



(*)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/>

(*)Grao en Bioloxía

Subjects

Year 1st

Code	Name	Quadmester	Total Cr.
11595-53824-S		1st	6
11595-53825-S		1st	6
11595-53826-S		1st	6
11595-53827-S		1st	6
11595-53828-S		1st	6
11595-53829-S		2nd	6
11595-53830-S		2nd	6
11595-53831-S		2nd	6
11595-53832-S		2nd	6
11595-53833-S		2nd	6

Year 2nd

Code	Name	Quadmester	Total Cr.
11595-53834-S		1st	6
11595-53835-S		1st	6
11595-53836-S		1st	6
11595-53837-S		1st	6
11595-53838-S		1st	6
11595-53839-S		2nd	6
11595-53840-S		2nd	6

11595-53841-S		2nd	6
11595-53842-S		2nd	6
11595-53843-S		2nd	6

Year 3rd

Code	Name	Quadmester	Total Cr.
11595-53844-S		1st	6
11595-53845-S		1st	6
11595-53846-S		1st	6
11595-53847-S		1st	6
11595-53848-S		1st	6
11595-53849-S		2nd	6
11595-53850-S		2nd	6
11595-53851-S		2nd	6
11595-53852-S		2nd	6
11595-53853-S		2nd	6

Year 4th

Code	Name	Quadmester	Total Cr.
11595-53854-S		1st	6
11595-53855-S		1st	6
11595-53856-S		1st	6
11595-53857-S		1st	6
11595-53858-S		1st	6
11595-53859-S		1st	6
11595-53860-S		1st	6
11595-53861-S		1st	6
11595-53862-S		1st	6
11595-53863-S		1st	6
11595-53864-S		1st	6
11595-53865-S		1st	6
11595-53866-S		1st	6
11595-53867-S		2nd	6
11595-53868-S		2nd	6
11595-53869-S		2nd	6
11595-53870-S		2nd	6
11595-53871-S		2nd	6
11595-53872-S		2nd	6
11595-53873-S		2nd	6
11595-53874-S		2nd	6
11595-53875-S		2nd	12

IDENTIFYING DATA				
(*)Biología: Evolución				
Subject	(*)Biología: Evolución			
Code	11595-53824-S			
Study programme	(*)Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	1st
Teaching language	#EnglishFriendly Spanish Galician			
Department				

Coordinator	Rolán Álvarez, Emilio
Lecturers	Díaz Costas, Seila María 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				
B1	Understanding the different levels of organisation in living organisms and the evidence for their evolution			
B14	Understanding the mechanisms of inheritance, evolution and biodiversity			
C1	Apply the scientific method through observation, experimentation and the testing of hypotheses, interpreting the results obtained and drawing well-founded conclusions			
C11	Identify and use verifiable and reliable sources of scientific information to assess the current state of a biological problem and address its resolution			
D1	Solving biological problems using the scientific method			
D3	Analysis and interpretation of the mechanisms of inheritance, evolution, biodiversity and the fossil record			

Expected results from this subject				
Expected results from this subject	Training and Learning Results			
New	B1 B14	C1 C11	D1 D3	

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. Developtment 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 stratigraphic 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 matter of the lecturer will be taught 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	B1 B14	C1	D3
Studies excursion	The evaluation will make by means of an individual survey made in the corresponding educational platform	5	B1 B14	C1	D3
Lecturing	At the end of course will make a type test prove (preferably) but that also can carry any practical problem.	40	B1 B14	C1 C11	D1 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	B1 B14	C1 C11	D1 D3

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 (25%).
2. Partial (Objective question exams). These are two exams from different contents of the lecture (35%).
3. Lecturing Final (including all contents of the lecture; 40%).

To pass the lecture any student may get a minimum qualification of 5 in average and larger than 3 in any part.

SECOND OPORUNITY:

The second opportunity exam is a new final test exam, while the rest of qualifications (Practice, Partial) 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 3 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

Megías, Gefaell 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

Zoology 1: Non-arthropod invertebrates/V02G031V01205

Ecology II/V02G031V01306

Zoology 2: Arthropod invertebrates and chordates/V02G031V01210

Genetics II/V02G031V01304

Genetics I/V02G031V01209

IDENTIFYING DATA				
(*)Física de los procesos biológicos				
Subject	(*)Física de los procesos biológicos			
Code	11595-53825-S			
Study programme	(*)Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	1st
Teaching language	#EnglishFriendly Spanish Galician English			
Department				
Coordinator	Martínez Piñeiro, Manuel Mato Corzón, Marta María			
Lecturers	Martínez Piñeiro, Manuel Mato Corzón, Marta María Ulla Miguel, Ana María			
E-mail	fammmc@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				
B2	Understanding the physicochemical principles that govern biological processes			
B3	Identify the characteristics and dynamics of the physical environment, including those resulting from human activity and global change			
B4	To understand the fundamentals of scientific and technical instrumentation, experimentation with living organisms, health and safety standards in laboratory and field work, as well as the basic protocols and regulations in each area of experimentation			
C1	Apply the scientific method through observation, experimentation and the testing of hypotheses, interpreting the results obtained and drawing well-founded conclusions			
C2	Apply mathematical, physical, chemical, statistical and computational tools to the analysis, interpretation and resolution of biological problems			
C13	To communicate biological knowledge and findings clearly and accurately, both in writing and orally, and using digital resources, to specialist and non-specialist audiences			
D2	Conducting and interpreting physicochemical, biological, hygiene and health analyses and assessments, bioassays and functional tests, particularly in the health, industrial, agri-food and environmental sectors, and issuing reports			
D8	Assessment, protection, conservation and restoration of the physical environment, biodiversity and ecosystems. Identification and use of biological and environmental indicators			

Expected results from this subject				
Expected results from this subject		Training and Learning Results		
New	B2	C1	D2	
	B3	C2	D8	
	B4	C13		

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 Thermodynamics	2.1 Heat and temperature 2.2 Principles of Thermodynamics 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 about 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	B4 C1 C2 C13	D2	
Mentored work	There will be a group work, including an oral presentation of it, that represents 16% of the mark.	16	B2 B3 B4 C1 C2 C13	D2 D8	
Lecturing	The content covered in the lectures (theory) constitutes an important part of the final grade. It will be assessed as part of the written tests and/or exams, accounting for 20%. These exams are specifically focused on theory. It is proposed that there be a midterm exam that allows for partial course completion, which must be passed with a minimum score of 3.5 out of 10 in order to be taken into account in the continuous assessment	20	B2 B3 B4 C1 C2 C13	D2 D8	
Essay questions exam	The problem sets constitute an important part of the overall grade. They will be assessed as part of the written tests and/or exams, accounting for 40%. These exams are specifically focused on problem-solving. It is proposed that there be a midterm exam that allows for partial course completion, which must be passed with a minimum score of 3.5 out of 10 in order to be taken into account in the continuous assessment.	40	B2 B3 B4 C1 C2 C13	D2 D8	
Self-assessment	A self-assessment writing will be up to 4% of the mark.	4	C1 C13		

Other comments on the Evaluation

CONTINUOUS EVALUATION:

Evaluation will be made by means of the sum of the marks for written tests, laboratory practices, a self-evaluation written report and a group work to be exposed 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 problem-solving test must be passed with a minimum score of 3.5 out of 10 in order to be included in the continuous assessment average. The theory and problem-solving tests may compensate each other to obtain a minimum overall score of 5 (a pass), provided that at least 3.5 out of 10 is achieved. The final exam is NOT intended to improve the grade obtained in the midterm exam held throughout the course under the continuous assessment system. Attendance at seminars, and the completion and submission of all practical work, are mandatory to pass the course. Any special cases and/or particular circumstances will be considered individually.

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

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

Complementary Bibliography

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

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				
Matemáticas aplicadas a la biología				
Subject	Matemáticas aplicadas a la biología			
Code	11595-53826-S			
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 proporcionarlle 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	
B8	Coñecer as ferramentas matemáticas, estatísticas e informáticas aplicadas ao análise e resolución de problemas do ámbito da bioloxía
B21	Explorar a aplicabilidade da bioloxía ao concepto dunha única saúde (humana, animal, vexetal, e ambiental), aos obxectivos de desenvolvemento sostible, á optimización dos procesos produtivos e a promover a conservación do medio natural
C1	Aplicar o método científico mediante a observación, a experimentación e o contraste de hipótese, interpretando os resultados obtidos e formulando conclusións fundamentadas
C2	Aplicar ferramentas matemáticas, físicas, químicas, estatísticas e informáticas á análise, interpretación e resolución de problemas biolóxicos
C13	Comunicar de xeito claro e preciso os coñecementos e resultados biolóxicos, tanto de forma escrita como oral e usando recursos dixitais, a audiencias especializadas e non especializadas
C14	Planificar e organizar tarefas e actividades, xestionar o tempo e os recursos
C15	Colaborar e traballar en equipo, compartir responsabilidades e contribuír ao logro de obxectivos comúns en contextos de investigación e na actividade profesional
D1	Resolución de problemas biolóxicos aplicando o método científico
D13	Actuar con perspectiva de xénero e con respecto á diversidade e a multiculturalidade, co obxectivo de alcanzar unha sociedade máis xusta e igualitaria

Resultados previstos na materia

Expected results from this subject	Training and Learning Results		
	B8	C1	D1
	B21	C2	D13
		C13	
		C14	
		C15	

Contidos

Topic
TEMARIO DA MATERIA
1. O ESPAZO R^n :
O espazo vectorial R^n . Matrices e determinantes.
Aplicacións lineais: matriz asociada. Formas cadráticas.

2. INTRODUCCIÓN 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. INTRODUCCIÓN 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. Álgebra 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 introductorias	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 introductorias	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	B8 B21	C1 C2 C13 C14 C15	D1 D13
Prácticas con apoio das TIC	Avaliarase o traballo na aula de informática	10	B8 B21	C1 C2 C13 C14	D1 D13

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	B8 B21	C1 C2 C13 C14	D1 D13
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/examenos/	40	B8 B21	C1 C2 C13 C14	D1 D13

Other comments on the Evaluation

AVALIACIÓN CONTINUA

Para os estudantes que opten pola Avaliación Continua:

- 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, presentárase 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/examenos/>

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 avaliábeis. As sancións por condutas deshonestas poden carrexar a non superación da materia.

CONDICIÓN 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 da 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., **Matemáticas**, 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 sinxelas, 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				
(*)Química aplicada a la biología				
Subject	(*)Química aplicada a la biología			
Code	11595-53827-S			
Study programme	(*)Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	1st
Teaching language	#EnglishFriendly Spanish English			
Department				
Coordinator	Domínguez Seoane, Marta Souto Salgado, José Antonio			
Lecturers	Domínguez Seoane, Marta Souto Salgado, José Antonio			
E-mail	souto@uvigo.es mseane@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	
B2	Understanding the physicochemical principles that govern biological processes
B4	To understand the fundamentals of scientific and technical instrumentation, experimentation with living organisms, health and safety standards in laboratory and field work, as well as the basic protocols and regulations in each area of experimentation
C1	Apply the scientific method through observation, experimentation and the testing of hypotheses, interpreting the results obtained and drawing well-founded conclusions
C12	To incorporate workplace safety practices to prevent risks and protect the health of both living beings and the environment
C15	Collaborate and work as a team, share responsibilities and contribute to the achievement of common goals in research contexts and in professional practice
D1	Solving biological problems using the scientific method
D13	To act with a gender perspective and with respect for diversity and multiculturalism, with the aim of achieving a fairer and more equal society

Expected results from this subject

Expected results from this subject	Training and Learning Results		
New	B2 B4	C1 C12 C15	D1 D13

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	1. SECURITY RULES IN THE CHEMICAL LABORATORY.
PRACTICE 1	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	B2 B4	C1 C12 C15	D13
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	B2	C15	D1
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	B2	C1	D1
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	B2	C1	D1

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 of the 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 grade of both 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 of laboratory 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-Hill, 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				
(*)Geología				
Subject	(*)Geología			
Code	11595-53828-S			
Study programme	(*)Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	1st
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	Diz Ferreiro, Paula			
Lecturers	Copete Hernández, María Fernanda Diz Ferreiro, Paula Marino , Gianluca Rubio Armesto, María Belén			
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				
B2	Understanding the physicochemical principles that govern biological processes			
B3	Identify the characteristics and dynamics of the physical environment, including those resulting from human activity and global change			
C1	Apply the scientific method through observation, experimentation and the testing of hypotheses, interpreting the results obtained and drawing well-founded conclusions			
C10	Draft reports, proposals and technical documents on topics relating to the various branches of biology			
C11	Identify and use verifiable and reliable sources of scientific information to assess the current state of a biological problem and address its resolution			
C13	To communicate biological knowledge and findings clearly and accurately, both in writing and orally, and using digital resources, to specialist and non-specialist audiences			
D3	Analysis and interpretation of the mechanisms of inheritance, evolution, biodiversity and the fossil record			
D8	Assessment, protection, conservation and restoration of the physical environment, biodiversity and ecosystems. Identification and use of biological and environmental indicators			
D11	Preparation and presentation of reports, projects, technical reports and assessments in the field of biology			

Expected results from this subject				
Expected results from this subject	Training and Learning Results			
New	B2	C1	D3	
	B3	C10	D8	
		C11	D11	
		C13		

Contents	
Topic	
1. Concept and Principles of Geology	Geology, a Earth science Physical Geology and historical geology Geological principles Time and space in geology
2. Global Tectonics.	Continental drift Inner Earth structure Plate tectonics
3. The Atmosphere and the Hydrosphere	The Atmosphere: origin, composition, structure and dynamics. The hydrological cycle Oceans and ocean circulation
4. The rocks cycle	Concept Types of rocks and its relation to the geological cycle Inner geological cycle External geological cycle.
5. Continental environments	Glacial environment Fluvial environment 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.
8. Geological resources	Genesis and exploitation of fossil hydrocarbons (coal, oil, gas) and mineral resources
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.
GLOSSARY	Contribution to a glossary of geological terms

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	27	40	67
Seminars	1	11	12
Field practice	8	0	8
Laboratory practical	9	9	18
Portfolio/dossier	0	7	7
Report of practices, practicum and external practices	0	14	14
Essay questions exam	3	0	3
Presentation	2	14	16
Report of practices, practicum and external practices	0	2	2
Portfolio / dossier	0	3	3

*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.
Portfolio/dossier	Instructions for preparing an entry for the glossary of geological terms and its presentation.

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.
Portfolio/dossier	
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	C1 C10 C11 C13	D11
Essay questions exam	A theoretical written examination on the fundamental contents of the subject, consisting of two in-class tests.	40	B2 B3 C1 C11 C13	D3 D8
Presentation	The presentation will be evaluated individually and in groups according to the rubric provided by the instructor. Attendance at the seminars is mandatory.	15	B2 B3 C1 C10 C11 C13	D8 D11
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.	30	C1 C10 C11 C13	D8 D11
Portfolio / dossier	The written glossary entry will be assessed according to the rubric provided by the teacher. The student must also give an oral presentation to the whole class. The contribution to the glossary is voluntary.	10	B2 B3 C1 C10 C11 C13	D3 D8 D11

Other comments on the Evaluation

Continuous assessment is carried out throughout the course. In order to be assessed continuously, students must complete all the planned activities marked as compulsory in each of the blocks.

Attendance to lectures will be monitored on some days at random. Student participation during lectures will be taken into account.

To pass the subject, students must sit both theory exams, complete all practical sessions, seminars, and the field trip, and obtain a minimum mark of 5 out of 10 in each of these components. If this minimum mark is not achieved, the weighted average of the different components will not be calculated, and the final grade recorded will be the highest grade obtained among the failed components.

The theoretical assessment will consist of two written tests based on the contents taught in lectures. To pass this part, a minimum score of 5 out of 10 must be obtained in each test. Assessment activities passed in the first sitting will be retained for the second sitting.

Students who opt out of continuous assessment may request a global assessment within the period established by the institution. This assessment will take place on the official dates for the first and second sittings established by the institution. It will consist of a single theoretical-practical exam accounting for 100% of the final grade.

It is mandatory to include in the user profile on the Moovi platform a photograph allowing identification of the person, as well as the institutional email address (@alumnado.uvigo.gal). Emails sent from non-institutional addresses will not be answered.

Students enrolled in this subject are required to demonstrate responsible and honest conduct (see Title VII of the Regulations on assessment, grading, and quality of teaching and the learning process). If any form of copying is detected in any activity, the student will automatically fail that part of the subject.

Any form of fraud (copying and/or plagiarism) aimed at misrepresenting a student's level of knowledge or skills in any type of test, report, or assignment is considered unacceptable. Fraudulent behavior will result in failing the subject for the entire academic year.

The use of mobile phones for non-academic purposes is not permitted during in-person activities.

Sources of information

Basic Bibliography

Tarbut, 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

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

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

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

Complementary Bibliography

Recommendations

IDENTIFYING DATA				
Biología: Suelo, medio acuático y clima				
Subject	Biología: Suelo, medio acuático y clima			
Code	11595-53829-S			
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	Asensio Fandiño, Verónica Cabaleiro Álvarez, David 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	
B3	Identificar as características e dinámicas do medio físico, incluíndo as derivadas da acción humana e do cambio global
B5	Coñecer os métodos e técnicas máis habituais para a observación, identificación, obtención, procesado e análise de mostras de orixe biolóxica e non biolóxico en estudos de laboratorio, campo ou mediados por soportes informáticos, de análises de imaxes ou doutro tipo de sinais que acheguen datos de interese.
C2	Aplicar ferramentas matemáticas, físicas, químicas, estatísticas e informáticas á análise, interpretación e resolución de problemas biolóxicos
C9	Identificar axentes físicos, químicos e biolóxicos, incluíndo tóxicos e patóxenos, avaliar a súa actividade e deseñar estratexias para o seu seguimento e control
D2	Realización e interpretación de análise e diagnósticos fisicoquímicos, biolóxicos, hixiénicosanitarios, bioensaios e probas funcionais, especialmente nos ámbitos sanitario, industrial, agroalimentario e medioambiental, e emisión de informes
D9	Xestión, control e tratamento de axentes físicos, químicos e biolóxicos e os seus produtos tóxicos, en todos os ámbitos da Bioloxía
D13	Actuar con perspectiva de xénero e con respecto á diversidade e a multiculturalidad, co obxectivo de alcanzar unha sociedade máis xusta e igualitaria
D14	Compromiso cos obxectivos de desenvolvemento sostible e a conservación do medio ambiente, promovendo prácticas responsables e solucións innovadoras

Resultados previstos na materia			
Expected results from this subject	Training and Learning Results		
Nova	B3	C2	D2
	B5	C9	D9
			D13
			D14

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
Lección maxistral	14	30	44
Prácticas de laboratorio	16	24	40
Seminario	3	12	15
Resolución de problemas de forma autónoma	0	2	2
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	Medio acuático e Clima. 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.
Lección maxistral	Solos. 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.
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.

Atención personalizada

Methodologies	Description
Lección maxistral	Orientación e resolución de dúbidas sobre as actividades propostas ao longo do curso e sobre os conceptos teóricos referentes ao estudo do Medio Acuático e do Clima.
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	Orientación e resolución de dúbidas sobre as actividades propostas ao longo do curso e sobre os conceptos teóricos referentes ao estudo do Solo.

Avaliación

	Description	Qualification	Training and Learning Results
Lección maxistral	Medio acuático e clima. Proba escrita (preguntas tipo test e/ou preguntas curtas) sobre os contidos fundamentais da materia referentes ao estudo do medio acuático e do clima. Valorase cun 14% a parte de Clima e un 15% a parte do Medio acuático	29	B3 C9 D13 D14
Lección maxistral	Solo. Proba escrita (preguntas tipo test e/ou preguntas curtas) sobre os contidos fundamentais da materia referente ao estudo dos solos	24	B3 C9 D2 D13 D14

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. Valorase cun 22% as practicas da parte de Solo e un 2% as da parte de Clima	24	B5 C2 D2 C9 D13 D14
Seminario	Avaliarase a participación activa e os informes presentados. A valoración de cada módulo é a seguinte: un 12% para a parte de Solo, un 2% para a parte de Clima e un 5% para a parte de Medio acuático	19	C9 D9 D13 D14
Observación sistemática	Avaliarase a asistencia e participación activa durante as sesións presenciais da materia	4	D13 D14

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 continua 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 avaliación continua. Para poder aprobar mediante este tipo de avaliación, 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
 PORTA J, LOPEZ ACEVEDO M, POCH RM, **Edafología: Uso y protección del suelo**, 978-84-8476-661-2, 3ª edición, Mundi-Prensa, 2014

Complementary Bibliography

LAL R, **Encyclopedia of Soil Science**, 978-1-4987-8699-7, Third Edition, Taylor & Francis, 2017
 ODUM EP, BARRET GW, **Fundamentos de Ecología**, 9789706864703, 5ª edición, Thomson, 2006
 PORTA J, LOPEZ ACEVEDO M, ROQUERO, C, **Edafología para la agricultura y el medio ambiente.**, 84-7114-468-9, 3ª edición, Mundi-Prensa, 2003
 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
 García Navarro A., **Curso: Edafología. Universidad de Extremadura**, <http://www.unex.es/edafo/>,

Recomendacións

Subjects that it is recommended to have taken before

Química: Química aplicada á bioloxía/V02G031V01105
 Xeoloxía: Xeoloxía/V02G031V01103

IDENTIFYING DATA				
(*)Biología: Técnicas básicas de laboratorio				
Subject	(*)Biología: Técnicas básicas de laboratorio			
Code	11595-53830-S			
Study programme	(*)Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	2nd
Teaching language	Spanish Galician			
Department				
Coordinator	Gil Martín, Emilio			
Lecturers	Covelo Fernández, Ana Gil Martín, Emilio Miguel Villegas, Encarnación de Míguez Miramontes, Jesús Manuel Pedrol Bonjoch, María Nuria Portela Couñago, Laura 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	
B4	To understand the fundamentals of scientific and technical instrumentation, experimentation with living organisms, health and safety standards in laboratory and field work, as well as the basic protocols and regulations in each area of experimentation
B5	To be familiar with the most common methods and techniques for the observation, identification, collection, processing and analysis of biological and non-biological samples in laboratory, field or computer-based studies, including the analysis of images or other types of signals that provide relevant data.
B6	To understand the fundamentals of microscopy and histological techniques, as well as their significance in the analysis of biological samples
B7	To understand the techniques and methodologies involved in the isolation, purification, analysis, identification and quantification of biomolecules, including genetic material
C3	Use macroscopic, microscopic and molecular methods to observe, identify, characterise and preserve biological specimens, as well as to obtain samples and components of interest
C4	To isolate and culture microorganisms, cells, tissues and organs in order to facilitate their study and the characterisation of their biological activity
C5	Carry out analyses of samples from various sources, bioassays and functional tests. Determine and interpret biological parameters under normal and abnormal conditions
C12	To incorporate workplace safety practices to prevent risks and protect the health of both living beings and the environment
D1	Solving biological problems using the scientific method
D2	Conducting and interpreting physicochemical, biological, hygiene and health analyses and assessments, bioassays and functional tests, particularly in the health, industrial, agri-food and environmental sectors, and issuing reports
D6	Propose and participate in protocols relating to reproduction, conservation and genetic improvement, as well as the cultivation of cells, tissues, organs and specimens
D10	Apply ethical principles in research and professional practice, taking into account the impact of technological and scientific advances. Comply with the laws, regulations and administrative provisions governing the professional practice of biology
D11	Preparation and presentation of reports, projects, technical reports and assessments in the field of biology

Expected results from this subject

Expected results from this subject	Training and Learning Results
------------------------------------	-------------------------------

New	B4	C3	D1
	B5	C4	D2
	B6	C5	D6
	B7	C12	D10
			D11

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 practices0		1	1
Report of practices, practicum and external practices0		1	1
Report of practices, practicum and external practices0		1	1
Report of practices, practicum and external practices0		1	1
Report of practices, practicum and external practices0		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	B4 C3 D1 B5 C4 D2 B6 C5 D6 B7 C12 D10 D11
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	B4 C3 D1 B5 C4 D2 B6 C5 D6 B7 C12 D10 D11
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	B4 C3 D1 B5 C4 D2 B6 C5 D6 B7 C12 D10 D11

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.	5	B4 C3 D1 B5 C4 D2 B6 C5 D6 B7 C12 D10 D11
	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.		
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.	20	B4 C3 D1 B5 C4 D2 B6 C5 D6 B7 C12 D10 D11
	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.		
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.	30	B4 C3 D1 B5 C4 D2 B6 C5 D6 B7 C12 D10 D11
	If FIT's score does not reach the 40% of maximum, the subject will be considered suspended.		

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 the student to carry out ALL the learning and evaluation activities established in each experimental module, unless justified absence by reasons officially established; illness or federated sport competitions. If this requirement is not reached, the student will be governed by the global assessment system (see below). Consequently, 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-Elsevier 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

Mathematics: Mathematics applied to Biology/V02G031V01104

Chemistry: Chemistry applied to biology/V02G031V01105

Physics: Physics of biological processes/V02G031V01102

IDENTIFYING DATA				
Biología: Técnicas básicas de campo				
Subject	Biología: Técnicas básicas de campo			
Code	11595-53831-S			
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	Fernández Lago, María del Carmen Gomez Brandon, Maria Juan Ovejero, Raquel Millán Fernández, Laura 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	
B1	Comprender os distintos niveis de organización dos seres vivos e as evidencias da súa evolución
B4	Coñecer os fundamentos da instrumentación científica-técnica, a experimentación con organismos vivos, as normas de seguridade e hixiene nos traballos de laboratorio e de campo, así como os protocolos e normativas básicas en cada ámbito de experimentación
B5	Coñecer os métodos e técnicas máis habituais para a observación, identificación, obtención, procesado e análise de mostras de orixe biolóxica e non biolóxico en estudos de laboratorio, campo ou mediados por soportes informáticos, de análises de imaxes ou doutro tipo de sinais que acheguen datos de interese.
C1	Aplicar o método científico mediante a observación, a experimentación e o contraste de hipótese, interpretando os resultados obtidos e formulando conclusións fundamentadas
C3	Utilizar metodoloxías macroscópicas, microscópicas e moleculares para observar, identificar, caracterizar e conservar espécimes biolóxicos, así como obter mostras e constituíntes de interese
C7	Muestrear, caracterizar, catalogar, avaliar e xestionar recursos naturais e biolóxicos (poboacións, comunidades e ecosistemas) utilizando ferramentas apropiadas e bases de datos. Propoñer estratexias de conservación e restauración
C13	Comunicar de xeito claro e preciso os coñecementos e resultados biolóxicos, tanto de forma escrita como oral e usando recursos dixitais, a audiencias especializadas e non especializadas
C15	Colaborar e traballar en equipo, compartir responsabilidades e contribuír ao logro de obxectivos comúns en contextos de investigación e na actividade profesional
D1	Resolución de problemas biolóxicos aplicando o método científico
D11	Elaboración e presentación de informes, proxectos, memorias técnicas e valoracións no ámbito da Bioloxía

Resultados previstos na materia

Expected results from this subject	Training and Learning Results		
Nova	B1	C1	D1
	B4	C3	D11
	B5	C7	
		C13	
		C15	

Contidos

Topic	
Descrición do medio.	Solos. Intermareal rochoso. Hidromorfología de ríos.

Toma de mostrax no campo (deseño de mostraxes e métodos de extracción, recolección, transporte e conservación de mostrax).	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, conductividade). 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 mostrax 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 recibirá atención personalizada 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	B1 B4 B5
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	B4 C1 B5 C3 C7 C13 C15

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	B4 B5	D1 D11
Exame de preguntas obxectivas	Avaliaranse os coñecementos adquiridos mediante un exame de preguntas curtas e resolución de casos.	35	B1 B4 B5	C13 D1
Resolución de problemas e/ou exercicios	Avaliarase a resolución de exercicios baseados nos resultados obtidos no campo e laboratorio.	15		C1 C3 C7 C13 C15 D1 D11

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.

Se un/unha estudante copia en calquera proba, obterá un cero automaticamente nesa 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 avaliáveis.

AVALIACIÓN GLOBAL

Os/as estudantes que renuncién 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 avaliación 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 micológica 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 líques de Galicia**, 2003
- Samo Lumberras, 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 II: Arquegoniadas/V02G031V01207
Zooloxía I: Invertebrados non artrópodos/V02G031V01205
Ecoloxía II/V02G031V01306
Zooloxía II: Invertebrados artrópodos e cordados/V02G031V01210
Botánica I: Algas e fungos/V02G031V01202
Ecoloxía I/V02G031V01301

Subjects that are recommended to be taken simultaneously

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

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 maxistras, 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 ASISTENCIA 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				
Biología: Herramientas informáticas en biología				
Subject	Biología: Herramientas informáticas en biología			
Code	11595-53832-S			
Study programme	Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1	2c
Teaching language	Castelán			
Department	Bioquímica, xenética e inmunoloxía Ecoloxía e bioloxía animal Física aplicada			
Coordinator	Carvajal Rodríguez, Antonio			
Lecturers	Bravo Paneque, Alfonso Carvajal Rodríguez, Antonio Ceide Sandoval, Laura Eugenia Díaz Costas, Seila María Fernández Fernández, Ángel Manuel Rey Rodríguez, Iván Torres Palenzuela, Jesús Manuel Varela González, Sara			
E-mail	acraaj@uvigo.es			
Web				
General description	O obxectivo da materia é introducir ao alumno na importancia do aspecto computacional na moderna Bioloxía mostrándolle un mapa de aplicacións nos diversos campos da mesma. O alumno verá e practicará exemplos que van desde o uso de teledetección, os sistemas de información xeográfica e mapeo de territorios, tratamento dixital da imaxe, a importancia das bases de datos biolóxicas, etc. O alumno tamén adquirirá nocións sobre programación informática dada a súa importancia actual para o desempeño do biólogo a nivel profesional e científico.			

Resultados de Formación e Aprendizaxe	
Code	
B4	Coñecer os fundamentos da instrumentación científica-técnica, a experimentación con organismos vivos, as normas de seguridade e hixiene nos traballos de laboratorio e de campo, así como os protocolos e normativas básicas en cada ámbito de experimentación
B5	Coñecer os métodos e técnicas máis habituais para a observación, identificación, obtención, procesado e análise de mostras de orixe biolóxica e non biolóxico en estudos de laboratorio, campo ou mediados por soportes informáticos, de análises de imaxes ou doutro tipo de sinais que acheguen datos de interese.
B8	Coñecer as ferramentas matemáticas, estatísticas e informáticas aplicadas ao análise e resolución de problemas do ámbito da bioloxía
C2	Aplicar ferramentas matemáticas, físicas, químicas, estatísticas e informáticas á análise, interpretación e resolución de problemas biolóxicos
C11	Identificar e utilizar fontes de información científica, contrastables e fiables, para fundamentar o estado dun problema biolóxico e poder abordar a súa resolución
D1	Resolución de problemas biolóxicos aplicando o método científico
D15	Actuar con alto grao de autonomía e de forma proactiva, incorporando os avances tecnolóxicos e científicos a prol de achegar solucións innovadoras ás necesidades e demandas da sociedade

Resultados previstos na materia			
Expected results from this subject	Training and Learning Results		
Nova	B4	C2	D1
	B5	C11	D15
	B8		

Contidos	
Topic	
Procura de información en Bioloxía.	Concepto de base de datos. Principais bases de datos biolóxicas. Aplicacións de bases de datos en bioloxía. Creación e xestión de bases de datos.

