



(*)Facultade de Bioloxía

Presentación

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

Dean Team

(*)
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Grado en Biología

Subjects

Year 4th

Code	Name	Quadmester	Total Cr.
V02G031V01401	Quality management and control	1st	6
V02G031V01402	Pollution	2nd	6
V02G031V01403	Bioinformatics	2nd	6
V02G031V01404	Drafting and execution of projects	2nd	6
V02G031V01405	Clinical biochemistry and immunology	1st	6
V02G031V01406	Public health microbiology and parasitology	1st	6
V02G031V01407	Integrative cell biology and physiology: Implications for health	1st	6
V02G031V01408	Human genetics and molecular pathology	1st	6
V02G031V01409	Agri-food analysis and diagnostic	1st	6
V02G031V01410	Biotechnology applied to animal production	1st	6
V02G031V01411	Biotechnology applied to plant production	1st	6
V02G031V01412	Biotechnology applied to microbiological production	1st	6

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

IDENTIFYING DATA				
Quality management and control				
Subject	Quality management and control			
Code	V02G031V01401			
Study programme	Grado en Biología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	1st
Teaching language	Spanish			
Department				
Coordinator	Gallardo Medina, Mercedes Cal Arca, Ángela María			
Lecturers	Cal Arca, Ángela María Gallardo Medina, Mercedes			
E-mail	ANGELA.CAL@UVIGO.ES medina@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 aim of this course is for the student to know and understand the principles of quality management and of the environment, as well as the rules of organization and effective management of a laboratory. In this respect, may acquire competence in the application of the ISO 9000 quality management standard, ISO 14000 of environmental management and ISO 17025 for the management and technical competence of testing and calibration laboratories. The schedule of the subject is approved in the Faculty Board and can be consulted in the following link: http://bioloxia.uvigo.es/en/teaching/schedules			

Training and Learning Results				
Code				
A2	Students should know how to apply their knowledge to their work or vocation in a professional way. They also should have the competences that are usually proved through the elaboration and defence of arguments and the resolution of problems within their study field.			
A4	Students should able to communicate information, ideas, issues and solutions to all audiences (specialist and unskilled audience).			
B4	Draft and write reports, documents and projects related to Biology. Proceed to their presentation and debate in the teaching and specialized areas, highlighting the competences of the degree.			
B5	Develop capacities for creativity, innovation and entrepreneurship, in academic and social relevant fields as well as in interaction with the productive sector.			
B7	To aim for quality objectives in the development of the activity done and incorporate ethical principles, which should prevail in the professional practice of Biology.			
C9	Identify resources of biological origin and assess their efficient and sustainable use in order to obtain products of interest. Propose and implement improvements in production systems.			
C12	Writing reports and technical dossiers, as well as directing and executing projects on topics related to biology and its applications.			
C13	Provide training, participate in R+D+i projects, communicate results and disseminate knowledge. Contribute to the social projection of biology and to raising awareness of the environment.			
C14	Advise, assess and supervise scientific-technical, ethical, legal and socio-economic aspects related to biology and its applications.			
D3	Commitment to sustainability and the environment. Equal, sensible and efficient use of resources.			
D4	Collaborate and work in teams or multidisciplinary groups, promote negotiation skills and the ability to reach agreements.			
D5	Communicate effectively and appropriately, including the use of computer tools and English.			

Expected results from this subject				
Expected results from this subject	Training and Learning Results			
To know the standards of management and control of quality systems related to biology.	A2	B7	C9 C13	D3
To understand the concept of quality systems and their application. To manage and apply the most important quality systems.	A4	B4 B5	C9 C12	D3 D5

To know and become familiar with the methods of validation, calibration, uncertainty calculation, verification tests, quality standards and other quality parameters and systems.	A2 A4	B4 B7	C14	D3 D5
To assess, verify and accredit quality.	A2 A4	B4 B5	C12 C13 C14	D4 D5
To be aware of the importance and impact of the implementation of quality systems at professional and societal level.	A2 A4	B5 B7	C9 C13	D3 D4
Apply knowledge of quality management to advise, supervise and assess scientific-technical, ethical, legal and socio-economic aspects related to Biology.	A2 A4	B5 B7	C14	D4 D5

Contents

Topic	
Block 1.- The Quality Management System	Subject 1. The Quality management: concept and historical evolution Subject 2. Design and implementation of a Quality Management System
Block 2.- Models and standards for the Quality management	Subject 3. Quality Management. UNE-EN-ISO 9000 Subject 4. Environmental management: UNE-EN-ISO 14000. EMAS Subject 5. Quality management in the laboratory: standards and techniques. Regulation UNE-EN ISO/IEC 17025
Block 4.- Tools for the Quality management	Subject 6. Tools for the Quality management Subject 7. The continuous improvement and the participatory management of the quality
Seminars and ABPs	Develop in small groups a project for a company, organization or institution on the implementation of an integrated system of Quality & Environment management, applying 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 both in the subject area on the Moovi platform and on the Faculty's website.

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, as well as on the Faculty's website.
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Assessment				
	Description	Qualification	Training and Learning Results	
Lecturing	Class attendance will be randomly checked throughout the course.	5	A2 B7 C9 D3 C14	
Essay	The practical sessions will be complemented with the individual delivery through the Moovi platform of the tasks performed during each practical. These deliverables may be subsequently completed and improved within the deadline established for each delivery. This methodology is part of the continuous evaluation.	30	A2 B4 C12 D3 B7 C14 D4	
Project	The project will be carried out in groups (2 to 3 students). On the established date (usually 10-15 days prior to the date of the final exam), each group of students will submit the written project as a result of the Project Based on Learning, carried out during the practical sessions. This methodology is part of the continuous evaluation.	30	A2 B4 C9 D3 A4 B5 C12 D4 B7 C13 D5 C14	
Objective questions exam	It will be carried out in the final exam. It will allow to evaluate the theoretical knowledge imparted in the teaching sessions, as well as the acquired competences. They may include closed questions with different answer alternatives (true/false, multiple choice, matching of elements, etc.).	25	A2 B7 C9 D3 C14	
Presentation	It will be carried out in the final exam. The group of students will carry out the presentation and defense of their project.	10	A2 B5 C13 D4 A4 D5	

Other comments on the Evaluation

CONTINUOUS EVALUATION

In order to pass the subject, students 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 the practical 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 in account if it includes the key ideas of the project, the student's ability to convey a clear idea of the project to third parties and him/her 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>

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

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

Varios autores, **Herramientas para la Calidad**, 2004

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

Seoánez Calvo Mamp; Angulo Aguado L, **Manual de gestión medioambiental de la empresa: sistemas de gestión medioambiental, auditorías medioambientales, evaluaciones de impacto ambiental y otras estrategias**, 1999

Rubio Romero JC, **Gestión de la prevención de riesgos laborales: OHSAS 18001 - Directrices OIT para su integración con calidad y medioambiente**, 2002

Recommendations

Subjects that continue the syllabus

Bioinformatics/V02G031V01403

Pollution/V02G031V01402

Internships/V02G031V01981

Drafting and execution of projects/V02G031V01404

Final Year Dissertation/V02G031V01991

Subjects that are recommended to be taken simultaneously

Agri-food analysis and diagnostic/V02G031V01409

Environmental analysis and diagnosis/V02G031V01413

Biodiversity: management and conservation/V02G031V01415

Integrative cell biology and physiology: Implications for health/V02G031V01407

Clinical biochemistry and immunology/V02G031V01405
Biotechnology applied to animal production/V02G031V01410
Biotechnology applied to microbiological production/V02G031V01412
Biotechnology applied to plant production/V02G031V01411
Environmental impact evaluation/V02G031V01414
Human genetics and molecular pathology/V02G031V01408
Management and Conservation of spaces/V02G031V01416
Public health microbiology and parasitology/V02G031V01406

IDENTIFYING DATA				
Pollution				
Subject	Pollution			
Code	V02G031V01402			
Study programme	Grado en Biología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	Spanish Galician			
Department				
Coordinator	Fernández Covelo, Emma			
Lecturers	Fernández Covelo, Emma Gomez Brandon, María González Rodríguez, Luis Mariño Callejo, María Fuencisla			
E-mail	emmaf@uvigo.es			
Web				
General description	Know of form updated the distinct sources and types of contaminants that affect to the half and to the biota Know the dynamics of the *contaminantes in the compartments of the ecosystem Know the processes of reuse of waste and biorremediación for recovery of environments contaminated http://bioloxia.uvigo.es/docs/docencia/horarios/hor_4grado_1sem1718.pdf			

Training and Learning Results				
Code				
A3	Students should prove ability for information-gathering and interpret important data (usually within their study field) to judge relevant social, scientific or ethical topics.			
B2	Manage scientific-technical information using diverse and reliable sources. Analyze data and documents and interpret them critically and rigorously, including considerations on their social relevance and in the professional field of Biology.			
B4	Draft and write reports, documents and projects related to Biology. Proceed to their presentation and debate in the teaching and specialized areas, highlighting the competences of the degree.			
B5	Develop capacities for creativity, innovation and entrepreneurship, in academic and social relevant fields as well as in interaction with the productive sector.			
C1	Solve problems by applying the scientific method, the concepts and terminology specific to biology, mathematical models and statistical and computer tools.			
C7	Sampling, characterising, cataloguing and managing natural and biological resources (populations, communities and ecosystems).			
C8	Describe, assess and plan the physical environment, use bio-indicators and identify environmental problems. Provide solutions for the control, monitoring and restoration of ecosystems.			
C10	Identify biological and biotechnological processes and their potential applications, in particular in health, agri-food and environmental fields.			
C12	Writing reports and technical dossiers, as well as directing and executing projects on topics related to biology and its applications.			
D3	Commitment to sustainability and the environment. Equal, sensible and efficient use of resources.			
D4	Collaborate and work in teams or multidisciplinary groups, promote negotiation skills and the ability to reach agreements.			
D5	Communicate effectively and appropriately, including the use of computer tools and English.			

Expected results from this subject				
Expected results from this subject		Training and Learning Results		
To know the main sources, the different types and, above all, the dynamics of the most important pollutants and their relationship with biology.	A3	C1 C10	D3	
To understand the concept of environmental pollution and its effects on organisms. To understand the processes of treatment and bioremediation of pollution.	A3	B2 C1 C8 C10	D3	
To be aware of the different types of waste, their treatment and their use in recovery processes in degraded environments.	A3	B2 B5 C1 C8 C10	D3	
To get an introductory overview of environmental toxicology, agro-food and toxicology in living beings.	A3	B2 C1 C8	D3	
To know and understand the situations in which the legislation and the regulations must be applied.	A3	B2 B4 B5 C12	D3	
Applying knowledge and techniques related to contamination in different processes related to environmental management.	A3	B2 B5 C1 C7	D3	

Applying knowledge and technology related to Contamination in aspects related to the production, exploitation, analysis and diagnosis of biological processes and resources.	A3	B2	C1 C8 C10	D3
To obtain information, develop experiments and interpret results.	A3	B4 B5	C7 C12	D4 D5
To understand the social projection of pollution and its repercussions on professional practice.	A3	B5	C1 C8	D3
To know and use the concepts, terminology and scientific-technical instrumentation related to Contamination.	A3	B2 B5	C8	D3

Contents

Topic

1. INTRODUCCION To THE CONTAMINATION	- Definition. Basic concepts. Types and categories of contaminants. - Sources and roads of entrance to the environment and biota. - Dynamic of contaminants: distribution and flow. - Bioindicators, biomonitors. - Legislation and normative
2. BIODEGRADABLE WASTE	-Organic matter -Oil and derivative
3. ORGANIC POLLUTANTS	-PAHs, Hydrocarbons halogenados, PCBs
4. SOLID WASTE AND DISSIPATE	- Plastic and other solid waste - heat
4. INORGANIC POLLUTANTS	-Acidity -Elements potentially toxic
5. MICROBIAL POLLUTION	-Concept and sources of pollution of microbial origin -Microorganisms indicators of pollution -Dynamic of microbial pollution in atmosphere, floor and water -residual Waters and treatment. Treatment anoxic of lick. -Impact of the pollution in environment. -Legislation and normative on microbiological pollution
6. TREATMENT OF WASTE And PROCESSES OF RECOVERY	- Biorremediation. - Composting. - Reuse of waste through the system am used to-plant - Recovery of floors contaminated
7. BIOLOGICAL EFFECTS OF The CONTAMINANTS	-Exhibition of alive organisms the contaminants. Routes of entrance. Toxicocinética. Bioaccumulation, Biotransformation. -Effects of the contaminants to physiological level. -Molecular and cellular mechanisms of action of the contaminants. -Essays of toxicity. -Effects of the contaminants to populational level and of communities of organisms. -Evolution of resistance.

