish jointly the grades received by the students enrolled in the subject.

If a student obtains a grade of suspense, the evaluating committee will give him and his tutor a report gathering the recommendations to improve the work towards a later evaluation. In particular, it will be emphasized if the negative grade obtained by the student can be recovered in a second opportunity of the same course or if, on the contrary, the student must complete all the work in another academic year.

Second call
The student may recover in a second opportunity of the same term those aspects that did not exceed in the first, as long as the report obtained by the Evaluating Board in that first opportunity so specified.

The Final Degree Project Committee will establish and make public in advance the terms that will govern the evaluation process in the second opportunity. It will include the deadlines for the submission of the defense request and the tutor's report. I will also specify the date, place and time of the presentation and defense of the project to the Committee.

Schedule:

The final degree project does not have an established schedule; each student will establish their schedule according to the supervisor, usually during the second term of the academic year.

Dates scheduled for the evaluation of the TFGs for the 2024-25 course:

Official dates were approved in the Faculty Board. See link: http://bioloxia.uvigo.es/es/docencia/examenes

Applicable regulations:

The Final Degree Project Regulations of the University of Vigo, approved in "Consello de Goberno" is available at: https://secretaria.uvigo.gal/uv/web/normativa/public/show/550

The Regulations of the Faculty of Biology for the completion of the Final Degree Project, approved in "Xunta de Facultade" is available at: http://bioloxia.uvigo.es/docs/docencia/grado/tfg/normativa_TFG_facultad_biologia.pdf

Ethical issues

Plagiarism will be strictly prosecuted in the final degree projects, especially in the elaboration of the final report, being a reason for failure in the subject. The unjustified use of artificial intelligence programs is not allowed either.

Sources of information
Basic Bibliography
Complementary Bibliography

Recommendations

Other comments
Recommendation for inscription in the subject:

- Before to enroll in the Final Degree Project the student must have enrolled all the necessary credits to obtain the official title of degree, except those corresponding to the project itself, either by passing the corresponding subjects or by

recognition.
- To be able to make the application for presentation and defense of the Final Degree Project, the student should have passed all the necessary credits to obtain the degree, except those corresponding to the project itself, either by overcoming the corresponding subjects or by recognition.

Therefore, it is highly recommended that students register for this subject only if they have a certain security of being able to overcome all the credits enrolled in the academic year.

Regulations of the Final Degree Project and information on the planning of the subject in the course is available at:
http://bioloxia.uvigo.es/en/teaching/end-of-degree-project

Mobility programs:
The final degree projects can be carried out within a student mobility program, stating their characteristics in the respective study contract. Students who opt for this modality must have the approval of the mobility coordinator of the center and the coordinator of the subject Final Degree Project. Therefore, it is recommended to start these processes well in advance.