Técnicas e principios físicos da *teledetección.	Teledetección, espectro EM, procesos de interacción coa materia. Resolucións, órbitas e fontes de datos de teledetección. Comportamento espectral das cubertas, parámetros medibles e índices de interese en bioloxía.
Tratamento visual e dixital de imaxe.	Correccións, Melloras e Transformacións
Sistemas de información xeográfica (*GIS).	Sistemas de Información Xeográfica, Sistemas de Coordenadas e Proxeccións. Conservación e xestión do territorio. GIS en R, formatos vectoriales e raster, operacións con capas GIS.
Nocións de programación.	O computador como ferramenta de traballo. Bioloxía e a programación. ¿Que é programar? ¿Que é unha linguaxe de programación? ¿Por qué programar en Bioloxía? Introducción á programación.
Software libre para a programación e o tratamento de datos en Bioloxía.	Ferramentas para unha ciencia aberta

Planificación

	Class hours	Hours outside the classroom	Total hours
Lección maxistral	3	6	9
Lección maxistral	3	6	9
Lección maxistral	4	8	12
Prácticas con apoio das TIC	16	5	21
Prácticas con apoio das TIC	12	5	17
Prácticas con apoio das TIC	12	5	17
Resolución de problemas	0	65	65

*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	Teledetección (TD): As clases están organizadas en sesións de 50 minutos. Na maioría dos casos dedicaranse a explicar conceptos e métodos básicos debido ás restricións de tempo pedirase aos alumnos que realicen traballo autónomo.
Lección maxistral	R: As clases están organizadas en sesións de 50 minutos. Na maioría dos casos dedicaranse a explicar conceptos e métodos básicos debido ás restricións de tempo pedirase aos alumnos que realicen traballo autónomo.
Lección maxistral	Python: As clases están organizadas en sesións de 50 minutos. Na maioría dos casos dedicaranse a explicar conceptos e métodos básicos debido ás restricións de tempo pedirase aos alumnos que realicen traballo autónomo.
Prácticas con apoio das TIC	Teledetección (TD): O obxectivo das prácticas en computador é mostrar algunhas aplicacións computacionais de gran importancia en Bioloxía así como introducir ao alumno en aspectos básicos de manexo de bases de datos e programación aplicada a Bioloxía.
Prácticas con apoio das TIC	R: O obxectivo das prácticas en computador é mostrar algunhas aplicacións computacionais de gran importancia en Bioloxía así como introducir ao alumno en aspectos básicos de manexo de bases de datos e programación aplicada a Bioloxía.
Prácticas con apoio das TIC	Python: O obxectivo das prácticas en computador é mostrar algunhas aplicacións computacionais de gran importancia en Bioloxía así como introducir ao alumno en aspectos básicos de manexo de bases de datos e programación aplicada a Bioloxía.
Resolución de problemas	A resolución de problemas e exercicios complementa e afianza o visto nas clases teóricas e prácticas. Na aprendizaxe dos distintos usos de ferramentas informáticas para Bioloxía a resolución de problemas é un recurso pedagóxico de gran importancia.

Atención personalizada

Methodologies	Description
---------------	-------------

Resolución de problemas	O proceso de aprendizaxe do alumno que complementa as clases maxistrais e as prácticas, levará a cabo mediante o desenvolvemento de actividades non presenciais e a través da plataforma de teledocencia Moovi. Nesta plataforma o alumno atopará algúns dos seguintes recursos: o material coas presentacións das clases de teoría, lecturas complementarias, documentos útiles para estudar e completar as clases teóricas, o guion de prácticas, listas de problemas e exercicios que debe realizar nun prazo dado, e exames de autoevaluación. Os profesores reservarán un tempo para atender e resolver as dúbidas do alumnado, tanto para as clases maxistrais, como para as clases prácticas. 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 procedemento para levar a cabo esa atención personalizada.
-------------------------	--

Avaliación				
	Description	Qualification	Training and Learning Results	
Lección maxistral	Teledetección (TD): - Exame bloque 1 - Asistencia ás actividades presenciais	14	B4 B5 B8	
Lección maxistral	R: - Exame bloque 2 - Asistencia ás actividades presenciais	13	B4 B5 B8	
Lección maxistral	Python: - Exame bloque 3 - Asistencia ás actividades presenciais	13	B4 B5 B8	
Prácticas con apoio das TIC	Teledetección (TD): - Asistencia e aproveitamento - Exame - Memoria - Resolución de problemas/exercicios	20	B4 B5 B8	C2 C11 D1 D15
Prácticas con apoio das TIC	R: - Asistencia e aproveitamento - Exame - Memoria - Resolución de problemas/exercicios	20	B4 B5 B8	C2 C11 D1 D15
Prácticas con apoio das TIC	Python: - Asistencia e aproveitamento - Exame - Memoria - Resolución de problemas/exercicios	20	B4 B5 B8	C2 C11 D1 D15

Other comments on the Evaluation

A materia consta de tres bloques temáticos diferenciados, os cuales constitúen per se importantes ferramentas para o desempeño da Bioloxía moderna:

Bloque temático-1: Teledetección e sistemas de información xeográfica (TD)

Bloque temático-2: Análise de datos e linguaxe de programación R

Bloque temático-3: Introducción á programación con Python

AVALIACIÓN CONTINUA

É o modo de avaliación por defecto. A avaliación detallada é:

Lección maxistral:

Exame presencial bloque 1: 14%

Exame presencial bloque 2: 13%

Exame presencial bloque 3: 13%

Asistencia a actividades presenciais

Prácticas con apoio das TIC:

Bloque 1: 20%

Bloque 2: 20%

Bloque 3: 20%

Asistencia e aproveitamento Memoria Resolución de problemas e exercicios

Presentación de ejercicios na plataforma virtual no prazo establecido
Control ao final de cada práctica Exame final

Para superar a asignatura es necesario

1) Obter unha nota final mínima de 4 sobre 10 (40%) en cada bloque tanto no seu parte práctica como no exame final. Se non se supera o mínimo de cada bloque non se aprobará a materia.

2) A asistencia a todas as actividades presenciais (incluíndo as prácticas) é OBRIGATORIA para APROBAR a materia, salvo ausencia debidamente xustificada por algún dos motivos de exención oficialmente considerados (enfermidade ou compromisos deportivos federados).

3) Na parte práctica o alumno debe realizar unha proba ao final de cada práctica de cada grupo. A superación desta proba (ou a realización dun traballo se o profesor así o decide porque o alumno non superou a parte práctica) será necesaria para superar a materia ademais do exame final. A parte práctica (asistencia a prácticas máis superación da proba ou traballo se ha lugar) supoñerá en cada bloque un 20% da nota final total.

4) O exame final desagregase en tres probas independentes, unha por bloque, e supón en cada bloque o 13% (14% no bloque 1) da cualificación final sendo necesario obter un mínimo de 5 puntos sobre 10 no devandito exame.

5) Se, e só si, superouse a nota mínima de cada bloque, a nota final da materia calcúlase como a media ponderada das notas de cada bloque segundo a fórmula:

$$\text{nota final FIB} = \text{bloque 1 (0.2 nota prácticas + 0.14 exame)} + \text{bloque 2 (0.2 nota prácticas + 0.13 exame)} + \text{bloque 3 (0.2 nota prácticas + 0.13 exame)}.$$

En caso de non alcanzarse a nota mínima nalgún bloque a nota final é suspenso.

É dicir, debe alcanzarse a nota mínima de cada bloque para calcularse a nota final do modo indicado. Nótese que a entrega da memoria, traballo e/o exercicios de prácticas requirido polo profesor en cada bloque é obrigatoria de modo que a súa non presentación impide aprobar a materia (non se alcanzará a nota mínima por bloque).

Os alumnos que non se presenten ao exame final constarán como Non Presentados.

Segunda oportunidade

Todas as cualificacións, excepto a do exame final, gardaranse para a segunda oportunidade en xullo. Por tanto se un alumno non realizou a parte práctica (non chega á nota mínima) non poderá superar o exame de segunda oportunidade. No caso do exame final se un alumno aprobou un bloque, queda a discreción do profesor o gardarlle a nota para a segunda oportunidade. En calquera caso o alumno sempre poderá presentarse para subir nota.

AVALIACIÓN GLOBAL

A solicitude para esta opción de avaliación terase que presentar no tempo e forma que determine o Centro, que será publicado con anterioridade ao comezo académico.

Dado o carácter experimental de todas as actividades, a asistencia ás mesmas é obrigatoria para poder optar a esta opción de avaliación.

A non asistencia a prácticas, clases obrigatorias e seminarios, sen causa xustificada invalida esta posibilidade, así como a oportunidade de avaliación extraordinaria (2ª oportunidade).

No caso do exame global se o alumno asistiu a todas as actividades. A proba global divídese para cada bloque temático en dous partes: unha parte práctica (60% da nota) e unha teórica (40%) da nota.

OUTRAS CONSIDERACIONES

Coma a presencialidade e o interese son evaluables, o alumnado ten a obriga de subir unha foto tipo carné a ficha da plataforma Moovi no tempo e forma indicado no día da presentación da materia.

Calquera intento de levar a cabo actividades ilegais nos exames (copia etc.)/ etc.), así como o plaxio nas actividades que se realicen supoñerá un suspenso na materia.

HORARIOS DOCENTES: <http://bioloxia.uvigo.es/es/docencia/horarios>

HORARIOS EXAMES: <http://bioloxia.uvigo.es/es/docencia/examenes>

CONSELLOS PARA FACILITAR A MATERIA

- 1) Para un mellor desenvolvemento da materia, aconséllase LER CON ATENCIÓN a Guía Docente (metodoloxía e avaliación), así como as informacións presentadas en plataforma Moovi de forma continua polo profesorado e/o coordinador.
- 2) O material didáctico publicado na plataforma Moovi, facilitará a comprensión das explicacións, mellorará a resolución de cuestións e dúbidas e permitirá rendibilizar o tempo das clases maxistras, prácticas e titorías, polo que debe ser lido polo alumno previamente á realización das prácticas.
- 3) Temario de teledetección: Cando a práctica requira traballo previo, a non realización do mesmo, implica que non contabilice a asistencia á mesma coas implicacións que iso teña na nota final. Nas prácticas de Teledetección cada alumno debe levar o seu propio computador.

Bibliografía. Fontes de información

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

Haddock S.H.D, **Practical Computing for Biologists**, Ed. Sinauer Associates, 2011

Hadley Wickham, **Advanced R**, O Reilly, 2019

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

Recomendacións

Subjects that are recommended to be taken simultaneously

Estatística: Bioestadística/V02G031V01107

Subjects that it is recommended to have taken before

Matemáticas: Matemáticas aplicadas á bioloxía/V02G031V01104

Bioloxía: Evolución/V02G031V01101

Xeoloxía: Xeoloxía/V02G031V01103

Física: Física dos procesos biolóxicos/V02G031V01102

IDENTIFYING DATA				
(*)Estadística: Bioestadística				
Subject	(*)Estadística: Bioestadística			
Code	11595-53833-S			
Study programme	(*)Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	2nd
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	Álvarez Hernández, María			
Lecturers	Álvarez Hernández, María Rodríguez Álvarez, María José			
E-mail	maria.alvarez@uvigo.gal			
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	
B8	To understand the mathematical, statistical, and computational tools used to analyze and solve problems in the field of biology
C1	Apply the scientific method through observation, experimentation and the testing of hypotheses, interpreting the results obtained and drawing well-founded conclusions
C2	Apply mathematical, physical, chemical, statistical and computational tools to the analysis, interpretation and resolution of biological problems
C10	Draft reports, proposals and technical documents on topics relating to the various branches of biology
C11	Identify and use verifiable and reliable sources of scientific information to assess the current state of a biological problem and address its resolution
C13	To communicate biological knowledge and findings clearly and accurately, both in writing and orally, and using digital resources, to specialist and non-specialist audiences
C14	Plan and organise tasks and activities; manage time and resources
D1	Solving biological problems using the scientific method
D11	Preparation and presentation of reports, projects, technical reports and assessments in the field of biology

Expected results from this subject

Expected results from this subject	Training and Learning Results		
New	B8	C1 C2 C10 C11 C13 C14	D1 D11

Contents

Topic	
TOPIC 1: 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.
TOPIC 2: 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.
TOPIC 3: MAIN DISTRIBUTIONS	Discrete and continuous random variables. Mean and variance. Main discrete and continuous distributions. Discrete models: Binomial, multinomial, hypergeometric, Poisson, geometric. Continuous models: Normal, exponential, chi-square, t-student, F Fisher-Snedecor.

TOPIC 4: INTRODUCTION TO HYPOTHESIS 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. Normality test.
TOPIC 5: FREQUENCY TABLES: MEASURES AND TESTS	Frequency tables. Goodness-of-fit tests. Proportions, chi-square test. Independence and homogeneity tests.
TOPIC 6: 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.
TOPIC 7: 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	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, 6 and 7	30	B8 C1 C2 C10 C11 C13 C14
Laboratory practical	Data analysis with the statistical program R	30	B8 C1 C2 C10 C11 C13 C14
Essay questions exam	Exam with exercises and questions on topics 1, 2 and 3	40	B8 C1 C2 C13 C14

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 = $\max\{\text{Final Exam}, 0.5 \text{ Final Exam} + 0.5 \text{ Laboratory test}\}$.

Continuous Assessment System (AC second opportunity):

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

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.

Additional note: Although the continuous assessment system makes it easier to pass a course, it is more difficult to earn a high qualification. To ensure students are not disadvantaged, if they pass the course, between 5 and 10 percent could be added to their qualification (only on the first opportunity).

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 publicaciones 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				
(*)Bioquímica I				
Subject	(*)Bioquímica I			
Code	11595-53834-S			
Study programme	(*)Grao en Bioloxía			
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 Villar Roca, Raquel			
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	
B5	To be familiar with the most common methods and techniques for the observation, identification, collection, processing and analysis of biological and non-biological samples in laboratory, field or computer-based studies, including the analysis of images or other types of signals that provide relevant data.
B7	To understand the techniques and methodologies involved in the isolation, purification, analysis, identification and quantification of biomolecules, including genetic material
B16	Understanding the mechanisms of cell signalling, the fundamentals of bioenergetics, and the regulation and integration of metabolism
C1	Apply the scientific method through observation, experimentation and the testing of hypotheses, interpreting the results obtained and drawing well-founded conclusions
C11	Identify and use verifiable and reliable sources of scientific information to assess the current state of a biological problem and address its resolution
C14	Plan and organise tasks and activities; manage time and resources
D1	Solving biological problems using the scientific method
D11	Preparation and presentation of reports, projects, technical reports and assessments in the field of biology
D15	To act with a high degree of autonomy and in a proactive manner, incorporating technological and scientific advances in order to provide innovative solutions to society's needs and demands

Expected results from this subject

Expected results from this subject	Training and Learning Results		
New	B5	C1	D1
	B7	C11	D11
	B16	C14	D15

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	Elaboration of a serum albumin standard line by the Lowry method.
PRACTICE 1	
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 office PILAR 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	B5 B7 B16	C1 C11 C14	D1 D11 D15
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	B5 B7 B16	C1 C11 C14	D1 D11 D15
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	B16	C1 C11 C14	D1 D11 D15
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	B16	C1 C11 C14	D1 D11 D15

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

NELSON D. L. & COX M. M., **Lehninger. Principios de Bioquímica**, 6ª Edición, Omega, 2014

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

Chemistry: Chemistry applied to biology/V02G031V01105

Physics: Physics of biological processes/V02G031V01102

IDENTIFYING DATA				
Botánica I				
Subject	Botánica I			
Code	11595-53835-S			
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 Quintela Sabarís, Celestino			
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	
B1	Comprender os distintos niveis de organización dos seres vivos e as evidencias da súa evolución
B5	Coñecer os métodos e técnicas máis habituais para a observación, identificación, obtención, procesado e análise de mostras de orixe biolóxica e non biolóxico en estudos de laboratorio, campo ou mediados por soportes informáticos, de análises de imaxes ou doutro tipo de sinais que acheguen datos de interese.
B9	Identificar as características anatómicas e morfolóxicas dos animais e vexetais que permiten a descrición taxonómica e a comprensión da súa adaptación ao medio natural
B12	Comprender a diversidade dos seres vivos e os ciclos biolóxicos, os procesos de reprodución e desenvolvemento, as relacións entre os organismos e a súa interacción coa contorna
C3	Utilizar metodoloxías macroscópicas, microscópicas e moleculares para observar, identificar, caracterizar e conservar espécimes biolóxicos, así como obter mostras e constituíntes de interese
C11	Identificar e utilizar fontes de información científica, contrastables e fiables, para fundamentar o estado dun problema biolóxico e poder abordar a súa resolución
C12	Incorporar prácticas de seguridade no traballo para previr riscos e protexer a saúde tanto dos seres vivos como do medio ambiente
C13	Comunicar de xeito claro e preciso os coñecementos e resultados biolóxicos, tanto de forma escrita como oral e usando recursos dixitais, a audiencias especializadas e non especializadas
C15	Colaborar e traballar en equipo, compartir responsabilidades e contribuír ao logro de obxectivos comúns en contextos de investigación e na actividade profesional
D8	Avaliación, protección, conservación e restauración do medio físico, a biodiversidade e os ecosistemas. Identificación e uso de indicadores biolóxicos e ambientais

Resultados previstos na materia			
Expected results from this subject	Training and Learning Results		
Nova	B1	C3	D8
	B5	C11	
	B9	C12	
	B12	C13	
		C15	

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 reprodución asexual en vexetais inferiores.	Reprodución vexetativa. Esporulación. Estructuras de resistencia. Exemplos ilustrativos.
Lección 7- Modalidades de reprodución sexual en vexetais inferiores.	Hologamia. Cistogamia. Somatogamia. Merogamia. Esporulación meiótica. Fenómenos de diferenciación sexual. Fenómenos de incompatibilidade sexual. Degradación da reprodución 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. Introdución ao estudo das algas.	Tipos morfolóxicos. Reprodución. Ciclos vitais. Nutrición. Amplitude ecolóxica.
Lección 10- ALGAS II. Divisións Glaucophyta e Rhodophyta.	Caracteres bioquímicos, citolóxicos, morfolóxicos e reprodutores. 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 reprodutores. Ecoloxía. Exemplos ilustrativos.
Lección 12- ALGAS IV. Divisións Euglenophyta e Pyrrophyta (Dinophyta).	Caracteres bioquímicos, citolóxicos, morfolóxicos e reprodutores. Sistemática. Ecoloxía. Exemplos ilustrativos.
Lección 13- ALGAS V. Divisións Cryptophyta e Prymnesiophyta (Haptophyta).	Caracteres bioquímicos, citolóxicos, morfolóxicos e reprodutores. sistemática. Ecoloxía. Exemplos ilustrativos.
Lección 14- ALGAS VI. División Heterokontophyta I: Clases Chrysophyceae, Synurophyceae, Bacillariophyceae (Diatomeas), Pinguiphyceae, Dictyochophyceae e Pelagophyceae.	Caracteres bioquímicos, citolóxicos, morfolóxicos e reprodutores. Sistemática. Ecoloxía e usos. Exemplos ilustrativos.
Lección 15- ALGAS VII. División Heterokontophyta II: Clases Raphidophyceae, Xanthophyceae, Phaeothamniophyceae e Phaeophyceae.	Caracteres bioquímicos, citolóxicos, morfolóxicos e reprodutores. 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. Introdución 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 reproductivos 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 estruturas vexetativas e reproductoras de Cianophyta, Chlorophyta, Rhodophyta e Phaeophyceae. Uso de claves de identificación.
Práctica 3- Fungos.	Observación de estruturas somáticas e reproductoras de Ascomycetes e Basidiomycetes. Uso de claves de identificación.
Práctica 4- Liques.	Observación de estruturas 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.

Atención personalizada	
Methodologies	Description
Lección maxistral	Previa cita, no horario de titorías, a profesora aclarará todas as dúbidas que non quedaran resoltas durante as sesións 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 sesións 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 avaliaranse mediante a realización de pequenas probas distribuídas aleatoriamente ao longo do cuadrimestre.	10	B1 B12	C11 D8
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	B5 B9	C3 C12 C15
Exame de preguntas obxectivas	O primeiro exame parcial versará sobre as doce 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 5 puntos sobre 10.	40	B1 B5 B9 B12	C11 C13
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	B1 B5 B9 B12	C12 C13

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>

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 "suspense", coa puntuación mínima 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 contemplarase durante tres cursos académicos consecutivos.

Requírese do alumnado que curse esta materia unha conduta responsable e honesta. Considérase inadmisíble 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,

Abbeyes, 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. & Kränzahn, F., **Champignons de Suisse**, Société de Mycologie de Lucerne,

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

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

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

Castro, M. et al., **Guía micológica 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				
(*)Biología celular y del desarrollo				
Subject	(*)Biología celular y del desarrollo			
Code	11595-53836-S			
Study programme	(*)Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2nd	1st
Teaching language	Galician English			
Department				
Coordinator	Pérez Fernández, Juan Pombal Diego, Manuel Ángel			
Lecturers	Megías Pacheco, Manuel Miguel Villegas, Encarnación de Pérez Fernández, Juan Pombal Diego, Manuel Ángel			
E-mail	pombal@uvigo.es jperezf@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	
B1	Understanding the different levels of organisation in living organisms and the evidence for their evolution
B5	To be familiar with the most common methods and techniques for the observation, identification, collection, processing and analysis of biological and non-biological samples in laboratory, field or computer-based studies, including the analysis of images or other types of signals that provide relevant data.
B6	To understand the fundamentals of microscopy and histological techniques, as well as their significance in the analysis of biological samples
B11	Identify and compare the structures, interactions and functions of cellular compartments and their components, tissues and organs
B12	Understanding the diversity of living things and biological cycles, processes of reproduction and development, relationships between organisms and their interaction with the environment
C3	Use macroscopic, microscopic and molecular methods to observe, identify, characterise and preserve biological specimens, as well as to obtain samples and components of interest
C13	To communicate biological knowledge and findings clearly and accurately, both in writing and orally, and using digital resources, to specialist and non-specialist audiences
D13	To act with a gender perspective and with respect for diversity and multiculturalism, with the aim of achieving a fairer and more equal society
D15	To act with a high degree of autonomy and in a proactive manner, incorporating technological and scientific advances in order to provide innovative solutions to society's needs and demands

Expected results from this subject

Expected results from this subject	Training and Learning Results		
New	B1	C3	D1
	B1	C13	D13
	B2	C18	D15
	B3	C19	
	B5	C30	
	B6		
	B11		
	B12		

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 addition, 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	Individual 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	Individual 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	B1 B11 B12	C13	D13 D15
Objective questions exam	Exam evaluating the theoretic classes	40	B1 B11 B12	C13	D13 D15
Objective questions exam	Exam evaluating the theoretic classes	30	B1 B11 B12	C13	D13 D15
Laboratory practice	Exam evaluating the lab sessions	10	B5 B6	C3	D13 D15
Laboratory practice	Exam evaluating the lab sessions	10	B5 B6	C3	D13 D15

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 (Cell 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/gi/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

Zoology 1: Non-arthropod invertebrates/V02G031V01205

Biochemistry I/V02G031V01201

Microbiology I/V02G031V01204

Botany I: Algae and fungi/V02G031V01202

IDENTIFYING DATA				
Zoología I				
Subject	Zoología I			
Code	11595-53837-S			
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 Paz Sedano, Sofía 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	
B1	Comprender os distintos niveis de organización dos seres vivos e as evidencias da súa evolución
B9	Identificar as características anatómicas e morfolóxicas dos animais e vexetais que permiten a descrición taxonómica e a comprensión da súa adaptación ao medio natural
B12	Comprender a diversidade dos seres vivos e os ciclos biolóxicos, os procesos de reprodución e desenvolvemento, as relacións entre os organismos e a súa interacción coa contorna
C3	Utilizar metodoloxías macroscópicas, microscópicas e moleculares para observar, identificar, caracterizar e conservar espécimes biolóxicos, así como obter mostras e constituíntes de interese
C11	Identificar e utilizar fontes de información científica, contrastables e fiables, para fundamentar o estado dun problema biolóxico e poder abordar a súa resolución
C13	Comunicar de xeito claro e preciso os coñecementos e resultados biolóxicos, tanto de forma escrita como oral e usando recursos dixitais, a audiencias especializadas e non especializadas
C14	Planificar e organizar tarefas e actividades, xestionar o tempo e os recursos
D13	Actuar con perspectiva de xénero e con respecto á diversidade e a multiculturalidade, co obxectivo de alcanzar unha sociedade máis xusta e igualitaria
D14	Compromiso cos obxectivos de desenvolvemento sostible e a conservación do medio ambiente, promovendo prácticas responsables e solucións innovadoras

Resultados previstos na materia			
Expected results from this subject		Training and Learning Results	
Nova	B1	C3	D13
	B9	C11	D14
	B12	C13	
		C14	

Contidos	
Topic	
PROGRAMA TEÓRICO	CONTIDOS
Tema 1. A ciencia zoolóxica. Introducción 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 filoxenéticas. 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	Ciclióforos, 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, Onicóforos, Tardígrados: caracteres xerais, forma e función. Filoxenia dos grupos e importancia.
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 Platelminotos, 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	Uso de claves dicotómicas para a determinación de especies

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 en grupo (relacionado coas prácticas). O grupo levará a cabo 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	B1 B9 B12	C11 C13 C14		
Práctica de laboratorio	A avaliación dos coñecementos e competencias alcanzados nesta parte levará a cabo no laboratorio mediante un exame e que incluírá ademais un recoñecemento de visu de 5 especies de invertebrados non artrópodos das que figuran na listaxe incluída na plataforma Moovi.	15	B1 B9 B12	C3 C14	D13 D14	
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	B12	C11		
Exame de preguntas obxectivas	Os contidos teóricos da materia serán explicados na aula a través de sesións maxistras. Para avaliar os coñecementos e competencias adquiridas polo alumnado sobre estes contidos teóricos realizaranse 2 probas escritas na aula que incluírán preguntas tipo test, de resposta curta, de relacionar, de desenvolvemento, etc.	40	B1 B9 B12	C14		
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	B1	C11 C13 C14	D13 D14	

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 sexa 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.

Só os alumnos que nunca asistisen ás clases teóricas, seminarios, prácticas ou non realicen ningunha das actividades avaliadas 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 sumaráse 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.

Se se detecta nos cuestionarios ou nos traballos tutelados indicios de copia (por exemplo, IA) o grupo de traballo pode ser chamado para responder distintas preguntas sobre o contido pola profesora de teoría.

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 mañá (ver data no horario).

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 é obrigatoria.

A asistencia ás clases teóricas controlárase algúns días ao azar e terase en conta a participación do alumnado 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 avaliáveis 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 avaliáveis.

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 %). A parte práctica poderá ser avaliada ben no laboratorio ou ben a través dun exame escrito.

Para poder superar a materia na avaliación global, debe alcanzarse un 5 sobre 10 na parte teórica e un 4,5 sobre 10 na parte práctica.

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 I'Anson, H., **Integrated Principles of Zoology**, 18ª ed., McGraw-Hill, 2020

Hickman, C.P., Keen, S.L., Eisenhour D.J., Larson, A. y I'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, C.P., Roberts, L.S., Keen, S.L., Larson, A., I'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 I'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

Biología: Evolución/V02G031V01101

Biología: 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 convindo. 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 rendibilizarse o tempo nas clases maxistras. En ningún caso dítanse 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.

CONDICIÓN 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				
(*)Microbiología I				
Subject	(*)Microbiología I			
Code	11595-53838-S			
Study programme	(*)Grao en Bioloxía			
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 Rocha Grandal, David			
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 acellular 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	
B1	Understanding the different levels of organisation in living organisms and the evidence for their evolution
B5	To be familiar with the most common methods and techniques for the observation, identification, collection, processing and analysis of biological and non-biological samples in laboratory, field or computer-based studies, including the analysis of images or other types of signals that provide relevant data.
B7	To understand the techniques and methodologies involved in the isolation, purification, analysis, identification and quantification of biomolecules, including genetic material
B10	To understand the taxonomic characteristics, functional structures and metabolism of viruses, bacteria and parasites
C3	Use macroscopic, microscopic and molecular methods to observe, identify, characterise and preserve biological specimens, as well as to obtain samples and components of interest
C4	To isolate and culture microorganisms, cells, tissues and organs in order to facilitate their study and the characterisation of their biological activity
D1	Solving biological problems using the scientific method
D2	Conducting and interpreting physicochemical, biological, hygiene and health analyses and assessments, bioassays and functional tests, particularly in the health, industrial, agri-food and environmental sectors, and issuing reports
D11	Preparation and presentation of reports, projects, technical reports and assessments in the field of biology
D13	To act with a gender perspective and with respect for diversity and multiculturalism, with the aim of achieving a fairer and more equal society

Expected results from this subject

Expected results from this subject	Training and Learning Results		
New	B1	C3	D1
	B1	C4	D1
	B2	C18	D2
	B3	C19	D11
	B5	C30	D13
	B7		
	B10		

Contents

Topic	
PROGRAM OF THEORY : Subjects	INDEX OF THE SUBJECTS
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 inoculum 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. 2.3. 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	14	14.15
Objective questions exam	0.15	14	14.15
Objective questions exam	0.15	14	14.15
Objective questions exam	0.15	14	14.15
Essay questions exam	0.15	14.3	14.45

*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	32	B5 B10	C3 C4	D1 D2 D11 D13
	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 practice classes is obligatory. A single lack of attendance is allowed due to force majeure and documented documentation.				
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.	12	B5 B10		D1 D2 D11 D13
	Attendance at seminars is mandatory. A single lack of attendance is allowed due to force majeure and documented documentation.				
Objective questions exam(*)	Cuestionario de preguntas tipo test	14	B1 B5 B7 B10	C3 C4	D1 D13
Objective questions exam(*)	Cuestionario de preguntas tipo test	14	B1 B5 B7 B10	C3 C4	D1 D13
Objective questions exam(*)	Cuestionario de preguntas tipo test	14	B1 B5 B7 B10	C3 C4	D1 D13
Objective questions exam(*)	Cuestionario de preguntas tipo test	12	B1 B5 B7 B10	C3 C4	D1 D13
Essay questions exam	(*)Examen de 2 preguntas	2	B1 B5 B7 B10	C3 C4	D1 D13

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 4 tests that will consist of objective and/or open 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.