Planning

	Class hours	Hours outside the classroom	Total hours
Laboratory practical	20	10	30
Seminars	8	8	16
Mentored work	1	63	64
Lecturing	20	10	30
Objective questions exam	2	2	4
Report of practices, practicum and external practices 1		2	3
Problem and/or exercise solving	1	2	3

*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	Effect of a contaminant in the soil: it will study the total content and the availability. Effects on germination, growth and other physiological parameters of plants. Effect in the reproduction of oligoquetos and integrity of the lysosomal membrane and microbiological analysis of the solution of the floor. Detection of microbiological indicators of pollution. The assistance to practices will be compulsory to be able to surpass the matter

Seminars	It will complement the theoretical part tackling appearances that in the remained clear what was necessary to complement. Resolution of doubts, etc. At the end of the explanation of each subject, will deliver to the students a questionnaire of questions referred to the same and that they will have to deliver in the term that was fixed conveniently. In the part of Microbiology, the students will cover a test in the classroom when finishing the explanation of each one of the ones of the subjects.
Mentored work	The students will have the help of the professors of the matter for the preparation of the work of practices
Lecturing	Theoretical development-practical, presentation of objectives and conceptual frame of each subject, presenting specific bibliography and examples related

Personalized assistance

Methodologies	Description
Lecturing	
Laboratory practical	
Seminars	

Assessment

	Description	Qualification	Training and Learning Results
Objective questions exam	Final control of the matter by means of a questionnaire of short answers and/or test. The evaluation of this control will suppose 30% of the total qualification of the matter. It is precise to reach a 5 to do average with the practical note.	30	A3 B2 C10 D3 B5
Report of practices, practicum and external practices	The integrated report of the practices of edaphology, zoology, vegetal physiology and microbiology will be realised in the format of scientific article according to the norms of the Environmental Pollution. At the beginning of course and in each one of the practices of the matter will realise indications of the requirements of them. It will be necessary to approve this part to surpass the matter	40	A3 B2 C1 D4 B4 C7 D5 C12
Problem and/or exercise solving	Evaluation of the participation of the student in the seminars, assistance to theoretical classes, etc. The professors will be able to request the delivery of questionnaires or test of each subject (a questionnaire, or test, of each one of the subjects that appear in the apartade of contents.).	30	A3 B2 C8 D3 B5 C10 D4

Other comments on the Evaluation

For the announcement of July, will conserve the parts approved, since it presupposes that the competitions, aptitudes and knowledges purchased do not lose .

http://bioloxia.uvigo.es/docs/docencia/examenes/exames_grado_2017-18.pdf

Sources of information

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.,

Seoáñez Calvo, M., **Tratado de la Contaminación atmosférica**, Mundi Prensa,

Hurst, C.J., Knudsen, G.R., McInern, M.J.ey, L.D. Stetzenbach, M.V. Walter (eds.), **Manual of Environmental Microbiology**, 3ª ed., American Society for Microbiology,

Rice, E.W., Baird, R.B., Eaton, A.D., Clesceri L.S. (eds), **Standard Methods for the Examination of Water and Wastewater. 23 th.**, A.P.H.A., A.W.W.A. and W.E.F. Washington.,

Lagadic, L., Caquet, T., Amiard, J-C, Ramade, F., **Use of biomarkers for Environmental Quality Assessment**, Balkema,

DeCaprio, A.P. (ed.), **Toxicologic Biomarkers**, Ed. Taylor & Francis,

Mirshal, I., **Soil Pollution: Origin, Monitoring & Remediation.**, Springer Verlag,

Sparks, D.L., **Environmental Soil Chemistry**, Academic Press,

Tan, K., **Environmental Soil Science**, Marcel Dekker. New York,

McCutcheon S.C. , Schnoor J.L., **Phytoremediation: Transformation and Control of Contaminants.**, Wiley and Sons, Inc.,

Singh, A., Ward, O.P., **Applied Bioremediation and Phytoremediation.**, Springer-Verlag,

Benlloch, M., Sancho, E., Tena, M. (eds.), **Fitorremediación de suelos contaminados del área de Aznalcóllar**, Universidad de Córdoba,

Schmidt, T.M., Schaechter, M., **Topics in Ecological and Environmental Microbiology**, Academic Press,

Bertrand, J.C., P. Caumette, P. Lebaron, R. Matheron, P. Normand, T. Sime-Ngando, **Environmental Microbiology: Fundamentals and Applications: Microbial Ecology**, Springer.,

Pepper, I.L., C.P. Gerba, T.J. Gentry., **Environmental Microbiology. 3ª ed.**, Academic Press,

H.B. Bradl, **Heavy Metals in the Environment: Origin, Interaction and Remediation**, Elsevier,

Alina Kabata Pendias, **Trace Elements in Soils and Plants**, CRC Press,

Yates, M.V., J.M., C.H. Nakatu, R.V. Miller., **Manual of Environmental Microbiology. 4ª ed.**, ASM Press.,

Barton, L.L., McLean, R.JC., **Environmental Microbiology and Microbial Ecology**, Wiley-Blackwel,

Beiras, R., **Marine Pollution: sources, fate and effects of 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

Recommendations

Subjects that continue the syllabus

Environmental analysis and diagnosis/V02G031V01413

Subjects that it is recommended to have taken before

Biology: Soil, aquatic environment and climate/V02G031V01106

IDENTIFYING DATA				
Bioinformatics				
Subject	Bioinformatics			
Code	V02G031V01403			
Study programme	Grado en Biología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	Posada González, David			
Lecturers	Arenas Busto, Miguel Galindo Dasilva, Juan Posada González, David			
E-mail	dposada@uvigo.es			
Web	http://www.uvigo.gal/es/universidad/administracion-personal/pdi/david-posada-gonzalez			
General description	This subject is intended to provide students with a first outlook into current bioinformatics. The approach will not consist of offering an overview of the various topics that bioinformatics contemplates today, which, by necessity, would imply an superficial perspective. On the contrary, after a brief overview of bioinformatics, we will focus mainly on the identification of genomic variants from massive sequencing data, in addition to the study of gene expression and the microbiome from this same type of data. On the one hand, the analysis of massive sequencing data is currently extremely popular and transversal in multiple areas of biology. On the other hand, in order to perform this type of analysis reliably, the student must first acquire a series of concepts and transversal skills that will greatly facilitate subsequent learning of other aspects of bioinformatics.			
IMPORTANT: The use of a laptop with the ability to connect to the internet via Wi-Fi is essential in all sessions. Those students who have problems meeting this requirement can go to the dean's office to borrow a laptop. The teaching methodologies will consist of an introductory activity, lectures, problem solving in the classroom and outside of it, practices in the computer room, and the use of the forum on the MooVi platform. Apart from asynchronous communication with the teacher through the moovi platform, at any time, students can arrange virtual or face-to-face tutoring with the teacher via email or in person. To be qualified, the student is required to upload a photo to the platform of the subject in moovi. (*) Subject of the English Friendly program. International students may request from the faculty: a) materials and bibliographical references to follow the subject in English, b) attend tutorials in English, c) tests and evaluations in English.				

Training and Learning Results	
Code	
A2	Students should know how to apply their knowledge to their work or vocation in a professional way. They also should have the competences that are usually proved through the elaboration and defence of arguments and the resolution of problems within their study field.
A5	Students should develop the necessary learning skills to undertake further studies with a high degree of autonomy.
B1	Developing autonomous learning by identifying their own training need and organizing and planning tasks and time.
B3	Apply the knowledge acquired in the degree and use the scientific-technical instrumentation and CIT in contexts of Biology and/or related to the professional practice.
B6	Develop analysis and synthesis, critical reasoning and argumentation skills, applying them in Biology and other scientific-technical disciplines.
C1	Solve problems by applying the scientific method, the concepts and terminology specific to biology, mathematical models and statistical and computer tools.
C2	Identify levels of organisation of living beings through the study of current specimens and fossils. Carry out phylogenetic analyses and study the mechanisms of heredity, evolution and biodiversity.
C5	Manipulate and analyse genetic material and determine its alterations and pathological implications. Knowing the applications of genetic engineering.
D4	Collaborate and work in teams or multidisciplinary groups, promote negotiation skills and the ability to reach agreements.
D5	Communicate effectively and appropriately, including the use of computer tools and English.

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

To recognize the role of Bioinformatics in the analysis and generation of hypotheses in Biology.	A2	B3 B6	C2	D5
To describe and understand key computational concepts, such as algorithms and relational databases, and their applications in biology.	A2 A5	B1 B3 B6	C1	D5
To understand and apply statistical methods commonly used in bioinformatics.	A5	B1 B3 B6	C1 C5	D4
To find, retrieve and organize different types of biological data.	A2 A5	B1 B3	C1 C2 C5	D4
To design simple bioinformatics applications.	A2 A5	B1 B3 B6	C1 C5	D4 D5
To practice reproducibility in bioinformatics.	A5	B1 B3	C1	D4 D5

Contents

Topic	
Lesson 1. Unix for Bioinformatics	Unix environment and command line. Remote servers. File access and manipulation. Regular expressions. Bash utilities and scripts.
Lesson 2. High-throughput DNA sequencing.	Sequencing platforms. Sequencing libraries. Sequencing coverage. FASTQ format. Read quality control.
Lesson 3. Sequence alignment	Concept of alignment. Scoring matrices. Alignment algorithms. Sequencing read mapping. SAM/BAM formats Post-processing.
Lesson 4. Variant calling	Types of variants. Identification. VCF format. Variant filtering. Annotation. Somatic variants.
Lesson 5. Quantification of gene expression	RNA-seq. Experimental design. RNA-seq alignment. Quantification. Differential expression analysis.
Lesson 6. Metagenomic analysis	Microbiome. Metagenomics. 16S analysis. Shotgun analysis. Alpha and beta diversity. Metagenomic annotation.
Lesson 7. Genome assembly and annotation	Assembly. Contigs and scaffolds. K-mer analysis. Assembly quality control. Genome annotation.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	14	14	28
Problem solving	30	82	112
Discussion Forum	0	4	4
Objective questions exam	0.5	0	0.5
Objective questions exam	0.5	0	0.5
Objective questions exam	0.5	0	0.5
Objective questions exam	0.5	0	0.5
Problem and/or exercise solving	1	0	1
Problem and/or exercise solving	1	0	1
Problem and/or exercise solving	1	0	1
Problem and/or exercise solving	1	0	1

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

Methodologies

	Description
Lecturing	Basic concepts and methodologies of the subject will be explained and developed.
Problem solving	Practical sessions of a computational nature will be carried out in which the student will put into use the concepts and methodologies developed theoretically. The student is required to use their own laptop. These practical sessions will include the manipulation and transfer of files in Unix, use of remote servers, bioinformatics programming, data quality control, read mapping, identification and annotation of genomic variants, quantification of gene expression, representation of data in R, genomic and metagenomic analysis. Furthermore, students will solve problems outside the classroom on the Moovi platform to strengthen the concepts and methodologies of the subject.
Discussion Forum	All students are expected to actively participate in the subject's discussion forum on the moovi platform, raising their doubts and responding to questions and comments from the teacher and other students.

Personalized assistance	
Methodologies	Description
Lecturing	Students will be able to interact directly with the teacher in relation to the lectures through individualized tutorials to resolve doubts. This personalized attention can be given in the classroom, agreeing on the date and time for a face-to-face or virtual meeting, via email, or using the Moovi platform messaging.
Problem solving	Students will be able to interact directly with the teacher in relation to problem solving through individualized tutorials to clarify doubts. This personalized attention can be given in the classroom, agreeing on the date and time for a face-to-face or virtual meeting, via email, or using the Moovi platform messaging.

Assessment						
	Description	Qualification	Training and Learning Results			
Objective questions exam	Partial 1: Lesson 1	5	A2	B1	C1	D4
			A5	B3	C2	D5
				B6	C5	
Objective questions exam	Partial 2: Lessons 2-3	5	A2	B1	C1	D4
			A5	B3	C2	D5
				B6	C5	
Objective questions exam	Partial 3: Lesson 4	5	A2	B1	C1	D4
			A5	B3	C2	D5
				B6	C5	
Objective questions exam	Partial 4: Lessons 5-7	5	A2	B1	C1	D4
			A5	B3	C2	D5
				B6	C5	
Problem and/or exercise solving	Partial 1: Problem-solving sessions 1-3	20	A2	B1	C1	D4
			A5	B3	C2	D5
				B6	C5	
Problem and/or exercise solving	Partial 2: Problem-solving sessions 4-5	20	A2	B1	C1	D4
			A5	B3	C2	D5
				B6	C5	
Problem and/or exercise solving	Partial 3: Problem-solving sessions 6-7	20	A2	B1	C1	D4
			A5	B3	C2	D5
				B6	C5	
Problem and/or exercise solving	Partial 4: Problem-solving sessions 8-10	20	A2	B1	C1	D4
			A5	B3	C2	D5
				B6	C5	

Other comments on the Evaluation

Throughout the course there will be four eliminatory partial tests, each one with a weight of 25% of the final grade. Each midterm will contain objective questions (20% of the grade) and problems (80% of the grade).

In June and July, students may retake any of these midterm exams.

Students who choose the global evaluation modality within the deadline established by the center may opt in June and/or July for 100% of the grade by taking the four midterm exams.

In all cases, in order 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

Recommendations

Subjects that it is recommended to have taken before

Biology: Informatic tools in biology/V02G031V01110

Statistics: Biostatistics/V02G031V01107

Mathematics: Mathematics applied to Biology/V02G031V01104

Genetics I/V02G031V01209

Genetics II/V02G031V01304

Other comments

Considerations before enrolling in Bioinformatics: <https://darwin.uvigo.es/docencia/binf2223/matricula.html>

This subject is almost entirely problem-solving based. That is, you will have to rack your brain. Be prepared to solve a Sudoku every day. It takes a continuous effort of several hours throughout the weeks of the course. Learning is sequential and each new step depends on the previous ones, much like mathematics in that sense. You will have to work a lot on your own, repeating tasks and checking solutions. We have 100 non face-to-face hours available, and you will have to use them. It is an intense subject, so be warned.

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

IDENTIFYING DATA				
Drafting and execution of projects				
Subject	Drafting and execution of projects			
Code	V02G031V01404			
Study programme	Grado en Biología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	4th	2nd
Teaching language	Spanish			
Department				
Coordinator	Gallego Veigas, Pedro Pablo Alonso Rodríguez, José Antonio			
Lecturers	Alonso Rodríguez, José Antonio Barreal Modroño, M. Esther Díaz Vilariño, Lucía Gallego Veigas, Pedro Pablo González Cespón, José Luis Pedrol Bonjoch, María Nuria			
E-mail	jaalonso@uvigo.es pgallego@uvigo.es			
Web				
General description	This subject will enter to the student in the methodology, direction, management and organisation of projects of investigation/company within the scope of the Biology. After studying the subject, the student owes to be able to draft, and schedule projects of investigation/company related with the Biology. Schedule of kinds: Available in http://bioloxia.uvigo.es/*ge/*docencia/schedules			

Training and Learning Results				
Code				
A2	Students should know how to apply their knowledge to their work or vocation in a professional way. They also should have the competences that are usually proved through the elaboration and defence of arguments and the resolution of problems within their study field.			
A3	Students should prove ability for information-gathering and interpret important data (usually within their study field) to judge relevant social, scientific or ethical topics.			
A4	Students should be able to communicate information, ideas, issues and solutions to all audiences (specialist and unskilled audience).			
B2	Manage scientific-technical information using diverse and reliable sources. Analyze data and documents and interpret them critically and rigorously, including considerations on their social relevance and in the professional field of Biology.			
B4	Draft and write reports, documents and projects related to Biology. Proceed to their presentation and debate in the teaching and specialized areas, highlighting the competences of the degree.			
B5	Develop capacities for creativity, innovation and entrepreneurship, in academic and social relevant fields as well as in interaction with the productive sector.			
B7	To aim for quality objectives in the development of the activity done and incorporate ethical principles, which should prevail in the professional practice of Biology.			
C10	Identify biological and biotechnological processes and their potential applications, in particular in health, agri-food and environmental fields.			
C12	Writing reports and technical dossiers, as well as directing and executing projects on topics related to biology and its applications.			
C13	Provide training, participate in R+D+i projects, communicate results and disseminate knowledge. Contribute to the social projection of biology and to raising awareness of the environment.			
C14	Advise, assess and supervise scientific-technical, ethical, legal and socio-economic aspects related to biology and its applications.			
D3	Commitment to sustainability and the environment. Equal, sensible and efficient use of resources.			
D4	Collaborate and work in teams or multidisciplinary groups, promote negotiation skills and the ability to reach agreements.			

Expected results from this subject				
Expected results from this subject	Training and Learning Results			
Know the professional competitions that the title and the legislation award to the Graduated in Biology.	A2	B7	C14	
Know the typology of projects and own studies of the professional fields of the biologist.		B4		
		B5		

Know and handle the concepts and the relative terminology to the Editorial and Execution of Projects.		B2	C10 C13
Obtain information and interpret results of projects.	A3	B2	C13
Know the methods of management and evaluation of projects.		B2 B4	
Know, understand and apply the relative valid legislation to the management, evaluation and execution of projects.	A2	B2 B7	
Know use the general methodology stop the editorial and manufacture of projects and studies.	A4	B4	C12 C13
Know the basic concepts of economy stop the realization of projects and studies.	A2		
Comprise the developmental phases of one project elaborating *cronogramas, studies of feasibility and of *rendibilidade.	A2		C10 C14
Apply knowledges and relative technology to the Editorial and Execution of Projects in aspects related with the development and implantation of the systems of management.	A2		C14
Take part in the direction, editorial and execution of projects.	A2 A3 A4	B4	C12 C13
Comprise the social projection of the Editorial and Execution of Projects and his repercussion in the professional exercise.	A2 A4	B2	C10 C14
Apply knowledges of Editorial and Execution of Projects for *asesorar, supervise and *peritar on scientific aspects-technical, ethical, legal and partner-economic related with the Biology.			C14 D3 D4

Contents

Topic	
Block 0	Presentation of the subject
Block 1.	Competitions *profesionales of the biologist. Projects of study in biology: - professional Competitions of the biologist. - Documents *y Studios: *valoracions, and *licitacions public in biology. - *Propiedad Industrial and intellectual: companies of technological base. *Emprendimiento, innovation *y *autoempleo.
Block 2.	Practical methodology stop the manufacture of projects and studies. - Projects. Definition and structure. - The memory. Structure and index by heart. Activity and *diagrama of the process. Purpose and range. Data of identification. Description of functional blocks. Application of the legislation. Conclusions. - Principles of representation in projects. Typology of the representation: dimension and relation. Sizes of blocks of title and scales. *Plegado Of formats the The4. - Criteria stop the manufacture of the representation of biological activities. Diagrams of principle. - Budget, assessment of the project. - Planning of projects. *Diagrama Of *Gantt - oral Presentation of the project.

Planning

	Class hours	Hours outside the classroom	Total hours
Introductory activities	2	0	2
Lecturing	11	11	22
Practices through ICT	8	8	16
Collaborative Learning	8	16	24
Seminars	9	9	18
Report of practices, practicum and external practices	0	20	20
Project	0	20	20
Objective questions exam	2	6	8
Presentation	6	14	20

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

Methodologies

Description

Introductory activities	Presentation *amena of the teaching guide, detailing the specialization of the teaching staff and his relation with the thematic blocks. *Expoñense The thematic of work and *establecense the groups. Also it explains the system of evaluation.
Lecturing	Sessions of *docencia theoretical where it/to professor/offers it a general vision of the subject to treat, indicating the concepts pin stop his understanding.
Practices through ICT	Activity of acquisition of knowledges, basic skills and handle of specific programs of the different *apartados of the project.
Collaborative Learning	(*)Descrición e *desarollo dun proxecto multidisciplinar (con alumnos doutras titulacións). Empregaranse metodoloxías como *Design *Thinking, Aprendizaxe en Servizo e Aprendizaxe Baseada en Problemas para deseñar o proxecto.
Seminars	Sessions of handle of real documents so that they know the typology of the main projects within the scope of the biology.

Personalized assistance

Methodologies	Description
Seminars	There will be different seminars that will include a part of theory and another of group practices.
Practices through ICT	Different practices will be carried out in the classroom in individual format and in small groups, supervised by the teachers of the subject.

Assessment

	Description	Qualification	Training and Learning Results			
Report of practices, practicum and external practices	The matter students in small groups they will present to memory project of biology. Solution problem. 35% Design Thinking Methodology 10% Learning service Methodology 15% Also carried out small works oriented teachers seminars. 10%	35	A2 A3 A4	B2 B4 B5 B7	C10 C12 C13 C14	D3 D4
Project	(*)Os alumnos da materia, en grupos pequenos, realizan un proxecto de actividade para deseñar a actividade produtiva relacionada co ámbito biolóxico	35				
Objective questions exam	Proofs for evaluation skills acquired including questions de resposta curta on works made.	10		B5 B7	C10 C14	
Presentation	The students, in multidisciplinary groups (engineers, humanities and/or economists) will present the complete project in a professional day.	20	A2 A3 A4	B2 B4 B5 B7	C10 C12 C13 C14	D3 D4

Other comments on the Evaluation

To pass the course the student need to obtain in each one of the 4 proofs, at least a 40 % of the total of the grade global of that evaluation item.

In case to get more than 5 poing in all the global grade will be the sum prorrataada, depending on the percentages described for each of the 4 evaluation items.

The course will be considered as SUSPENSO (no pass) when it do not reach said limit in all or some of the evaluation items, or in case the global grade do not reach the 5. In this case:

- 1.- In the record appear SUSPENSO with the grade drop that obtained in the proofs that did pass the limit or with the corresponding global note.
- 2.- The student get less than five (up to ten) the parts that did not reach the minimum in the second announcement. The rest of the parts save until the following announcement, as long as they get at least the 5 points (up to ten).

Each individual examination will have a factor of ponderation on the project.

The dates of *presentation of the memory and of project can be consulted in the platform MooVi.

The dates of the exams can consult in the following link: <http://bioloxia.uvigo.es/es/docencia/examenes>

Sources of information

Basic Bibliography

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,
Camprubí i García, Pere, **La profesión de Biólogo**, 1997,
PmBok Guide, **A guide to the Project Management Body of Knowledge**, 2014,
Antinio Colmenar, **Gestión de proyectos con microsoft project 2010**, 2011,
Harold Kerzner, **Project management. A systems approach to planning, scheduling and controlling**, 2011,
González Cespón, José Luis, **Apuntes de la materia**,

Recommendations

Subjects that continue the syllabus

Final Year Dissertation/V02G030V01991

Subjects that are recommended to be taken simultaneously

Final Year Dissertation/V02G030V01991

Subjects that it is recommended to have taken before

Quality management and control/V02G030V01911

IDENTIFYING DATA				
Bioquímica e inmunoloxía clínicas				
Subject	Bioquímica e inmunoloxía clínicas			
Code	V02G031V01405			
Study programme	Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4	1c
Teaching language	Castelán Galego			
Department	Bioquímica, xenética e inmunoloxía			
Coordinator	Magadán Momo, Susana			
Lecturers	González Fernández, María África Magadán Momo, Susana Valverde Pérez, Diana			
E-mail	smaga@uvigo.es			
Web				
General description	Materia de carácter teórico-práctico deseñada para desenvolver competencias e habilidades que permitan ao estudiantado 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			

Resultados de Formación e Aprendizaxe	
Code	
A2	Que os estudantes saiban aplicar os seus coñecementos ao seu traballo ou vocación dunha forma profesional e posúan as competencias que adoitan demostrarse por medio da elaboración e defensa de argumentos e a resolución de problemas dentro da súa área de estudo.
A3	Que os estudantes teñan a capacidade de reunir e interpretar datos relevantes (normalmente dentro da súa área de estudo) para emitir xuízos que inclúan unha reflexión sobre temas relevantes de índole social, científica ou ética.
B2	Xestionar información científico-técnica de calidade utilizando fontes diversas. Analizar datos e documentos e interpretalos de forma crítica e rigorosa, incluíndo reflexións sobre a súa relevancia social e no ámbito profesional da Bioloxía.
B3	Aplicar o coñecemento adquirido na titulación e empregar a instrumentación científico-técnica e as TIC en contextos propios da Bioloxía e/ou no exercicio da profesión.
B4	Elaborar e redactar informes, documentos e proxectos relacionados coa Bioloxía. Proceder á súa presentación e debate no ámbito docente e especializado, poñendo de manifesto as competencias da titulación
C3	Realizar e interpretar análises moleculares, físico-químicos e biolóxicos, incluíndo mostras de orixe humana. Realizar ensaios e probas funcionais en condicións normais e anómalas.
C4	Illar, identificar e cultivar microorganismos, células, tecidos e órganos, facilitando o seu estudo e a valoración da súa actividade metabólica.
C6	Comprender e integrar o funcionamento dos seres vivos (nivel celular, tisular, orgánico e individuo), interpretando as súas respostas homeostáticas e adaptativas.
C10	Identificar procesos biolóxicos e biotecnolóxicos e a súa posible aplicabilidade, en particular nos ámbitos sanitario, agroalimentario e ambiental.
C15	Realizar e interpretar estudos e análises clínicos e sanitarios orientados ao diagnóstico e desenvolvemento de terapias fronte a patoloxías humanas, así como ao seu control desde a perspectiva epidemiolóxica e de saúde pública
C17	Comprender a proxección social da bioloxía aplicada á saúde nos seus diferentes niveis (analítico, patolóxico e de saúde pública) e a súa repercusión no exercicio profesional
D3	Comprometerse coa sustentabilidade e medio ambiente. Uso de forma equitativa, responsable e eficiente dos recursos.
D4	Colaborar e traballar en equipo ou en grupos multidisciplinares, fomentar a capacidade de negociación e de alcanzar acordos.

Resultados previstos na materia	
Expected results from this subject	Training and Learning Results
Entender os fundamentos metodolóxicos e interpretación dos resultados das probas analíticas e inmunolóxicas para a emisión dun diagnóstico fiable.	A2 B2 C3 D3
	A3 B3 C4 D4
	B4 C6
	C10
	C15
	C17

Identificar os distintos tipos de mostras clínicas humanas, os métodos de procesado e as probas analíticas que se empregan nos laboratorios de Bioquímica e Inmunoloxía clínica.	A2	B3	C3 C4 C6 C15 C17	D3
Coñecer os fundamentos e as aplicacións da bioquímica clínica para o diagnóstico de enfermidades, analizando os factores que poden afectar o resultado dunha analítica.	A2 A3	B2 B3 B4	C3 C6 C10 C15 C17	D3 D4
Explicar os mecanismos de regulación da resposta inmunitaria humana, as súas alteracións en procesos patolóxicos e estratexias inmunoterapéuticas.	A2 A3	B2 B3 B4	C6 C10 C15 C17	
Comprender a proxección social das probas analíticas e a súa repercusión no exercicio profesional.	A2 A3	B2	C10 C17	D3 D4

Contidos

Topic

Tema 1. Fases do diagnóstico. Fase preanalítica. Obtención de espécimens. POCT.

Tema 2. Control de calidade no laboratorio clínico. Selección e validación de métodos.

Tema 3. Valor diagnóstico das probas clínicas. Valores de referencia e interpretación dos resultados.

Tema 4. Elementos básicos de Bioquímica Clínica. Valor semiolóxico da determinación de magnitudes bioquímicas: analitos e metabolismo.

Tema 5. Diagnóstico clínico de alteracións de órganos e sistemas. Paneis de probas diagnósticas e a súa interpretación.

Tema 6. Metabolismo da glicosa. Metabolismo óseo. Metabolismo dos lípidos.

Tema 7. Función hepática. Función do rin. Enfermidade cardíaca.

Tema 8. Introducción á Inmunoloxía clínica. Técnicas máis empregadas na Inmunoloxía clínica/Anticorpos monoclonais.

Tema 9. Inmunodeficiencias. Técnicas de diagnóstico e estudo da evolución de inmunodeficiencias primarias e secundarias.

Tema 10. Enfermidades autoinflamatorias e autoinmunitarias. Tipos, técnicas de diagnóstico, terapias e estudo da evolución.

Tema 11. Vacinación-resposta á vacina- Diagnóstico de infección. Técnicas para avaliar resposta humoral (Acs) e celular.

Tema 12. Transplantes e rexeitamento inmunitario. Ensaos para avaliar biocompatibilidade e evolución do Transplante.