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: $(4.5 \text{ exam} \times 0.28) + (8.0 \text{ summary} \times 0.05) = 1.26 + 0.4 = 1.66$ (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: biologia.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, McGraw-Hill, 2016

Willey, J., K. Sandman, D. Wood, **PRESCOTT'S Microbiology**, 11ª edición, McGraw-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				
(*)Bioquímica II				
Subject	(*)Bioquímica II			
Code	11595-53839-S			
Study programme	(*)Grao en Bioloxía			
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			
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	
B7	To understand the techniques and methodologies involved in the isolation, purification, analysis, identification and quantification of biomolecules, including genetic material
B15	To understand the structure of biomolecules and their role in biological processes
B16	Understanding the mechanisms of cell signalling, the fundamentals of bioenergetics, and the regulation and integration of metabolism
C1	Apply the scientific method through observation, experimentation and the testing of hypotheses, interpreting the results obtained and drawing well-founded conclusions
C11	Identify and use verifiable and reliable sources of scientific information to assess the current state of a biological problem and address its resolution
C14	Plan and organise tasks and activities; manage time and resources
D1	Solving biological problems using the scientific method
D11	Preparation and presentation of reports, projects, technical reports and assessments in the field of biology
D15	To act with a high degree of autonomy and in a proactive manner, incorporating technological and scientific advances in order to provide innovative solutions to society's needs and demands

Expected results from this subject

Expected results from this subject	Training and Learning Results		
New	B7	C1	D1
	B8	C11	D1
	B9	C14	D2
	B15	C15	D7
	B16	C17	D8
			D9
			D11
			D11
			D15
			D18

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 practice 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 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	B7 B15 B16	C1 C11 C14	D1 D11 D15	
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	B7 B15 B16	C1 C11 C14	D1 D11 D15	
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	B7 B15 B16	C1 C11 C14	D1 D11 D15	
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	B7 B15 B16	C1 C11 C14	D1 D11 D15	

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/horarios>The 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

Nelson, D. L. y Cox, M. M., **Lehninger Principios de Bioquímica**, 7ª Edición, Omega, 2019

Lodish, H; Beck, A; Kaiser, C.A.; Krieger, M; Bretscher,A; Ploegh, H; Amon, A; Scott, M.P., **Biología Celular y Molecular**, 7ª Edición., Editorial Médica Panamericana, 2016

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

Complementary Bibliography

Recommendations

IDENTIFYING DATA				
Botánica II				
Subject	Botánica II			
Code	11595-53840-S			
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 Molaes, Aida			
Lecturers	García Molaes, Aida Muñoz Sobrino, Castor			
E-mail	molaes@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	
B1	Comprender os distintos niveis de organización dos seres vivos e as evidencias da súa evolución
B5	Coñecer os métodos e técnicas máis habituais para a observación, identificación, obtención, procesado e análise de mostras de orixe biolóxica e non biolóxico en estudos de laboratorio, campo ou mediados por soportes informáticos, de análises de imaxes ou doutro tipo de sinais que acheguen datos de interese.
B9	Identificar as características anatómicas e morfolóxicas dos animais e vexetais que permiten a descrición taxonómica e a comprensión da súa adaptación ao medio natural
B12	Comprender a diversidade dos seres vivos e os ciclos biolóxicos, os procesos de reprodución e desenvolvemento, as relacións entre os organismos e a súa interacción coa contorna
C3	Utilizar metodoloxías macroscópicas, microscópicas e moleculares para observar, identificar, caracterizar e conservar espécimes biolóxicos, así como obter mostras e constituíntes de interese
C11	Identificar e utilizar fontes de información científica, contrastables e fiables, para fundamentar o estado dun problema biolóxico e poder abordar a súa resolución
C12	Incorporar prácticas de seguridade no traballo para prever riscos e protexer a saúde tanto dos seres vivos como do medio ambiente
C13	Comunicar de xeito claro e preciso os coñecementos e resultados biolóxicos, tanto de forma escrita como oral e usando recursos dixitais, a audiencias especializadas e non especializadas
C15	Colaborar e traballar en equipo, compartir responsabilidades e contribuír ao logro de obxectivos comúns en contextos de investigación e na actividade profesional
D8	Avaliación, protección, conservación e restauración do medio físico, a biodiversidade e os ecosistemas. Identificación e uso de indicadores biolóxicos e ambientais

Resultados previstos na materia			
Expected results from this subject		Training and Learning Results	
Nova	B1	C3	D8
	B5	C11	
	B9	C12	
	B12	C13	
		C15	

Contidos	
Topic	
BLOQUE I: INTRODUCCIÓN	
Lección 1: NIVEL DE ORGANIZACIÓN CORMÓFITOS	Caracteres que determinan a adaptación ao medio terrestre dos embriófitos: aparello vexetativo, reprodución 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 Lycopsidea. 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 Ginkgoideae.
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 basais: familias Amborellaceae e Nymphaeaceae. Clado Magnoliidae: Familia Magnoliaceae. Clado Monocotyledoneae: familias Liliaceae e Orchidaceae.
Lección 13: ANXIOSPERMAS III. CLADO EUDICOTYLEDONEAE	Eudicotiledóneas basais: 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 tutorías, 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 tutorías, a través do correo electrónico, o despacho virtual do Campus remoto ou o foro de MOOVI, os profesores atenderán todas aquelas cuestións que non quedaran resoltas durante as prácticas.
Seminario	No horario de tutorías, ou previa cita, a través do correo electrónico, o despacho virtual do Campus remoto ou o foro de MOOVI, o/a profesor/a encargado/a de impartilos atenderá todas aquelas cuestións que non quedaran resoltas durante as sesións de seminario.
Prácticas de campo	En horario de tutorías, 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 tutorías, 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	C11 C13 C15	D8
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	B5 B9	C3 C12
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	B1 B12	C11 C13
Exame de preguntas obxectivas	O segundo exame parcial versará sobre os contidos das leccións 8 a 13, ambas dúas incluídas. A cualificación obtida deberá ser igual ou superior a 5 puntos sobre 10 para superar a materia.	40	B1 B12	C11 C13

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 laboratorio 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-Manzanque, 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

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				
(*)Histología y organografía animal y vegetal				
Subject	(*)Histología y organografía animal y vegetal			
Code	11595-53841-S			
Study programme	(*)Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2nd	2nd
Teaching language	Spanish			
Department				
Coordinator	Megías Pacheco, Manuel			
Lecturers	Megías Pacheco, Manuel Miguel Villegas, Encarnación de			
E-mail	mmegias@uvigo.es			
Web	http://https://mmegias.webs.uvigo.es			
General description	Animal and plant histology and organography 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	
B6	To understand the fundamentals of microscopy and histological techniques, as well as their significance in the analysis of biological samples
B11	Identify and compare the structures, interactions and functions of cellular compartments and their components, tissues and organs
C3	Use macroscopic, microscopic and molecular methods to observe, identify, characterise and preserve biological specimens, as well as to obtain samples and components of interest
C4	To isolate and culture microorganisms, cells, tissues and organs in order to facilitate their study and the characterisation of their biological activity
C13	To communicate biological knowledge and findings clearly and accurately, both in writing and orally, and using digital resources, to specialist and non-specialist audiences
D13	To act with a gender perspective and with respect for diversity and multiculturalism, with the aim of achieving a fairer and more equal society
D15	To act with a high degree of autonomy and in a proactive manner, incorporating technological and scientific advances in order to provide innovative solutions to society's needs and demands

Expected results from this subject			
Expected results from this subject	Training and Learning Results		
New	B6	C3	D13
	B11	C4	D15
		C13	

Contents
Topic

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	B6 B11	C13 D13	D13 D15
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	B6 B11	C4 C13	D13 D15
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	B11	C3 C13	D13
Objective questions exam histology.	Written exam that includes the evaluation of the theoretical classes of animal histology.	35	B6 B11	C3	
Objective questions exam histology.	Written exam that includes the evaluation of the theoretical classes of plant histology.	15	B6 B11	C3	

Other comments on the Evaluation

Attendance to theory classes, practices and seminars is mandatory for all students and will be subject to rigorous control in the second year students. Continuous monitoring of attendance to theory and practice, as well as intervention in the seminar debates, will be used to monitor the performance of the student. The student will have to have at least 80% of attendance to the different activities to be evaluated.

The evaluation of the subject Animal and plant histology and organography will combine written tests and continuous evaluation throughout the course.

A) Evaluation of the seminar.

The evaluation of the seminar (maximum value: 1,1 point out of 10) will be carried out continuously during the course.

As there 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 the seminar in the final grade of the subject will be carried out if and only if the student is submitted to the official examination of the subject.

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

B) Practical Assessment

Throughout the practices will be carried out three tests that will mainly consist of the identification of tissues and / or organs through the observation of slides. Each test will have a maximum value of 0.8 points over 10. The qualification of the practices will remain within the current course.

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 of questions will be varied and may include:

- 1) Short answer questions.
- 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 in the 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 the subject, 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 be the result of multiplying the total grade (theory + practices + seminars + questionnaires) by 0.5.

Students who reject the continuous assessment may request the global assessment in the period established by the center. The evaluation will be carried out on the official dates of first and second opportunity. This evaluation will make it possible to achieve 100% of the score for the subject in an exam broken down into three parts: theoretical content (5 points), practical content (3 points) and seminars (2 points).

Repeating students from other courses must take the seminars and quizzes. If they consider and voluntarily, they may or may not attend the practices, but it is mandatory to take the exams that are carried out during the course.

According to the scale determined by the University of Vigo, the subject of Animal and plant histology and organography will have numerical qualification with only 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

HONOR REGISTRY: Awarded to students who have obtained a grade of 9 or higher. Their number may not exceed 5% of students enrolled in the subject in the corresponding academic year, unless the number of students enrolled is less than 20, in which case, a single Matriculation of Honor may be granted.

The dates of the exams and the class schedules can be consulted in the web page of the faculty being susceptible of modification in special circumstances.

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

Sources of information

Basic Bibliography

Álvarez Nogal R., **Citología e Histología de las plantas**, 1. ed, Eolas Ediciones., 2015

Brüel, A., Christensen, E.I., Qvortrup, K., Trandum-Jensen, J., Geneser, F., **Geneser Histología**, 4ª edición, Médica Panamericana, 2014

Cortés Benavides, F., **Cuadernos de Histología Vegetal**, 3ª edición, Editorial Marban, 1990

Evert, R.F., **Esau's Plant Anatomy: Meristems, Cells, and Tissues of the Plant Body - Their Structure, Function, and Development**, 3ª edición. New Jersey., Wiley & Sons, Inc., 2007

Gartner, L.P., Hiatt, J.L., **Atlas en Color y Texto de Histología**, 8ª edición, Wolters kluwer, 2023

Kierszenbaum, A.L., Tres, L.L., **Histology and cell biology An introduction to pathology**, 5ª edición, Elsevier, 2019

Megías, M., Molist, P., Pombal, M.A., **Atlas de Histología Vegetal y Animal**, <http://webs.uvigo.es/mmegias/inicio.html>,

Schünke, M., Schulte, E., Schumacher, U., **Colección Prometheus. Texto y Atlas de Anatomía (3 tomos)**, 3ª edición, Médica Panamericana, 2015

Craig, A. Canby, **Anatomía basada en la resolución de problemas**, 1ª ed, Elsevier, 2007

Schweingruber F.H.; Borner A.; Schulze E-D., **Atlas of stem anatomy in herbs, shrubs and trees vol 1 y 2**, Springer-Verlag, 2013

Liebich Hans-Georg, **Veterinary Histology**, 5ª, 5m, 2019

Álvarez Nogal, R., **Morfología microscópica de las plantas**, 1ª, Mac. Graw Hill Aula Magna, 2024

Complementary Bibliography

Welsch, U., **Sobotta. Histología (con la colaboración de T. Deller).**, 3ª edición, Médica Panamericana, 2014

Donald McMillan Richard Harris, **An Atlas of Comparative Vertebrate Histology**, 1st Edition, Academic Press, 2018

Pawlina, W., **Ross Histología. Texto y atlas. correlación con la Biología Molecular y Celular.**, 8edición, Wolters Kluwer, 2020

Treuting, dintzis Montine, **Comparative Anatomy and Histology**, 2nd, Elsevier, 2017

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				
(*)Zoología II				
Subject	(*)Zoología II			
Code	11595-53842-S			
Study programme	(*)Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2nd	2nd
Teaching language	#EnglishFriendly Spanish Galician English			
Department				
Coordinator	Mato de la Iglesia, Salustiano Iglesias Briones, Maria Jesús			
Lecturers	Iglesias Briones, Maria Jesús Kim , Sin-Yeon Mato de la Iglesia, Salustiano Noguera Amoros, Jose Carlos Velando Rodríguez, Alberto Luís			
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, endostyle or thyroid gland and postanal tail.			

Training and Learning Results

Code	
B1	Understanding the different levels of organisation in living organisms and the evidence for their evolution
B9	Identify the anatomical and morphological characteristics of animals and plants that enable their taxonomic description and an understanding of how they have adapted to their natural environment
B12	Understanding the diversity of living things and biological cycles, processes of reproduction and development, relationships between organisms and their interaction with the environment
C3	Use macroscopic, microscopic and molecular methods to observe, identify, characterise and preserve biological specimens, as well as to obtain samples and components of interest
C11	Identify and use verifiable and reliable sources of scientific information to assess the current state of a biological problem and address its resolution
C13	To communicate biological knowledge and findings clearly and accurately, both in writing and orally, and using digital resources, to specialist and non-specialist audiences
C14	Plan and organise tasks and activities; manage time and resources
D13	To act with a gender perspective and with respect for diversity and multiculturalism, with the aim of achieving a fairer and more equal society
D14	Commitment to the Sustainable Development Goals and environmental conservation, promoting responsible practices and innovative solutions

Expected results from this subject

Expected results from this subject	Training and Learning Results		
New	B1	C3	D13
	B9	C6	D14
	B12	C7	
		C9	
		C11	
		C13	
		C14	

Contents

Topic	
Presentation: General organisation of the course	Organisation of the course. Introduction and justification of the phylogenetic scheme adopted.
I. Phylum Arthropoda	General characteristics Subphylum Chelicerata Subphylum Miriapoda Subphylum Crustacea Subphylum Hexapoda

II. Phylum Echinodermata	General characteristics Class Crinoidea Class Asteroidea Class Ophiuroidea Class Echinoidea Class Holoturoidea
IV. Phylum Chordata	Exclusive characteristics Subphylum Cephalochordata Subphylum Urochordata Subphylum Vertebrata
V. Phylum Chordata: Craneata	Subphylum Vertebrata (Vertebrates except Tetrapods) Class Mixini Class Petromizontidae Class Chondrichthyes Class Actinopterygii Class Sarcopterygii
VI. Phylum Chordata: Craneata	Subphylum Vertebrata (Tetrapod Vertebrates) Class Amphibia 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 Echinoderms IV. Morphological study of Vertebrates I. V. Morphological study of Vertebrates II. VI. Morphological study of Vertebrates III. VII. 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	Theoretical 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 questionnaires 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 syllabus
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 virtually (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	B9	C3
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 student's 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	B12	C13 D13 C14 D14
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	B12	C11 C13 C14
Objective questions exam	The first assessment will 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	B1 B9 B12	
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	B1 B9 B12	

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 continuous 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

Kardong KV, **Vertebrates. Comparative Anatomy, Function, Evolution**, 978-1260092042, 8, McGraw-Hill, 2022

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				
(*)Genética I				
Subject	(*)Genética I			
Code	11595-53843-S			
Study programme	(*)Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2nd	2nd
Teaching language	Spanish			
Department				
Coordinator	Quesada Rodríguez, Humberto Carlos			
Lecturers	Canchaya Sanchez, Carlos Alberto			
	Díaz Costas, Seila María			
	Fernández Silva, Iria			
	García López, Alejandra			
	González Vázquez, Luis Daniel			
	Pérez Diz, Ángel Eduardo			
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	
B7	To understand the techniques and methodologies involved in the isolation, purification, analysis, identification and quantification of biomolecules, including genetic material
B14	Understanding the mechanisms of inheritance, evolution and biodiversity
C6	To isolate and manipulate genetic material, identify its abnormalities and their role in biological processes, particularly in diseases
C8	To cultivate, produce, process and enhance biological resources, and to promote their use and/or exploitation in order to obtain products and services of interest
D3	Analysis and interpretation of the mechanisms of inheritance, evolution, biodiversity and the fossil record
D5	Conducting genomic studies for genetic counselling, assisted reproductive technologies, developmental biology and gene therapy

Expected results from this subject

Expected results from this subject	Training and Learning Results		
New	B7 B14	C6 C8	D3 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 need 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 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.
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	B14	D3 D5

Problem solving	SEE DETAILS IN OTHER COMMENTS ABOUT THE EVALUATION. - Two mid-term exams - One final exam	35	B14	D3
Laboratory practical	SEE DETAILS IN OTHER COMMENTS ABOUT THE EVALUATION. - Knowledge 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	B7	C6 C8
Practices through ICT	SEE DETAILS IN OTHER COMMENTS ABOUT THE EVALUATION. - Online self-evaluations - Presentation of exercises within the established period	10	B14	D3

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-eliminary 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 minimum 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.
- Knowledge 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.
- Knowledge 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

Basic Bibliography

Griffiths AJF, Doebley J, Peichel C, Wassarman DA, **Introduction to Genetic Analysis**, 9781319114787, 12, WH Freeman, 2020

Michael R. Cummings, William S. Klug, Charlotte A. Spencer, Michael A. Palladino, Darrell Killian, **Concepts of Genetics**, 9781319114787, 12, Pearson Education, 2020

Pierce, Benjamin A, **Genética : un enfoque conceptual**, 978-84-9835-392-1, 5, Médica Panamericana, 2015

Complementary Bibliography

Watson, Baker, Bell, Gann, Levine, Losick, **Biología molecular del gen**, 978-607-9356-89-7, 7, Médica Panamericana, 2016

Benito Jiménez, César, **141 problemas de genética : resueltos paso a paso**, 978-84-9077-219-5, 1, Síntesis, 2015

Mensúa, Jose Luis, **Genética: problemas y ejercicios resueltos**, 978-84-9077-219-5, 1, Alhambra, 2003

Recommendations

Subjects that continue the syllabus

(*)Genética II/11595-53844-S

Other comments

It is recommended to study the subject continuously

IDENTIFYING DATA				
(*)Genética II				
Subject	(*)Genética II			
Code	11595-53844-S			
Study programme	(*)Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	3rd	1st
Teaching language	Spanish Galician English			
Department				
Coordinator	Rolán Álvarez, Emilio Canchaya Sanchez, Carlos Alberto			
Lecturers	Arenas Busto, Miguel Canchaya Sanchez, Carlos Alberto Fernández Silva, Iria Gutiérrez Chávez, Lizbet Moledo Rodríguez, Sarai Pazos Linares, Elena Rolán Álvarez, Emilio Tedone , Gabriele			
E-mail	rolan@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	
B7	To understand the techniques and methodologies involved in the isolation, purification, analysis, identification and quantification of biomolecules, including genetic material
B13	To understand the structure and complexity of genetic material, how it works, and the applications of genetic engineering
B14	Understanding the mechanisms of inheritance, evolution and biodiversity
C6	To isolate and manipulate genetic material, identify its abnormalities and their role in biological processes, particularly in diseases
C8	To cultivate, produce, process and enhance biological resources, and to promote their use and/or exploitation in order to obtain products and services of interest
D3	Analysis and interpretation of the mechanisms of inheritance, evolution, biodiversity and the fossil record
D4	Conducting phylogenetic, taxonomic, palaeontological and biogeographical analyses and studies of living organisms, particularly those that serve as a basis for demographic and epidemiological studies
D5	Conducting genomic studies for genetic counselling, assisted reproductive technologies, developmental biology and gene therapy
D6	Propose and participate in protocols relating to reproduction, conservation and genetic improvement, as well as the cultivation of cells, tissues, organs and specimens

Expected results from this subject			
Expected results from this subject	Training and Learning Results		
New	B7	C6	D3
	B13	C8	D4
	B14		D5
			D6

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	B7 B13 B14	D3 D4
Problem solving	- Two tests during the course - Final examination - Attendance at face-to-face activities - Problem solving	35	B7 B13 B14	D3 D4 D5
Practices through ICT	- Attendance and academic engagement - Written examination	15	B7 B13 B14	C6 D3 C8 D4 D5 D6
Autonomous problem solving	- Online self-assessments and other exercises - Submission of exercises via TEMA within the established deadline	10	B14	D3

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. An 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/schedule>

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

Sources of information

Basic Bibliography

Benito, C., Espino, F. J., **Genética: Conceptos esenciales**, 1, Médica Panamericana, 2013

W.S. Klug, M.R. Cummings, C.A. Spencer, M.A. Palladino, D.A. Killian, **Concepts of Genetics**, 12, Pearson, 2020

A.J. F. Griffiths, J. Doebley, C. Peichel, D.A. Wassarman, **Introduction to Genetic Analysis**, 12, W. H. Freeman, 2020

B. A. Pierce, **Genetics. A Conceptual Approach**, 7, Macmillan International, 2020

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				
Ecología I: Individuos y poblaciones				
Subject	Ecología I: Individuos y poblaciones			
Code	11595-53845-S			
Study programme	Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	3	1c
Teaching language	Galego			
Department	Ecoloxía e bioloxía animal			
Coordinator	González Castro, Bernardino			
Lecturers	Blanca Sújara, Rocío Galera Notario, Claudia González Castro, Bernardino Hernando Morales, Víctor Lasa Gonzalez, Aide			
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	
B3	Identificar as características e dinámicas do medio físico, incluíndo as derivadas da acción humana e do cambio global
B12	Comprender a diversidade dos seres vivos e os ciclos biolóxicos, os procesos de reprodución e desenvolvemento, as relacións entre os organismos e a súa interacción coa contorna
B20	Analizar a estrutura e dinámica das poboacións e comunidades, o funcionamento dos ecosistemas e os ciclos biogeoquímicos.
C1	Aplicar o método científico mediante a observación, a experimentación e o contraste de hipótese, interpretando os resultados obtidos e formulando conclusións fundamentadas
C2	Aplicar ferramentas matemáticas, físicas, químicas, estatísticas e informáticas á análise, interpretación e resolución de problemas biolóxicos
C7	Muestrear, caracterizar, catalogar, avaliar e xestionar recursos naturais e biolóxicos (poboacións, comunidades e ecosistemas) utilizando ferramentas apropiadas e bases de datos. Propoñer estratexias de conservación e restauración
D1	Resolución de problemas biolóxicos aplicando o método científico
D8	Avaliación, protección, conservación e restauración do medio físico, a biodiversidade e os ecosistemas. Identificación e uso de indicadores biolóxicos e ambientais

Resultados previstos na materia			
Expected results from this subject	Training and Learning Results		
Nova	B3	C1	D1
	B12	C2	D8
	B20	C7	

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. Padróns 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 estocasticidade. 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 metodolóxicas en Ecoloxía	Análise de datos experimentais sobre efectos de nutrientes en microorganismos. Análise de patróns de distribución espacial de plantas. Introducción á modelización de sistemas dinámicos.

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 Aide Lasa y Víctor Hernando (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 Aide Lasa. (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 Aide Lasa (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	B3 D8 B12
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	B12 C2 B20
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	C1 D1 C2 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	C2 D1

Prácticas con Avaliaranse, xunto co resto de prácticas, nun exame escrito a celebrar na data e hora apoio das indicadas en <https://bioloxia.uvigo.es/gl/docencia/horarios>. Asígnaselle aquí un valor do TIC 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

C2

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 considerárase "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 do TIC"), cunha cualificación máxima de 20%. Ao alumnado que aprobe o exame de prácticas, en calquera das 2 oportunidades dispoñibles, conserváraselle a cualificación en cursos posteriores mentres siga presentándose a algunha das probas da materia; se deixa de presentarse nalgún curso, terá que repetir as prácticas no curso seguinte en que se matricule da materia. Terá tamén que repetilas no caso de que non se manteñan as mesmas prácticas e a súa forma de avalialas, tal como aparece nesta guía. O alumnado que teña aprobadas as prácticas en cursos anteriores ao presente (2026-27) non necesitará volvelas a realizar nin examinarse neste curso, pero si a partir del se a súa cualificación final. no curso 2026-27. é de ☐Non Presentado☐.

Bloque 4: referido aos problemas ("Resolución de problemas"), cunha cualificación máxima de 15%.

A materia considerárase 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

Realízase 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 considerárase 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 inadmisíbel 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

Krebs, C. J., **Ecology : the experimental analysis of distribution and abundance**, 978-1292026275, 6ª, Pearson-Benjamin Cummings, 2014

Relyea, R.; Ricklefs, R.E, **Ecology:The economy of nature**, 978-1319187729, 8th, Macmillan education, 2018

Rodríguez, J., **Ecología**, 9788436835915, 4ª, Pirámide, 2016

Complementary Bibliography

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

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

Essington, **Introduction to Quantitative Ecology**, 978-0192843487, 1ª, Oxford University Press, 2021

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

Hutchinson, G. E., **Introducción a la Ecología de Poblaciones**, 978-8470312878, 1ª, Blume, 1981

Margalef, R., **Ecología**, 978-8428204057, 2ª, Omega, 1974

Molles, M.C., **Ecología: Conceptos y Aplicaciones**, 978-8448145958, 3ª, McGraw-Hill - Interamericana, 2006

Piñol, J.; Vilalta, J. M., **Ecología con números**, 978-8496553019, 1ª, Lynx, 2006

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				
(*)Fisiología animal I				
Subject	(*)Fisiología animal I			
Code	11595-53846-S			
Study programme	(*)Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	3rd	1st
Teaching language	Spanish Galician			
Department				
Coordinator	Míguez Miramontes, Jesús Manuel			
Lecturers	Correa Fleitas, Ignacio Lopez Patiño, Marcos Antonio Mallo Ferrer, Federico Míguez Miramontes, Jesús Manuel			
E-mail	jmmiguez@uvigo.es			
Web				
General description	Animal Physiology is a required course in the Biology degree program; therefore, knowledge of this subject is essential to the comprehensive education of a Biology graduate. The content of this course aims to explain the basic principles of how an animal organism functions; that is, it seeks to understand all the activities (physicochemical reactions) of the cells, tissues, and organs (whose structure and constituent elements have already been studied previously) that make up the animal body. The course also examines in detail how these systems enable different animals to adapt to their environment. Because physiological processes are extremely complex, the study and teaching of physiology must be approached by considering the various functional systems separately, while bearing in mind, however, that each function represents a partial component of the functional unit that is the living organism. Class schedules can be found at: http://bioloxia.uvigo.es/gl/docencia/horarios/ Course within the ENGLISH FRIENDLY PROGRAM. International students may request the following from faculty: a) materials and bibliographic references to follow the course in English, b) tutoring sessions in English, c) tests and assessments in English.			

Training and Learning Results	
Code	
B16	Understanding the mechanisms of cell signalling, the fundamentals of bioenergetics, and the regulation and integration of metabolism
B17	To integrate the physiological processes in animals, their regulation and their role in homeostatic and adaptive responses to the diverse environments in which they live
C5	Carry out analyses of samples from various sources, bioassays and functional tests. Determine and interpret biological parameters under normal and abnormal conditions
C8	To cultivate, produce, process and enhance biological resources, and to promote their use and/or exploitation in order to obtain products and services of interest
D1	Solving biological problems using the scientific method
D12	Participating in R+D+i activities, delivering training and disseminating knowledge, thereby contributing to the public profile of biology

Expected results from this subject			
Expected results from this subject	Training and Learning Results		
New	B16	C5	D1
	B17	C8	D12

Contents	
Topic	
Chapter 1. Introduction	Topic 1. Concept and Meaning of Physiology
Chapter 2. Cell Permeability and Excitability	Topic 2. Permeability and Transport Mechanisms Across the Plasma Membrane. Topic 3. Membrane Potential. Topic 4. Action Potential
Capítulo 3.- Neuronal communication	Topic 5. Synapses and Neurotransmitters. Topic 6. Synaptic Integration

Chapter 4. Sensory Physiology	Topic 7. General Properties of Sensory Systems. Topic 8. Chemical Sensitivity. Topic 9. Auditory and Vestibular Sensitivity. Topic 10. Visual Sensitivity.
Chapter 5. Motor Physiology	Topic 11. Spinal Reflexes. Topic 12. Voluntary Control of Movement.
Chapter 6. Muscle Physiology	Topic 13. Structure-Function Relationship in Muscle Topic 14. Excitation-Contraction Coupling Topic 15. Muscle Mechanics and Energy Topic 16. Smooth Muscle
Chapter 7. Internal Environment	Topic 17. Concept of the Internal Environment and Fluid Compartments. Blood Topic 18. Cellular Components of Blood Topic 19. Hemostasis and Coagulation
Chapter 8. Endocrine Physiology	Topic 20. Hormones and Endocrine Glands. Topic 21. Hypothalamus and Pituitary Gland. Neurohypophyseal Hormones. Growth and Lactation. Topic 22. Thyroid Gland. Topic 23. Adrenal Glands. Topic 24. Gonads and Reproductive Endocrinology. Topic 25. Endocrine Pancreas Topic 26. Vitamin-like Hormones and Bone Metabolism

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	32	70	102
Laboratory practical	12	8	20
Seminars	2	12	14
Objective questions exam	2	0	2
Objective questions exam	2	0	2
Essay	0	8	8
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	These sessions will take place in the classroom with all enrolled students attending; during these sessions, the theoretical foundations of the subject will be presented using PowerPoint presentations. The Moovi Platform will be used as a system for communication and contact with students.
Laboratory practical	An experimental course such as Physiology requires laboratory work to demonstrate many of the mechanisms and concepts explained in the theoretical portion of the course. Students must learn to handle laboratory materials, including biological materials; learn the fundamentals of the techniques used in physiological experimentation; acquire manual skills and dexterity; interpret results; and so on. The use of animals in educational experiments is permitted and regulated by the European Union; however, there is a growing trend toward seeking alternative methods that reduce the excessive sacrifice or handling of laboratory animals. One such alternative method is the use of computer programs that simulate physiological processes. In this introductory course to Physiology, the laboratory sessions in which students will participate will consist primarily of simulations of physiological processes. Lab sessions will be held in groups of no more than 20 students. They will take place in the computer lab of the School of Biology (simulation of physiological processes using computer software). One of the four lab sessions will involve biological samples and will be held in the Animal Physiology Lab (Block A, 2nd floor). Each group will have four 3-hour laboratory sessions, either in the morning or in the afternoon, depending on the group (see the schedule). The topics to be covered are as follows: Membrane potential and action potential assays. Cell permeability: passive diffusion, active diffusion, osmosis. Muscle contraction assays. Endocrine function: effects of thyroid hormones on basal metabolism. Osmolarity and tonicity using rat blood (lab).

Seminars	The seminars will consist of activities focused on the analysis of scientific articles, which will allow students to explore a specific topic in greater depth, thereby complementing the general content of the course. They will also include a brief presentation of the results to the rest of the class. The work will be carried out in small groups (3-4 students).
----------	--

Personalized assistance

Methodologies	Description
Lecturing	Students may ask questions or make comments during the lecture. Any questions that cannot be answered in class due to time constraints may be addressed during one-on-one tutoring sessions. Tutoring: Students may attend in-person tutoring sessions by scheduling an appointment in advance via email (jmmiguez@uvigo.es; fmallo@uvigo.es).
Laboratory practical	During lab sessions (since the groups are small), the instructor is available to answer any questions or address any concerns students may have. Students may also use email to ask questions or request an in-person tutoring session.
Seminars	Students are free to ask questions or make comments during the seminars. Any questions that cannot be answered in class due to time constraints will be addressed during the tutoring sessions.

Assessment

	Description	Qualification	Training and Learning Results	
Laboratory practical	Attendance at all labs is mandatory to pass the course. A documented, justified absence in accordance with current regulations will allow you to make up the lab in another section, if possible. An assessment test will be held at the end of the final practicum session, which will include questions related to the practicum activities. This section constitutes 10% of the final grade and will be worth 1 point.	10	C5 D1 C8 D12	
Seminars	Attendance at all seminars is mandatory to pass the course. Absences supported by documented proof, in accordance with current regulations, will allow students to attend the seminar in another group if possible. During the seminars, students will work in GROUPS of 3-4 students to analyze scientific articles on a specific topic within the course. Students will prepare a REPORT addressing basic aspects of the topic and the most relevant findings from the cited articles. Upon completion of the projects, students will give a brief PRESENTATION in class on the topic and the articles they worked on and will answer questions posed by students from other groups present in the classroom. This section accounts for 10% of the final grade (1 point).	10	B17	D1 D12
Objective questions exam	For continuous assessment, theoretical content will be evaluated through two midterms covering the two halves of the course: MIDTERM 1 This exam primarily covers neurophysiology and will be assessed using a multiple-choice test. Midterm 1 will account for 40% of the total grade and will be scored on a scale of 4 out of 10.	40	B16 B17	
Objective questions exam	For continuous assessment, theoretical content will be evaluated through two midterms covering the two halves of the course: MIDTERM 2 This exam primarily covers endocrinology and will be assessed using a multiple-choice test. Midterm 2 will account for 40% of the total grade and will be scored on a scale of 4 out of 10.	40	B16 B17	

Other comments on the Evaluation

Grades from exams and seminars will carry over within the same academic year. If a student does not pass the course during that academic year, they will be considered a new student in the course the following academic year.

Practicum grades will carry over for two consecutive academic years. If a student does not pass the course during those

academic years, they will be considered a new student in the course the following academic year.

CONTINUOUS ASSESSMENT

MIDTERM EXAMS 1 and 2

Midterm exams are part of the continuous assessment. To pass the course, students must pass both midterm exams (scoring 2 points or more on each). In that case, the grades from practical work and seminars will be added together to determine the final grade. If the total is equal to or greater than 5, the course is considered passed.