Tema 13. Cancro. Inmunoensaos para o estudo de tumores do sangue e sólidos. Enfermidade mínima residual. Inmunoterapias fronte ao cancro.

Tema 14. Fertilidade. Aspectos inmunolóxicos que afectan ó embarazo. Ensaos para avaliar problemas de fertilidade de causa inmunolóxica.

Tema 15. Hipersensibilidade. Tipos de hipersensibilidade e pseudoalerxia. Técnicas de diagnóstico e estudo da evolución da enfermidade.

Planificación

	Class hours	Hours outside the classroom	Total hours
Lección maxistral	18	36	54

Prácticas de laboratorio	28	26	54
Seminario	2	8	10
Exame de preguntas obxectivas	1	6	7
Práctica de laboratorio	4	8	12
Estudo de casos	2	4	6
Exame de preguntas obxectivas	1	6	7

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

Metodoloxía docente	
	Description
Lección maxistral	Exposición por parte do docente dos fundamentos e principios básicos da bioquímica e da inmunoloxía clínicas. Preténdese que o alumno adquira coñecementos básicos relacionados co control da calidade, probas diagnósticas, metodoloxías e interpretación de resultados. Como apoio ás explicacións teóricas, proporcionarase aos alumnos o material docente apropiado a través da plataforma Moovi do Campus Virtual.
Prácticas de laboratorio	O traballo no laboratorio está dirixido a conseguir competencias na realización das probas analíticas e interpretación dos resultados, co obxectivo de formar ao alumno nas actividades levadas a cabo nos laboratorios de Bioquímica ou Inmunoloxía clínica. Aos alumnos solicitaráselle a entrega dun informe de prácticas e/ou a solución de cuestións e/ou exercicios. Como apoio ás prácticas de laboratorio, proporcionarase aos alumnos o material docente apropiado a través da plataforma *Moovi do Campus Virtual.
Seminario	Os seminarios realizaranse mediante estudo de casos. Con eles preténdese que o estudantado desenvolva a súa capacidade para integrar e interpretar as análises clínicas no seu conxunto, resolver problemas, contrastar datos, reflexionar, completar coñecementos e realizar diagnóstico en base aos datos dispoñibles, adestrándose así nas bases do diagnóstico clínico. O traballo de estudo de casos realizarase por grupos reducidos de alumnos e será exposto nas datas sinaladas no calendario de actividades. Ao comezo de curso informarase o alumnado do procedemento a seguir.

Atención personalizada	
Methodologies	Description
Lección maxistral	As sesións expositivas serán participativas. A atención personalizada será realizada polos docentes responsables de cada tema nas correspondentes horas semanais de tutoría.
Prácticas de laboratorio	Os/As docentes responsables proporcionarán atención individualizada a cada alumno durante a realización das prácticas de laboratorio e darán o soporte necesario para a comprensión dos obxectivos, metodoloxía, técnicas concretas a utilizar e interpretación de resultados.
Seminario	Os/As estudantes serán distribuídos en pequenos grupos que resolverán estudo de casos relacionados coa análise e diagnóstico clínico. A resolución dos casos, os argumentos e os criterios utilizados deberán ser expostos e defendidos nunha presentación oral na que intervirán todos os membros do grupo. O traballo autónomo do/da alumno/a será supervisado, e resoltas as dúbidas polos profesores responsables. Todas as consultas e orientacións serán nas horas de tutorías de cada docente.

Avaliación		Qualification	Training and Learning Results			
	Description		A2	B2	C3	D3
Exame de preguntas obxectivas	Realizarase unha proba escrita:	25	A3	B3	C4	
	1) Temas 1 ao 7. Suporá o 25% da nota final.				C6	
	Nas probas serán avaliados os contidos fundamentais da materia (clases maxistráis e prácticas) a través de preguntas obxectivas (tipo test e resposta curta).				C10	
	PARA SUPERAR A MATERIA se esixe: a) un mínimo de 4 puntos (sobre 10) nesta proba escrita e b) obter unha nota media mínima de 5, calculada a partir da nota obtida na proba 1 (Temas 1 ao 7) e proba 2 (Temas 8 ao 15).				C15	C17

Práctica de laboratorio	As capacidades e destrezas adquiridas durante as prácticas de laboratorio serán AVALIADAS DE FORMA CONTINUA. A metodoloxía de avaliación e ponderación na nota final inclúe: 1- Implicación do alumno no desenvolvemento das prácticas. Suporá un 10% da cualificación final. 2- Entrega de informes de prácticas de laboratorio: de Bioquímica (BQ) e Inmunoloxía (IN) clínicas. Os informes serán ealizados por cada un dos subgrupos de alumnos organizado en cada grupo de prácticas. A nota media (BQ +IN /2) obtida nos informes suporá o 15% da nota final. 3- Resolución de problemas / exercicios /cuestións nas prácticas de laboratorio, cuxos resultados serán entregados na mesma sesión práctica e/ou xunto co informe de prácticas. A nota media (BQ +IN /2) obtida suporá o 15% da nota final.	40	A2 A3	B2 B3	C3 C4 C6 C10 C15	D3 D4
Estudo de casos	Resolución e presentación de casos clínicos, exposición e discusión do caso asignado. Suporá un 10% da cualificación final.	10	A2 A3	B2 B3	C3 C6 C10 C15 C17	D4
Exame de preguntas obxectivas	Realizarase unha proba escrita: 1) Temas 8 ao 15. Suporá o 25% da nota final. Nas probas serán avaliados os contidos fundamentais da materia (clases maxistráis e prácticas) a través de preguntas obxectivas (tipo test e resposta curta). PARA SUPERAR A MATERIA se esixe: a) un mínimo de 4 puntos (sobre 10) nesta proba escrita e b) obter unha nota media mínima de 5, calculada a partir da nota obtida na proba 1 (Temas 1 ao 7) e proba 2 (Temas 8 ao 15).	25	A2 A3	B2 B3	C3 C4 C6 C10 C15 C17	D3

Other comments on the Evaluation

Importante: Independentemente que o/a alumno/a escolla AVALIACIÓN CONTINUA OU GLOBAL a asistencia a todas as PRÁCTICAS DE LABORATORIO é OBRIGATORIA para APROBAR a materia (salvo as ausencias debidamente xustificadas).

Avaliación continua:

1) Dúas probas parciais: cada unha suporá o 25% da nota. Proba 1 (Temas 1 ao 7) e proba 2 (Temas 8 ao 15). PARA SUPERAR A MATERIA se esixe: a) un mínimo de 4 puntos (sobre 10) en cada proba e b) obter unha nota media mínima de 5, calculada a partir da nota obtida nos dous parciais.

2) Prácticas de laboratorio: Implicación do alumno (10% da nota final) + informes prácticas BQ e IN (15% da nota final) + resolución problemas/cuestións de BQ e IN clínica (15% da nota final).

3) Seminario /estudo de casos: 10% da nota final.

Para superar a materia a suma: nota media dos parciais + nota prácticas + nota seminario ten que ser igual ou superior a 5.

As actividades (proba parcial, prácticas e seminarios) superadas na primeira oportunidade dun curso se conservan para a segunda oportunidade. Na segunda oportunidade dun curso non se poden recuperar prácticas e seminarios, só se poden realizar os exames parciais non superados na primeira oportunidade.

Aos alumnos/as repetidores/as conservaráselles a nota das prácticas e os seminarios. Terán dereito a repetir as devanditas actividades sempre e cando renuncien por escrito á cualificación obtida anteriormente (documento asinado e enviado ao coordinador/a). A renuncia ten que ser feita antes de que comencen as prácticas.

Avaliación global:

O/a alumno/a que escolla avaliación global terá que superar unha proba final integradora na que se avaliará dos contidos das aulas maxistráis, prácticas de laboratorio e seminarios/estudos de caso. A proba consistirá en preguntas tipo test, preguntas curtas e resolución de problemas/caso clínico.

Para superar a materia a nota da proba global terá que ser igual ou superior a 5. De non superarse a proba final, a calificación do/a alumno/a SÓ será a obtida na proba final integradora sobre 10 puntos.

Na segunda oportunidade do curso, o/a alumno/a suspenso/a terá que ser novamente avaliado de todas as actividades mediante unha proba global.

Se non se supera a materia en ningunha das oportunidades do curso. O/a alumno/a non terá que facer as prácticas, pero sí será avaliado/a novamente de todos os contidos (aulas expositivas, prácticas e seminarios), xa sexa mediante avaliación

continua ou global.

Información xeral

O calendario académico pódese consultar no seguinte enlace:

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

O calendario de exames pódese consultar no seguinte enlace:

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

Bibliografía. Fontes de información

Basic Bibliography

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Robert R Rich, **Inmunología clínica. Principios y práctica**, 5ª edición, Elsevier, 2019

Barbara Detrick, **Manual of molecular and clinical laboratory immunology**, 8ª edición, ASM Press, 2016

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Bretscher Peter et al, **The foundations of Immunology and their Pertinence to Medicine**, 1ª edición, Friesen Press, 2016

Africa González Fernández et al, **Inmunogenética**, 1ª edición, Síntesis, 2018

toyos JR,et al, **Inmunotecnología y sus aplicaciones**, 1ª edición, Universidad de Oviedo, 2018

Regueiro, JR, et al., **Inmunología: biología y patología del sistema inmunitario**, 5ª edición, Panamericana, 2021

Male, D; Peebles, RS., et al, **Inmunología**, 9ª edición, Elsevier, 2021

Abbas et al, **Inmunología celular y molecular**, 9ª edición, Elsevier, 2018

Judith A. Owen, et al, **Kubi Immunology**, 7ª edición, McGraw/Hill, 2014

Complementary Bibliography

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

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

Recomendacións

Subjects that are recommended to be taken simultaneously

Biología celular e fisiología integrativas: Implicacións na saúde/V02G031V01407

Xenética humana e patoloxía molecular/V02G031V01408

Microbioloxía e parasitoloxía sanitarias/V02G031V01406

Subjects that it is recommended to have taken before

Bioquímica I/V02G031V01201

Bioquímica II/V02G031V01206

Inmunoloxía e parasitoloxía/V02G031V01305

Técnicas en bioloxía celular e molecular/V02G031V01310

IDENTIFYING DATA				
Microbioloxía e parasitoloxía sanitarias				
Subject	Microbioloxía e parasitoloxía sanitarias			
Code	V02G031V01406			
Study programme	Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4	1c
Teaching language	Castelán Galego			
Department	Bioloxía funcional e ciencias da saúde			
Coordinator	Combarro Combarro, María del Pilar			
Lecturers	Combarro Combarro, María del Pilar Iglesias Blanco, Raúl			
E-mail	pcombarro@uvigo.es			
Web				
General description	Materia deseñada para que o alumnado poida recoñecer a etiología e importancia sanitaria das principais enfermidades infecciosas humanas, abordar o diagnóstico dos seus axentes causales en mostras clínicas, e identificar os factores craves na súa epidemioloxía e control desde unha perspectiva de saúde pública.			

Resultados de Formación e Aprendizaxe

Code				
A4	Que os estudantes poidan transmitir información, ideas, problemas e solucións a un público tanto especializado como non especializado.			
B1	Desenvolver a aprendizaxe autónoma, identificando as súas propias necesidades formativas e organizando e planificando as tarefas e o tempo.			
B2	Xestionar información científico-técnica de calidade utilizando fontes diversas. Analizar datos e documentos e interpretarlos de forma crítica e rigorosa, incluíndo reflexións sobre a súa relevancia social e no ámbito profesional da Bioloxía.			
B6	Desenvolver as capacidades de análises e sínteses, de razoamento crítico e argumentación, aplicándoas en contextos propios da Bioloxía e outras disciplinas científico-técnicas.			
C3	Realizar e interpretar análises moleculares, físico-químicos e biolóxicos, incluíndo mostras de orixe humana. Realizar ensaios e probas funcionais en condicións normais e anómalas.			
C11	Realizar e interpretar bioensaios, identificar axentes químicos e biolóxicos, incluíndo os patógenos, así como os seus produtos tóxicos. Desenvolver e aplicar técnicas de control biolóxico			
C15	Realizar e interpretar estudos e análises clínicos e sanitarios orientados ao diagnóstico e desenvolvemento de terapias fronte a patoloxías humanas, así como ao seu control desde a perspectiva epidemiolóxica e de saúde pública			
C17	Comprender a proxección social da bioloxía aplicada á saúde nos seus diferentes niveis (analítico, patolóxico e de saúde pública) e a súa repercusión no exercicio profesional			
D3	Comprometerse coa sustentabilidade e medio ambiente. Uso de forma equitativa, responsable e eficiente dos recursos.			
D4	Colaborar e traballar en equipo ou en grupos multidisciplinares, fomentar a capacidade de negociación e de alcanzar acordos.			