If a student fails one midterm exam, the grade from the other midterm exam as well as the grades from the practicals and seminars will not be added. The student's grade will be the grade from the failed exam. If both midterm exams are failed, the final grade will be the average of the two, and the grades from the practicals and seminars cannot be added.

In any case, to pass the course, students must complete and pass the practicals and seminars. Otherwise, the student's grade will be the lowest score obtained in any of these activities, regardless of the scores obtained on the midterm exams.

A grade of "Did Not Take the Exam" will be assigned only if the student has not participated in any of the course's assessment activities.

FINAL EXAM

If a student fails one or both midterm exams, they may make up the grade by taking the official first-chance final exam.

If any exam remains failed, the student may take the second-chance final exam to make up the grade.

In any case, to pass the course on the final exams, students must have completed and passed the lab sessions and seminars.

To pass the course, students must earn a minimum of 5 points out of a maximum of 10, calculated by adding four components: Test 1 (4) + Test 2 (4) + Practical (1) + Seminar (1).

COMPREHENSIVE EVALUATION

If a student requests a comprehensive evaluation within the deadlines established by the institution, they may take Tests 1 and 2 together on the official final exam during the first or second testing opportunity.

Please note that completing and passing the practical sessions and seminars remains mandatory for the comprehensive evaluation.

DATES OF TESTS AND FINAL EXAMS

The dates for all tests and final exams can be found at the following links:

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

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

Sources of information

Basic Bibliography

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

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

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

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

Rhoades, Tanner., **Fisiología Médica**, 6ª, Wolters Kluwer, 2023

Koeppen, Stanton, **Berne Levy FISIOLÓGIA**, 8ª, Elsevier, 2024

Hall, Hall., **Guyton y Hall: Tratado de Fisiología Médica**, 14ª, Elsevier, 2021

Complementary Bibliography

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

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

Barret, Barman, Bortano, Brooks., **Fisiología Médica de Ganong**, 26, McGraw Hill, 2020

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

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

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

Recommendations

IDENTIFYING DATA				
Fisiología vegetal I				
Subject	Fisiología vegetal I			
Code	11595-53847-S			
Study programme	Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	3	1c
Teaching language	#EnglishFriendly #PortuguêsAmigável Castelán Galego			
Department	Bioloxía vexetal e ciencias do solo			
Coordinator	González Rodríguez, Luis			
Lecturers	González García, Eva González Rodríguez, Luis Núñez González, Noa Sánchez Moreiras, Adela María			
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	
B16	Comprender os mecanismos da sinalización celular, os fundamentos da bioenergética e a regulación e integración do metabolismo
B19	Coñecer e integrar o funcionamento dos vexetais e a súa regulación, incluíndo os procesos de crecemento e desenvolvemento e as respostas e adaptacións ao ambiente
C8	Cultivar, producir, transformar e mellorar recursos de orixe biolóxica e valorar a súa utilización e-ou explotación para obter produtos e servizos de interese
C11	Identificar e utilizar fontes de información científica, contrastables e fiables, para fundamentar o estado dun problema biolóxico e poder abordar a súa resolución
C13	Comunicar de xeito claro e preciso os coñecementos e resultados biolóxicos, tanto de forma escrita como oral e usando recursos dixitais, a audiencias especializadas e non especializadas
C15	Colaborar e traballar en equipo, compartir responsabilidades e contribuír ao logro de obxectivos comúns en contextos de investigación e na actividade profesional
D2	Realización e interpretación de análise e diagnósticos fisicoquímicos, biolóxicos, hixiénicosanitarios, bioensaos e probas funcionais, especialmente nos ámbitos sanitario, industrial, agroalimentario e medioambiental, e emisión de informes
D8	Avaliación, protección, conservación e restauración do medio físico, a biodiversidade e os ecosistemas. Identificación e uso de indicadores biolóxicos e ambientais
D11	Elaboración e presentación de informes, proxectos, memorias técnicas e valoracións no ámbito da Bioloxía
D15	Actuar con alto grao de autonomía e de forma proactiva, incorporando os avances tecnolóxicos e científicos a prol de achegar solucións innovadoras ás necesidades e demandas da sociedade

Resultados previstos na materia

Expected results from this subject	Training and Learning Results		
Espérase que o estudantado desenvolva unha comprensión integrada dos principais procesos fisiolóxicos das plantas e adquira a capacidade de interpretar, relacionar e aplicar os coñecementos da Fisioloxía Vexetal a diferentes contextos biolóxicos.	B16	C8	D2
	B19	C11	D8
		C13	D11
		C15	D15

Ao rematar a materia, o estudantado deberá ter reforzado a súa capacidade de razoamento crítico, de análise de información científica e de resolución de problemas, así como a súa autonomía na aprendizaxe. Do mesmo xeito, espérase que mellore a súa capacidade para traballar de maneira colaborativa, argumentar as súas interpretacións e comunicar con rigor conceptos e procesos fisiolóxicos.

Contidos

Topic

	1. Organización funcional da célula vexetal. Relación entre estrutura celular, compartimentación e función fisiolóxica. 2. Membranas vexetais e transporte de substancias. Propiedades das membranas, difusión, transporte facilitado e transporte activo. 3. Potencial electroquímico e transporte iónico. Xeración de gradientes, funcionamento das bombas de protóns e transporte acoplado de solutos. 4. Homeostase celular. Regulación do pH, do equilibrio iónico e do volume celular. 5. Parede celular vexetal. Composición, propiedades mecánicas, crecemento celular e modificación da parede.
Relacións hídricas e transporte	1. Propiedades da auga relevantes para as plantas. Estrutura, cohesión, adhesión, capilaridade e interacción coa materia vexetal. 2. Potencial hídrico e movemento da auga. Compoñentes do potencial hídrico e aplicación á interpretación dos fluxos de auga no sistema solo-planta-atmosfera. 3. Absorción de auga e nutrientes pola raíz. Vías de transporte radial, función da endoderme e regulación da absorción. 4. Transporte de auga polo xilema. Mecanismo de cohesión-tensión, xeración da presión negativa e factores que condicionan o fluxo. 5. Transpiración e regulación estomática. Intercambio gasoso, funcionamento dos estomas e resposta aos factores ambientais. 6. Transporte de solutos polo floema. Fontes e sumidoiros, carga e descarga do floema e hipótese do fluxo de presión. 7. Integración do transporte a longa distancia. Relación funcional entre xilema e floema e distribución dos recursos na planta.
Fotosíntese	1. Organización do aparato fotosintético. Estrutura e función do cloroplasto, das membranas tilacoidais e dos pigmentos fotosintéticos. 2. Captación da luz e transferencia da enerxía. Espectros de absorción, complexos antena e centros de reacción. 3. Transporte fotosintético de electróns. Funcionamento dos fotosistemas, fluxo electrónico lineal e cíclico e redución do NADP⁺. 4. Fotofosforilación. Xeración do gradiente de protóns e síntese de ATP. 5. Balance enerxético da fase fotoquímica. Relación entre fotóns, electróns, protóns, ATP e NADPH. 6. Asimilación fotosintética do carbono. Fases do ciclo de Calvin-Benson, función da Rubisco e balance estequiométrico. 7. Fotorrespiración. Bases bioquímicas, custos metabólicos e significado fisiolóxico. 8. Mecanismos de concentración de CO₂. Características fisiolóxicas das plantas C₃, C₄ e CAM. 9. Regulación ambiental da fotosíntese. Efectos da luz, da temperatura, da dispoñibilidade de CO₂ e do estado hídrico.
Metabolismo secundario	1. Concepto e función do metabolismo especializado. Relación co metabolismo primario e importancia para a adaptación das plantas. 2. Principais rutas biosintéticas. Orixe dos metabolitos especializados a partir das vías do acetato-malonato, do ácido shikímico e dos isoprenoides. 3. Regulación do metabolismo especializado. Control do desenvolvemento, indución por sinais ambientais e interacción coas hormonas vexetais. 4. Análise integrada de casos. Interpretación da produción de metabolitos especializados como resposta funcional das plantas ás condicións ambientais.
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
Prácticas de laboratorio	15	15	30
Seminario	3	25	28
Estudo de casos	15	30	45

Metodoloxías baseadas en investigación	7	22	29
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 sesións de lección maxistral terán unha duración de 50 minutos e estarán orientadas á explicación, integración e discusión dos conceptos e procedementos de maior dificultade. Partirán do traballo previo realizado polo estudantado a partir dos materiais facilitados ou recomendados polo profesorado. Durante estas sesións combinaranse exposicións breves con preguntas, actividades de aplicación, interpretación de figuras e resultados experimentais e resolución de dúbidas. O estudantado deberá completar o traballo desenvolvido na aula mediante o estudo autónomo, a revisión dos materiais de referencia e a realización das actividades propostas.
Prácticas de laboratorio	As prácticas de laboratorio permitirán aplicar os fundamentos teóricos da materia, familiarizar o estudantado con algunhas técnicas experimentais empregadas en Fisioloxía Vexetal e desenvolver competencias relacionadas co deseño, execución e interpretación de experimentos. Antes de cada práctica, o alumnado deberá revisar o fundamento teórico, os obxectivos e o protocolo experimental. Durante as sesións, realizará as determinacións previstas, rexistrará os datos de maneira rigorosa e analizará os resultados obtidos. A aprendizaxe completárase mediante a resolución das cuestións recollidas no caderno de prácticas, nas que deberá interpretar os resultados, relacionalos cos procesos fisiolóxicos estudados e valorar as posibles limitacións do procedemento experimental.
Seminario	Os seminarios desenvolveranse en equipos reducidos de cinco ou seis estudantes. Cada equipo realizará un traballo bibliográfico guiado sobre un tema relacionado cos contidos da materia, prestando especial atención á planificación, á distribución equilibrada das tarefas, á selección crítica das fontes e á coordinación do traballo colectivo. O proceso será supervisado mediante entregas parciais que permitirán comprobar a evolución do traballo e proporcionar retroalimentación. Poderanse empregar ferramentas de intelixencia artificial como apoio á procura, organización ou revisión da información, sempre de maneira transparente, crítica e responsable. O estudantado deberá verificar a información obtida, identificar o uso destas ferramentas cando corresponda e asumir a autoría e responsabilidade do resultado final. O traballo culminará na elaboración dun resumo científico e presentación dun vídeo. Avaliaranse tanto a calidade e o rigor científico dos contidos como a capacidade de síntese, a comunicación do coñecemento, a organización do equipo e a participación individual dos seus integrantes.
Estudo de casos	Nas sesións de estudo de casos presentaranse situacións reais ou verosímiles relacionadas coa Fisioloxía Vexetal. O estudantado, organizado en grupos, deberá identificar o problema, seleccionar a información relevante, formular hipóteses, interpretar datos e propoñer explicacións ou solucións fundamentadas. Para a resolución dos casos disporá de materiais docentes, datos experimentais, representacións gráficas ou bibliografía especializada. A actividade finalizará coa posta en común e discusión das propostas, favorecendo o razoamento fisiolóxico, a argumentación científica e a comparación entre distintas interpretacións.
Metodoloxías baseadas en investigación	O estudantado desenvolverá actividades de indagación orientadas á construción crítica do coñecemento. Estas actividades poderán incluír a formulación de preguntas e hipóteses, a procura estruturada de información científica, a análise de artigos, a interpretación de datos experimentais e a avaliación da solidez das evidencias dispoñibles. A procura de información realizarase mediante fontes académicas fiables e seguindo criterios de relevancia, actualidade e rigor científico. O obxectivo será que o alumnado diferencie entre información, evidencia e interpretación, e que desenvolva a capacidade de elaborar conclusións fundamentadas e comunicalas cunha terminoloxía científica adecuada.

Atención personalizada	
Methodologies	Description
Lección maxistral	O estudantado deberá realizar unha primeira aproximación autónoma aos contidos mediante os materiais proporcionados polo profesorado antes do desenvolvemento de cada unidade temática. A partir das respostas ás actividades e cuestionarios previos, identificaranse os conceptos e procesos que presenten maiores dificultades, que serán aclarados e reforzados durante as sesións presenciais. A atención personalizada orientarase á resolución de dúbidas, á revisión de erros conceptuais e á mellora das estratexias de estudo. Estas actuacións desenvolveranse na aula, nos horarios de tutoría individual ou grupal e, cando proceda, a través de Moovi ou o correo electrónico do profesorado.

Seminario	A atención personalizada realizarase mediante o seguimento continuado do traballo de cada equipo, complementado con titorías individuais e grupais. O profesorado orientará a delimitación do tema, a planificación das tarefas, a procura e selección crítica da información, a organización dos contidos e a preparación do resumo científico e da presentación final. Nas titorías grupais abordaranse tamén competencias transversais, especialmente a coordinación do traballo cooperativo, a comunicación científica e o uso crítico, ético e transparente das ferramentas de intelixencia artificial. A retroalimentación proporcionada nas entregas parciais permitirá detectar dificultades, corrixir desviacións e mellorar progresivamente o traballo.
Prácticas de laboratorio	Durante as prácticas, o profesorado proporcionará atención directa e adaptada ás necesidades do alumnado para facilitar a comprensión dos obxectivos experimentais, dos fundamentos fisiolóxicos e das técnicas empregadas. Supervisarase a correcta execución dos procedementos, o rexistro rigoroso dos datos e a interpretación dos resultados. O carácter participativo das sesións permitirá detectar dificultades individuais ou dos equipos e establecer accións específicas de reforzo. Fomentarase a distribución equilibrada das tarefas, a responsabilidade individual e o traballo cooperativo. As dúbidas relacionadas co caderno de prácticas, o tratamento dos datos ou a interpretación dos resultados poderán resolverse durante as sesións, nos horarios de titoría ou a través da sección correspondente en Moovi.
Estudo de casos	O estudantado resolverá de maneira autónoma e colaborativa os casos propostos, baixo a supervisión do profesorado. A atención personalizada centrarase en orientar a identificación do problema, axudar a seleccionar a información relevante e formular preguntas que favorezan o razoamento, sen proporcionar directamente a solución. Durante o desenvolvemento da actividade observarase o progreso dos grupos e ofreceranse apoios diferenciados en función das dificultades detectadas. A posta en común permitirá proporcionar retroalimentación sobre a argumentación empregada, a interpretación dos datos e a solidez das conclusións.
Metodoloxías baseadas en investigación	O profesorado acompañará o proceso de indagación, orientando a formulación das preguntas, a definición das estratexias de procura, a selección de fontes académicas e a análise crítica da información. A supervisión desenvolverase principalmente durante as actividades presenciais, mediante intervencións adaptadas ao avance e ás dificultades do alumnado. A atención personalizada buscará evitar procuras pouco estruturadas, axudar a diferenciar entre evidencias e interpretacións e orientar a elaboración de sínteses bibliográficas rigorosas. Tamén se proporcionará retroalimentación sobre a formulación das conclusións e a comunicación dos resultados da investigación.
Tests	Description
Exame de preguntas de desenvolvemento	O profesorado orientará o estudantado sobre as características da proba, os criterios de avaliación e o nivel de integración e argumentación requirido nas respostas. Antes da realización do exame (nunca na semana previa ao exame), poderanse resolver dúbidas sobre os contidos da materia e revisar estratexias para estruturar respostas científicas claras, precisas e fundamentadas. Tras a avaliación, o estudantado poderá solicitar a revisión da proba nos termos e prazos establecidos previamente. Esta revisión permitirá analizar os erros cometidos, aclarar os criterios aplicados e identificar aspectos susceptibles de mellora.

Avaliación					
	Description	Qualification	Training and Learning Results		
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	B19	C15	D2 D8 D11
Seminario	En equipos de traballo elaborase e exporase un traballo sobre un proceso dentro do marco da Fisioloxía Vexetal.	20	B16	C8 C11 C13 C15	D11 D15
Estudo de casos	Solución e análise de supostos estruturados na aula. Avaliaranse de forma individualizada a participación, e o clima de traballo e discusión no grupo.	10	B16 B19	C11 C15	D2 D15
Metodoloxías baseadas en investigación	Avalíase a entrega por parte do alumnado da resolución e camiño seguido para resolver a actividade proposta na aula.	20	B16 B19	C11 C13 C15	D2 D8 D11 D15
Exame de preguntas de desenvolvemento	Onde se valorarán os coñecementos adquiridos durante o curso mediante respostas curtas, interpretación de gráficas ou procesos e estudo de casos.	30	B16 B19	C13	D2 D11 D15

Other comments on the Evaluation

A calificación mínima en cada unha das partes (exame teórico, seminarios, metodoloxías baseadas na investigación 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 incluírá cuestións sobre as diferentes partes metodolóxicas.

A proba teórica avaliarase mediante un exame que incluírá preguntas de definición, interpretación de gráficas e estudos de caso. 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 segunda convocatoria (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

IDENTIFYING DATA				
Inmunología y parasitología				
Subject	Inmunología y parasitología			
Code	11595-53848-S			
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 Momo, 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 adquiriran 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, ultraestrutura, 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	
B10	Coñecer as características taxonómicas, estruturas funcionais e metabolismo de virus, bacterias e parasitos
B12	Comprender a diversidade dos seres vivos e os ciclos biolóxicos, os procesos de reprodución e desenvolvemento, as relacións entre os organismos e a súa interacción coa contorna
B17	Integrar os procesos fisiolóxicos en animais, a súa regulación e o seu papel nas respostas homeostáticas e adaptativas á diversidade de ambientes nos que habitan
B18	Identificar os compoñentes do sistema inmunolóxico, os mecanismos de recoñecemento e efectores da resposta inmune e o seu papel na protección do organismo
C4	Illar e cultivar microorganismos, células, tecidos e órganos para facilitar o seu estudo e a caracterización da súa actividade biolóxica
C5	Realizar análise de mostras de distinta orixe, bioensaios e probas funcionais. Determinar e interpretar parámetros biolóxicos en condicións normais e anómalas
C9	Identificar axentes físicos, químicos e biolóxicos, incluíndo tóxicos e patóxenos, avaliar a súa actividade e deseñar estratexias para o seu seguimento e control
C13	Comunicar de xeito claro e preciso os coñecementos e resultados biolóxicos, tanto de forma escrita como oral e usando recursos dixitais, a audiencias especializadas e non especializadas
D1	Resolución de problemas biolóxicos aplicando o método científico
D8	Avaliación, protección, conservación e restauración do medio físico, a biodiversidade e os ecosistemas. Identificación e uso de indicadores biolóxicos e ambientais

Resultados previstos na materia

Expected results from this subject	Training and Learning Results		
Nova	B10	C4	D1
	B12	C5	D6
	B17	C9	D8
	B18	C13	D8
		C19	
		C20	

Contidos

Topic	
Bases orgánicas e tisulares e compoñentes celulares e humores do Sistema Inmunitario nos vertebrados.	Órganos Tecidos Células Xeneralidades de receptores e compoñentes humerais
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 inmunolóxicas
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. Adaptacións dos parásitos.
Importancia sanitaria dos parásitos	Concepto e desenvolvemento da enfermidade 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 dos módulos de Inmunoloxía e de Parasitoloxía. O obxectivo principal desta actividade é que os alumnos adquiran formación sobre determinados aspectos relevantes e aplicados da Inmunoloxía e da Parasitoloxía. A asistencia aos seminarios é obrigatoria. A falta de asistencia sen xustificación fará que os seminarios se suspendan, e por 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 prácticas do módulo de Parasitoloxía estarán orientadas á aprendizaxe de diversas técnicas de inmunoquímica, á identificación morfolóxica e ao diagnóstico de parásitos, así como á resolución de problemas de ecoparasitoloxía. As sesións prácticas do módulo de Inmunoloxía estarán orientadas á aprendizaxe de diversas técnicas inmunolóxicas e á súa posterior aplicación.

Lección maxistral	Impartiranse clases teóricas da módulo de Parasitoxía (14 horas). Clases nas que o alumno aprenderá os conceptos básicos da Parasitoxía e tamén, a súa importancia nas Ciencias da Natureza, Bioloxía e Ciencias da Saúde.
-------------------	--

Lección maxistral	Impartiranse clases teóricas da módulo 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. (Inmunoloxía 5%; Parasitoxía 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	B10 B12 B17 B18	C5 C13	D1 D8
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%; Parasitoxía 15%)	20	B10 B12 B17 B18	C4 C5 C9 C13	D1 D8
Exame de preguntas obxectivas	Parcial Módulo Inmunoloxía	40	B17 B18	C9 C13	D1 D8
Exame de preguntas obxectivas	Parcial Módulo Parasitoxía	30	B10 B12	C9 C13	D1 D8

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 Parasitoxía (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).

Para superar a materia é necesario:

1. Un mínimo de 4,5 puntos (sobre 10) en cada exame parcial e
2. Obter unha nota media mínima de 5, calculada a partir da nota media obtida nos dous exames.
3. A cualificación final da materia estará determinada pola suma das cualificacións obtidas en ambos os dous módulos, cunha puntuación máxima de 10 puntos.

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 renunciem 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

Abul K. Abbas & Andrew H. Lichtman & Shiv Pillai, **Inmunología básica: Funciones y trastornos del sistema inmunitario**, 978-841-3826578, 7ª edición, Elsevier, 2024

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

Regueiro, JR, Lopez Larrea, C, González-Rodríguez, S, Martínez-Naves, E., **Inmunología: biología y patología del sistema inmunitario**, 978-849-1104209, 5ª edición, Panamericana, 2022
<http://immunologylink.com>, **página web con links interesantes**,
Mehlhorn, H., **Animal Parasites: Diagnosis, Treatment, Prevention.**, Springer, (2016)
Mehlhorn, H., **Human Parasites: Diagnosis, Treatment, Prevention**, Springer, 2023
Archibald, J.M.; Simpson, A.G.B., **Handbook of the Protists.**, Springer, 2017
Loker, E.S. & Hofkin, B.V., **Parasitology: A Conceptual Approach.**, New York: Garland Science, 2015
Roberts, L.S. & Janovy, J. Jr., **Foundations of Parasitology**, McGraw-Hill, 2013
Complementary Bibliography
González Fernández, A., **INMUNO POWER: Conoce y fortalece tus defensas**, 978-841-3841748, 1ª edición, La esfera de los libros, 2021
Male, D, Peebles, RS et al, **Inmunología**, 978-849-1138907, 9ª edición, Elsevier, 2021
<https://www.inmunologia.org/revista/home.php>, **REVISTA INMUNOLOGIA**,
<https://www.nature.com/ni/>, **Nature Immunology**,
CORDERO DEL CAMPILLO, M., ROJO-VAZQUEZ, F.A., MARTINEZ, A.R., SANCHEZ, C., HERNANDEZ, S., NAVARRETE,,
Parasitología Veterinaria, McGraw/Hill Interamericana, 2000
BEAVER, P.C., JUNG, R.C. & CUPP, E.W., **Parasitología Clínica de Craig Faust**, Masson Editores,
Gállego Berenguer, J., **Manual de parasitología : morfología y biología de los parásitos de interés sanitario**,
Barcelona : Universitat de Barcelona, D.L., 2007
MEHLHORN, H., **Encyclopedic Reference of Parasitology. 2nd. Edition**, Springer Verlag, 2008
<http://www.cdc.gov/spanish/>,
<https://www.who.int/es>, **Organización Mundial de la Salud**,
<http://www.cdfound.to.it/>, **Atlas of Medical Parasitology**,
Bowman, D.D. Georgis, **Parasitology For Veterinarians**, Springer, (2014).
Goater, T.M.; Goater, C.M. & Esch, G.W., **Parasitism: The Diversity and ecology of animal parasites**, Cambridge University Press, 2015
Poulin, R., **Evolutionary ecology of parasites. 2nd ed.**, Princeton University Press., 2007
Adroher, F.J.; Campos, M. & Hueli, L., **Guía Práctica de Parasitología.**, Facultad de Farmacia. Universidad de Granada, 2004
Acha, P.N. Szyfres, B., **Zoonosis y enfermedades transmisibles comunes al hombre y a los animales, vol. 3, Parasitosis.**, Organización Panamericana de la Salud, Washington., 2003
Puerta Jiménez, I. & Vicente Romero, M.R., **Parasitología en el Laboratorio. Guía básica de diagnóstico**, 2015
Ezenwa, V.O.; Altizer, S.M. & Hall, R.J., **Animal Behavior and Parasitism.**, Oxford University Press, 2022
Thomas, F., Guegan, J.G. & Renaud, F., **Ecology and evolution of parasitism.**, Oxford University Press., 2009
<https://www.woah.org/es/inicio/>,
http://www.oie.int/esp/es_index.htm,
<https://parasiteswithoutborders.com/>,

Recomendaciones

Subjects that continue the syllabus

Técnicas en biología celular e molecular/V02G031V01310

Subjects that are recommended to be taken simultaneously

Técnicas en biología celular e molecular/V02G031V01310

Other comments

Os alumnos deben ter un nivel axeitado de inglés.

IDENTIFYING DATA				
Microbiología II				
Subject	Microbiología II			
Code	11595-53849-S			
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	González Abril, Ana Rocha Grandal, David			
E-mail	ana.gonzalez.abril@uvigo.gal			
Web	http://bioloxia.uvigo.es/gl/docencia/horarios/Horario_G031_3curso_2s_2026-27.pdf			
General description	Estudio de bacterias, arqueas, virus e partículas subvirais: taxonomía e filoxenia, diversidade, características xerais, ecolóxicas e interaccións con outros organismos e co medio ambiente.			

Resultados de Formación e Aprendizaxe

Code	
B5	Coñecer os métodos e técnicas máis habituais para a observación, identificación, obtención, procesado e análise de mostras de orixe biolóxica e non biolóxico en estudos de laboratorio, campo ou mediados por soportes informáticos, de análises de imaxes ou doutro tipo de sinais que acheguen datos de interese.
B7	Coñecer as técnicas e metodoloxías de illamento, purificación, análise, identificación e cuantificación de biomoléculas, incluíndo o material xenético
B10	Coñecer as características taxonómicas, estruturas funcionais e metabolismo de virus, bacterias e parasitos
B12	Comprender a diversidade dos seres vivos e os ciclos biolóxicos, os procesos de reprodución e desenvolvemento, as relacións entre os organismos e a súa interacción coa contorna
B14	Comprender os mecanismos da herdanza, a evolución e a biodiversidade
C3	Utilizar metodoloxías macroscópicas, microscópicas e moleculares para observar, identificar, caracterizar e conservar espécimes biolóxicos, así como obter mostras e constituíntes de interese
C13	Comunicar de xeito claro e preciso os coñecementos e resultados biolóxicos, tanto de forma escrita como oral e usando recursos dixitais, a audiencias especializadas e non especializadas
D2	Realización e interpretación de análise e diagnósticos físicoquímicos, biolóxicos, hixiénicosanitarios, bioensaios e probas funcionais, especialmente nos ámbitos sanitario, industrial, agroalimentario e medioambiental, e emisión de informes
D4	Realización de análise e estudos filoxenéticos, taxonómicos, paleontolóxicos e biogeográficos dos seres vivos, especialmente aqueles que sirvan de base para estudos demográficos e epidemiolóxicos
D13	Actuar con perspectiva de xénero e con respecto á diversidade e a multiculturalidade, co obxectivo de alcanzar unha sociedade máis xusta e igualitaria

Resultados previstos na materia

Expected results from this subject	Training and Learning Results		
Nova	B5	C3	D2
	B7	C13	D4
	B10		D13
	B12		
	B14		

Contidos

Topic	
Tema 1. Evolución e Filoxenia	Contexto molecular da diversidade microbiana. Cronómetros evolutivos. Filoxenia derivada do análise de secuencias de RNA ribosómicos: árbores filoxenéticas.
Tema 2. Taxonomía	Conceptos de Taxonomía e Sistemática. Sistemas de Clasificación. Categorías Taxonómicas. Nomenclatura. Técnicas empregadas en estudos 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: Outros phyla Gram negativas	Características principais e xéneros representativos de outros 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 reprodución. O alumnado non poderá ter en clase o teléfono móbil 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 nalgúns leccións maxistrais.

Atención personalizada

Methodologies	Description
Lección maxistral	Durante todo o proceso de aprendizaxe e especialmente en horas de tutoría, atenderáanse todas as dúbidas expostas en relación cos contidos teóricos da materia.
Seminario	Durante o desenvolvemento desta actividade atenderáanse todas as dúbidas expostas polos alumnos.
Prácticas de laboratorio	Durante todo o proceso de aprendizaxe e tamén en horario de tutoría, atenderáanse 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 avalíaranse 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	B5 C3 D2 B7 C13 D4 B10 D13 B12
Seminario	No seminario de aprendizaxe colaborativa realizarase un exame teórico que poderá ser tipo test ou preguntas curtas sobre os contidos tratados. Avalíaranse 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	B5 C3 D2 B10 C13 D4 B14 D13
Exame de preguntas obxectivas	Na primeira proba parcial, avalíaranse 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. Avalíarase tamén o dominio do vocabulario, capacidade de expresión e síntese.	35	B7 C13 D13 B10 B12 B14
Exame de preguntas obxectivas	Na segunda proba parcial, avalíaranse 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. Avalíarase tamén o dominio do vocabulario, capacidade de expresión e síntese.	35	B7 C13 D13 B10 B12 B14

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 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 maxistrais. 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 seguintes 2 cursos. O alumnado repetidor que realizara as prácticas e seminarios fai máis tempo deberá realízalas novamente para superar a materia.

8) A nota obtida no/nos exames de teoría e prácticas, e que sexan superadas para facer a media con as demais calificacións, no poderá subirse nota en exames extraordinarios nin en segunda convocatoria.

9) Se require do alumnado que curse esta materia unha conducta responsábel e honesta. Se considera inadmisíbel 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 condutas fraudulentas poderán supoñer suspender a asignatura durante un curso completo.

10) O uso de sistemas de intelixencia artificial nesta materia rexerase pola normativa vixente da UVIGO. As instrucións específicas para o seu uso nas distintas actividades de ensino e avaliación comunicaranse ao alumnado a través das canles habituais de comunicación da materia, preferiblemente mediante a presentación inicial e a plataforma MooVI da UVIGO.

As datas da proba final escrita pódense consultar na seguinte ligazón: <http://bioloxia.uvigo.es/gl/docencia/exames>

Bibliografía. Fontes de información

Basic Bibliography

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

Tortora G.J., Case C.L. Bair, W.B., Weber, D., Funke B.R., Funke, B.R., **Microbiology: An Introduction**, 14ª edición, Pearson, 2023

Willey, J., K. Sandman, D. Wood, **Prescott's Microbiology**, 12ª edición, Mc Graw Hill Education, 2022

Complementary Bibliography

Bauman, R.W., **Microbiology with diseases by taxonomy**, 6ª edición, Pearson, 2020

Black, J.G., L.J. Black, **Microbiology: Principles and Explorations**, 10ª edición, Wiley, 2018

Colomé, J.S., R. J. Cano, A.M. Kubinski, D.V. Grady, **Laboratory Exercises in Microbiology**, 1ª edición, West Publishing Company, 1986

Cowan, M.K., H. Smith, **Microbiology: A Systems Approach**, 6ª edición, Mc Graw Hill ed, 2020

P. M. Howley, D. M. Knipe, **Fields Virology: Emerging Viruses**, 7ª edición, Wolters Kluwer Health, 2020

P. M. Howley, D. M. Knipe, B.A. Damania, J.I. Cohen, S.P.J. Whelan, **Fields Virology Vol 3: RNA Viruses**, 7ª edición, Wolters Kluwer Health, 2022

P. M. Howley, D. M. Knipe, B.A. Damania, J.I. Cohen, **Fields Virology Vol 2: DNA Viruses**, 7ª edición, Wolters Kluwer Health, 2021

P. M. Howley, D. M. Knipe, B.A. Damania, J.I. Cohen, S.P.J. Whelan, **Fields Virology Vol 3: RNA Viruses**, 7ª edición, Wolters Kluwer Health, 2022

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

Bioteecnoloxía aplicada á produción microbiana/V02G031V01412

Microbioloxía e parasitoloxía sanitarias/V02G031V01406

IDENTIFYING DATA				
(*)Ecología II: Comunidades y ecosistemas				
Subject	(*)Ecología II: Comunidades y ecosistemas			
Code	11595-53850-S			
Study programme	(*)Grao en Biología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	3rd	2nd
Teaching language	Spanish			
Department				
Coordinator	Pardo Gamundi, Isabel María			
Lecturers	Aranguren Gassis, María Clerencia Izquierdo, Mar Delgado Núñez, Cristina Juan Ovejero, Raquel Pardo Gamundi, Isabel María			
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://biologia.uvigo.es/gl/docencia/horarios/			

Training and Learning Results

Code				
B12	Understanding the diversity of living things and biological cycles, processes of reproduction and development, relationships between organisms and their interaction with the environment			
B20	To analyse the structure and dynamics of populations and communities, the functioning of ecosystems, and biogeochemical cycles.			
B21	To explore the application of biology to the One Health concept (human, animal, plant and environmental health), to the Sustainable Development Goals, to the optimisation of production processes, and to promoting the conservation of the natural environment			
C7	Sample, characterise, catalogue, assess and manage natural and biological resources (populations, communities and ecosystems) using appropriate tools and databases. Propose conservation and restoration strategies			
C11	Identify and use verifiable and reliable sources of scientific information to assess the current state of a biological problem and address its resolution			
C15	Collaborate and work as a team, share responsibilities and contribute to the achievement of common goals in research contexts and in professional practice			
D8	Assessment, protection, conservation and restoration of the physical environment, biodiversity and ecosystems. Identification and use of biological and environmental indicators			
D14	Commitment to the Sustainable Development Goals and environmental conservation, promoting responsible practices and innovative solutions			

Expected results from this subject

Expected results from this subject	Training and Learning Results		
New	B12	C7	D8
	B20	C11	D14
	B21	C15	

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. Food webs. 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	In-person work guided by the professor, designed to delve deeper into topics related to or complementary to the material covered in lectures. Scientific articles and examples will be studied and analyzed through specific questions designed by the professor, addressing topics related to or complementary to the content covered during lecture hours. Seminars: 1. Emergent Properties of the Community 2. River Ecology: Introduction to Practical Applications 3. Estimates of Primary and Secondary Production
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 particulate 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 appointment. Schedule of assistance: Isabel Pardo: Tuesday and Wednesday 11.00-13:00 h; Raquel Juan: Monday and Wednesday 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 appointment. Schedule of assistance: Isabel Pardo: Tuesday and Wednesday of 11.00-13:00 pm; Cristina Delgado: Monday and Wednesday 11:00-13:00 h. Raquel Juan: 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 appointment. Schedule of Assistance: María Aranguren: Tuesday 11:00-14:00 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 appointment. 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 appointment. Schedule of Assistance: Isabel Pardo: Tuesday and Wednesday 11:00-13:00 h; Cristina Delgado: Monday and Wednesday 11:00-13:00 h. Raquel Juan: 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	C11	D8
Debate	Preparation, assistance and participation in the debate	5	B12	C11 D14
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	B20 B21	C7 C15 D8
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	B20 B21	C7 C11 C15
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	B12 B20 B21	D8 D14
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	B12 B20 B21	D8 D14

Other comments on the Evaluation

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

The practices (including the presentation of the report), as well as the activities related to the Seminar and the Debate, must be carried out compulsorily, 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 contents evaluated in the two partial exams included in the continuous assessment.

All exams (first partial exam, second partial exam and the July exam) will follow the same criteria: a grade of 5 must be obtained in all of them so that the grades of the other assessable sections of the subject (seminars, practical report, debate, etc.) can be added to the exam.

If the student fails the subject on the second attempt, the grades of the practicals, seminars and debate will be kept for the following academic year.

The student will be qualified as "not presented" if they do not appear for the written exams of the 1st and/or 2nd opportunity.

The final exam calendar 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,

Complementary Bibliography

Margalef, R, **Ecología**, 84-282-0405-5, 1974, Omega,
 Odum, E.P, **Fundamentos de ecología**, 2006,
 Odum, E.P., **Ecología: el puente entre ciencia y sociedad**, 1998,
 Pomeroy, L.R. y Alberts, J.J. (eds.), **Concepts of Ecosystems Ecology. A Comparative View**, 1988,

Ricklefs, R.E., **Ecology**, 1990,
Rodríguez, J., **Ecología**, 9788436829501, 2016, Piramide,

Recommendations

Subjects that continue the syllabus

- (*)Evaluación de impacto ambiental/11595-53859-S
 - (*)Gestión y conservación de espacios/11595-53861-S
 - (*)Análisis y diagnóstico medioambiental/11595-53858-S
-

Subjects that it is recommended to have taken before

- (*)Ecología I: Individuos y poblaciones/11595-53845-S
- Ecology I/V02G031V01301
-

IDENTIFYING DATA				
(*)Fisiología animal II				
Subject	(*)Fisiología animal II			
Code	11595-53851-S			
Study programme	(*)Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	3rd	2nd
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	Soengas Fernández, José Luis			
Lecturers	Covelo Fernández, Ana Pérez Tierra, Gabriel Portela Couñago, Laura 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				
B16	Understanding the mechanisms of cell signalling, the fundamentals of bioenergetics, and the regulation and integration of metabolism			
B17	To integrate the physiological processes in animals, their regulation and their role in homeostatic and adaptive responses to the diverse environments in which they live			
C5	Carry out analyses of samples from various sources, bioassays and functional tests. Determine and interpret biological parameters under normal and abnormal conditions			
C8	To cultivate, produce, process and enhance biological resources, and to promote their use and/or exploitation in order to obtain products and services of interest			
C11	Identify and use verifiable and reliable sources of scientific information to assess the current state of a biological problem and address its resolution			
C15	Collaborate and work as a team, share responsibilities and contribute to the achievement of common goals in research contexts and in professional practice			
D2	Conducting and interpreting physicochemical, biological, hygiene and health analyses and assessments, bioassays and functional tests, particularly in the health, industrial, agri-food and environmental sectors, and issuing reports			
D6	Propose and participate in protocols relating to reproduction, conservation and genetic improvement, as well as the cultivation of cells, tissues, organs and specimens			
D11	Preparation and presentation of reports, projects, technical reports and assessments in the field of biology			

Expected results from this subject

Expected results from this subject	Training and Learning Results			
New	A4	B4 B16 B17	C5 C8 C11 C15	D1 D2 D6 D7 D11

Contents

Topic	
-------	--

Chapter I: Cardiovascular Physiology	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 breathing	Topic 6. General characteristics of breathing Topic 7. Breathing in aquatic animals Topic 8. Air breathing Topic 9. Diffusion and transport of gases Topic 10. Breathing regulation
Chapter III: Excretory function and osmoregulation	Topic 11. General characteristics of excretion Topic 12. Urine formation Topic 13. Osmoregulation Topic 14. Regulation of acid-base balance
Chapter IV: Digestive Physiology	Topic 15. General characteristics of digestive systems Topic 16. Motility and digestive secretions Topic 17. Digestion and absorption Topic 18. Regulation of food intake
Chapter V: Reproduction	Topic 19. General characteristics of reproduction Topic 20. Male reproductive physiology Topic 21. Female reproductive physiology 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	B16 B17
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	B16 B17
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	C11 D11 C15
Laboratory practical	Attendance to practical classes is mandatory. At the end of them, a practical classes report will be delivered by each of the subgroups that will be organized in each practical group.	10	C5 D2 C8 D6 C15

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

- Hill, W., Wyse, G.A., Anderson, M., **Animal Physiology 4th edition**, Oxford University Press, 2017
- Randall, D., French, K., **Eckert Animal Physiology 5ª edición**, WH Freeman, 2021
- Moyes, C.D., Schulte, P.M., **Principios de Fisiología animal**, Pearson, Addison and Wesley, 2007
- 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 edición 14**, Interamericana-McGraw-Hill, 2021
- Rhoades, R.A. y Tanner, G.A., **Fisiología Médica**, Masson-Little, Brown, 2017
- Barber, A. y Ponz, F., **Principios de Fisiología Animal.**, 978-8477385561, Síntesis, 2020
- Koeppen, B.M., Stanton, **Berne & Levy Physiology**, Elsevier, 2017
- Moyes, C.D., Schulte, P.M., **Principles of Animal Physiology**, Pearson, 2014

Complementary Bibliography

- Hill, R.W., Wyse, G.A., Anderson, M., **Fisiología Animal**, Panamericana, 2006
- Randall, D., Burggren, W., French, K., **Fisiología animal.**, McGraw-Hill/Interamericana, 1998
- Silverthorn, **Fisiología humana**, Médica Panamericana, 2021
- Thibodeau, G.A. y Patton, K.T., **Anatomía y Fisiología**, Mosby-Doyma, 1995
- Tresguerres, J.A.F., **Fisiología Humana**, McGraw-Hill Interamericana,
- 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				
Fisiología vegetal II				
Subject	Fisiología vegetal II			
Code	11595-53852-S			
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	González García, Eva Pedrol Bonjoch, María Nuria 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				
B1	Comprender os distintos niveis de organización dos seres vivos e as evidencias da súa evolución			
B5	Coñecer os métodos e técnicas máis habituais para a observación, identificación, obtención, procesado e análise de mostras de orixe biolóxica e non biolóxico en estudos de laboratorio, campo ou mediados por soportes informáticos, de análises de imaxes ou doutro tipo de sinais que acheguen datos de interese.			
B16	Comprender os mecanismos da sinalización celular, os fundamentos da bioenergética e a regulación e integración do metabolismo			
B19	Coñecer e integrar o funcionamento dos vexetais e a súa regulación, incluíndo os procesos de crecemento e desenvolvemento e as respostas e adaptacións ao ambiente			
C1	Aplicar o método científico mediante a observación, a experimentación e o contraste de hipótese, interpretando os resultados obtidos e formulando conclusións fundamentadas			
C3	Utilizar metodoloxías macroscópicas, microscópicas e moleculares para observar, identificar, caracterizar e conservar espécimes biolóxicos, así como obter mostras e constituíntes de interese			
C4	Illar e cultivar microorganismos, células, tecidos e órganos para facilitar o seu estudo e a caracterización da súa actividade biolóxica			
C5	Realizar análise de mostras de distinta orixe, bioensaos e probas funcionais. Determinar e interpretar parámetros biolóxicos en condicións normais e anómalas			
D1	Resolución de problemas biolóxicos aplicando o método científico			
D2	Realización e interpretación de análise e diagnósticos fisicoquímicos, biolóxicos, hixiénicosanitarios, bioensaos e probas funcionais, especialmente nos ámbitos sanitario, industrial, agroalimentario e medioambiental, e emisión de informes			
D6	Propoñer e participar en protocolos de reprodución, conservación e mellora xenética, así como de cultivo de células, tecidos, órganos e espécimes			
D11	Elaboración e presentación de informes, proxectos, memorias técnicas e valoracións no ámbito da Bioloxía			

Resultados previstos na materia

Expected results from this subject	Training and Learning Results			
Nova	A1	B1	C1	D1
	A2	B1	C3	D2
	A3	B2	C3	D6
	A4	B5	C4	D11
	A5	B5	C5	
		B16		
		B19		

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.

Crecedemento 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 crecedemento 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 maxistras son leccións de 50 min, para explicar e desenvolver os contidos, interaccións teóricas e exemplos de casos prácticos de Fisioloxía 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 maxistras deben ser completadas con traballo autónomo do alumnado utilizando ditas fontes de información.
Prácticas de laboratorio	Complementan as sesións maxistras, familiarizando ao alumnado coas técnicas de laboratorio e a recollida e tratamento de datos cuantitativos en Fisioloxía Vexetal. Realizarán experimentos concretos (v. contidos) cuxos resultados se avaliarán nun exame ao final das prácticas.
Seminario	O traballo levarase a cabo en grupos estables dun mínimo de 3 e un máximo de 4 estudantes. Na primeira sesión de seminarios, cada grupo elixirá un tema relacionado cos contidos de Fisioloxía Vexetal II de entre os propostos polo profesorado. Cada tema incluírá artigos científicos que os estudantes terán que revisar para contestar por escrito a unha serie de cuestións sobre os mesmos nas dúas últimas sesións presenciais de seminarios.

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 maxistras 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	B5 C1 D2 C3 D6 C4 D11 C5
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	B1 C1 D1 B5 D11 B16 B19

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 maxistras 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.	30	B1 B5 B16 B19	C1 C5 D1 D2 D11
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.				
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 maxistras 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.	30	B1 B5 B16 B19	C1 C5 D1 D2 D11
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.				

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.

Advértese 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 titorías en grupo (seminarios) durante dous anos, sempre que as aprobou. O alumnado repetidor que realice as prácticas e seminarios hai máis tempo deberá realízalas novamente para superar a materia.

Bibliografía. Fontes de información

Basic Bibliography

Buchanan, B.B.; Gruissem, W.; Jones, R.L., **Biochemistry and Molecular Biology of Plants**, 2, American Society of Plant Physiologists/Wiley Blac, 2015

Jones, R.; Ougham, H.; Thomas, H.; Waaland, S., **The Molecular Life of Plants**, Wiley-Blackwell, 2013

Taiz, L.; Zeiger, E.; Moller, I.M.; Murphy, A., **Plant Physiology and Development**, 9780197577240, 7, Sinauer Associates-Oxford University Press, 2023

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

Dennis, D.T.; Turpin, D.H., **Plant Physiology, Biochemistry and Molecular Biology**, Longman, 1990

Díaz de la Guardia, M., **Fisiología de las plantas**, 2, Servicio de Publicaciones, Univ. Córdoba, 2010

George, E.F.; Hall, M.A.; De Klerk, G.-J., **Plant Propagation by Tissue Culture**, 3, Springer, 2008

Hopkins, W.G.; Hüner, N.P.A., **Introduction to Plant Physiology**, 4, John Wiley & Sons, Inc., 2009

Pineda, M., **Resúmenes de Fisiología Vegetal**, 2, Servicio de Publicaciones, Univ. Córdoba, 2012

Reigosa, M.J.; Pedrol, N.; Sánchez, A., **La ecofisiología vegetal. Una ciencia de síntesis**, Thomson, 2003

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

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

Botánica II: Arquegoniadas/V02G031V01207

Bioquímica I/V02G031V01201

Bioquímica II/V02G031V01206

IDENTIFYING DATA				
(*)Técnicas en biología celular y molecular				
Subject	(*)Técnicas en biología celular y molecular			
Code	11595-53853-S			
Study programme	(*)Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	3rd	2nd
Teaching language	Spanish			
Department				
Coordinator	Simón Vázquez, Rosana			
Lecturers	Galindo Dasilva, Juan Gutiérrez Chávez, Lizbet Martínez Mariño, Víctor Morán Martínez, María Paloma Pazos Linares, Elena Pérez Potti, André Simón Vázquez, Rosana Villar Roca, Raquel Zoni , Valeria			
E-mail	rosana.simon@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	
B4	To understand the fundamentals of scientific and technical instrumentation, experimentation with living organisms, health and safety standards in laboratory and field work, as well as the basic protocols and regulations in each area of experimentation
B5	To be familiar with the most common methods and techniques for the observation, identification, collection, processing and analysis of biological and non-biological samples in laboratory, field or computer-based studies, including the analysis of images or other types of signals that provide relevant data.
B7	To understand the techniques and methodologies involved in the isolation, purification, analysis, identification and quantification of biomolecules, including genetic material
B13	To understand the structure and complexity of genetic material, how it works, and the applications of genetic engineering
B15	To understand the structure of biomolecules and their role in biological processes
C1	Apply the scientific method through observation, experimentation and the testing of hypotheses, interpreting the results obtained and drawing well-founded conclusions
C3	Use macroscopic, microscopic and molecular methods to observe, identify, characterise and preserve biological specimens, as well as to obtain samples and components of interest
C4	To isolate and culture microorganisms, cells, tissues and organs in order to facilitate their study and the characterisation of their biological activity
C5	Carry out analyses of samples from various sources, bioassays and functional tests. Determine and interpret biological parameters under normal and abnormal conditions
C6	To isolate and manipulate genetic material, identify its abnormalities and their role in biological processes, particularly in diseases
D5	Conducting genomic studies for genetic counselling, assisted reproductive technologies, developmental biology and gene therapy
D6	Propose and participate in protocols relating to reproduction, conservation and genetic improvement, as well as the cultivation of cells, tissues, organs and specimens
D11	Preparation and presentation of reports, projects, technical reports and assessments in the field of biology

Expected results from this subject			
Expected results from this subject		Training and Learning Results	
(*)	B4	C1	D5
	B5	C3	D6
	B7	C4	D11
	B13	C5	
	B15	C6	

Contents	
Topic	
Advanced microscopy techniques (Module I, Cell Biology) - 12 hours	Immunohistochemistry and immunofluorescence Fluorescence microscopy Electron microscopy
Purification 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	Description of the structure and methodology of the subject.
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	B4 B5 B15	C1 C3 C4 C5
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	B4 B5 B7 B15	C1 C3 C5
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	B4 B5 B7 B15	C1 C3 C4 C5
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	B4 B5 B7 B13	C1 C3 C5 C6
Objective questions exam	The knowledge acquired in the practices and complementary activities developed in the four modules of the subject are evaluated.	40	B4 B5 B7 B13 B15	

Other comments on the Evaluation

TBCM is a course with compulsory practical sessions distributed across four modules: I. Cell Biology; II. Biochemistry; III. Immunology; IV. Genetics.

COMPULSORY ATTENDANCE AT PRACTICAL SESSIONS

Attendance at laboratory practicals is compulsory. Students must attend all practical sessions and must always do so in the group to which they have been officially assigned.

Unjustified absence from one or more laboratory sessions will prevent students from passing the course through continuous assessment.

Only one justified absence from laboratory practicals will be accepted, in accordance with Article 15.2 of the Regulations on the assessment, grading and quality of teaching and of the student learning process at the Universidade de Vigo. In the event of a justified absence from one session, the continuous assessment activity corresponding to that practical session cannot be made up and will be awarded 0 points.

Justified absence from two or more laboratory practicals will prevent continuous assessment. In this case, students must take the global assessment.

CONTINUOUS ASSESSMENT

Continuous assessment is the recommended mode for following the course.

A total of 60% of the final mark is obtained from multiple-choice tests and the submission of reports throughout the course. In addition, circumstances such as lack of punctuality, attendance in a group other than the one assigned, lack of integration into the working group, failure to comply with laboratory rules, or a demotivated, passive, or negligent attitude will penalise up to 50% of the continuous assessment mark corresponding to each practical session.

The modules are weighted as follows: Cell Biology, 12%; Biochemistry, 18%; Immunology, 12%; Genetics, 18%.

In order to pass the course, students must obtain a minimum mark of 3.5 out of 10 in each module.

The remaining 40% of the final mark is obtained from the first- or second-opportunity examination, which will take place on

the dates scheduled by the Faculty/School. In this case, students must also obtain a minimum mark of 3.5 out of 10 in each of the four modules.

If the minimum mark of 3.5 is not achieved in any of the modules, the final numerical grade recorded in the official transcript will be no higher than 4 points.

The marks obtained in continuous assessment will be retained only during the academic year in which they are obtained, including the extraordinary examination session. If the course is not passed during that academic year, all activities and assessments for the four modules must be repeated in the following year.

GLOBAL ASSESSMENT

Students who cannot be assessed through continuous assessment, or who must take the global assessment because they have failed to meet the attendance requirements, will be assessed by means of an examination accounting for 100% of the final mark.

The examination will consist of two parts:

1. A theoretical part, accounting for 50% of the final mark. It will include questions corresponding to the contents of the four course modules, weighted in the same way as in continuous assessment. A minimum mark of 3.5 out of 10 must be obtained in each module.
2. A practical part, accounting for 50% of the final mark. It will consist of the oral resolution of a practical case for each module. Students will have one hour to prepare the examination and, subsequently, one hour to answer questions posed by an examination panel made up of course teaching staff. A minimum mark of 3.5 out of 10 must also be obtained in each module.

It is recommended to visit the web <https://bioloxia.uvigo.es/es/docencia/examenes/> to confirm the exam date.

USE OF ELECTRONIC DEVICES AND ARTIFICIAL INTELLIGENCE

The use of digital devices (computers, mobile phones, and tablets) during practical sessions will be limited exclusively to tasks related to the practical work, such as completing tests and exercises proposed by the teaching staff or accessing the practical session guidelines.

Any use of these devices for any other purpose not authorised by the teaching staff will result in a penalty in the mark corresponding to the continuous assessment of each practical session.

During any assessment activity, the use or possession of mobile phones, smartwatches, smart glasses, headphones, tablets, laptops, or any other electronic device is not permitted, unless expressly authorised by the teaching staff.

Devices must remain switched off and stored away from the workstation or examination desk. The mere possession of these devices during an assessment activity may lead to immediate expulsion from the assessment and a failing grade in the corresponding examination session.

The use of artificial intelligence tools, conversational assistants, automatic text-generation systems, automatic translators, exercise-solving applications, or any other equivalent digital resource is also not permitted in tests, reports, questionnaires, or assessable activities, unless expressly authorised by the teaching staff for a specific activity.

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

Hunter E, **Practical electron microscopy: a beginner's illustrated guide**, 1993

Lefkovits I, **Immunology methods manual: the comprehensive sourcebook of techniques**, Academic Press, 1997

Nelson DL y Cox MM, **Lehninger: principios de bioquímica**, 7a, Ediciones Omega, 2018

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_qUD8T2a5OB7lc-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				
Análisis y diagnóstico agroalimentario				
Subject	Análisis y diagnóstico agroalimentario			
Code	11595-53854-S			
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	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, parasitolóxicos 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	
B5	Coñecer os métodos e técnicas máis habituais para a observación, identificación, obtención, procesado e análise de mostras de orixe biolóxica e non biolóxico en estudos de laboratorio, campo ou mediados por soportes informáticos, de análises de imaxes ou doutro tipo de sinais que acheguen datos de interese.
B21	Explorar a aplicabilidade da bioloxía ao concepto dunha única saúde (humana, animal, vexetal, e ambiental), aos obxectivos de desenvolvemento sostible, á optimización dos procesos produtivos e a promover a conservación do medio natural
C9	Identificar axentes físicos, químicos e biolóxicos, incluíndo tóxicos e patóxenos, avaliar a súa actividade e deseñar estratexias para o seu seguimento e control
C11	Identificar e utilizar fontes de información científica, contrastables e fiables, para fundamentar o estado dun problema biolóxico e poder abordar a súa resolución
C13	Comunicar de xeito claro e preciso os coñecementos e resultados biolóxicos, tanto de forma escrita como oral e usando recursos dixitais, a audiencias especializadas e non especializadas
C18	Desenvolver e aplicar metodoloxías analíticas e de control de produtos agroalimentarios, supervisar a seguridade e calidade na cadea alimentaria. Avaliar e comunicar riscos para a saúde e o medioambiente
D2	Realización e interpretación de análise e diagnósticos fisicoquímicos, biolóxicos, hixiénicosanitarios, bioensaos e probas funcionais, especialmente nos ámbitos sanitario, industrial, agroalimentario e medioambiental, e emisión de informes
D9	Xestión, control e tratamento de axentes físicos, químicos e biolóxicos e os seus produtos tóxicos, en todos os ámbitos da Bioloxía

Resultados previstos na materia			
Expected results from this subject	Training and Learning Results		
Nova	B5 B21	C9 C11 C13 C18	D2 D9

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 principais 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 erros 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	B5 B21	C9 C11 C13 C18	D2
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	B5	C9 C11 C13 C18	D9
Exame de preguntas obxectivas	Este exame, que incluírá 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	B5	C9 C13	D2 D9
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	B5	C9 C13	D2 D9

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 avaliábeis 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 en Prácticas (40%), Estudo de casos (20%) e Proba final integradora (40%; 26,8% preguntas obxectivas e 13,2% preguntas de desenvolvemento).** No entanto, **para poder superar a materia, e poder sumar as cualificacións obtidas nas distintas actividades avaliábeis, deberase alcanzar polo menos un 4,0 (sobre 10) nas Prácticas, no Estudo de casos, e en cada unha das partes (Química Analítica, Microbioloxía 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/actividade na que non alcanzasen o 4,0.**

Loxicamente, os alumnos que se atopen nesta situación conservarán a nota da parte/s ou actividade/é "superada/s" ($\geq 4,0$) en primeira oportunidade, para telas en conta na nota final. **Na segunda oportunidade, será tamén imprescindible alcanzar o 4,0 en todas as partes/actividades obxecto de recuperación.**

O **uso de sistemas de intelixencia artificial** nesta materia rexeráse pola normativa de aplicación da UVIGO. As instrucións específicas sobre a súa utilización nas distintas actividades docentes e de avaliación poranse en coñecemento do estudantado na presentación da materia e a través das respectivas plataformas de docencia.

As datas da proba final integradora pódense consultar na seguinte ligazón: <http://bioloxia.uvigo.es/es/docencia/examenes>.

Bibliografía. Fontes de información

Basic Bibliography

Doyle, M.P., Díez-González, F., Hill, C., **Food Microbiology. Fundamentals and Frontiers.**, 5ª ed., ASM Press, 2019

Shibamoto, T., Bjeldanes, L., **Introduction to food toxicology**, 2nd. ed., Academic Press, 2009

Labbé, R.G., García, S., **Guide to Foodborne Pathogens**, 2nd ed., Wiley, 2013

Xiao, L., Ryan, U., Feng, Y., **Biology of Foodborne Parasites**, CRC Press, 2015

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

Juneja, V.K., Sofos, J.N., **Pathogens and toxins in foods. Challenges and Interventions**, ASM Press, 2009

Tennant, D.R., **Food chemical risk analysis**, Blackie-Chapman & Hall, 1997

International Commission 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: Occurrence 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

IDENTIFYING DATA				
Bioteecnología aplicada a la producción animal				
Subject	Bioteecnología aplicada a la producción animal			
Code	11595-53855-S			
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 Portela Couñago, Laura Rolán Álvarez, Emilio Velasco Rubial, Cristina			
E-mail	cvrubial@uvigo.es			
Web				
General description	A materia Bioteecnoloxía Aplicada á Producción 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	
B7	Coñecer as técnicas e metodoloxías de illamento, purificación, análise, identificación e cuantificación de biomoléculas, incluíndo o material xenético
B17	Integrar os procesos fisiolóxicos en animais, a súa regulación e o seu papel nas respostas homeostáticas e adaptativas á diversidade de ambientes nos que habitan
B21	Explorar a aplicabilidade da bioloxía ao concepto dunha única saúde (humana, animal, vexetal, e ambiental), aos obxectivos de desenvolvemento sostible, á optimización dos procesos produtivos e a promover a conservación do medio natural
C8	Cultivar, producir, transformar e mellorar recursos de orixe biolóxica e valorar a súa utilización e-ou explotación para obter produtos e servizos de interese
C9	Identificar axentes físicos, químicos e biolóxicos, incluíndo tóxicos e patóxenos, avaliar a súa actividade e deseñar estratexias para o seu seguimento e control
C15	Colaborar e traballar en equipo, compartir responsabilidades e contribuír ao logro de obxectivos comúns en contextos de investigación e na actividade profesional
C19	Deseñar e xestionar procesos de produción animal, vexetal e microbiana, implantar normas de control de calidade e propoñer melloras na eficiencia e sustentabilidade. Identificar novos ámbitos de aplicación e oportunidades profesionais e-ou industriais
D2	Realización e interpretación de análise e diagnósticos fisicoquímicos, biolóxicos, hixiénicosanitarios, bioensaios e probas funcionais, especialmente nos ámbitos sanitario, industrial, agroalimentario e medioambiental, e emisión de informes
D6	Propoñer e participar en protocolos de reprodución, conservación e mellora xenética, así como de cultivo de células, tecidos, órganos e espécimes
D7	Xestión de sistemas de produción, transformación e manipulación de produtos e subprodutos de materiais biolóxicos e biotecnolóxicos, e de sistemas e normas de calidade, especialmente nos ámbitos industrial, sanitario, agroalimentario e medioambiental

Resultados previstos na materia	
Expected results from this subject	Training and Learning Results

Identificar os sistemas de produción animal.	B7	C8	D2
Coñecer as bases fisiolóxicas da produción animal.	B17	C9	D6
Aplicar coñecementos biotecnolóxicos na reprodución e o benestar animal.	B21	C15	D7
Coñecer as bases da alimentación e nutrición animal e a biotecnoloxía asociada.		C19	
Describir as condicións sanitarias e hixiénicas na produción animal.			
Coñecer a lexislación e normativas da produción animal.			
Comprender as técnicas de mellora en produción animal.			

Contidos

Topic	
Capítulo 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 produción 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: - Propóranse 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 expóranse 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	Capítulos 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 maxistralExame de preguntas obxectivas e preguntas de desenvolvemento sobre os contidos do bloque de Fisioloxía. Para superar a materia esíxese un mínimo de 3 puntos (sobre 10) no exame.	30	
Seminario Valorarase: -Calidade da memoria escrita presentada (organización, redacción, adecuación da bibliografía, enfoque e profundidade axetados ó tema). -Calidade da presentación oral (adecuación ó tempo, calidade da información presentada nas figuras, expresión oral, capacidade de transmisión de información, dominio da linguaxe técnica). -Respostas ás preguntas expostas.	30	
Prácticas de laboratorio A asistencia a prácticas é obrigatoria. Cada un dos tres módulos de prácticas (fisioloxía, sanidade e mellora) avalíaranse 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	
Lección maxistralExame de preguntas obxectivas e preguntas de desenvolvemento sobre os contidos do bloque de sanidade e resolución de problema no bloque de mellora. Para superar a materia esíxese un mínimo de 3 puntos (sobre 10) no exame.	30	

Other comments on the Evaluation

1) Avaliación continúa

É obrigatorio realizar as prácticas da materia. A non realización das mesmas suporá un suspenso na calificación global aínda 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 conservaráselles 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 aínda que se superen o resto de actividades previstas.

Para superar a materia deberá realizar obrigatoriamente o seminario.