Resultados previstos na materia

Expected results from this subject	Training and Learning Results			
Recoñecer o alcance da Microbioloxía e Parasitoloxía sanitarias, a súa relación con outras disciplinas e a súa importancia no ámbito da saúde e o desenvolvemento económico e social dos países.	A4	C17		
Recoñecer a etioloxía e transcendencia sanitaria das principais enfermidades infecciosas humanas.	A4	B1 B2 B6	C17	D3 D4
Analizar e diagnosticar patóxenos en mostras clínicas de orixe humana e ambientais.	A4	B1 B2 B6	C3 C11 C15	D3 D4
Identificar os factores craves implicados na epidemioloxía e control das principais enfermidades infecciosas humanas desde a perspectiva da saúde pública.	A4	B1 B2 B6	C17	D4
Aplicar de forma integrada os coñecementos adquiridos para acometer a resolución de casos teórico-prácticos relacionados coas enfermidades infecciosas humanas.	A4	B1 B2 B6		D4

Contidos

Topic

Tema 1. Epidemioloxía	Terminoloxía e conceptos fundamentais. Natureza das epidemias. Factores que influen nas epidemias. Mecanismos de transmisión. Tipos de epidemias. Mecanismos de saúde pública para controlar epidemias. Enfermidades emerxentes.
Tema 2. Interaccións patóxeno- hospedador	Desenvolvemento dun proceso infeccioso. Mecanismos de patoxenicidad
Tema 3. Características dos axentes etiolóxicos, epidemioloxía, patogenia, cadro clínico, diagnóstico, tratamento e prevención das principais enfermidades de etiología bacteriana e vírica.	Enfermidades transmitidas por consumo de auga e alimentos. Enfermidades transmitidas polo aire. Enfermidades de transmisión sexual. Enfermidades transmitidas por contacto. Enfermidades transmitidas por animais.
Tema 4. Introducción ás parasitosis humanas	Impacto global das parasitosis humanas e conceptos clave en Parasitología 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

Planificación

	Class hours	Hours outside the classroom	Total hours
Lección maxistral	25	25	50
Estudo de casos	3	15	18
Prácticas de laboratorio	20	20	40
Exame de preguntas obxectivas	1	25	26
Resolución de problemas e/ou exercicios	1	15	16

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

Metodoloxía docente

	Description
Lección maxistral	Sesións de 50 minutos nas que se expoñerán os fundamentos teóricos da materia
Estudo de casos	Os estudantes recibirán as instrucións para a resolución mediante traballo en grupo dunha serie de casos prácticos relacionados co diagnóstico e control de diferentes enfermidades infecciosas, que deberán expoñerse con posterioridade.
Prácticas de laboratorio	As prácticas realizaranse nos laboratorios de Microbioloxía e Parasitología e permitirán aplicar e desenvolver os coñecementos adquiridos nos ensinos teóricos. O alumno realizará as prácticas seguindo os protocolos e usando o material fornecido polo profesor, que explicará e supervisará o seu traballo. Os alumnos deberán presentar un informe dos resultados obtidos

Atención personalizada

Methodologies	Description
Lección maxistral	Durante todo o proceso de aprendizaxe e especialmente en horas de tutoría, atenderanse todas as dúbidas expostas en relación cos contidos teóricos da materia.
Estudo de casos	O profesorado orientará ao alumnado sobre as principais tarefas a realizar nesta actividade, e comprobará que o traballo en grupo vai na dirección adecuada e estase realizando sen problemas. Cando estes non sexa así, procederase a reconducir a situación.
Prácticas de laboratorio	Durante todo o proceso de aprendizaxe e tamén en horario de tutorías, atenderanse todas as dúbidas expostas en relación cos contidos prácticos da materia. O profesorado supervisará o traballo de laboratorio dos alumnos de cada grupo, corrixiendo os erros detectados no desempeño das técnicas e atendendo todas as cuestións que poidan xurdir ao longo das sesións prácticas e da elaboración dos correspondentes informes.

Avaliación

	Description	Qualification	Training and Learning Results
Estudo de casos	Avaliaranse a redacción, presentación e defensa final dos casos resoltos.	20	A4 B1 C3 D4 B2 C11 B6 C15 C17
Prácticas de laboratorio	Avaliaranse a actitude e as capacidades e destrezas adquiridas polos alumnos durante as prácticas, así como a capacidade para redactar informes e/o dar respostas adecuadas e ben argumentadas a cuestionarios expostos en relación coas actividades realizadas durante estas sesións	30	A4 B1 C3 D3 B2 C11 D4 B6 C15

Exame de preguntas obxectivas	Mediante esta proba avaliaranse coñecementos e habilidades adquiridos polos alumnos ao longo das sesións teóricas e prácticas da materia.	30	A4 B6 C3 C11 C15
Resolución de problemas e/ou exercicios	Nesta proba avaliarase a capacidade do alumnado para resolver, de forma argumentada, unha serie de casos/situacións de tipo práctico relacionadas co diagnóstico e control de certas enfermidades infecciosas.	20	A4 B6 C3 C11 C15 C17

Other comments on the Evaluation

1. A asistencia e participación en todas as actividades programadas dentro das Sesións Prácticas e do Estudo de casos prácticos é obrigatoria, de tal maneira que a ausencia ou non realización inxustificada destas actividades impedirá superar a materia. Polo tanto, o alumnado que desee acollerse a modalidade de avaliación global, deberá realizar tamén obrigatoriamente estas dúas actividades.

2. Para aprobar a materia será necesario alcanzar unha cualificación global final de 5,0 (sobre 10), unha vez sumadas as cualificacións ponderadas obtidas nas de Prácticas (30%), Estudo de casos (20%), Exame de preguntas obxectivas (30%) e Resolución de problemas e/ou exercicios (20%). Con todo, para poder superar a materia, e poder sumar as cualificacións obtidas nas actividades de Prácticas e Estudo de casos, deberá alcanzarse unha nota mínima de 4,0 (sobre 10) tanto no exame de preguntas obxectivas como na resolución de problemas e/ou exercicios. Os alumnos que non cumpran este requisito na primeira oportunidade serán cualificados en actas con 4,9 (Suspenso), e deberán repetir na segunda oportunidade (xullo) a proba relativa á parte ou partes nas que non alcanzasen o 4,0. Os alumnos que se atopen nesta situación conservarán a nota da/s parte/s superada/s ($\geq 4,0$) en primeira oportunidade e das Prácticas e Estudo de casos, para telas en conta na nota final. Na segunda oportunidade, será tamén imprescindible alcanzar o 4,0 en todas as partes obxecto de recuperación. As datas da proba final escrita pódense consultar na seguinte ligazón:
<http://bioloxia.uvigo.es/es/docencia/examenes>.

Bibliografía. Fontes de información

Basic Bibliography

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

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P.R. Murray, K. S. Rosenthal, M.A. Pfaller, **Medical Microbiology**, 9ª edición, Elsevier, 2020

K.J. Ryan, N. Ahmad, J.A. Alspa, W. L. Drewugh, M.Lagunoff, P. Pottinger, L.B. Reller, M.E. Reller,, **Medical Microbiology**, 8ª edición, McGraw Hill, 2022

Complementary Bibliography

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R. Goering, H. Dockrell, M. Zuckerman, P. L. Chiodini, **Mims' Medical Microbiology and Immunology**, 6ª edición, Elsevier, 2018

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

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

J. Mensa, A. Soriano, E. López Suñe, P. LLanares, **Guía terapéutica Antimicrobiana 2023**, Antares, 2023

Recomendacións

Subjects that continue the syllabus

Análise e diagnóstico agroalimentario/V02G031V01409

Subjects that are recommended to be taken simultaneously

Análise e diagnóstico agroalimentario/V02G031V01409

Subjects that it is recommended to have taken before

Microbioloxía I/V02G031V01204

Inmunoloxía e parasitoloxía/V02G031V01305

Microbioloxía II/V02G031V01309

IDENTIFYING DATA				
Integrative cell biology and physiology: Implications for health				
Subject	Integrative cell biology and physiology: Implications for health			
Code	V02G031V01407			
Study programme	Grado en Biología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	1st
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	Míguez Miramontes, Jesús Manuel			
Lecturers	Blanco Imperiali, Ayelén Melisa Megías Pacheco, Manuel Míguez Miramontes, Jesús Manuel			
E-mail	jmmiguez@uvigo.es			
Web				
General description	English Friendly subject: International students may request from the teachers: a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English. The objective of the course is to deepen in the cellular bases and physiological responses that allow the organism to maintain homeostasis in normal situations, as well as in the alterations that are triggered by changes in the environment and with certain pathologies. The course deals with the contents that complement the formation previously acquired on the cytological and physiological bases of living beings, as well as their integrative functioning.			

Training and Learning Results	
Code	
A2	Students should know how to apply their knowledge to their work or vocation in a professional way. They also should have the competences that are usually proved through the elaboration and defence of arguments and the resolution of problems within their study field.
A3	Students should prove ability for information-gathering and interpret important data (usually within their study field) to judge relevant social, scientific or ethical topics.
B2	Manage scientific-technical information using diverse and reliable sources. Analyze data and documents and interpret them critically and rigorously, including considerations on their social relevance and in the professional field of Biology.
B3	Apply the knowledge acquired in the degree and use the scientific-technical instrumentation and CIT in contexts of Biology and/or related to the professional practice.
B4	Draft and write reports, documents and projects related to Biology. Proceed to their presentation and debate in the teaching and specialized areas, highlighting the competences of the degree.
C3	Perform and interpret molecular, physicochemical and biological analyses, including samples of human origin. Conduct assays and functional tests under normal and abnormal conditions.
C6	Understanding and integrate the functioning of living beings (cellular, tissue, organ and individual level), explaining their homeostatic and adaptive responses.
C10	Identify biological and biotechnological processes and their potential applications, in particular in health, agri-food and environmental fields.
C16	The ability to identify the genetic and molecular bases of disease, advise on genetic counselling and genomic studies. Understand the control of cellular activity and integrated physiological responses, analysing their repercussions on health.
C17	Understanding the social projection of biology applied to health at its different levels (analytical, pathological and public health) and its repercussions on professional practice.
D1	Understand the meaning and use of the gender perspective in the different fields of knowledge and in professional practice with the aim of achieving a fairer and more equal society.
D2	Communicate speaking and in writing in Galician.
D3	Commitment to sustainability and the environment. Equal, sensible and efficient use of resources.
D4	Collaborate and work in teams or multidisciplinary groups, promote negotiation skills and the ability to reach agreements.

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

To understand the importance of cellular compartments in the function of tissues and organs.	A2 A3	B2 B3	C3 C6 C16	D2
To understand the influence of the environment on the control of cellular activity.	A2 A3	B2	C3 C6 C16 C17	D1 D4
To know the cellular basis of major diseases.	A2	B3 B4	C3 C6 C16	D2 D4
To identify the mechanisms of integration of the different physiological systems.	A3	B3 B4	C3 C6 C10 C16	D1 D4
To understand the physiological basis of adaptive responses.	A3	B2	C3 C6 C16	D3
To know the physiological basis of cognitive functions and behaviour.	A2 A3	B2	C6 C17	D1 D2 D4

Contents

Topic	
THEORETICAL CONTENTS	Topic 1. Cellular stress. Causes of cellular stress and cell responses to maintain homeostasis. Apoptosis and autophagy.
SECTION 1. Cellular homeostasis. Alterations and consequences in health.	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. Body homeostasis. Adaptive responses and functional alterations	Topic 5. Body homeostasis, health and disease. Homeostatic regulation. Disease: determining, conditioning and predisposing factors. Factors (physical, chemical, biological) causing 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	Some of the possible activities that would be developed in the practical sessions are the following:
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.	- 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	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.
Classroom sessions in which the resolution of experimental problems and case studies will be approached through work in small groups.	

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		Qualification	Training and Learning Results			
	Description					
Objective questions exam	There will be 4 short tests (10 minutes) throughout the term, which will be given during class time. These tests are aimed at evaluating theoretical knowledge taught in class sessions.	10	A2	B4	C6 C10 C16	D1
Essay questions exam	It will take place in the final test. It will allow evaluating theoretical and general knowledge of the subject. It will include short development questions and practical cases.	40	A2	B3	C6 C16	D2
Essay	Aimed at evaluating knowledge related to the seminar sessions. They are works done in groups (2-3 students) and in pairs of groups. They will involve the development of a short report, an exposition and a defense of the work in front of the class. Three aspects will be taken into account in the evaluation: 1. Performance during the realization of the work (20%). 2. Presentation and defense of the final proposal (5%). 3. Ability to argue the strong points of one's own project and the weak points of the opponent (5%).	30	A2 A3	B2 B4	C6 C10 C16 C17	D1 D2 D3 D4
Objective questions exam	It is aimed at the evaluation of the practical contents. It will be carried out in the last practical session of Cell Biology (first part of the test, 7%) and Physiology (second part of the test, 13%).	20	A3	B3 B4	C3 C6 C10 C16	D3 D4

Other comments on the Evaluation

Minimum grades and second chance evaluation

In order to pass the course, students must complete all the proposed activities and achieve a minimum grade of 5 points out of 10 (5/10) in each evaluable activity (theoretical contents, seminars, laboratory practices). However, it will be possible to

compensate the different activities if a minimum grade of 4/10 points is reached in each of them. In case of not reaching the minimum grade in the section of theoretical contents (4/10), that will be the grade that will appear in the final qualification of the subject (the grades of practices and seminars will not be taken into account).

The justification of non-attendance to the practical sessions and seminars does not exempt the student from taking them in another group, as long as the calendar allows it.

Second opportunity and next course

The activities passed in the first opportunity of the course will be retained for the second opportunity. In the case of practices and seminars, their recovery in the second opportunity will entail the realization of an alternative evaluation test.

Students who repeat the subject in the following course will keep the grades obtained in the activities passed in the previous course, having to repeat those not passed. Optionally they can repeat those activities even if they pass them, in this case participating in a new evaluation process.

Global assessment

Students may request a global assessment, which will entail the waiver of continuous assessment. The global evaluation will allow obtaining 100% of the score of the subject by means of a test on the official date set for the final exam of the subject, both in the first opportunity and in the second one.

The exam may include: - Objective development questions; - Development questions; - Practical cases, etc.

The global evaluation does not exempt from the realization of practices and seminars of the subject. In the case of not realization of these activities, the final grade in the subject will be of 0 points.

Academic and examination 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/examen>

Ethical aspects.

Plagiarism will be prosecuted in the work, as well as copying from other students during the evaluation tests, which may be grounds for a reduction of the grade and even a failure in the subject.

Sources of information

Basic Bibliography

- Alberts, B., **Molecular Biology of the Cell**, 6, 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
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- 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

Biochemistry I/V02G031V01201

Biochemistry II/V02G031V01206

Animal and plant histology and cytology I/V02G031V01203

Animal and plant histology and cytology II/V02G031V01208

Genetics I/V02G031V01209

Animal physiology I/V02G031V01302

Animal physiology II/V02G031V01307

Genetics II/V02G031V01304

IDENTIFYING DATA				
Human genetics and molecular pathology				
Subject	Human genetics and molecular pathology			
Code	V02G031V01408			
Study programme	Grado en Biología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	1st
Teaching language	Spanish			
Department				
Coordinator	Valverde Pérez, Diana			
Lecturers	Fernández Silva, Íria 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 *profesorado: to) material and bibliographic references for the follow-up of the matter in English, *b) attend the *tutorías in English, *c) proofs and evaluations in English.			

Training and Learning Results

Code	
A1	Students should prove understanding and knowledge in this study field that starts in the Secondary Education and with a level that, even though it is supported in advanced books, also includes some aspects that involve knowledge from the vanguard of the study field.
A2	Students should know how to apply their knowledge to their work or vocation in a professional way. They also should have the competences that are usually proved through the elaboration and defence of arguments and the resolution of problems within their study field.
B1	Developing autonomous learning by identifying their own training need and organizing and planning tasks and time.
B2	Manage scientific-technical information using diverse and reliable sources. Analyze data and documents and interpret them critically and rigorously, including considerations on their social relevance and in the professional field of Biology.
B6	Develop analysis and synthesis, critical reasoning and argumentation skills, applying them in Biology and other scientific-technical disciplines.
C3	Perform and interpret molecular, physicochemical and biological analyses, including samples of human origin. Conduct assays and functional tests under normal and abnormal conditions.
C5	Manipulate and analyse genetic material and determine its alterations and pathological implications. Knowing the applications of genetic engineering.
C11	Perform and interpret bioassays, identify chemical and biological agents, including pathogens, as well as their toxic products. Develop and apply biological control techniques.
C12	Writing reports and technical dossiers, as well as directing and executing projects on topics related to biology and its applications.
C16	The ability to identify the genetic and molecular bases of disease, advise on genetic counselling and genomic studies. Understand the control of cellular activity and integrated physiological responses, analysing their repercussions on health.
C17	Understanding the social projection of biology applied to health at its different levels (analytical, pathological and public health) and its repercussions on professional practice.
D5	Communicate effectively and appropriately, including the use of computer tools and English.

Expected results from this subject

Expected results from this subject	Training and Learning Results			
Recognise the organisation of the human genome.	A1 A2	B1 B2 B6	C16	
Know and understand the biochemical and genetic changes that occur in a wide rank of pathologies.	A1 A2	B1 B2 B6	C3 C16	D5

Present the methodologies for the diagnostic, follow-up, and investigation of the illnesses.	A1 A2	B1 B2 B6	C5 C12 C16 C17	D5
Purchase basic skills of laboratory for the diagnostic of illnesses.	A1 A2	B1 B2	C3 C5 C11	D5

Contents

Topic	
□ The human genome.	Technical analysis of the structure and expression of genes and genomes. Structure of the human genome, genic regulation and epigenome Genetic Variation Genetic of populations and human evolution
□ Citogenética Human.	Chromosomes, cellular division, and human or Technical karyotype of analysis citogenético and clinical diagnostic chromosomal Alterations
□ Genetic base of the human illnesses.	Or Connecting phenotypes and genotypes or Mapping and identification of genes for illnesses *monogénicas
□ Inheritance *multifactorial.	Or Identification of factors of risk and molecular base in complex illnesses or Models of illness of inheritance *multifactorial
□ Genetics of the cancer.	Or genetic and environmental Factors of the cancer or *Oncogenes and genes *supresores or *Epigenética
□ Molecular pathology of human illnesses.	Or *Metabolopatías or *Transtornos *monogénicos or polygenic Inheritance
□ Molecular diagnostic.	Or Technical used or Indications for the proofs or Diagnostic *postnatal, *prenatal and *preimplantatorio or genetic Advice and ethical appearances

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	30	30	60
Practices through ICT	12	48	60
Case studies	3	6	9
Objective questions exam	1	5	6
Objective questions exam	1	5	6
Case studies	1	1	2
Report of practices, practicum and external practices	0	4	4
Presentation	1	0	1
Problem and/or exercise solving	1	1	2

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

Methodologies

	Description
Lecturing	Exhibition by part of the professor of the foundations and basic principles. Like support to the theoretical explanations, will provide to the educational material students adapted through the platform Moovi of the Virtual Campus
Practices through ICT	To the students will request them the delivery of a report of practice and/or resolution of questions and/or exercises. Like support to practise them, will provide the students with the appropriate educational material through the platform Moovi of the Virtual Campus
Case studies	To the start of the course will deliver them to the students a case so that it develop his capacity to integrate information and resolve problems. To the start of the course will inform to the students of the procedure to be followed

Personalized assistance

Methodologies	Description
Case studies	They will offer tutorías personalised to guide the development of the cases posed

Assessment

	Description	Qualification	Training and Learning Results			
Objective questions exam	Subjects 1 to the 4. In the proofs will be evaluated the fundamental contents of the matter (masterclasses and practical) through objective questions (type test and short answer).	25	A1 A2	B1 B2 B6	C3 C16	D5
Objective questions exam	Subjects 5 to the 7. In the proofs will be evaluated the fundamental contents of the matter (masterclasses and practical) through objective questions (type test and short answer).	25	A1 A2	B1 B2 B6	C3 C16	D5
Case studies	The students will have to present the resolution of the case presented attending to the scale that will facilitate them to principle of course	20	A1 A2	B1 B2 B6	C5 C11 C12 C17	D5
Report of practices, practicum and external practices	The capacities and skills purchased during practise them will be evaluated of continuous form. The methodology of evaluation and weighting in the final note includes: 1- Implication of the student in the development of the practices. It will suppose 10% of the final qualification. 2- Delivery of reports of practices of laboratory. The reports will be made by each one of the subgroups of students organised in each group of practices. The half note obtained inform us will suppose 15% of the final note.	25	A1 A2	B1 B2 B6	C3 C11 C12	D5
Presentation	The students owe to present of oral way to resolution of the case chosen	5	A1 A2	B1 B2 B6	C11 C12 C16 C17	D5

Other comments on the Evaluation

Important: Independently that the 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 students/the *repetidores/ace will 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 proof *integradora in which it will evaluate of the contents of the classrooms *magistrales, 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 proof *integradora 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 *expositivas, practical and seminars), already was by means of continuous

or global evaluation.

General information

The academic calendar *pode consult in the following link:

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

The calendar of examinations *pode 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. Alvaro 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 immunology/V02G031V01405

Public health microbiology and parasitology/V02G031V01406

Subjects that it is recommended to have taken before

Biochemistry I/V02G031V01201

Biochemistry II/V02G031V01206

Genetics I/V02G031V01209

Genetics II/V02G031V01304

Technics in cellular and molecular biology/V02G031V01310

IDENTIFYING DATA				
Análise e diagnóstico agroalimentario				
Subject	Análise e diagnóstico agroalimentario			
Code	V02G031V01409			
Study programme	Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4	1c
Teaching language	Castelán Galego			
Department	Bioloxía funcional e ciencias da saúde Química analítica e alimentaria			
Coordinator	Iglesias Blanco, Raúl			
Lecturers	Gago Martínez, Ana Iglesias Blanco, Raúl Leao Martins, Jose Manuel			
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	
A2	Que os estudantes saiban aplicar os seus coñecementos ao seu traballo ou vocación dunha forma profesional e posúan as competencias que adoitan demostrarse por medio da elaboración e defensa de argumentos e a resolución de problemas dentro da súa área de estudo.
B1	Desenvolver a aprendizaxe autónoma, identificando as súas propias necesidades formativas e organizando e planificando as tarefas e o tempo.
B2	Xestionar información científico-técnica de calidade utilizando fontes diversas. Analizar datos e documentos e interpretalos de forma crítica e rigorosa, incluíndo reflexións sobre a súa relevancia social e no ámbito profesional da Bioloxía.
B6	Desenvolver as capacidades de análises e sínteses, de razoamento crítico e argumentación, aplicándoas en contextos propios da Bioloxía e outras disciplinas científico-técnicas.
C9	Identificar recursos de orixe biolóxica e valorar a súa explotación eficiente e sostible para obter produtos de interese. Propoñer e implantar melloras nos sistemas produtivos.
C10	Identificar procesos biolóxicos e biotecnolóxicos e a súa posible aplicabilidade, en particular nos ámbitos sanitario, agroalimentario e ambiental.
C11	Realizar e interpretar bioensaios, identificar axentes químicos e biolóxicos, incluíndo os patógenos, así como os seus produtos tóxicos. Desenvolver e aplicar técnicas de control biolóxico
C18	Desenvolver e aplicar metodoloxías analíticas e de control de produtos agroalimentarios, a súa manipulación e conservación. Identificar a seguridade e calidade na cadea alimentaria e avaliar riscos para a saúde e o medio ambiente
C20	Comprender a proxección social da bioloxía aplicada á produción nos seus diferentes niveis de aplicación (analítico, produtivo e de xestión) e a súa repercusión no exercicio profesional
D4	Colaborar e traballar en equipo ou en grupos multidisciplinares, fomentar a capacidade de negociación e de alcanzar acordos.
D5	Comunicar de maneira eficaz e adecuada, incluíndo o uso de ferramentas dixitais e o inglés.

Resultados previstos na materia			
Expected results from this subject	Training and Learning Results		
Recoñecer os principais perigos, defectos e/ou riscos alimentarios, a importancia dos sistemas de rastrexabilidade, e as principais políticas de xestión no ámbito da Seguridade e Calidade Alimentaria.	A2	C9 C11 C18	D4 D5

Recoñecer os principios básicos da Análise e Diagnóstico Agroalimentario e os principais tipos de mostras agroalimentarias.	A2	B1 B2	C9 C10 C11 C18	D4 D5
Aplicar as técnicas de mostraxe e principais métodos analíticos que se empregan nos laboratorios de Análises e Diagnóstico Agroalimentario, e interpretar correctamente os seus resultados de acordo aos parámetros de referencia establecidos na lexislación vixente.	A2	B6	C9 C10 C11 C18	D4 D5
Aplicar coñecementos e técnicas propios da Análise e Diagnóstico Agroalimentario para asegurar a inocuidade dos alimentos en todas as etapas da cadea alimentaria, e mellorar a xestión do medio ambiente no que se refire ao control de determinados perigos biolóxicos.	A2	B6	C9 C10 C11 C18	D4 D5
Aplicar coñecementos de Análises e Diagnóstico Agroalimentario para o asesoramento, supervisión e/ou peritaxe de situacións ou problemas relacionados con seguridade e calidade alimentaria.	A2	B1 B2	C11 C18 C20	D4 D5
Recoñecer a importancia social da Análise e Diagnóstico Agroalimentario e a súa repercusión no exercicio profesional do biólogo.			C20	

Contidos

Topic	
Introdución á análise e diagnóstico agroalimentario	Seguridade alimentaria e trazabilidade Perigos/riscos e defectos alimentarios O sistema APPCC O Codex Alimentarius
Riscos alimentarios biolóxicos (I)	Microorganismos patóxenos transmitidos por alimentos Microorganismos que condicionan a calidade alimentaria Técnicas de detección e identificación Lexislación
Riscos alimentarios biolóxicos (II)	Parásitos zoonóticos transmitidos por alimentos Parásitos que condicionan a calidade alimentaria Técnicas de detección e identificación Lexislación
Riscos alimentarios químicos	Contaminantes inorgánicos Contaminantes orgánicos (naturais e antropoxénicos) Técnicas de detección Lexislación

Planificación

	Class hours	Hours outside the classroom	Total hours
Lección maxistral	6	8	14
Prácticas de laboratorio	38	38	76
Estudo de casos	4	30	34
Exame de preguntas obxectivas	1	16	17
Exame de preguntas de desenvolvemento	1	8	9

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

Metodoloxía docente

	Description
Lección maxistral	Clases de 50 min nas que se introducirá o alumno no campo da seguridade alimentaria, presentando os conceptos básicos relacionados coa detección e control de perigos/riscos e defectos de orixe biolóxica en alimentos
Prácticas de laboratorio	Sesións de prácticas en laboratorio orientadas á aprendizaxe dunha serie de técnicas analíticas que permiten a detección e identificación de microorganismos, parasitos e substancias contaminantes de orixe biolóxica en diversas mostras alimentarias. Durante, ou ao final das sesións prácticas, os alumnos deberán resolver, mediante traballo autónomo, unha serie de cuestións formuladas polos profesores en relación ás técnicas analíticas empregadas e aos riscos alimentarios detectados. A resolución de cuestionarios e/ou realización de breves informes permitirá ao alumno completar a súa formación presencial e adquirir unha visión integral da disciplina
Estudo de casos	Os estudantes recibirán instrucións e unha serie de casos prácticos relacionados coa análise de alimentos, que deberán resolver traballando en pequenos grupos. As sesións dedicadas para esta actividade utilizaranse para supervisar a evolución do traballo realizado polos diferentes grupos, e se é o caso, reorientar ao alumnado (sesión de control intermedia; 1 h), así como para a presentación e defensa dos casos, unha vez resoltos (3 h).