Na data de avaliación da primeira ou segunda oportunidade fará un exame cun valor do 60% que incluírá todos os bloques da 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**, Síntesis, 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 II/V02G031V01307

Xenética II/V02G031V01304

Inmunoloxía e parasitoloxía/V02G031V01305

Microbioloxía II/V02G031V01309

Fisioloxía animal I/V02G031V01302

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				
(*)Biotecnología aplicada a la producción vegetal				
Subject	(*)Biotecnología aplicada a la producción vegetal			
Code	11595-53856-S			
Study programme	(*)Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	1st
Teaching language	#EnglishFriendly			
Department				
Coordinator	Barreal Modroño, María Esther			
Lecturers	Barreal Modroño, María Esther Galindo Dasilva, Juan			
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				
B21	To explore the application of biology to the One Health concept (human, animal, plant and environmental health), to the Sustainable Development Goals, to the optimisation of production processes, and to promoting the conservation of the natural environment			
C1	Apply the scientific method through observation, experimentation and the testing of hypotheses, interpreting the results obtained and drawing well-founded conclusions			
C2	Apply mathematical, physical, chemical, statistical and computational tools to the analysis, interpretation and resolution of biological problems			
C4	To isolate and culture microorganisms, cells, tissues and organs in order to facilitate their study and the characterisation of their biological activity			
C11	Identify and use verifiable and reliable sources of scientific information to assess the current state of a biological problem and address its resolution			
C15	Collaborate and work as a team, share responsibilities and contribute to the achievement of common goals in research contexts and in professional practice			
C19	Design and manage animal, plant and microbial production processes; implement quality control standards; and propose improvements in efficiency and sustainability. Identify new areas of application and professional and/or industrial opportunities			
D1	Solving biological problems using the scientific method			
D6	Propose and participate in protocols relating to reproduction, conservation and genetic improvement, as well as the cultivation of cells, tissues, organs and specimens			
D7	Management of production, processing and handling systems for products and by-products derived from biological and biotechnological materials, as well as quality systems and standards, particularly in the industrial, healthcare, agri-food and environmental sectors			
D14	Commitment to the Sustainable Development Goals and environmental conservation, promoting responsible practices and innovative solutions			

Expected results from this subject

Expected results from this subject		Training and Learning Results			
New	A2	B1	C1	D1	
	A3	B2	C2	D1	
	A4	B3	C4	D2	
	A5	B4	C11	D3	
		B21	C15	D4	
			C19	D5	
			C65	D6	
				D7	
				D14	

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	B21	D14

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	C1 C2 C4 C11 C15 C19	D1 D6 D7
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	C1 C2 C11 C15 C19	D1 D6 D7 D14

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, J.L., **Introducción a la mejora genética vegetal**, 2ª, Ediciones Mundi Prens, 2002

Ferreira, J.J.; 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, R.K 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

(*)Proyectos en biología aplicados a la producción/11595-53870-S

(*)Trabajo de Fin de Grado/11595-53875-S

Subjects that are recommended to be taken simultaneously

(*)Análisis y diagnóstico agroalimentario/11595-53854-S

Biotechnology applied to microbiological production/V02G031V01412

Agri-food analysis and diagnostic/V02G031V01409

IDENTIFYING DATA				
(*) Bioteología aplicada a la producción microbiana				
Subject	(*)Bioteología aplicada a la producción microbiana			
Code	11595-53857-S			
Study programme	(*)Grao en Bioloxía			
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	
B4	To understand the fundamentals of scientific and technical instrumentation, experimentation with living organisms, health and safety standards in laboratory and field work, as well as the basic protocols and regulations in each area of experimentation
B21	To explore the application of biology to the One Health concept (human, animal, plant and environmental health), to the Sustainable Development Goals, to the optimisation of production processes, and to promoting the conservation of the natural environment
C4	To isolate and culture microorganisms, cells, tissues and organs in order to facilitate their study and the characterisation of their biological activity
C8	To cultivate, produce, process and enhance biological resources, and to promote their use and/or exploitation in order to obtain products and services of interest
C11	Identify and use verifiable and reliable sources of scientific information to assess the current state of a biological problem and address its resolution
C13	To communicate biological knowledge and findings clearly and accurately, both in writing and orally, and using digital resources, to specialist and non-specialist audiences
C15	Collaborate and work as a team, share responsibilities and contribute to the achievement of common goals in research contexts and in professional practice
C19	Design and manage animal, plant and microbial production processes; implement quality control standards; and propose improvements in efficiency and sustainability. Identify new areas of application and professional and/or industrial opportunities
D7	Management of production, processing and handling systems for products and by-products derived from biological and biotechnological materials, as well as quality systems and standards, particularly in the industrial, healthcare, agri-food and environmental sectors
D13	To act with a gender perspective and with respect for diversity and multiculturalism, with the aim of achieving a fairer and more equal society
D15	To act with a high degree of autonomy and in a proactive manner, incorporating technological and scientific advances in order to provide innovative solutions to society's needs and demands

Expected results from this subject	
Expected results from this subject	Training and Learning Results

New	B4	C1	D6
	B5	C4	D7
	B8	C8	D13
	B21	C11	D15
		C13	
		C15	
		C19	

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	B21	C8 C11 C13 C15 C19	D7 D13 D15
Objective questions exam	Exam with objective questions about PRACTICAL SESIONS	15	B4 B21	C4 C8 C13 C15	D7 D13 D15
Objective questions exam	Exam with objective questions on the theoretical concepts of the INTRODUCTION AND GENERAL ASPECTS OF THE SUBJECT	10	B21	C8 C11 C13 C19	D7 D13
Objective questions exam	Exam with objective questions on the theoretical aspects of PRODUCTION TECHNOLOGY	20	B21	C8 C11 C13 C19	D7 D13

Objective questions exam	Exam with objective questions on the theoretical aspects of MICROBIAL PRODUCTION (I)	15	B21	C8 C11 C13 C19	D7 D13
Objective questions exam	Exam with objective questions on the theoretical aspects of MICROBIAL PRODUCTION (II)	15	B21	C8 C11 C13 C19	D7 D13

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 0.25 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 sessions 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.

The use of artificial intelligence systems in this subject shall be governed by the current regulations of the UVIGO.

Specific instructions for their use in the various teaching and assessment activities will be communicated to students through the usual communication channels of the subject, preferably by means of the initial presentation and the UVIGO's MooVI platform.

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.

Recommendations

Subjects that it is recommended to have taken before

Microbiology I/V02G031V01204

Microbiology II/V02G031V01309

IDENTIFYING DATA				
Análisis y diagnóstico medioambiental				
Subject	Análisis y diagnóstico medioambiental			
Code	11595-53858-S			
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 Ecología e biología animal			
Coordinator	Delgado Núñez, Cristina			
Lecturers	Asensio Fandiño, Verónica Calviño Cancela, María Delgado Núñez, Cristina Fernández Lago, María del Carmen Juan Ovejero, Raquel Muñoz Sobrino, Castor Noguera Amoros, Jose Carlos			
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://biologia.uvigo.es/es/docencia/horarios/			

Resultados de Formación e Aprendizaxe

Code	
B21	Explorar a aplicabilidade da bioloxía ao concepto dunha única saúde (humana, animal, vexetal, e ambiental), aos obxectivos de desenvolvemento sostible, á optimización dos procesos produtivos e a promover a conservación do medio natural
C7	Muestrear, caracterizar, catalogar, avaliar e xestionar recursos naturais e biolóxicos (poboacións, comunidades e ecosistemas) utilizando ferramentas apropiadas e bases de datos. Propoñer estratexias de conservación e restauración
C10	Redactar informes, proxectos e memorias técnicas sobre temáticas das diferentes ramas da bioloxía
C11	Identificar e utilizar fontes de información científica, contrastables e fiables, para fundamentar o estado dun problema biolóxico e poder abordar a súa resolución
C15	Colaborar e traballar en equipo, compartir responsabilidades e contribuír ao logro de obxectivos comúns en contextos de investigación e na actividade profesional
C16	Aplicar técnicas de análise e diagnóstico medioambiental, propoñer e desenvolver estudos de impacto ambiental e establecer medidas de prevención, protección e mitigación de efectos negativos.
D2	Realización e interpretación de análise e diagnósticos fisicoquímicos, biolóxicos, hixiénicosanitarios, bioensaos e probas funcionais, especialmente nos ámbitos sanitario, industrial, agroalimentario e medioambiental, e emisión de informes
D8	Avaliación, protección, conservación e restauración do medio físico, a biodiversidade e os ecosistemas. Identificación e uso de indicadores biolóxicos e ambientais
D10	Aplicar principios deontolóxicos na actividade investigadora e no exercicio profesional, valorando o impacto dos avances tecnolóxicos e científicos. Cumprir as disposicións lexislativas, regulamentarias e administrativas que rexen o exercicio profesional da Bioloxía
D14	Compromiso cos obxectivos de desenvolvemento sostible e a conservación do medio ambiente, promovendo prácticas responsables e solucións innovadoras

Resultados previstos na materia

Expected results from this subject	Training and Learning Results		
Nova	B21	C7	D2
		C10	D8
		C11	D10
		C15	D14
		C16	

Contidos

Topic

Tema 1. Introducción 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 desenvolvemento sostible	Sistemas socioecolóxicos Tipos de servizos ecosistémicos Sistemas adaptativos complexos Obxetivos de desenvolvemento 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, incluíndo solos, auga e organismos vivos, e se realizarán análises 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 incluíndo 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 tutorías.
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 obxectivas con preguntas tipo test e de resposta curta, nun exame final escrito.	40
Prácticas de laboratorio	Valoraranse mediante preguntas obxectivas os coñecementos adquiridos en prácticas mediante preguntas en cuestionarios que deberán ser entregados o profesorado.	30
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
Debate	Debatirase na aula sobre diferentes temas de actualidade e sobre os traballos tutelados presentados polos diferentes grupos.	10

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 nalguna das partes, a nota final será a que obteña nesa parte limitante.

En convocatorias diferentes á ordinaria, a avaliación 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, independentemente de que teña presentado o traballo e cuestionarios.

Datos de exames: Pódense consultar no seguinte enderezo: <http://bioloxia.uvigo.es/es/docencia/examenes/>

No caso de que non se pudiera realizar os exames de maneira presencial optárase 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.

Cualquier uso da IA en traballos académicos debe ser declarado, indicando a ferramenta utilizada, a función realizada e o alcance na súa intervención e que parte do traballo é de autoría humana.

Ante o indicios fundados de uso da IA o profesorado pode non admitir traballos, solicitar probas adicionais ou remitir o caso o proceso administrativo disciplinario correspondente

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

IDENTIFYING DATA				
(*)Evaluación de impacto ambiental				
Subject	(*)Evaluación de impacto ambiental			
Code	11595-53859-S			
Study programme	(*)Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	1st
Teaching language	Spanish Galician			
Department				
Coordinator	Olabarria Uzquiano, Celia			
Lecturers	Fernández Covelo, Emma Muñoz Sobrino, Castor Olabarria Uzquiano, Celia Velo Antón, Guillermo			
E-mail	colabarria@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	
B3	Identify the characteristics and dynamics of the physical environment, including those resulting from human activity and global change
B8	To understand the mathematical, statistical, and computational tools used to analyze and solve problems in the field of biology
B21	To explore the application of biology to the One Health concept (human, animal, plant and environmental health), to the Sustainable Development Goals, to the optimisation of production processes, and to promoting the conservation of the natural environment
C10	Draft reports, proposals and technical documents on topics relating to the various branches of biology
C11	Identify and use verifiable and reliable sources of scientific information to assess the current state of a biological problem and address its resolution
C16	Apply environmental analysis and assessment techniques, propose and carry out environmental impact assessments, and put in place measures to prevent, protect against and mitigate negative effects.
D2	Conducting and interpreting physicochemical, biological, hygiene and health analyses and assessments, bioassays and functional tests, particularly in the health, industrial, agri-food and environmental sectors, and issuing reports
D8	Assessment, protection, conservation and restoration of the physical environment, biodiversity and ecosystems. Identification and use of biological and environmental indicators
D11	Preparation and presentation of reports, projects, technical reports and assessments in the field of biology
D13	To act with a gender perspective and with respect for diversity and multiculturalism, with the aim of achieving a fairer and more equal society
D15	To act with a high degree of autonomy and in a proactive manner, incorporating technological and scientific advances in order to provide innovative solutions to society's needs and demands

Expected results from this subject			
Expected results from this subject	Training and Learning Results		
New	B3	C10	D2
	B8	C11	D8
	B21	C16	D11
			D13
			D15

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 interdisciplinary, group leader, management of the EIS. The challenge of the EIS stop the scientific disciplines: recommendations with information limited, multidisciplinary, 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 the EIS: 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 landscape factors. Identification and prediction of impacts. (2 hours) 9. Socioeconomic factors (historical, archaeological, 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 addition, 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 chosen 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 acquired 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	B3 B21	D2 D8 D13 D15	
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	B3 B8 B21	C10 C11 C16	D2 D8 D11 D13 D15
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	B3 B8 B21	D2 D8 D13 D15	
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	B3 B8	C16 D2 D8 D11 D13 D15	

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

Basic Bibliography

Aguiló Alonso, M. et al., **Guía para la elaboración de estudios del medio físico: contenido y metodología.**, 4ª reimpr., Ministerio de Medio Ambiente,, 2000

Arce Ruiz, R.M., **La evaluación de impacto ambiental en la encrucijada: Los retos del futuro.**, Ecoiuris, 2002

Canter, L. W., **Manual de evaluación de impacto ambiental: técnicas para la elaboración de los estudios de impacto**, McGraw-Hill, 1998

Conesa Fernández-Vítora, V., **Guía metodológica para la evaluación del impacto ambiental.**, 3ª ed, Mundi-Prensa, 2003

Encinas Malagón, M.D., Gómez de Balugera López de Alda, Z., **Evaluación de Impacto Ambiental: Aspectos Teóricos**, 2011

Garmendia, A., Salvador, A., Crespo, C., Garmendia, L., **Evaluación de Impacto ambiental**, Pearson, Prentice Hall, 2005

Gómez Orea, D., **Evaluación de impacto ambiental: un instrumento preventivo para la gestión ambiental**, 2ª ed, Mundi-Prensa, 2003

Asociación Española de Evaluación de Impacto Ambiental (EIA): <http://www.eia.es>,

Evaluación de Impacto Ambiental (legislación): <http://www.miliarium.com/Paginas/Leyes/eia/eia.htm>,

International Association for Impact Assessment (IAIA): <http://www.iaia.org>,

Ministerio de Medio Ambiente: <http://www.mma.es>,

de Tomás Sánchez, J.E., **Tres décadas de la evaluación del impacto ambiental en España. Revisión, necesidad y propuestas para un cambio de paradigma.**, 2014

Environmental Impact Assessment Review, <http://www.sciencedirect.com/science/journal/01959255>,

Cantó, S., Riera, P., Borrego, A., **La evaluación de impacto ambiental en España: coste y limitaciones**, 371, Economía Industrial, 2009

Treweek, J., **Ecological impact assessment**, John Wiley & Sons, 2009

Bautista, L.M., García, J.T., Calmaestra, R.G., Palacín, C., Martín, C.A., Morales, M.B., Bonal, R., **Effect of weekend road traffic on the use of space by raptors**, Conservation Biology, 2004

Lozano Cutanda, B., **Ley 9/2018: análisis de las modificaciones de la Ley de Evaluación Ambiental**, 86, Actualidad Jurídica Ambiental, 2019

Ministerio de Medio Ambiente, **Libro blanco de la educación ambiental en España en pocas palabras**, Gestión y Estudios Ambientales, S. C. L., 1999

Bergström, L., Kautsky, L., Malm, T., Rosenberg, R., Wahlberg, M., Capetillo, N.A., Wilhelmsson, D., **Effects of offshore wind farms on marine wildlife-a generalized impact assessment**, 9, Environmental Research Letters, 2014

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

Complementary Bibliography

Glasson, J.; Therivel, R.; Chadwick, A., **Introduction to environmental impact assessment.**, 2ª ed, Spon Press, 1999

García Ureta, A., **Comentarios sobre la ley 21/2013, de evaluación ambiental**, 194, Revista de Administración Pública, 2014

Vicente Davila, F., **Evaluación de impacto ambiental transfronteriza entre España y Portugal**, 2014

Fahrig, L., Rytwinski, T., **Effects of roads on animal abundance: an empirical review and synthesis**, 14, Ecology and Society, 2009

Pardo, M., **Environmental impact assessment myth or reality? Lessons from Spain**, 17, Environmental Impact Assessment, 1997

Torres, A., Palacín, C., Seoane, J., Alonso, J.C., **Assessing the effects of a highway on a threatened species using Before-During-After and Before-During-After-Control-Impact designs**, 144, Biological Conservation, 2011

Newman, E.I., **Applied Ecology and Environmental Management**, 2ª ed., Wiley-Blackwell, 2000

Partidário, M.R., **Guía de Mejores Prácticas para la Evaluación Ambiental Estratégica**, Agencia Portuguesa do Ambiente (APA) y Redes Energ, 2012

Mata, C., Hervás, I., Herranz, J., Suárez, F., Malo, J.E., **Are motorway wildlife passages worth building? vertebrate use of road-crossing structures on a Spanish motorway**, 88, Journal of Environmental Management, 2008

Rabin, L.A., Coss, R.G., Owings, D.H., **The effects of wind turbines on antipredator behavior in California ground squirrels**, 131, Biological Conservation, 2006

Bailey, H., Brookes, K.L., Thompson, P.M., **Assessing environmental impacts of offshore wind farms: lessons learned and recommendations for the future**, 10, Aquatic Biosystems, 2014

<https://www.miteco.gob.es/es/calidad-y-evaluacion-ambiental/temas/evaluacion-ambiental/>,

Recommendations

Subjects that continue the syllabus

(*)Contaminación/11595-53867-S

Subjects that are recommended to be taken simultaneously

(*)Biodiversidad: Gestión y conservación/11595-53860-S

(*)Análisis y diagnóstico medioambiental/11595-53858-S

Subjects that it is recommended to have taken before

(*)Zoología I/11595-53837-S

(*)Ecología I: Individuos y poblaciones/11595-53845-S

(*)Biología: Suelo, medio acuático y clima/11595-53829-S

(*)Zoología II/11595-53842-S

(*)Ecología II: Comunidades y ecosistemas/11595-53850-S

(*)Botánica I/11595-53835-S

(*)Botánica II/11595-53840-S

IDENTIFYING DATA				
Biodiversidad: Gestión y conservación				
Subject	Biodiversidad: Gestión y conservación			
Code	11595-53860-S			
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 Ecología e bioloxía animal			
Coordinator	Garrido González, Josefa			
Lecturers	Caballero Rúa, Armando Gallardo Jaime, Miriam García de Leaniz Caprile, Carlos 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	
B12	Comprender a diversidade dos seres vivos e os ciclos biolóxicos, os procesos de reprodución e desenvolvemento, as relacións entre os organismos e a súa interacción coa contorna
B20	Analizar a estrutura e dinámica das poboacións e comunidades, o funcionamento dos ecosistemas e os ciclos biogeoquímicos.
B21	Explorar a aplicabilidade da bioloxía ao concepto dunha única saúde (humana, animal, vexetal, e ambiental), aos obxectivos de desenvolvemento sostible, á optimización dos procesos produtivos e a promover a conservación do medio natural
C1	Aplicar o método científico mediante a observación, a experimentación e o contraste de hipótese, interpretando os resultados obtidos e formulando conclusións fundamentadas
C7	Muestrear, caracterizar, catalogar, avaliar e xestionar recursos naturais e biolóxicos (poboacións, comunidades e ecosistemas) utilizando ferramentas apropiadas e bases de datos. Propoñer estratexias de conservación e restauración
C11	Identificar e utilizar fontes de información científica, contrastables e fiables, para fundamentar o estado dun problema biolóxico e poder abordar a súa resolución
C17	Organizar e xestionar espazos naturais, desenvolver estudos de biodiversidade e de conservación e restauración de ecosistemas. Planificar a explotación racional e sostible dos seus recursos
D3	Análise e interpretación dos mecanismos da herdanza, a evolución, a biodiversidade e o rexistro fósil
D8	Avaliación, protección, conservación e restauración do medio físico, a biodiversidade e os ecosistemas. Identificación e uso de indicadores biolóxicos e ambientais
D11	Elaboración e presentación de informes, proxectos, memorias técnicas e valoracións no ámbito da Bioloxía

Resultados previstos na materia

Expected results from this subject	Training and Learning Results		
Nova	B12	C1	D3
	B20	C1	D8
	B21	C7	D11
		C11	
		C17	

Contidos

Topic	
FUNDAMENTOS CONCEPTUAIS DA BIODIVERSIDADE	Biodiversidade: Conceptos básicos. Indicadores e medidas da biodiversidade. Biodiversidade e Ecosistemas
CAUSAS E CONSEQUENCIAS DA PERDA DE BIODIVERSIDADE	Patróns de extinción e ameazas á Biodiversidade. Impacto biolóxico do cambio global.

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 conservación 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	B20	C1	D3
Traballo tutelado	O traballo realizado polo alumno será avaliado, ben individualmente ou en grupo, en función do número de alumnos matriculados.	20	B12	C1	D11
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	B20	C11	D11
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	B20	C17	D8
				C7	D8
				C17	D3
					D8

Other comments on the Evaluation

Propónse 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

acolherse 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

Begon, M., Mortimer, M. & D. J. Thompson, **Population Ecology: a unified study of animals and plants**, 3a. edición, Blackwell Science, 1996

Buckland, S.T., Anderson, D.R., Burnham, K.P., Laake, J.L., Borchers, D.L. & Thomas, L., **Introduction to Distance Sampling: Estimating Abundance of Biological Populations**, Oxford University Press, 2001

Caughley, G., **Analysis of vertebrate populations**, John Wiley and Sons, 1977

Dobson, A. P., **Conservation and biodiversity**, Scientific American Library, 1996

Frankham, R., J. D. Ballou y D. A. Briscoe, **Introduction to Conservation Genetics**, Cambridge University Press, 2002

Hunter, M. L., Gibbs, J. P., **Fundamentals of conservation biology**, Wiley-Blackwell, 2007

Pullin, A. S., **Conservation biology**, Cambridge University Press, 2002

Sutherland, W. J., **The conservation handbook: research, management and policy**, John Wiley & Sons, 2000

van Dyke, F., **Conservation Biology: Foundations, Concepts, Applications**, 2nd ed, Springer Verlag, 2008

Complementary Bibliography

Beissinger, S. R. & McCullough, D. R., **Population Viability Analysis**, University of Chicago Press, 2002

Caswell, H., **Matrix Population Models – Construction, Analysis, and Interpretation**, Sinauer Associates, 1989

Caughley, G., Gunn, A., **Conservation biology in theory and practice**, Wiley-Blackwell, 1996

Ebert, T., **Plant and Animal populations. Methods in demography**, Academic Press, 1999

Gaston, KJ, y Spicer JL, **Biodiversity: an introduction**, Wiley-Blackwell, 2004

Gilpin, M.E. and Soulé, M.E., **Conservation biology: The Science of Scarcity and Diversity**, Sinauer Associates, 1986

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

Botánica II: Arquegoniadas/V02G031V01207

Zooloxía I: Invertebrados non artrópodos/V02G031V01205

Ecoloxía II/V02G031V01306

Zooloxía II: Invertebrados artrópodos e cordados/V02G031V01210

Xenética II/V02G031V01304

Bioloxía: Ferramentas informáticas en bioloxía/V02G031V01110

Botánica I: Algas e fungos/V02G031V01202

Bioloxía: Técnicas básicas de campo/V02G031V01109

Ecoloxía I/V02G031V01301

Estatística: Bioestatística/V02G031V01107

IDENTIFYING DATA				
(*)Gestión y conservación de espacios				
Subject	(*)Gestión y conservación de espacios			
Code	11595-53861-S			
Study programme	(*)Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	1st
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	Soto González, Benedicto			
Lecturers	Asensio Fandiño, Verónica Calviño Cancela, María Juan Ovejero, Raquel Millán Fernández, Laura Soto González, Benedicto			
E-mail	edbene@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	
B20	To analyse the structure and dynamics of populations and communities, the functioning of ecosystems, and biogeochemical cycles.
B21	To explore the application of biology to the One Health concept (human, animal, plant and environmental health), to the Sustainable Development Goals, to the optimisation of production processes, and to promoting the conservation of the natural environment
C1	Apply the scientific method through observation, experimentation and the testing of hypotheses, interpreting the results obtained and drawing well-founded conclusions
C10	Draft reports, proposals and technical documents on topics relating to the various branches of biology
C11	Identify and use verifiable and reliable sources of scientific information to assess the current state of a biological problem and address its resolution
C17	Organise and manage natural areas; carry out studies on biodiversity and the conservation and restoration of ecosystems; plan for the rational and sustainable use of their resources
D8	Assessment, protection, conservation and restoration of the physical environment, biodiversity and ecosystems. Identification and use of biological and environmental indicators
D15	To act with a high degree of autonomy and in a proactive manner, incorporating technological and scientific advances in order to provide innovative solutions to society's needs and demands

Expected results from this subject			
Expected results from this subject	Training and Learning Results		
New	B12	C1	D3
	B16	C10	D8
	B20	C11	D15
	B21	C17	
		C31	

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 Restoration.
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 Restoration.	Chapter 8. Principles of ecosystem management, uncertainty, and adaptive management. Chapter 9. Replacement, rehabilitation, restoration 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	Problems 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	All questions raised by students regarding these topics will be addressed in the classroom or in tutorials, which will be done by appointment by contacting the professors: maria@uvigo.es and edbene@uvigo.es, also available at https://moovi.uvigo.gal/

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	C1 C10 C11	D15
Problem solving	The approach used to solve the problem as well as the correction of the result will be assessed.	10	C1 C11	D8 D15
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	C10 C11	D15
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 Pedology, as demonstrated in a short-questions exam.	26	B21 C1 C17	D8
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	B20 B21 C1 C17	D8

Other comments on the Evaluation

It is required to obtain a minimum score of 5 (out of 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

Ausden, Malcolm, **Habitat management for conservation : a handbook of techniques**, 1-4356-3100-5, Oxford University Press, 2007

Sutherland, William; Hill, David, **Managing Habitats for Conservation**, 0-521-44776-3, Cambridge University Press, 1995
Porta, J.; Lopez-Acevedo, M.; Poch, R.M., **Edafología. Uso y protección del suelo**, 978-84-8476-661-2, 3, Mundi-Prensa, 2014

Complementary Bibliography

Sodhi, Navjot S., Ehrlich, Paul R., **Conservation Biology for all**,

Recommendations

IDENTIFYING DATA				
(*)Bioquímica e inmunoloxía clínicas				
Subject	(*)Bioquímica e inmunoloxía clínicas			
Code	11595-53862-S			
Study programme	(*)Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	1st
Teaching language	Spanish Galician			
Department				
Coordinator	González Fernández, María África			
Lecturers	González Fernández, María África Toucedo Rodríguez, Rocío 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 Inmunolóxicos con maior impacto na saúde humana. Trataranse aspectos relativos á aplicación das determinacións bioquímicas e inmunolóxicas para o diagnóstico e seguimento de enfermidades humanas			

Training and Learning Results	
Code	
B5	To be familiar with the most common methods and techniques for the observation, identification, collection, processing and analysis of biological and non-biological samples in laboratory, field or computer-based studies, including the analysis of images or other types of signals that provide relevant data.
B18	Identify the components of the immune system, the recognition mechanisms and effector cells of the immune response, and their role in protecting the body
B21	To explore the application of biology to the One Health concept (human, animal, plant and environmental health), to the Sustainable Development Goals, to the optimisation of production processes, and to promoting the conservation of the natural environment
C5	Carry out analyses of samples from various sources, bioassays and functional tests. Determine and interpret biological parameters under normal and abnormal conditions
C15	Collaborate and work as a team, share responsibilities and contribute to the achievement of common goals in research contexts and in professional practice
C20	To conduct and interpret clinical studies and analyses aimed at diagnosing and developing treatments for diseases, as well as managing them from an epidemiological and public health perspective
D1	Solving biological problems using the scientific method
D2	Conducting and interpreting physicochemical, biological, hygiene and health analyses and assessments, bioassays and functional tests, particularly in the health, industrial, agri-food and environmental sectors, and issuing reports
D10	Apply ethical principles in research and professional practice, taking into account the impact of technological and scientific advances. Comply with the laws, regulations and administrative provisions governing the professional practice of biology
D15	To act with a high degree of autonomy and in a proactive manner, incorporating technological and scientific advances in order to provide innovative solutions to society's needs and demands

Expected results from this subject			
Expected results from this subject	Training and Learning Results		
New	B5	C1	D1
	B18	C5	D2
	B21	C15	D10
		C20	D15

Contents	
Topic	
Subject 1. stages of the diagnostic. Pre-analytical stages. The obtentions of specimens. *POCT.	(*) Fase preanalítica. Obtención de espécimens. POCT.
Subject 2. Control of quality in the clinical laboratory. Selection and validation of methods.	(*)Selección e validación de métodos.
Subject 3. Diagnostic value of the clinical tests. Values of reference and interpretation of results.	(*)Valores de referencia e interpretación dos resultados.

Subject 4. Basic elements of Clinical Biochemistry. Semiological features of the determination of biochemical magnitudes: anlyltes and metabolism.	(*)Valor semiológico da determinación de magnitudes bioquímicas: analitos e metabolismo.
Subject 5. Clinical diagnostic of alterations in organs and systems. Test panels and their interpretation.	(*)Paneis de probas diagnósticas e a súa interpretación.
Subject 6. Metabolism of the glucose. Bone metabolism. Metabolism of lipids.	(*)Metabolismo da glicosa. Metabolismo óseo. Metabolismo dos lípidos.
Subject 7. Hepatic function. Renal function. Cardiac illness.	(*)Función hepática. Función do rin. Enfermidade cardíaca.
Subject 8. Introduction to the clinical Immunology. Techniques used in clinical Immunology/ Monoclonal Antibodies.	(*)Introducción á sistema inmunitario Técnicas máis empregadas na Inmunoloxía clínica Anticorpos monoclonais.
Subject 9. Immunodeficiencies. Test for the diagnosis and to evaluate the disease progress.	(*)Técnicas de diagnóstico e estudo da evolución de inmunodeficiencias primarias e secundarias.
Subject 10. Autoimmunity and auto-inflammatory diseases. Diagnosis, therapy and the evaluation of the disease progress.	(*)Tipos, técnicas de diagnóstico, terapias e estudo da evolución.
Subject 11. Vaccination-Diagnostic of infection. Study of humoral (antibodies) and cellular response.	(*)Técnicas para avaliar resposta humoral (Acs) e celular.
Subject 12. Transplants and immune rejection. Essays to evaluate biocompatibility and evolution of the organ/tissue.	(*)Ensaio para avaliar biocompatibilidade e evolución do Transplante.
Subject 13. Cancer. Immunoassays to study the haematological solid tumors. Minimal Residual Disease. Immunotherapies.	(*)Enfermidade mínima residual. Inmunoterapias fronte ao cancro.
Subject 14. Fertility. Immunological aspect of pregnancy. Essays to evaluate immunological based problems of fertility.	(*) Aspectos inmunolóxicos que afectan ó embarazo. Ensaio para avaliar problemas de fertilidade de causa inmunolóxica.
Subject 15. Hipersensitivity. Types of hipersensitivity and pseudoallergy. Test for the diagnosis and study of disease evolution.	(*)Tipos de hipersensibilidade e pseudoalergia. Técnicas de diagnóstico e estudo de evolución da enfermidade.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	18	36	54
Laboratory practical	28	26	54
Seminars	2	8	10
Objective questions exam	1	6	7
Laboratory practice	4	8	12
Case studies	2	4	6
Objective questions exam	1	6	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	Lectures about basic principles of biochemistry and clinical immunology. It will provide to the student the basic knowledge about quality control, tests, methodologies and interpretation of results. To support the theoretical explanations, different kind of documents will be provided to the students through the platform Moovi of the Virtual Campus.
Laboratory practical	The work in the laboratory will provide competences in the procedure of the analytical test and the interpretation of the results, with the aim to form to the student in the activities carried out in the clinical laboratories of Biochemistry and Immunology. The students will generate a report of lab work and/or the solution of questions and/or exercises. To support the lab work different kind of documents will be provided to the students through the platform Moovi of the Virtual Campus.
Seminars	The seminars will be based on study of cases. The student will develop the capacity to integrate and interpret the clinical analyses, resolve problems, contrast data, complete knowledges and make diagnostic based on the available data. The work of study of cases will be done by groups and will be exposed. At the beginning of the course we will inform to the students about the procedure.

Personalized assistance	
Methodologies	Description
Lecturing	The lectures will be active. The student can required a tutorial with each teacher in the corresponding tutorial schedule.
Laboratory practical	During the lab work each student will be supported for the understanding of the aims, methodology, concrete techniques and the interpretation of the results. The student can require a tutorial with each teacher in the corresponding tutorial schedule.
Seminars	The students distributed in small groups will have to resolve study of cases related with the clinic diagnosis. The resolution of the cases, the arguments and the criteria used will be presented and defended. The autonomous work of the student will be supervised. The student can required a tutorial with each teacher in the corresponding tutorial schedule.