Atención personalizada

Methodologies	Description
Estudo de casos	O profesorado orientará ao alumnado sobre as 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	A2 B1 B2 B6	C9 C10 C11 C18 C20
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 redacción, presentación e defensa final dos casos resoltos.	20	A2 B1 B2 B6	C9 C10 C20 D4 D5
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	A2 B2 B6	C9 C10 C11 C18
Exame de preguntas de desenvolvemento	Este exame, que tamén formará parte da Proba final integradora que supoñerá o 40% da nota final da materia, avaliará a capacidade do alumnado para resolver diversos casos ou situacións prácticas relacionadas coa análise agroalimentaria de forma argumentada.	13.2	A2 B2 B6	C9 C10 C11 C18 D5

Other comments on the Evaluation

1. Dado que as actividades de formación e avaliación continua programadas dentro das **Prácticas de Laboratorio** e do **Estudo de casos** (incluída a sesión de control intermedio) están deseñadas para formar ao alumnado en habilidades e competencias directamente relacionadas co exercicio da profesión no campo da análise e diagnóstico agroalimentario, **a asistencia e participación do alumnado en ambas as actividades 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 nas de Prácticas (40%), Estudo de casos (20%) e Proba final integradora (40%). Con todo, **para poder superar a materia, e poder sumar as cualificacións obtidas nas actividades de Prácticas e Estudo de casos, deberá alcanzarse unha nota mínima de 4,0 (sobre 10) en cada unha das partes (Química Analítica, Microbiología e Parasitología) que integrarán a Proba final.** Os alumnos que non cumpran este requisito na primeira oportunidade serán cualificados na acta coa nota máis alta alcanzada nas partes suspensas, e deberán repetir na **segunda oportunidade (xullo)** a proba relativa á parte ou partes nas que non alcanzasen o 4,0. Loxicamente, os alumnos que se atopen nesta situación conservarán a nota da/s parte/s superada/s ($\geq 4,0$) en primeira oportunidade e das Prácticas e Estudo de casos, para telas en conta na nota final. Na segunda oportunidade, será tamén imprescindible alcanzar o 4,0 en todas as partes obxecto de recuperación.

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

Bibliografía. Fontes de información

Basic Bibliography

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

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European Food Safety Authority (EFSA), <https://www.efsa.europa.eu/en>,

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Gajadhar, A., **Foodborne parasites in the food supply web: Occurence and control**, 1st Ed., Woodhead Publishing, 2015

Ryan, K.J., N. Ahmad, J.A. Alspaugh, et al., **Sherris & Ryan's Medical Microbiology**, 8th Ed., Mc Graw Hill, 2022

Recomendacións

Subjects that are recommended to be taken simultaneously

Análise e diagnóstico clínico/V02G030V01903

Análise e diagnóstico medioambiental/V02G030V01902

Subjects that it is recommended to have taken before

Inmunoloxía e parasitoloxía/V02G030V01604

Microbioloxía II/V02G030V01605

IDENTIFYING DATA				
Bioteecnoloxía aplicada á produción animal				
Subject	Bioteecnoloxía aplicada á produción animal			
Code	V02G031V01410			
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 Bioquímica, xenética e inmunoloxía			
Coordinator	Soengas Fernández, José Luis			
Lecturers	Conde Sieira, Marta García Estévez, José Manuel Iglesias Blanco, Raúl Rolán Álvarez, Emilio Soengas Fernández, José Luis			
E-mail	jsoengas@uvigo.es			
Web				
General description	A materia Bioteecnoloxía Aplicada á Produción animal aborda as características básicas da Producción Animal, que se ocupa do estudo de como obter máximo rendemento, administrando os recursos adecuadamente baixo criterios de sustentabilidade para o mellor aproveitamento dos animais domésticos e silvestres que son útiles ao home para producir alimentos ou derivados (carne, ovos, leite, pel, etc) ou para cubrir outras necesidades (animais de experimentación, anticorpos, etc). Adicionalmente se abordan os aspectos biotecnolóxicos da mesma. O calendario académico se pode consultar en: http://bioloxia.uvigo.es/gl/docencia/horarios			

Resultados de Formación e Aprendizaxe	
Code	
A2	Que os estudantes saiban aplicar os seus coñecementos ao seu traballo ou vocación dunha forma profesional e posúan as competencias que adoitan demostrarse por medio da elaboración e defensa de argumentos e a resolución de problemas dentro da súa área de estudo.
A3	Que os estudantes teñan a capacidade de reunir e interpretar datos relevantes (normalmente dentro da súa área de estudo) para emitir xuízos que inclúan unha reflexión sobre temas relevantes de índole social, científica ou ética.
B2	Xestionar información científico-técnica de calidade utilizando fontes diversas. Analizar datos e documentos e interpretalos de forma crítica e rigorosa, incluíndo reflexións sobre a súa relevancia social e no ámbito profesional da Bioloxía.
B3	Aplicar o coñecemento adquirido na titulación e empregar a instrumentación científico-técnica e as TIC en contextos propios da Bioloxía e/ou no exercicio da profesión.
B4	Elaborar e redactar informes, documentos e proxectos relacionados coa Bioloxía. Proceder á súa presentación e debate no ámbito docente e especializado, poñendo de manifesto as competencias da titulación
B7	Perseguir obxectivos de calidade no desenvolvemento da súa actividade e incorporar á súa conduta os principios éticos que deben rexer no exercicio profesional da Bioloxía.
C9	Identificar recursos de orixe biolóxica e valorar a súa explotación eficiente e sostible para obter produtos de interese. Propoñer e implantar melloras nos sistemas produtivos.
C10	Identificar procesos biolóxicos e biotecnolóxicos e a súa posible aplicabilidade, en particular nos ámbitos sanitario, agroalimentario e ambiental.
C12	Redactar informes e memorias técnicas, así como dirixir e executar proxectos en temas relacionados coa bioloxía e as súas aplicacións
C19	Xestionar procesos de produción animal, vexetal e microbiana, implementar ferramentas biolóxicas que melloren a eficiencia produtiva e identificar novos ámbitos de aplicación e oportunidades profesionais
C20	Comprender a proxección social da bioloxía aplicada á produción nos seus diferentes niveis de aplicación (analítico, produtivo e de xestión) e a súa repercusión no exercicio profesional
D2	Comunicarse por oral e por escrito en lingua galega.
D3	Comprometerse coa sustentabilidade e medio ambiente. Uso de forma equitativa, responsable e eficiente dos recursos.
D4	Colaborar e traballar en equipo ou en grupos multidisciplinares, fomentar a capacidade de negociación e de alcanzar acordos.

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

Identificar os sistemas de produción animal.	A2 A3	B2 B3 B4 B7	C9 C10 C12 C19 C20	D2 D3 D4
Coñecer as bases fisiolóxicas da produción animal.	A2 A3	B2 B3 B4 B7	C9 C10 C12 C19 C20	D2 D3 D4
Aplicar coñecementos biotecnolóxicos na reprodución e o benestar animal.	A2 A3	B2 B3 B4 B7	C9 C10 C12 C19 C20	D2 D3 D4
Coñecer as bases da alimentación e nutrición animal e a biotecnoloxía asociada.	A2 A3	B2 B3 B4 B7	C9 C10 C12 C19 C20	D2 D3 D4
Describir as condicións sanitarias e hixiénicas na produción animal.	A2 A3	B2 B3 B4 B7	C9 C10 C12 C19 C20	D2 D3 D4
Coñecer a lexislación e normativas da produción animal.	A2 A3	B2 B3 B4 B7	C9 C10 C12 C19 C20	D2 D3 D4
Comprender as técnicas de mellora en produción animal.	A2 A3	B2 B3 B4 B7	C9 C10 C12 C19 C20	D2 D3 D4

Contidos

Topic

Capítulo I: Bases fisiolóxicas da produción animal (Profesor Soengas)	Tema 1. Sistemas produtivos Tema 2. Reprodución e crecemento Tema 3. Benestar animal
Capítulo II: Alimentación e nutrición animal (Profesor Soengas)	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 -Proporanse temas para que os preparen os alumnos organizados en grupos de 2-3 (dependendo do número de alumnos matriculados). Os temas que se propoñan abarcarán o máximo número de grupos de animais posibles incluíndo gandería, produción de aves, acuicultura e produción doutras especies de interese. - Na primeira reunión con cada grupo tipo B realizarase a planificación da elaboración dos distintos temas. Na segunda reunión tipo B farase un seguimento da preparación dos temas. - Antes das datas de exposición cada grupo de alumnos deberá entregar unha memoria escrita do traballo realizado. - Nas tres últimas sesións de grupo A exporanse os temas por parte dos alumnos para a continuación debater sobre os mesmos.
Prácticas de laboratorio	A asistencia ás prácticas é obrigatoria para superar a materia. Os alumnos realizarán 16h de prácticas, das cales: - 8h corresponden a Fisioloxía (Avaliación de índices de crecemento e parámetros de composición nun modelo de produción a pequena escala) - 4h corresponden a sanidade e hixiene (diagnóstico) - 4h corresponden a mellora animal (simulación por computador dun proceso de selección artificial)
Seminario	Dedicaranse á planificación e seguimento dos temas elaborados polos distintos grupos de alumnos
Lección maxistral	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 maxistral	Exame 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	A3	B3	C9 C10 C12 C19 C20	D2 D3
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	A2 A3	B2 B7	C9 C10 C12 C19 C20	D2 D3 D4

Prácticas de laboratorio	A asistencia a prácticas é obrigatoria. Cada un do tres módulos de prácticas (fisioloxía, sanidade e mellora) avaliaranse por separado por asistencia, informe de prácticas (fisioloxía) ou preguntas (mellora e sanidade). O 50% da nota corresponde ao módulo de Fisioloxía animal. Os módulos de mellora e sanidade representan o 25% cada un.	10	A2 A3	B4	C9 C10 C12	D2 D3
Lección maxistral	Exame 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	A3	B3	C9 C10 C12 C19 C20	D2 D3

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

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

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Broom, D.M., **Farm animal behaviour and welfare**, CABI, 2006

Buxadé, C, **Zootecnia: bases de producción animal, vol I**, Mundi-Prensa,

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Falconer, D.S., **Introducción a la genética cuantitativa**, Acribia, 2001

Fontdevila, A, **Introducción a la genética de poblaciones**, Síntesis, 1999

Fraser, D, **Understanding animal welfare**, Blackwell science, 2008

Griffiths, A.J.F., **Genética moderna**, McGraw-Hill, Interamericana, 2000

Herranz,A., **Bienestar animal**, Ministerio de agricultura, 2003

Sainsbury, D., **Animal health: health, disease and welfare of farm livestock**, Cornell University, 1983

Sotillo, J.L, **Producción animal e higiene veterinaria**, Universidad de Murcia, 2000

Recomendacións

Subjects that it is recommended to have taken before

Fisioloxía animal I/V02G030V01502

Fisioloxía animal II/V02G030V01602

Xenética II/V02G030V01505

Inmunoloxía e parasitoloxía/V02G030V01604

Microbioloxía II/V02G030V01605

Técnicas avanzadas en bioloxía/V02G030V01504

Other comments

Para o correcto seguimento da materia o alumno deberá inscribirse ao principio de curso na plataforma de teledocencia. Na inscrición, é importante que inclúa a dirección de correo-e que utiliza habitualmente, para poder recibir información do seu profesorado de forma persoalizada.

IDENTIFYING DATA				
Biotechnology applied to plant production				
Subject	Biotechnology applied to plant production			
Code	V02G031V01411			
Study programme	Grado en Biología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	1st
Teaching language	Spanish			
Department				
Coordinator	Barreal Modroño, M. Esther			
Lecturers	Barreal Modroño, M. Esther Canchaya Sanchez, Carlos Alberto Gallego Veigas, Pedro Pablo			
E-mail	edesther@uvigo.es			
Web	http://bioloxia.uvigo.es/es/			
General description	The subject will provide the student with skills in four areas: plant production systems and good practices, plant breeding and reproduction techniques (plant biotechnology), plant safety and health, legislation and regulations. The subject includes master classes, seminars, case studies in cooperative learning, and practical laboratory classes. http://bioloxia.uvigo.es/gl/docencia/horarios			

Training and Learning Results

Code				
A4	Students should be able to communicate information, ideas, issues and solutions to all audiences (specialist and unskilled audience).			
A5	Students should develop the necessary learning skills to undertake further studies with a high degree of autonomy.			
B4	Draft and write reports, documents and projects related to Biology. Proceed to their presentation and debate in the teaching and specialized areas, highlighting the competences of the degree.			
B5	Develop capacities for creativity, innovation and entrepreneurship, in academic and social relevant fields as well as in interaction with the productive sector.			
B7	To aim for quality objectives in the development of the activity done and incorporate ethical principles, which should prevail in the professional practice of Biology.			
C4	Isolate, identify and grow microorganisms, cells, tissues and organs, making easier their study and the assessment of their metabolic activity.			
C9	Identify resources of biological origin and assess their efficient and sustainable use in order to obtain products of interest. Propose and implement improvements in production systems.			
C10	Identify biological and biotechnological processes and their potential applications, in particular in health, agri-food and environmental fields.			
C11	Perform and interpret bioassays, identify chemical and biological agents, including pathogens, as well as their toxic products. Develop and apply biological control techniques.			
C12	Writing reports and technical dossiers, as well as directing and executing projects on topics related to biology and its applications.			
C19	The ability to manage animal, plant and microbial production processes, implement biological tools that improve production efficiency and identify new areas of application and professional opportunities.			
C20	Understanding the social projection of biology applied to production at its different levels of application (analytical, production and management) and its repercussions on professional practice.			
D3	Commitment to sustainability and the environment. Equal, sensible and efficient use of resources.			
D4	Collaborate and work in teams or multidisciplinary groups, promote negotiation skills and the ability to reach agreements.			
D5	Communicate effectively and appropriately, including the use of computer tools and English.			