Assessment		Qualification	Training and Learning Results		
	Description				
Objective questions exam	One test: 1) for 1 to 7 subjects (see contents section). It corresponds to 25% of final quotation. The test will evaluate the fundamental contents of the subject (expository and practical classes) through objective questions (multiple choice and short answer). TO PASS THE COURSE it is required: a) a minimum of 4 points (out of 10) in this test and b) to obtain a minimum average grade of 5, calculated from the grade obtained in test 1(subject 1 to 7) and test 2 (subjects 8 to 15).	30	B5 B21	C5 C20	D1 D10
Laboratory practice	The abilities and skills acquired during the laboratory practices will be CONTINUOUSLY EVALUATED. The evaluation methodology and weighting in the final grade includes: 1- Involvement of the student in the development of the practices. It will correspond to 10% of the final grade. 2- Delivery of laboratory practice reports: clinical Biochemistry (BQ) and Immunology (IN). The reports will be done by each of the subgroups of students organized in each group of practices. The average grade (BQ + IN /2) obtained in each report will represent 15% of the final grade. 3- Resolution of problems/exercises/questions in the laboratory practices, whose results will be delivered in the same practical session and/or together with the practice report. The average grade (BQ +IN /2) obtained will represent 15% of the final grade.	30	B5 B18 B21	C5 C15 C20	D1 D2 D10 D15
Case studies	Resolution and presentation of clinical cases, exposition and discussion of the assigned case. It will account for 10% of the final grade.	10	B5 B18 B21	C5 C15 C20	D1 D2 D10 D15
Objective questions exam	One test: 1) for 8 to 15 subjects (see contents section). It corresponds to 25% of final quotation. The test will evaluate the fundamental contents of the subject (expository and practical classes) through objective questions (multiple choice and short answer). TO PASS THE COURSE it is required: a) a minimum of 4 points (out of 10) in this test and b) to obtain a minimum average grade of 5, calculated from the grade obtained in test 1(subject 1 to 7) and test 2 (subjects 8 to 15).	30	B18 B21	C5 C20	D1

Other comments on the Evaluation

Important:

Regardless of the choice of CONTINUOUS OR OVERALL EVALUATION attendance to all LABORATORY PRACTICES is MANDATORY to PASS the subject (except for duly justified absences).

Continuous evaluation:

Two partial tests: each one will account for 25% of the grade. Test 1 (subjects 1 to 7) and Test 2 (subjects 8 to 15). TO PASS THE SUBJECT it is required: a) a minimum of 4 points (out of 10) in each test and b) to obtain a minimum average grade of 5,

calculated from the grade obtained in the two exams.

Laboratory practicals: Student involvement (10% of the final grade) + BQ and IN practical reports (15% of the final grade) + resolution of BQ and IN clinical problems/questions (15% of the final grade).

Seminar /case study: 10% of the final grade.

To pass the subject the sum: average grade of the midterm + practical exam + seminar grade, must be equal or higher than 5.

The activities (midterm, practicals and seminars) passed in the first opportunity of a course are kept for the second opportunity. In the second opportunity of a course, internships and seminars cannot be recovered, only the partial exams not passed in the first opportunity can be taken.

For repeating students, the grade of the practicals and seminars will be retained. They will have the right to repeat these activities as long as they give up the quotation obtained in the previous course (document signed and sent to the coordinator). It should be done before starting the lab teaching activities.

Global evaluation:

The student who chooses global evaluation will have to pass a final integrative test in which the contents of the lectures, laboratory practices and seminars/case studies will be evaluated. The test will consist of multiple choice questions, short questions and problem solving/clinical case.

In order to pass the subject, the quotation of the global test will have to be equal or higher than 5. If the final test is not passed, the student's quotation will be that obtained in the final integrative test out of 10 points.

In the second opportunity of the course, the failed student will have to be evaluated again in all the activities by means of a global test.

If the subject is not passed in any of the opportunities of the course, the student will not have to attend the practical sessions again, but he/she will be evaluated again of all the contents (lectures, practical and seminars), either by means of continuous or global evaluation.

General information

The academic calendar can be consulted at the following link:

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

The calendar of exams can be consulted at the following link:

<http://bioloxia.uvigo.es/gl/teaching/examinations>

Sources of information

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**, ISBN: 978-84-9113-662-0, 1ª edición, Elsevier, 2020

Raif S. Geha, Luigi Notarangelo, **Case Studies in Immunology: A Clinical Companion**, ISBN: 978-08-153-4512-1, 7ª edición, W. W. Norton & Company, 2016

Robert R Rich, **Inmunología clínica. Principios y práctica**, ISBN: 978-8-491-13476-3, 5ª edición, Elsevier, 2019

Schmitz, J; Detrick, B and O'Gorman, M., **Manual of molecular and clinical laboratory immunology**, ISBN: 978-1-68367-399-6, 9ª edición, ASM Press, 2025

Male, D; Peebles, RS., et al, **Inmunología**, ISBN: 979-13-7003-023-0, 10ª edición, Elsevier, 2026

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.**, ISBN: 978-8-413-82694-3, 7ª edición, Elsevier, 2024

Baynes, John W, **Bioquímica médica**, ISBN : 978-8-491-13406-0, 5ª edición, Elsevier, 2019

Bretscher Peter et al, **The foundations of Immunology and their Pertinence to Medicine**, ISBN: 978-1-460-29656-1, 1ª edición, Friesen Press, 2016

Abul K. Abbas, Andrew H. Lichtman and Shiv Pillai, **Inmunología básica**, ISBN: 978-8-413-82657-8, 7ª edición, Elsevier, 2024

Sharon Stranford; Judy Owen; Patricia Jones; Jenni Punt, **Kubi's Immunology**, ISBN: 978-1-319-49865-8, 8ª edición, McGraw/Hill, 2023

Africa González Fernández et al, **Inmunogenética**, ISBN: 978-84-9171-155-1, 1ª edición, Síntesis, 2018

Toyos JR, et al, **Inmunotecnología y sus aplicaciones**, ISBN: 978-84-16343-73-7, 1ª edición, Universidad de Oviedo, 2018

Regueiro, JR, et al., **Inmunología: biología y patología del sistema inmunitario**, ISBN: 978-8-4911-0420-9, 5ª edición, Panamericana, 2021

<https://www.inmunologia.org/revista/home.php>,

<https://www.sciencedirect.com/journal/clinical-immunology>,

Recommendations

Subjects that are recommended to be taken simultaneously

Integrative cell biology and physiology: Implications for health/V02G031V01407

Human genetics and molecular pathology/V02G031V01408

Public health microbiology and parasitology/V02G031V01406

Subjects that it is recommended to have taken before

Biochemistry I/V02G031V01201

Biochemistry II/V02G031V01206

Immunology and parasitology/V02G031V01305

Technics in cellular and molecular biology/V02G031V01310

IDENTIFYING DATA				
(*)Microbiología y parasitología sanitarias				
Subject	(*)Microbiología y parasitología sanitarias			
Code	11595-53863-S			
Study programme	(*)Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	1st
Teaching language	Spanish Galician			
Department				
Coordinator	González Abril, Ana			
Lecturers	González Abril, Ana Iglesias Blanco, Raúl Osorio Novas, Elisa			
E-mail	ana.gonzalez.abril@uvigo.gal			
Web				
General description	(*)Materia deseñada para que o alumnado poida recoñecer a etioloxía 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 única (One Health).			

Training and Learning Results	
Code	
B21	To explore the application of biology to the One Health concept (human, animal, plant and environmental health), to the Sustainable Development Goals, to the optimisation of production processes, and to promoting the conservation of the natural environment
C5	Carry out analyses of samples from various sources, bioassays and functional tests. Determine and interpret biological parameters under normal and abnormal conditions
C9	Identify physical, chemical and biological agents, including toxins and pathogens; assess their activity; and devise strategies for their monitoring and control
C11	Identify and use verifiable and reliable sources of scientific information to assess the current state of a biological problem and address its resolution
C13	To communicate biological knowledge and findings clearly and accurately, both in writing and orally, and using digital resources, to specialist and non-specialist audiences
C15	Collaborate and work as a team, share responsibilities and contribute to the achievement of common goals in research contexts and in professional practice
C20	To conduct and interpret clinical studies and analyses aimed at diagnosing and developing treatments for diseases, as well as managing them from an epidemiological and public health perspective
D2	Conducting and interpreting physicochemical, biological, hygiene and health analyses and assessments, bioassays and functional tests, particularly in the health, industrial, agri-food and environmental sectors, and issuing reports
D4	Conducting phylogenetic, taxonomic, palaeontological and biogeographical analyses and studies of living organisms, particularly those that serve as a basis for demographic and epidemiological studies
D9	Management, control and handling of physical, chemical and biological agents and their toxic by-products, across all fields of biology
D13	To act with a gender perspective and with respect for diversity and multiculturalism, with the aim of achieving a fairer and more equal society

Expected results from this subject				
Expected results from this subject		Training and Learning Results		
New	A1	B4	C5	D2
	A2	B5	C9	D3
	A3	B6	C11	D4
	A4	B8	C13	D5
	A5	B21	C14	D9
			C15	D13
			C15	
			C20	

Contents	
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, patoxenia, 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. Introducción ás parasitosis humanas	(*)Impacto global das parasitosis humanas e conceptos clave en Parasitoloxía sanitaria
(*)Tema 5. Características dos axentes etiolóxicos, epidemioloxía, patoxenia, cadro clínico, diagnóstico e prevención das principais enfermidades de etiología 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

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	25	25	50
Case studies	3	15	18
Laboratory practical	20	20	40
Objective questions exam	1	25	26
Problem and/or exercise solving	1	15	16

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

Methodologies

	Description
Lecturing	(*)Sesiões de 50 minutos nas que se expoñerán os fundamentos teóricos da materia. O alumnado non poderá ter en clase o teléfono móbil 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.
Case studies	(*)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.
Laboratory practical	(*)As prácticas realizaranse nos laboratorios de Microbioloxía e Parasitoloxía e permitirán aplicar, desenvolver e completar 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

Personalized assistance

Methodologies	Description
Lecturing	
Case studies	
Laboratory practical	

Assessment

	Description	Qualification	Training and Learning Results
Case studies	(*)Avaliaranse a redacción, presentación e defensa final dos casos resoltos.	25	C5 D2 C9 D13 C11 C13 C15 C20
Laboratory practical	(*)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	C5 D2 C9 D4 C11 D13 C13 C15 C20

Objective questions exam	(*)Mediante esta proba avaliaranse coñecementos e habilidades adquiridos polos alumnos ao longo das sesións teóricas e prácticas da materia.	35	B21 C20 D9 D13
Problem and/or exercise solving	(*)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	C5 D2 C9 D9 C11 D13 C13 C15 C20

Other comments on the Evaluation

Sources of information

Basic Bibliography

N.C. Engleberg, V. DiRita, M. Imperiale, **Schaechter's Mechanisms of Microbial Disease**, 6ª, Wolters Kluwer Health, 2022

L.S. García, **Diagnostic Medical Parasitology**, 6ª, ASM Press, 2016

R. Goering, H. Dockrell, M. Zuckerman, P. L. Chiodini,, **Mims' Medical Microbiology and Immunology**, 7ª, Elsevier, 2024

Complementary Bibliography

L.R. Ash, T.C. Orihel,, **Atlas de parasitología humana**, 5ª, Médica Panamericana, 2010

Center for Disease Control and Prevention (CDC), **Parasites**,

Center for Disease Control and Prevention (CDC)., **DPDx, Laboratory Identification of Parasites of Public Health Concern**,

P.G. Engelkirk, Duben-Engelkirk, J., R.G. Fader, **Burton's Microbiology for the Health Sciences**, 20ª, Lippincott 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

P. M. Howley, D. M. Knipe, B.A. Damania, J.I Cohen, S.P.J. Whelan, **Fields Virology Vol 3: RNA Viruses**, 7ª, Wolters Kluwer Health, 2021

J. Mensa, A. Soriano, **Guía terapéutica 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

Recommendations

Subjects that continue the syllabus

Agri-food analysis and diagnostic/V02G031V01409

Subjects that are recommended to be taken simultaneously

Agri-food analysis and diagnostic/V02G031V01409

Subjects that it is recommended to have taken before

Microbiology I/V02G031V01204

Immunology and parasitology/V02G031V01305

Microbiology II/V02G031V01309

IDENTIFYING DATA				
(*)Biología celular y fisiología integrativas: Implicaciones en la salud				
Subject	(*)Biología celular y fisiología integrativas: Implicaciones en la salud			
Code	11595-53864-S			
Study programme	(*)Grao en Bioloxía			
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 Portela Couñago, Laura			
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				
B11	Identify and compare the structures, interactions and functions of cellular compartments and their components, tissues and organs			
B17	To integrate the physiological processes in animals, their regulation and their role in homeostatic and adaptive responses to the diverse environments in which they live			
B21	To explore the application of biology to the One Health concept (human, animal, plant and environmental health), to the Sustainable Development Goals, to the optimisation of production processes, and to promoting the conservation of the natural environment			
C5	Carry out analyses of samples from various sources, bioassays and functional tests. Determine and interpret biological parameters under normal and abnormal conditions			
C11	Identify and use verifiable and reliable sources of scientific information to assess the current state of a biological problem and address its resolution			
C15	Collaborate and work as a team, share responsibilities and contribute to the achievement of common goals in research contexts and in professional practice			
C21	To investigate the genetic and molecular causes of the disease and provide guidance on genetic testing. To identify changes in cellular activity and physiological responses associated with health conditions.			
D2	Conducting and interpreting physicochemical, biological, hygiene and health analyses and assessments, bioassays and functional tests, particularly in the health, industrial, agri-food and environmental sectors, and issuing reports			
D15	To act with a high degree of autonomy and in a proactive manner, incorporating technological and scientific advances in order to provide innovative solutions to society's needs and demands			

Expected results from this subject				
Expected results from this subject		Training and Learning Results		
New	B11	C5	D2	
	B17	C11	D15	
	B21	C15		
		C21		

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 3-4 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	B11 B17 B21	D15
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	B11 B17 B21	C21 D2 D15
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	B21	C11 C15 D15 C21
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		C5 C15 D2 C21

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 schedules

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.

- Copying from other students during exams may also result in a lower grade or a failing grade in the course.
- Plagiarism in assignments will be prosecuted. If detected, it will negatively affect the final grade.
- The use of AI to completely or substantially replace a student's own work, or to present AI-generated content as one's own without proper attribution, is not permitted. In such cases, this will be considered academic fraud and may result in the rejection of the assignment, a request for additional evidence, or a reduction in the final grade.

Sources of information

Basic Bibliography

- Alberts, B., **Molecular Biology of the Cell**, 6, Garland 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
- Harding, J., Lodolce, J.P., **Becker's world of the cell**, Hoboken: Pearson, 2021
- López-Otín C., Kroemer G., **Hallmarks of health**, 7;184(1): 33-63, Cell, 2021
- López-Otín C., Blasco MA, Partridge L, Serrano M, Kroemer G., **The hallmarks of aging**, 153(6):1194-217, Cell, 2013
- Guyton A.C., Hall J.E., **Tratado de Fisiología médica**, 14, McGraw-Hill Interamericana., 2021
- Hall J.C., Hall M.E., **Guyton and Hall, Textbook of medical physiology**, 14, Elsevier, 2021
- Norris T.M., **PORTH Fundamentos de fisiopatología**, 5, Wolter-Kluwer, 2020
- Tresguerres J.A.F. et al., **Fisiología humana**, McGraw-Hill Interamericana, 2010
- Rhoades R.A., Bell D.R., **Fisiología médica**, Wolter-Kluwer, 2018
- Silverthorn, **Fisiología humana. Un enfoque integrado**, Ed. Médica Panamericana, 2021

Complementary Bibliography

- Kandel E.R., Schwartz J.H., Jessell T.M., Siegelbaum S.A., Hudspeth A.J., **Principles of neural science**, McGraw-Hill, 2013
- Haines D.E., **Principios de neurociencia. Aplicaciones básicas y clínicas**, Elsevier, 2014
- Redolar, **Fisiología de la conducta**, Ed. Médica Panamericana, 2015
- Madrid J.A., Rol de Lama A., **Cronobiología Básica y clínica**, Editecred, 2006
- Caciopo J.T., Tassinari L.G., Berntson G.G., **Handbook of psychophysiology**, Cambridge Univ. Press, 2007
- Koukkari W.L., Sothorn R.B., **Introducing Biological Rhythms.**, Springer, 2006
- Gluck M.A., Mercado E., Myers C.E., **Learning and memory. From brain to behavior**, McMillan Higher Education, 2014
- Hof P.R., Mobbs C.V., **Functional neurobiology of aging**, Ed. Academic Press, 2001
- 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 immunology/V02G031V01405
- Human genetics and molecular pathology/V02G031V01408

Subjects that it is recommended to have taken before

- Animal and plant histology and cytology II/V02G031V01208
- Animal physiology II/V02G031V01307
- Biochemistry I/V02G031V01201
- Animal and plant histology and cytology I/V02G031V01203
- Biochemistry II/V02G031V01206
- Genetics II/V02G031V01304
- Genetics I/V02G031V01209
- Animal physiology I/V02G031V01302

IDENTIFYING DATA				
(*)Genética humana y patología molecular				
Subject	(*)Genética humana y patología molecular			
Code	11595-53865-S			
Study programme	(*)Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	1st
Teaching language	Spanish			
Department				
Coordinator	Valverde Pérez, Diana			
Lecturers	Díaz Costas, Seila María Galindo Dasilva, Juan Pasantes Ludeña, Juan José 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	
B13	To understand the structure and complexity of genetic material, how it works, and the applications of genetic engineering
B16	Understanding the mechanisms of cell signalling, the fundamentals of bioenergetics, and the regulation and integration of metabolism
B21	To explore the application of biology to the One Health concept (human, animal, plant and environmental health), to the Sustainable Development Goals, to the optimisation of production processes, and to promoting the conservation of the natural environment
C6	To isolate and manipulate genetic material, identify its abnormalities and their role in biological processes, particularly in diseases
C11	Identify and use verifiable and reliable sources of scientific information to assess the current state of a biological problem and address its resolution
C13	To communicate biological knowledge and findings clearly and accurately, both in writing and orally, and using digital resources, to specialist and non-specialist audiences
C21	To investigate the genetic and molecular causes of the disease and provide guidance on genetic testing. To identify changes in cellular activity and physiological responses associated with health conditions.
D11	Preparation and presentation of reports, projects, technical reports and assessments in the field of biology

Expected results from this subject

Expected results from this subject	Training and Learning Results			
Recognise the organisation of the human genome.	B1	C5		
	B2	C6		
	B13	C11		
Know and understand the biochemical and genetic changes that occur in a wide rank of pathologies.	B13	C21		
	B16			
Present the methodologies for the diagnostic, follow-up, and investigation of the illnesses.	B21	C13	D11	
Purchase basic skills of laboratory for the diagnostic of illnesses.		C6	D11	
		C11		
		C13		
		C21		

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.	Connecting phenotypes and genotypes Mapping and identification of genes for monogenic diseases
□ Multifactorial Inheritance.	Identification of factors of risk and molecular base in complex illnesses Models of illness of multifactorial inheritance
□ Genetics of the cancer.	Genetic and environmental factors of cancer Oncogenes and suppressors genes Epigenetics
□ Molecular pathology of human illnesses.	Metabolopathies Monogenic diseases polygenic Inheritance
□ Molecular diagnostic.	Techniques used Indications for the tests Postnatal, prenatal and preimplantation diagnostic 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	B13 C13 B16 B21
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	B13 C13 B16 B21
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	

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	C6 C11 C21	D11
Presentation	The students owe to present of oral way to resolution of the case chosen	5	B21 C11 C13 C21	D11

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 repeatedly 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

Emery; Turnpenny, **Elementos de genética médica y genómica**, 16, Elsevier, 2022

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 II/V02G031V01304
Genetics I/V02G031V01209
Technics in cellular and molecular biology/V02G031V01310

IDENTIFYING DATA				
(*)Gestión y control de calidad				
Subject	(*)Gestión y control de calidad			
Code	11595-53866-S			
Study programme	(*)Grao en Bioloxía			
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	
B21	To explore the application of biology to the One Health concept (human, animal, plant and environmental health), to the Sustainable Development Goals, to the optimisation of production processes, and to promoting the conservation of the natural environment
C10	Draft reports, proposals and technical documents on topics relating to the various branches of biology
C13	To communicate biological knowledge and findings clearly and accurately, both in writing and orally, and using digital resources, to specialist and non-specialist audiences
C15	Collaborate and work as a team, share responsibilities and contribute to the achievement of common goals in research contexts and in professional practice
C18	Develop and implement analytical and control methodologies for agri-food products; monitor safety and quality throughout the food chain. Assess and communicate risks to health and the environment
C19	Design and manage animal, plant and microbial production processes; implement quality control standards; and propose improvements in efficiency and sustainability. Identify new areas of application and professional and/or industrial opportunities
D7	Management of production, processing and handling systems for products and by-products derived from biological and biotechnological materials, as well as quality systems and standards, particularly in the industrial, healthcare, agri-food and environmental sectors
D10	Apply ethical principles in research and professional practice, taking into account the impact of technological and scientific advances. Comply with the laws, regulations and administrative provisions governing the professional practice of biology
D14	Commitment to the Sustainable Development Goals and environmental conservation, promoting responsible practices and innovative solutions

Expected results from this subject				
Expected results from this subject		Training and Learning Results		
New	A1	B4	C14	D3
	A2	B5	C15	D5
	A3	B6		
	A4	B8		
	A5			
New		B21	C1	D7
			C10	D10
			C13	D14
			C15	
			C18	
			C19	

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	B21	C18	D7
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	B21	C15 C18 C19	D7 D10 D14
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	B21	C10 C18 C19	D7 D10 D14
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	B21	C18 C19	D7 D14
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		C13 C15	

Other comments on the Evaluation

CONTINUOUS EVALUATION

In order to pass the subject, students must complete the following activities: work, project, presentation, exam, and achieve a minimum grade of 5 points out of 10. Nevertheless, the different activities can be compensated if a minimum grade of 4/10 points is achieved on them. 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 the one that appearing as the subject final grade (the rest of the sections will not be taken into account).

During the theoretical classes, four attendance controls will be carried out randomly. Each control will value 0.125 points that will have an impact on the final 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 of the project carried out during the practical sessions. The quality of the project presented, its originality, usefulness 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 in the classroom during the practical sessions. This will be reflected in a deliverable that must be uploaded to the Moovi platform at the end of each practical session. In order to complete and improve each section of the project carried out during the internship, it will be valued the fact of uploading to Moovi an improvement of the work done in the practices (complete information, aspects of organization and format, etc.), within the deadlines assigned for this purpose. On the other hand, the participation and interest shown by the student in the classroom during the internship will also be valued.

Presentation

The evaluation of the presentation takes into 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 fluently 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>

Use of Artificial Intelligence

In this course, the use of AI by students is permitted, subject to certain conditions, for the following tasks and activities: searching for and synthesizing sources and images.

The use of AI is expressly prohibited for: the total or substantial replacement of the student's own authorship, presenting AI-generated content as one's own without declaring it, identity impersonation, the fabrication or manipulation of data, and any other use that constitutes academic fraud.

In all cases, students must declare: the tool used, the parts of the activity in which it was used, and the human/critical review carried out on the result.

Use of AI contrary to what is established in this teaching guide may be considered academic fraud, in accordance with applicable current regulations of the UVigo and disciplinary regulations, and may result in the work being rejected/not accepted.

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

Arturo Calvo de Mora y otros, **GESTION DE LA CALIDAD**, Pirámide, 2021

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

Woodside G, **Auditoría de sistemas de gestión ambiental: introducción a la norma ISO 14001**, 2001

Enríquez Palomino, A. y Sánchez Riovero, M., **ISO 14001:2015. Implantación de sistemas de gestión ambiental**, Confemental, 2018

Seoáñez 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

Internships/V02G031V01981

Drafting and execution of projects/V02G031V01404

Subjects that are recommended to be taken simultaneously

Integrative cell biology and physiology: Implications for health/V02G031V01407
Biodiversity: management and conservation/V02G031V01415
Biotechnology applied to animal production/V02G031V01410
Clinical biochemistry and immunology/V02G031V01405
Biotechnology applied to plant production/V02G031V01411
Human genetics and molecular pathology/V02G031V01408
Biotechnology applied to microbiological production/V02G031V01412
Agri-food analysis and diagnostic/V02G031V01409
Management and Conservation of spaces/V02G031V01416
Public health microbiology and parasitology/V02G031V01406
Environmental impact evaluation/V02G031V01414
Environmental analysis and diagnosis/V02G031V01413

IDENTIFYING DATA				
Contaminación				
Subject	Contaminación			
Code	11595-53867-S			
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 Fernández Lago, María del Carmen 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	
B3	Identificar as características e dinámicas do medio físico, incluíndo as derivadas da acción humana e do cambio global
B21	Explorar a aplicabilidade da bioloxía ao concepto dunha única saúde (humana, animal, vexetal, e ambiental), aos obxectivos de desenvolvemento sostible, á optimización dos procesos produtivos e a promover a conservación do medio natural
C9	Identificar axentes físicos, químicos e biolóxicos, incluíndo tóxicos e patóxenos, avaliar a súa actividade e deseñar estratexias para o seu seguimento e control
C14	Planificar e organizar tarefas e actividades, xestionar o tempo e os recursos
C15	Colaborar e traballar en equipo, compartir responsabilidades e contribuír ao logro de obxectivos comúns en contextos de investigación e na actividade profesional
C16	Aplicar técnicas de análise e diagnóstico medioambiental, propoñer e desenvolver estudos de impacto ambiental e establecer medidas de prevención, protección e mitigación de efectos negativos.
D8	Avaliación, protección, conservación e restauración do medio físico, a biodiversidade e os ecosistemas. Identificación e uso de indicadores biolóxicos e ambientais
D9	Xestión, control e tratamento de axentes físicos, químicos e biolóxicos e os seus produtos tóxicos, en todos os ámbitos da Bioloxía
D11	Elaboración e presentación de informes, proxectos, memorias técnicas e valoracións no ámbito da Bioloxía
D14	Compromiso cos obxectivos de desenvolvemento sostible e a conservación do medio ambiente, promovendo prácticas responsables e solucións innovadoras

Resultados previstos na materia

Expected results from this subject	Training and Learning Results		
Nova	B3	C9	D2
	B4	C14	D8
	B18	C15	D9
	B21	C16	D11
		C24	D14
		C31	

Contidos

Topic	
1. INTRODUCCION 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. TRATAMIENTO 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. -Efectos dos contaminantes a nivel fisiolóxico. -Mecanismos moleculares e celulares de acción dos contaminantes. -Ensaio 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
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 disponibilidad. 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 temas.

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 prácticos 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	C14 C15
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.	30	C9 D8
Informe de prácticas, prácticum e prácticas externas	O informe integrado das prácticas de edafoloxía, microbioloxía, zoología e fisioloxía 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 40%	40	B3 C14 D11 B21 C15 D14 C16
Resolución de problemas e/ou exercicios	Avaliación da participación do alumno nos seminarios, asistencia a clases teóricas, etc. (10%) O outro 15% corresponde os cuestionarios ou test sobre el contenido teórico	25	D9 D14

Other comments on the Evaluation

A asistencia a prácticas e seminarios é obrigatoria en caso de avaliación continua

Se se detecta nos cuestionarios ou nos traballos tutelados indicios de copia (por exemplo, IA) o grupo de traballo pode ser chamado para responder distintas preguntas sobre o contido polos profesores da materia

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. Dita 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

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,

Mirshah, 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.J.C., **Environmental Microbiology and Microbial Ecology.**, Wiley-Blackwel,

Beiras, R., **Marine Pollution: sources, fate and effects of pollutants in coastal ecosystems.**, Ed. Elsevier. UK., 2018

Lipp, W.C., E. B. Braun-Howland, T.E. Baxter (eds), **Standard 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

Biología: Solo, medio acuático e clima/V02G031V01106

IDENTIFYING DATA				
(*)Bioinformática				
Subject	(*)Bioinformática			
Code	11595-53868-S			
Study programme	(*)Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	Posada González, David			
Lecturers	Arenas Busto, Miguel Bravo Paneque, Alfonso Ceide Sandoval, Laura Eugenia Moledo Rodríguez, Sarai Posada González, David Tedone , Gabriele			
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 increasingly popular and cross-cutting across 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, problem-solving exercises outside the classroom, and the use of the forum on the Moovi platform. Apart from asynchronous communication 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 receive a grade, the student must upload a photo to the Moovi platform. (*) 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	
B5	To be familiar with the most common methods and techniques for the observation, identification, collection, processing and analysis of biological and non-biological samples in laboratory, field or computer-based studies, including the analysis of images or other types of signals that provide relevant data.
B8	To understand the mathematical, statistical, and computational tools used to analyze and solve problems in the field of biology
B21	To explore the application of biology to the One Health concept (human, animal, plant and environmental health), to the Sustainable Development Goals, to the optimisation of production processes, and to promoting the conservation of the natural environment
C2	Apply mathematical, physical, chemical, statistical and computational tools to the analysis, interpretation and resolution of biological problems
C6	To isolate and manipulate genetic material, identify its abnormalities and their role in biological processes, particularly in diseases
C11	Identify and use verifiable and reliable sources of scientific information to assess the current state of a biological problem and address its resolution
C20	To conduct and interpret clinical studies and analyses aimed at diagnosing and developing treatments for diseases, as well as managing them from an epidemiological and public health perspective
D1	Solving biological problems using the scientific method
D5	Conducting genomic studies for genetic counselling, assisted reproductive technologies, developmental biology and gene therapy

D15 To act with a high degree of autonomy and in a proactive manner, incorporating technological and scientific advances in order to provide innovative solutions to society's needs and demands

Expected results from this subject

Expected results from this subject	Training and Learning Results		
New	B5	C2	D1
	B8	C6	D5
	B21	C11	D15
		C20	

Contents

Topic	
Lesson 1. High-throughput DNA sequencing.	Sequencing platforms. Libraries. Coverage. FASTQ format. Quality control.
Lesson 2. Sequence alignment	Alignment. Scoring. Alignment algorithms. Sequencing read mapping. SAM/BAM formats Post-processing.
Lesson 3. Variant calling	Types of variants. Identification. Calling strategies. VCF format. Structural variation. Filtering. Annotation
Lesson 4. Quantification of gene expression	RNA-seq. Experimental design. RNA-seq alignment. Quantification. Differential expression analysis.
Lesson 5. Genome assembly and annotation	Assembly. Algorithms. Evaluation. K-mer analysis. Genome annotation.
Lesson 6. Metagenomic analysis	Microbiome. Metagenomics. 16S analysis. Shotgun analysis. Alpha and beta diversity. Metagenomic annotation

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	12	12	24
Problem solving	32	84	116
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 will be conducted, in which students will apply the concepts and methodologies developed in the theoretical lessons. Students are required to use their laptops. These practical sessions will cover file manipulation and transfer in Unix, remote server access, bioinformatics programming, data quality control, read mapping, identification and annotation of genomic variants, gene expression quantification, data representation in R, genome assembly, and metagenomic analysis. Furthermore, students will solve problems on the Moovi platform outside the classroom to strengthen their understanding of the subject's concepts and methodologies.
Discussion Forum	All students are expected to actively participate in the subject's discussion forum on the Moovi platform by raising 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, via a date and time for a face-to-face or virtual meeting, via email, or through 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, thereby facilitating problem-solving. This personalized attention can be provided in the classroom, via a date and time for a face-to-face or virtual meeting, via email, or through the Moovi platform's messaging feature.

Assessment					
	Description	Qualification	Training and Learning Results		
Objective questions exam	Unit 1: Problems 1-3	5	B8	C2	D1
					D15
Objective questions exam	Unit 2: Lessons 1-2; Problems 4-5	5	B5	C2	D1
			B8	C11	D5
					D15
Objective questions exam	Unit 3: Lesson 3; Problems 6-7	5	B5	C2	D1
			B8	C6	D5
			B21	C11	D15
				C20	
Objective questions exam	Unit 4: Lessons 4-6; Problems 8-10	5	B5	C2	D1
			B8	C11	D5
			B21	C20	D15
Problem and/or exercise solving	Unit 1: Problem-solving sessions 1-3	20	B8	C2	D1
				C11	D15
Problem and/or exercise solving	Unit 2: Problem-solving sessions 4-5	20	B5	C2	D1
			B8	C11	D5
					D15
Problem and/or exercise solving	Unit 3: Problem-solving sessions 6-7	20	B5	C2	D1
			B8	C6	D5
			B21	C11	D15
				C20	
Problem and/or exercise solving	Unit 4: Problem-solving sessions 8-10	20	B5	C2	D1
			B8	C11	D5
			B21	C20	D15

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 by the deadline established by the center may 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

Mathematics: Mathematics applied to Biology/V02G031V01104

Genetics II/V02G031V01304

Biology: Informatic tools in biology/V02G031V01110

Genetics I/V02G031V01209

Statistics: Biostatistics/V02G031V01107

Other comments

Considerations before enrolling in Bioinformatics:

<https://posadoc.notion.site/Consideraciones-antes-de-matricularse-en-Bioinforma-tica-4-de-Biologi-a-2ef2d70adea780a2a941d856df23c1ff?pvs=143>

This subject is entirely problem-solving-based. It will require continuous effort for several hours each week throughout the course. Learning is sequential, and each new step depends on the previous ones, much like mathematics. You will need to work independently, repeating tasks and verifying solutions. You have 100 non-face-to-face hours available that you must use.

No prior knowledge of any programming language is required to take this course; however, basic familiarity with computer tools (e.g., operating a laptop, opening and closing programs, accessing the internet) is necessary.

IDENTIFYING DATA				
(*)Proyectos en biología aplicados a la salud				
Subject	(*)Proyectos en biología aplicados a la salud			
Code	11595-53869-S			
Study programme	(*)Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	Spanish			
Department				

Coordinator	Gallego Veigas, Pedro Pablo			
Lecturers	Campos Juanatey, Diego Gallardo Medina, Mercedes Gallego Veigas, Pedro Pablo González Cespón, José Luis Iglesias Blanco, Raúl Magadán Momo, Susana Míguez Miramontes, Jesús Manuel Vecino Bello, Xanel			
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	
B21	To explore the application of biology to the One Health concept (human, animal, plant and environmental health), to the Sustainable Development Goals, to the optimisation of production processes, and to promoting the conservation of the natural environment
C10	Draft reports, proposals and technical documents on topics relating to the various branches of biology
C11	Identify and use verifiable and reliable sources of scientific information to assess the current state of a biological problem and address its resolution
C12	To incorporate workplace safety practices to prevent risks and protect the health of both living beings and the environment
C13	To communicate biological knowledge and findings clearly and accurately, both in writing and orally, and using digital resources, to specialist and non-specialist audiences
C15	Collaborate and work as a team, share responsibilities and contribute to the achievement of common goals in research contexts and in professional practice
C20	To conduct and interpret clinical studies and analyses aimed at diagnosing and developing treatments for diseases, as well as managing them from an epidemiological and public health perspective
D5	Conducting genomic studies for genetic counselling, assisted reproductive technologies, developmental biology and gene therapy
D7	Management of production, processing and handling systems for products and by-products derived from biological and biotechnological materials, as well as quality systems and standards, particularly in the industrial, healthcare, agri-food and environmental sectors
D10	Apply ethical principles in research and professional practice, taking into account the impact of technological and scientific advances. Comply with the laws, regulations and administrative provisions governing the professional practice of biology
D11	Preparation and presentation of reports, projects, technical reports and assessments in the field of biology
D12	Participating in R+D+i activities, delivering training and disseminating knowledge, thereby contributing to the public profile of biology
D15	To act with a high degree of autonomy and in a proactive manner, incorporating technological and scientific advances in order to provide innovative solutions to society's needs and demands

Expected results from this subject	
Expected results from this subject	Training and Learning Results

New	B21	C10 C11 C12 C13 C15 C20	D5 D7 D10 D11 D12 D15
-----	-----	--	--------------------------------------

Contents

Topic

Topic 1: The Biology Profession □ Introduction to the subject

Topic 2. Project design I:

Practical methodology for preparing projects, reports and technical studies

Topic 3. Project design II:

Planning, feasibility, assessments, regulations, legislation, and waste and pollutant management

Topic 4.- Engineering of the biology project: technical project report

Topic 5.- Project documentation: (*)
report, appendices and drawings

Practicals 1-8: In groups, students will carry out the complete design and development of an Applied Biology for Health project (broad concept, as in ONE HEALTH) and resolve case studies

Workshops: Quality in Applied Biology projects, talks with biology professionals, and job-seeking tools

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	12	10	22
Practices through ICT	12	12	24
Collaborative Learning	12	6	18
Workshops	6	12	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
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.
Workshops	Activities focused on acquiring procedural knowledge and manipulative/instrumental skills on a specific topic, with dedicated teacher support for the individual and/or group activities carried out by students.

Personalized assistance

Methodologies	Description
Practices through ICT	Various practicals will be carried out in the classroom, individually and in small groups, supervised by the subject's lecturers.

Collaborative Learning	A small-group project in the field of health will be developed by students, under the supervision of teaching staff with specialist expertise in the subject matter.
Workshops	Talks and workshops will be held with biology and employment professionals. During these activities, students will be able to interact either with those responsible for running them or with the subject's teaching staff.

Assessment						
	Description	Qualification	Training and Learning Results			
Project	Project □ Biology report: In small groups, students will prepare a report covering the biological aspects of the project in the field of HEALTH (ONE HEALTH).	35	B21	C10 C11 C20	D5 D10 D11 D12 D15	
Project	Project □ Technical report and appendices: In small groups, students will produce a technical report, with appendices, covering the design of the production activity related to the HEALTH field addressed in the biology report.	35	B21	C10 C11 C12	D5 D11 D12 D15	
Objective questions exam	Objective test: assessment of the competences acquired, including short-answer questions on theory and work carried out.	10	B21	C20	D10 D15	
Presentation	Students will present the complete project on a professional day and, where applicable, on a further resit day.	20		C11 C13		

Other comments on the Evaluation

Continuous Assessment

To pass the subject by continuous assessment, students must obtain, in each of the 4 assessment components, a minimum of 30% of the maximum value assigned to that component.

If this threshold is met in all components, the final mark will be the weighted sum of the components (according to the percentages described previously). The subject will be considered passed when this sum is equal to or greater than 5.0 out of 10.

Fail conditions and second opportunity:

1. Mark recorded: If the weighted sum of the components is equal to or greater than 5.0, but the minimum of 30% has not been reached in one or more of them, the mark recorded will be the lowest of those obtained. If the overall sum is below 5.0, that sum will be recorded instead.
2. Second opportunity (resit): Students will only need to retake those components in which they did not reach the required threshold. Marks already obtained in the components that were passed will be kept for this second opportunity.
3. Weighting of the group project: The mark obtained by the group for the project (Biology Report + Technical Report and Appendices combined) will be adjusted on an individual basis. This will be done by applying a correction factor based on the mark the student obtained in the individual short-answer examination (marked out of 10), using the following formula:

Individual Project Mark = Group Mark x (Individual Examination Mark / 10).

The exact dates for submission of the report and the project will be announced in advance and will be available via the MooVI platform.

Global Assessment

Students who choose the global-assessment route must be examined on all the competences of the subject. To do so, they must individually submit and defend: a report on the biological aspects, a report on the technical aspects, the oral presentation of the complete project, and sit the individual examination.

To pass the subject by this route, it will be essential to obtain at least 30% of the maximum mark in each of the 4 assessment components, and for the weighted sum of all of them to reach a minimum of 5.0 out of 10.

Sources of information

Basic Bibliography

Camprubí i García, Pere, **La profesión de Biólogo**, 1997,

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

Navas López, J.A. y Guerras Marín, L.A., **La Dirección Estratégica de la Empresa. Teoría y Aplicaciones**, 2007, www.biologosdegalicia.org,

Correa, I., **Manual de licitaciones públicas**, 2002,

Palomar Olmeda, A., **Guía 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

Other comments

The *UVIGO, through the Area of Employment and *Emprendimiento (<https://www.uvigo.gal/Is/university/administracion-personal/organizacion-administrative/unit-employment-emprendimiento>) offers a series of activities that form part of the cycle *EMPREGARte of 4 hours of length and allow to complete professional competitions:

- *Autocoñecemento: or *teu *proxecto profesional□
- *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**(*)Proyectos en biología aplicados a la producción**

Subject	(*)Proyectos en biología aplicados a la producción			
Code	11595-53870-S			
Study programme	(*)Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	Spanish			
Department				

Coordinator	Gallego Veigas, Pedro Pablo
Lecturers	Campos Juanatey, Diego Gallardo Medina, Mercedes Gallego Veigas, Pedro Pablo González Cespón, José Luis Iglesias Blanco, Raúl Magadán Momo, Susana Míguez Miramontes, Jesús Manuel Vecino Bello, Xanel
E-mail	pgallego@uvigo.es
Web	
General description	This subject will introduce students to the methodology, direction, management and organisation of research/business projects in the field of production. After completing the subject, students should be able to draft and plan research/business projects related to PRODUCTION, exploring in depth the biotechnological approach to animal and plant production systems, microbial technology, agri-food analysis and control, and innovation in sustainable production methods (SDGs), in line with the circular economy, among other aspects. Class timetable: Available at http://bioloxia.uvigo.es/es/docencia/horarios

Training and Learning Results

Code	
B21	To explore the application of biology to the One Health concept (human, animal, plant and environmental health), to the Sustainable Development Goals, to the optimisation of production processes, and to promoting the conservation of the natural environment
C10	Draft reports, proposals and technical documents on topics relating to the various branches of biology
C11	Identify and use verifiable and reliable sources of scientific information to assess the current state of a biological problem and address its resolution
C12	To incorporate workplace safety practices to prevent risks and protect the health of both living beings and the environment
C13	To communicate biological knowledge and findings clearly and accurately, both in writing and orally, and using digital resources, to specialist and non-specialist audiences
C15	Collaborate and work as a team, share responsibilities and contribute to the achievement of common goals in research contexts and in professional practice
C19	Design and manage animal, plant and microbial production processes; implement quality control standards; and propose improvements in efficiency and sustainability. Identify new areas of application and professional and/or industrial opportunities
D5	Conducting genomic studies for genetic counselling, assisted reproductive technologies, developmental biology and gene therapy
D7	Management of production, processing and handling systems for products and by-products derived from biological and biotechnological materials, as well as quality systems and standards, particularly in the industrial, healthcare, agri-food and environmental sectors
D10	Apply ethical principles in research and professional practice, taking into account the impact of technological and scientific advances. Comply with the laws, regulations and administrative provisions governing the professional practice of biology
D11	Preparation and presentation of reports, projects, technical reports and assessments in the field of biology
D12	Participating in R+D+i activities, delivering training and disseminating knowledge, thereby contributing to the public profile of biology

D15 To act with a high degree of autonomy and in a proactive manner, incorporating technological and scientific advances in order to provide innovative solutions to society's needs and demands

Expected results from this subject

Expected results from this subject		Training and Learning Results	
New	B21	C10	D5
		C11	D7
		C12	D10
		C13	D11
		C15	D12
		C19	D15

Contents

Topic	
Topic 1: The Biology Profession □ Introduction to the subject	
Topic 2. Project design I: Practical methodology for preparing projects, reports and technical studies	
Topic 3. Project design II: Planning, feasibility, assessments, regulations, legislation, and waste and pollutant management.	
Topic 4.- Engineering of the biology project: technical project report.	
Topic 5.- Project documentation: report, appendices, and drawings (*)	
Practicals 1-8: In groups, students will carry out the complete design and development of an Applied Biology for Health project (broad concept, as in ONE HEALTH) and resolve case studies	(*)Obradoiros: Calidade nos proxectos de Bioloxía Aplicada, charlas con profesionais da bioloxía e ferramentas para o emprego
Workshops: Quality in Applied Biology projects, talks with biology professionals, and job-seeking tools	

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	12	10	22
ICT supported practices (Repeated, Dont Use)	12	12	24
Collaborative Learning	12	6	18
Workshops	6	12	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
Lecturing	Theoretical teaching sessions in which lecturers provide a general overview of the topic, outlining the key concepts needed to understand it.
ICT supported practices (Repeated, Dont Use)	Activity for acquiring knowledge, basic skills and use of the specific software required for the different sections of the project.
Collaborative Learning	Description and development of a multidisciplinary project (with students from other degree programmes where possible). Methodologies such as Design Thinking, Service Learning and Problem-Based Learning will be used to design the project.
Workshops	Activities focused on acquiring procedural knowledge and manipulative/instrumental skills on a specific topic, with dedicated teacher support for the individual and/or group activities carried out by students.

Personalized assistance

Methodologies	Description
---------------	-------------

Workshops	Talks and workshops will be held with biology and employment professionals. During these activities, students will be able to interact either with those responsible for running them or with the subject's teaching staff.
Collaborative Learning	A small-group project in the field of health will be developed by students, under the supervision of teaching staff with specialist expertise in the subject matter.
ICT supported practices (Repeated, Dont Use)	Various practicals will be carried out in the classroom, individually and in small groups, supervised by the subject's lecturers.

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	B21	C10 C11 C15 C19	D5 D7 D10 D11 D12 D15
Project	Memory and Technical Annexes: The students of the matter, in small groups, made a project related with the production field	35	B21	C10 C11 C12 C15 C19	D10 D11 D15
Objective questions exam	Proofs for evaluation of the competitions purchased that include questions of short answer on theory and works made.	10	B21	C19	D10 D15
Presentation	Students will present the complete project on a professional day and, where applicable, on a further resit day.	20		C11 C13 C15	

Other comments on the Evaluation

Continuous Assessment

To pass the subject by continuous assessment, students must obtain, in each of the 4 assessment components, a minimum of 30% of the maximum value assigned to that component.

If this threshold is met in all components, the final mark will be the weighted sum of the components (according to the percentages described previously). The subject will be considered passed when this sum is equal to or greater than 5.0 out of 10.

Fail conditions and second opportunity:

Mark recorded: If the weighted sum of the components is equal to or greater than 5.0, but the minimum of 30% has not been reached in one or more of them, the mark recorded will be the lowest of those obtained. If the overall sum is below 5.0, that sum will be recorded instead.

Second opportunity (resit): Students will only need to retake those components in which they did not reach the required threshold. Marks already obtained in the components that were passed will be kept for this second opportunity.

Weighting of the group project: The mark obtained by the group for the project (Biology Report + Technical Report and Appendices combined) will be adjusted

on an individual basis. This will be done by applying a correction factor based on the mark the student obtained in the individual short-answer examination (marked out of 10), using the following formula:

Individual Project Mark = Group Mark x (Individual Examination Mark / 10).

The exact dates for submission of the report and the project will be announced in advance and will be available via the MooVI platform.

Global Assessment

Students who choose the global-assessment route must be examined on all the competences of the subject. To do so, they must individually submit and defend: a report on the biological aspects, a report on the technical aspects, the oral presentation of the complete project, and sit the individual examination.

To pass the subject by this route, it will be essential to obtain at least 30% of the maximum mark in each of the 4 assessment components, and for the weighted sum of all of them to reach a minimum of 5.0 out of 10.

Sources of information

Basic Bibliography

Camprubí i García, Pere, **La profesión de Biólogo**, 1997,

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

Navas López, J.A. y Guerras Marín, L.A., **La Dirección Estratégica de la Empresa. Teoría y Aplicaciones**, 2007,

www.biologosdegalicia.org,

Correa, I., **Manual de licitaciones públicas**, 2002,

Palomar Olmeda, A., **Guía 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

IDENTIFYING DATA**(*)Proyectos en biología aplicados al medioambiente**

Subject	(*)Proyectos en biología aplicados al medioambiente			
Code	11595-53871-S			
Study programme	(*)Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	Spanish			
Department				

Coordinator	Gallego Veigas, Pedro Pablo
Lecturers	Campos Juanatey, Diego Gallardo Medina, Mercedes Gallego Veigas, Pedro Pablo González Cespón, José Luis Iglesias Blanco, Raúl Magadán Momo, Susana Míguez Miramontes, Jesús Manuel Muñoz Sobrino, Castor Soto González, Benedicto Vecino Bello, Xanel
E-mail	pgallego@uvigo.es
Web	
General description	This subject will introduce students to the methodology, direction, management and organisation of research/business projects in the ENVIRONMENTAL field. After completing the subject, students should be able to draft and plan research/business projects related to the ENVIRONMENT, exploring in depth the methodologies for analysing biological resources and ecosystems, environmental impact assessment, the effects of global change on biodiversity, species conservation and the restoration of contaminated environments, among other aspects. Class timetable: Available at http://bioloxia.uvigo.es/es/docencia/horarios

Training and Learning Results

Code	
B21	To explore the application of biology to the One Health concept (human, animal, plant and environmental health), to the Sustainable Development Goals, to the optimisation of production processes, and to promoting the conservation of the natural environment
C10	Draft reports, proposals and technical documents on topics relating to the various branches of biology
C11	Identify and use verifiable and reliable sources of scientific information to assess the current state of a biological problem and address its resolution
C12	To incorporate workplace safety practices to prevent risks and protect the health of both living beings and the environment
C13	To communicate biological knowledge and findings clearly and accurately, both in writing and orally, and using digital resources, to specialist and non-specialist audiences
C15	Collaborate and work as a team, share responsibilities and contribute to the achievement of common goals in research contexts and in professional practice
C17	Organise and manage natural areas; carry out studies on biodiversity and the conservation and restoration of ecosystems; plan for the rational and sustainable use of their resources
D7	Management of production, processing and handling systems for products and by-products derived from biological and biotechnological materials, as well as quality systems and standards, particularly in the industrial, healthcare, agri-food and environmental sectors
D8	Assessment, protection, conservation and restoration of the physical environment, biodiversity and ecosystems. Identification and use of biological and environmental indicators
D10	Apply ethical principles in research and professional practice, taking into account the impact of technological and scientific advances. Comply with the laws, regulations and administrative provisions governing the professional practice of biology
D11	Preparation and presentation of reports, projects, technical reports and assessments in the field of biology

D12 Participating in R+D+i activities, delivering training and disseminating knowledge, thereby contributing to the public profile of biology

D15 To act with a high degree of autonomy and in a proactive manner, incorporating technological and scientific advances in order to provide innovative solutions to society's needs and demands

Expected results from this subject

Expected results from this subject		Training and Learning Results		
New	A1	B1	C8	D1
	A2	B2	C10	D2
	A3	B3	C11	D3
	A4	B5	C12	D4
	A5	B6	C13	D5
		B7	C15	D6
		B9	C17	D7
		B11	C44	D7
		B14	C49	D8
		B15	C52	D8
		B18		D9
		B21		D10
				D10
				D11
				D11
				D12
				D15

Contents

Topic

Topic 1: The Biology Profession – Introduction to the subject

Topic 2. Project design I: Practical methodology for preparing projects, reports and technical studies

Topic 3. Project design II: Planning, feasibility, assessments, regulations, legislation, and waste and pollutant management

Topic 4.- Engineering of the biology project: technical project report

Topic 5.- Project documentation: report, appendices, and drawings (*)

Practicals 1-8: In groups, students will carry out the complete design and development of an Applied Biology for Health project (broad concept, as in ONE HEALTH) and resolve case studies

Workshops: Quality in Applied Biology projects, talks with biology professionals, and job-seeking tools.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	12	10	22
Practices through ICT	12	12	24
Collaborative Learning	12	6	18
Workshops	6	12	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
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.
Workshops	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
Workshops	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	Project □ Biology report: in small groups, students will prepare a report covering the biological aspects of the biological project.	35	B21	C10 C11 C15 C17	D8 D10 D11 D12 D15
Project	Project □ Technical Report and appendices: students taking this module will, in small groups, carry out a project on an activity related to the environment	35	B21	C10 C11 C12	D7 D11 D12 D15
Objective questions exam	Objective test: Assessment of the competences acquired, including short-answer questions on theory and work carried out.	10	B21	C17	D10 D15
Presentation	Students will present the complete project on a professional day and, where applicable, on a further resit day	20		C11 C13	

Other comments on the Evaluation

Continuous Assessment

To pass the subject by continuous assessment, students must obtain, in each of the 4 assessment components, a minimum of 30% of the maximum value assigned to that component.

If this threshold is met in all components, the final mark will be the weighted sum of the components (according to the percentages described previously). The subject will be considered passed when this sum is equal to or greater than 5.0 out of 10.

Fail conditions and second opportunity:

Mark recorded: If the weighted sum of the components is equal to or greater than 5.0, but the minimum of 30% has not been reached in one or more of them, the mark recorded will be the lowest of those obtained. If the overall sum is below 5.0, that sum will be recorded instead.

Second opportunity (resit): Students will only need to retake those components in which they did not reach the required threshold. Marks already obtained in the components that were passed will be kept for this second opportunity.

Weighting of the group project: The mark obtained by the group for the project (Biology Report + Technical Report and Appendices combined) will be adjusted on an individual basis. This will be done by applying a correction factor based on the mark the student obtained in the individual short-answer examination (marked out of 10), using the following formula:

Individual Project Mark = Group Mark x (Individual Examination Mark / 10).

The exact dates for submission of the report and the project will be announced in advance and will be available via the MooVI platform.

Global Assessment

Students who choose the global-assessment route must be examined on all the competences of the subject. To do so, they must individually submit and defend: a report on the biological aspects, a report on the technical aspects, the oral presentation of the complete project, and sit the individual examination.

To pass the subject by this route, it will be essential to obtain at least 30% of the maximum mark in each of the 4 assessment components, and for the weighted sum of all of them to reach a minimum of 5.0 out of 10.

Sources of information

Basic Bibliography

Camprubí i García, Pere, **La profesión de Biólogo**, 1997,

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

Navas López, J.A. y Guerras Marín, L.A., **La Dirección Estratégica de la Empresa. Teoría y Aplicaciones**, 2007,

www.biologosdegalicia.org,

Correa, I., **Manual de licitaciones públicas**, 2002,

Palomar Olmeda, A., **Guía 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

Other comments

Through its Employment and Entrepreneurship Office, UVigo organises, every year, a series of fairs and workshops on preparing for an active job search and making contact with companies seeking to recruit staff; these will, in due course, be advertised to students on this subject, and attendance is recommended.

IDENTIFYING DATA				
(*)Prácticas externas: Producción				
Subject	(*)Prácticas externas: Producción			
Code	11595-53872-S			
Study programme	(*)Grao en Bioloxía			
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 within the production field. 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	
B21	To explore the application of biology to the One Health concept (human, animal, plant and environmental health), to the Sustainable Development Goals, to the optimisation of production processes, and to promoting the conservation of the natural environment
C10	Draft reports, proposals and technical documents on topics relating to the various branches of biology
C12	To incorporate workplace safety practices to prevent risks and protect the health of both living beings and the environment
C14	Plan and organise tasks and activities; manage time and resources
C15	Collaborate and work as a team, share responsibilities and contribute to the achievement of common goals in research contexts and in professional practice
D10	Apply ethical principles in research and professional practice, taking into account the impact of technological and scientific advances. Comply with the laws, regulations and administrative provisions governing the professional practice of biology
D11	Preparation and presentation of reports, projects, technical reports and assessments in the field of biology
D13	To act with a gender perspective and with respect for diversity and multiculturalism, with the aim of achieving a fairer and more equal society
D14	Commitment to the Sustainable Development Goals and environmental conservation, promoting responsible practices and innovative solutions
D15	To act with a high degree of autonomy and in a proactive manner, incorporating technological and scientific advances in order to provide innovative solutions to society's needs and demands

Expected results from this subject

Expected results from this subject	Training and Learning Results		
New	B21	C10	D10
		C12	D11
		C14	D13
		C15	D14
			D15

Contents

Topic

The student will carry out an internship in some labour and professional real environments related with any of the fields in Biology related to production (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	B21	C12 C14 C15	D10 D13 D14 D15	
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 establish 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		C10	D11	

Other comments on the Evaluation

The instructions to prepare the memory of the internship will be 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 platform Moovi.

IDENTIFYING DATA				
(*)Prácticas externas: Medioambiente				
Subject	(*)Prácticas externas: Medioambiente			
Code	11595-53873-S			
Study programme	(*)Grao en Bioloxía			
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 the environmental field. 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			
B21	To explore the application of biology to the One Health concept (human, animal, plant and environmental health), to the Sustainable Development Goals, to the optimisation of production processes, and to promoting the conservation of the natural environment		
C10	Draft reports, proposals and technical documents on topics relating to the various branches of biology		
C12	To incorporate workplace safety practices to prevent risks and protect the health of both living beings and the environment		
C14	Plan and organise tasks and activities; manage time and resources		
C15	Collaborate and work as a team, share responsibilities and contribute to the achievement of common goals in research contexts and in professional practice		
D10	Apply ethical principles in research and professional practice, taking into account the impact of technological and scientific advances. Comply with the laws, regulations and administrative provisions governing the professional practice of biology		
D11	Preparation and presentation of reports, projects, technical reports and assessments in the field of biology		
D13	To act with a gender perspective and with respect for diversity and multiculturalism, with the aim of achieving a fairer and more equal society		
D14	Commitment to the Sustainable Development Goals and environmental conservation, promoting responsible practices and innovative solutions		
D15	To act with a high degree of autonomy and in a proactive manner, incorporating technological and scientific advances in order to provide innovative solutions to society's needs and demands		

Expected results from this subject

Expected results from this subject	Training and Learning Results		
New	B21	C10	D10
		C12	D11
		C14	D13
		C15	D14
			D15

Contents

Topic

The student will carry out an internship in some labour and professional real environments related with any of the fields in Biology in the environmental field (management, evaluation, 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.	75	B21	C12	D10	
	Then, the "external" tutor will evaluate the activity developed by the student during the period of the internship.			C14	D13	
				C15	D14	D15
Report of practices, practicum and external practices	The "academic" tutor will review and evaluate the memory of the internship drafted by the student.	25		C10	D11	
	The "academic" tutor will establish 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 %).					

Other comments on the Evaluation

The instructions to prepare the memory of the internship will be 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 platform Moovi.

IDENTIFYING DATA				
(*)Prácticas externas: Salud				
Subject	(*)Prácticas externas: Salud			
Code	11595-53874-S			
Study programme	(*)Grao en Bioloxía			
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, related to health aspects. 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	
B21	To explore the application of biology to the One Health concept (human, animal, plant and environmental health), to the Sustainable Development Goals, to the optimisation of production processes, and to promoting the conservation of the natural environment
C10	Draft reports, proposals and technical documents on topics relating to the various branches of biology
C12	To incorporate workplace safety practices to prevent risks and protect the health of both living beings and the environment
C14	Plan and organise tasks and activities; manage time and resources
C15	Collaborate and work as a team, share responsibilities and contribute to the achievement of common goals in research contexts and in professional practice
D10	Apply ethical principles in research and professional practice, taking into account the impact of technological and scientific advances. Comply with the laws, regulations and administrative provisions governing the professional practice of biology
D11	Preparation and presentation of reports, projects, technical reports and assessments in the field of biology
D13	To act with a gender perspective and with respect for diversity and multiculturalism, with the aim of achieving a fairer and more equal society
D14	Commitment to the Sustainable Development Goals and environmental conservation, promoting responsible practices and innovative solutions
D15	To act with a high degree of autonomy and in a proactive manner, incorporating technological and scientific advances in order to provide innovative solutions to society's needs and demands

Expected results from this subject

Expected results from this subject	Training and Learning Results		
New	B21	C10 C12 C14 C15	D10 D11 D13 D14 D15

Contents

Topic

The student will carry out an internship in some labour and professional real environments related with any of the fields of health biology (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	B21	C12 C14 C15	D10 D13 D14 D15
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 establish 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		C10	D11

Other comments on the Evaluation

The instructions to prepare the memory of the internship will be 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 platform Moovi.

IDENTIFYING DATA				
(*)Trabajo de Fin de Grado				
Subject	(*)Trabajo de Fin de Grado			
Code	11595-53875-S			
Study programme	(*)Grao en Bioloxía			
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 (FDP) 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. THE FINAL DEGREE PROJECT AS A SUBJECT FOR SPECIALISATIONS. The FDP may be included as a module for the degree specialisations (Applied Biology for Health; Applied Biology for the Environment; Applied Biology for Production), provided that the project undertaken by the student is aligned with the learning objectives defined in the degree programme for the chosen specialisation.			

Training and Learning Results				
Code				
B21	To explore the application of biology to the One Health concept (human, animal, plant and environmental health), to the Sustainable Development Goals, to the optimisation of production processes, and to promoting the conservation of the natural environment			
C10	Draft reports, proposals and technical documents on topics relating to the various branches of biology			
C11	Identify and use verifiable and reliable sources of scientific information to assess the current state of a biological problem and address its resolution			
C13	To communicate biological knowledge and findings clearly and accurately, both in writing and orally, and using digital resources, to specialist and non-specialist audiences			
C14	Plan and organise tasks and activities; manage time and resources			
D1	Solving biological problems using the scientific method			
D7	Management of production, processing and handling systems for products and by-products derived from biological and biotechnological materials, as well as quality systems and standards, particularly in the industrial, healthcare, agri-food and environmental sectors			
D9	Management, control and handling of physical, chemical and biological agents and their toxic by-products, across all fields of biology			
D10	Apply ethical principles in research and professional practice, taking into account the impact of technological and scientific advances. Comply with the laws, regulations and administrative provisions governing the professional practice of biology			
D11	Preparation and presentation of reports, projects, technical reports and assessments in the field of biology			
D12	Participating in R+D+i activities, delivering training and disseminating knowledge, thereby contributing to the public profile of biology			
D15	To act with a high degree of autonomy and in a proactive manner, incorporating technological and scientific advances in order to provide innovative solutions to society's needs and demands			

Expected results from this subject				
Expected results from this subject	Training and Learning Results			
New	B21	C10	D1	
		C11	D7	
		C13	D9	
		C14	D10	
			D11	
			D12	
			D15	

Contents

Topic

* The Final Degree Project (FDP) may be included as a course for the DEGREE PROGRAM SPECIALIZATIONS (biology applied to health; biology applied to the environment; biology applied to production), provided that the project developed by the student is aligned with the educational objectives defined in the degree program for the selected specialization.

The subject Final Degree 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 The type of project should be limited to these sections:

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:

-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.

-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.

-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.

- Type B: proposed by students and agreed with a professor of the degree who will supervise the work.

- Work applied to biology carried out in external public and private institutions.

-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 outlined in the regulations of the Final Degree Project in Biology.

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 assist 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 leads to the tutorial report template that will be used in the 2026-27 academic year. http://bioloxia.uvigo.es/docs/docencia/grado/tfg/TFG_informe_tutor.pdf	25	B21 C14 D1 D7 D9 D10 D11 D12 D15
Project	The student must submit a report of the project in which the main details of the work done are included. The following link leads to the rules for preparing the Final Degree Project report for the 2026-27 academic year. https://bioloxia.uvigo.es/gl/docencia/traballo-fin-de-grao/	35	B21 C10 D11 C11 D12 D15
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	C13 D11 C14 D12 D15

Other comments on the Evaluation

Final 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.

Final 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 Final Degree Project for the 2026-27 academic year

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_bioloxia.pdf

Ethical aspects.

- Plagiarism in assignments will be prosecuted. If detected, it will negatively affect the final grade.
- The use of AI to completely or substantially replace a student's own work, or to present AI-generated content as one's own without proper attribution, is not permitted. In such cases, this will be considered academic fraud and may result in the rejection of the assignment, a request for additional evidence, or a reduction in the final grade.

Sources of information

Basic Bibliography

Complementary Bibliography

Recommendations

Other comments

RECOMMENDATION FOR REGISTRATION IN THE COURSE

- 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.

RECOMMENDATIONS FOR INCLUDING THE FINAL DEGREE PROJECT AS A COURSE WITHIN A DEGREE MENTION.

The student, together with the project advisor, must ensure that the proposed project aligns with the educational objectives established for the specialization he wish to pursue in the degree program. The Final Degree Project Committee will develop guidelines for preparing applications to be assigned projects within the degree program's specializations.