Expected results from this subject

Expected results from this subject	Training and Learning Results			
To identify the main plant production systems.	A5	B4	C9 C10 C20	D3
To understand the basics of plant production from a biological and sustainable perspective.	A5	B7	C9 C20	D3
To understand plant breeding techniques and asexual reproduction.	A5	B4	C4 C9 C10	D5

To understand the genetic and biotechnological tools of plant breeding.	A5		C9 C10 C19	D5
Handling the scientific-technical instrumentation related to plant breeding in the laboratory.	A5	B7	C4 C11 C19	D4
Applying knowledge and technologies related to plant production in aspects of production, exploitation, analysis and diagnosis of plant biological processes and resources.	A4 A5	B4 B7	C12	D3 D4 D5
Applying knowledge related to plant production to advise, supervise and provide expertise on scientific-technical, ethical, legal and socio-economic aspects related to living beings and the environment.	A4	B4 B5 B7	C11 C12 C19 C20	D3 D4 D5
To obtain information, develop experiments and interpret results using the scientific method.	A5	B7	C11 C12 C19	D4 D5
To understand the social projection of plant production and its repercussions on professional practice.	A4 A5	B4 B5 B7	C12 C19 C20	D3 D4 D5

Contents

Topic	
Block 1: Production systems (Plant Physiology Area).	Topic 1. Basis of Plant Production.
Block 1: Production systems (Plant Physiology Area).	Topic 2. Plant Production Techniques
Block 2: Plant Breeding (Genetic Area)	Topic 3. Fundamentals of Plant Breeding
Block 2: Plant Breeding (Genetic Area)	Topic 4. Fundamentals of Genomic Selection
Block 3: Plant Biotechnology (Plant Physiology Area)	Topic 5. Introduction to Plant Biotechnology
Block 3: Plant Biotechnology (Plant Physiology Area)	Topic 6. Genetic transformation of plants
Block 4: Plant health and legislation.(Plant Physiology Area)	Topic 7. Plant Health
Block 4: Plant health and legislation. (Plant Physiology Area)	Topic 8. Intellectual property and standards.
Practice	1. Water stress and plant production 2. Introduction to adventitious morphogenesis 3. Poor plant nutrition and its impact on yield

Planning

	Class hours	Hours outside the classroom	Total hours
Introductory activities	1	0	1
Lecturing	23	45	68
Problem solving	6	6	12
Seminars	6	6	12
Laboratory practical	12	24	36
Objective questions exam	2	7	9
Report of practices, practicum and external practices	0	4	4
Case studies	0	8	8

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

Methodologies

	Description
Introductory activities	A class will be dedicated to the presentation of the subject and the teaching guide, with an explanation of the evaluation procedure and indication of the deadlines for the work.
Lecturing	The master sessions are 50-minute lessons, to explain and develop the contents of Plant production. They must be completed with autonomous work of the student consulting books of text and further reading, mainly scientific articles.
Problem solving	Cooperative learning is formulated based on problems and cases.
Seminars	Seminar methodology is formulated with collaborative work and presentation of teamwork for the agricultural systems section.
Laboratory practical	These are mandatory laboratory practices consisting of familiarization of students with basic plant culture techniques and plant biotechnology.

Personalized assistance	
Methodologies	Description
Lecturing	Throughout the term, teachers will be available in person at their offices during tutoring hours. It is recommended to make an appointment by mail to avoid crowds, you wait and/or the teacher has a busy schedule that day.
Problem solving	Consultations can be made by e-mail or through the TEMA platform, in addition to being able to use face-to-face tutorials
Seminars	Tasks will be carried out to solve problems and exercises that will be dealt with in the same seminar.
Laboratory practical	The laboratory sessions will include a temporary space to perform tasks that will serve as training for the realization of the practice report.

Assessment						
	Description	Qualification	Training and Learning Results			
Objective questions exam	The final exam will consist of objective questions related to the learning achieved.	30	A5	B4	C4 C19 C20	D3
Report of practices, practicum and external practices	Presentation of a final report in which the methodology, materials, data obtained, statistical analysis, graphic representation and discussion of the results obtained will be presented, including all the literature consulted.	40	A4 A5	B4 B7	C4 C10 C11 C12 C19 C20	D4 D5
Case studies	The evaluation of the seminars will be done through collaborative work (plant physiology) and problem solving of individual form (Genetics) together with the delivery of a small report or an objective test.	30	A4 A5	B5	C9 C11 C19	D3

Other comments on the Evaluation

Given that the training and continuous evaluation activities programmed within the Laboratory Practices and Seminars are designed to train students in skills and competences directly related to the exercise of the profession in the field of biotechnology applied to plant production, the attendance and participation of students in both evaluable activities is mandatory, in such a way that the absence or unjustified non-performance of these activities will prevent passing the subject. Therefore, considering the practical nature and the results of training and learning that are sought to achieve with both methodologies, students who opt for the global evaluation mode must also perform these activities.

It will be essential to obtain in each of the parts, at least 40% of the total evaluation, to compensate.

Students who do not meet this requirement at the first opportunity will be graded on the transcript with the highest grade achieved in the failed parts, and must repeat at the second opportunity (July) the test related to the part or parts in which they have not reached the 4.0. Logically, students who find themselves in this situation will keep the grade of the part/s passed (≥ 4.0) in the first opportunity and of the Practicals and Seminars, to take them into account in the final grade. In the second opportunity, it will also be essential to reach 4.0 in all the parts subject to recovery. The reports of practices and seminars that must be passed in the second call will be done individually. In the case of internships, once passed, the grade will be kept for the following year.

Ethical aspects, plagiarism will be prosecuted in the works, as well as copying from other students during the evaluation tests, which may be cause for a reduction of the grade and even a failure in the subject. This fraudulent conduct will be sanctioned with the firmness and rigor established by current regulations and may result in the suspension of the course for an entire academic year.

The dates of the exams are indicated in the following link:

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

Sources of information

Basic Bibliography

Parker, R, **La Ciencia de las Plantas**, 1ª, Editorial Paraninfo, 2000

Ferreira, JJ; Ordás, A y Pérez M, **La genética de los caracteres cuantitativos en la mejora vegetal del siglo XXI**, 1ª, Sociedad Española de Genética y Sociedad Española, 2012

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

Caballero, A., **Genética Cuantitativa**, 1ª, Editorial Síntesis, 2017

Complementary Bibliography

Cubero, JL, **Introducción a la mejora genética vegetal**, 2ª, Ediciones Mundi Prensa, 2002

Casal, I; García-López, JL; Guisán, JM y Martínez Zapater, JM, **La Biotecnología Aplicada a la Agricultura**, 1ª, Eumedia S.A., 2000

Varshney, RK y Tuberosa, R, **Genomics-Assisted Crop Improvement**. Springer, 1ª, Springer, 2007-2010

Recommendations

Subjects that continue the syllabus

Drafting and execution of projects/V02G030V01801

Final Year Dissertation/V02G030V01991

Subjects that are recommended to be taken simultaneously

Quality management and control/V02G030V01911

Agri-food analysis and diagnostic/V02G031V01409

Biotechnology applied to microbiological production/V02G031V01412

Subjects that it is recommended to have taken before

Plant physiology I/V02G030V01503

Plant physiology II/V02G030V01603

Genetics II/V02G030V01505

IDENTIFYING DATA				
Biotechnology applied to microbiological production				
Subject	Biotechnology applied to microbiological production			
Code	V02G031V01412			
Study programme	Grado en Biología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	1st
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	Sieiro Vázquez, Carmen			
Lecturers	Sieiro Vázquez, Carmen			
E-mail	mcsieiro@uvigo.es			
Web				
General description	Microbial biotechnology studies microorganisms, and the processes they carry out on a large scale, with the aim of producing products of applied and commercial interest in the health, agri-food and environmental fields. The subject covers the different knowledge, fundamental and applied, related to industrial production processes, as well as the search, selection and improvement of the microbial strains involved. The most relevant products currently being produced by micro-organisms and future prospects for new applications are examined.			
	The schedule of the subject can be consulted at the following link: http://bioloxia.uvigo.es/es/docencia/horarios			
	English Friendly subject: International students may request from the teachers: a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.			

Training and Learning Results	
Code	
A5	Students should develop the necessary learning skills to undertake further studies with a high degree of autonomy.
B1	Developing autonomous learning by identifying their own training need and organizing and planning tasks and time.
B2	Manage scientific-technical information using diverse and reliable sources. Analyze data and documents and interpret them critically and rigorously, including considerations on their social relevance and in the professional field of Biology.
B4	Draft and write reports, documents and projects related to Biology. Proceed to their presentation and debate in the teaching and specialized areas, highlighting the competences of the degree.
C4	Isolate, identify and growth microorganisms, cells, tissues and organs, making easier their study and the assessment of their metabolic activity.
C5	Manipulate and analyse genetic material and determine its alterations and pathological implications. Knowing the applications of genetic engineering.
C9	Identify resources of biological origin and assess their efficient and sustainable use in order to obtain products of interest. Propose and implement improvements in production systems.
C10	Identify biological and biotechnological processes and their potential applications, in particular in health, agri-food and environmental fields.
C19	The ability to manage animal, plant and microbial production processes, implement biological tools that improve production efficiency and identify new areas of application and professional opportunities.
C20	Understanding the social projection of biology applied to production at its different levels of application (analytical, production and management) and its repercussions on professional practice.
D4	Collaborate and work in teams or multidisciplinary groups, promote negotiation skills and the ability to reach agreements.

Expected results from this subject		
Expected results from this subject	Training and Learning Results	
To identify microbial products of applied importance and demonstrate scientific criteria to find the most appropriate microorganisms for their production, according to their metabolic diversity.	A5	C4 C9
To apply the knowledge acquired to deal with the selection and improvement of microorganisms of biotechnological interest.	A5	C4 C5 C9
To differentiate the different types of industrial fermentations, identify the most important technological aspects for their implementation and recognize the role of environmental factors in the development of fermentation.	A5	C9 C10 C19

To apply in an integrated manner the knowledge acquired to design, optimize and control of profitable and sustainable fermentation processes, as well as the design of product purification processes.	A5	C10 C19 C20
Knowing the legislation and regulations related to microbial production.	B2	
To compile and handle information and/or data related to the different aspects of microbial production and interpret them critically. Make reasoned judgements or assessments, apply them to innovation or transmit them in an academic or business context.	B1 B2 B4	D4

Contents

Topic

1-Introduction to Microbial Biotechnology: Historical Development, Socioeconomic Importance and Legislation

2-Microbial Metabolism and Production: Regulation and Metabolic Strategies for Hyperproduction

3-Production Technology (I): Culture media and industrial sterilization, industrial fermentation and product recovery and processing

4-Production Technology (II): Development of industrial strains (searching, selection and improvement of strains)

5-Microbial food production: alcoholic beverages, dairy products and novel foods obtained by fermentation

6-Microbial production of drugs: antimicrobials, vaccines, hormones and other products of therapeutic interest

7-Microbial production of enzymes, amino acids, pigments and vitamins

8-Production of organic acids, solvents and biofuels

9-Microbial Polymers Production: Polysaccharides, Bioplastics and Biosurfactants

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	13.5	3	16.5
Seminars	10	32	42
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.

Seminars	I. The students, guided by the teacher, will document (search, evaluate, classify and select information) on a topic related to the program of the subject (or on a part of such topic) and, with the selected material, will prepare a summary. II. Students will work on the topic for which they have researched by completing a worksheet and preparing a presentation, which they will present to their classmates and the teacher. They will have a discussion with the teacher and their classmates about the topic and will resolve any questions that arise in relation 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.

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: Abstract delivered considering the ability to seek to value, classify and select information, as well as the ability to structure, synthesize, criticize and interrelate the contents. Students will have a rubric that will detail the aspects that will be evaluated (5%). WORK/PRESENTATION AND EXPOSITION: The worksheet elaborated by the students on the topic will be considered, as well as the exposition (capacity to synthesize, explain and transmit the information) that they carry out and the presentation (design and selection of the support material) that they use in the exposition. The ability to resolve questions and issues related to the topic will also be taken into account. Students will have a rubric that will detail the aspects that will be evaluated (10 %). OBJECTIVE TEST on the contents of the seminars (10%)	25	A5	B1 B2 B4	C20	D4
Objective questions exam	Exam with objective questions about PRACTICAL SESSIONS	15	A5	B1 B2	C4 C20	D4
Objective questions exam	Exam with objective questions on the theoretical concepts of the INTRODUCTION AND GENERAL ASPECTS OF THE SUBJECT	10	A5	B2	C4 C5 C9 C10 C19 C20	
Objective questions exam	Exam with objective questions on the theoretical aspects of PRODUCTION TECHNOLOGY	20	A5	B2	C4 C5 C9 C10 C19 C20	
Objective questions exam	Exam with objective questions on the theoretical aspects of MICROBIAL PRODUCTION (I)	15	A5	B2	C4 C5 C9 C10 C19 C20	
Objective questions exam	Exam with objective questions on the theoretical aspects of MICROBIAL PRODUCTION (II)	15	A5	B2	C4 C5 C9 C10 C19 C20	

Other comments on the Evaluation

1.- The evaluation will be preferably continuous according to the qualification of the activities/test above mentioned. It is

essential to achieve a grade of 5/10 to pass the subject. It will be necessary to achieve a minimum grade of 4/10 in each of the activities/tests to pass the subject. In case of not achieving the minimum grade required in any of the activities/tests, the grade that will appear in the report card will be the highest failing grade achieved by the student.

Attendance to practicals and seminars is compulsory for all students, being allowed to miss only one session 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.

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.

DATES OF EXAMINATIONS

They can be consulted in the following link:

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

Sources of information

Basic Bibliography

Okator N. and Okeke B., **Modern Industrial Microbiology and Biotechnology**, 978-036-77816-75, 2nd ed., CRC Press, 2021

Wilson D.B., Sahm H., Stahmann K-P and Koffas M., **Industrial Microbiology**, 978-527-34035-4, First ed., Wiley, 2020

Glazer A.N. and Nikaido H., **Microbial Biotechnology. Fundamentals of Applied Microbiology**, 2nd ed., Cambridge University Press, 2008.

Byong H. Lee, **Fundamentals of Food Biotechnology**, 2nd ed., Wiley-Blackwell, 2015.

Hutkins R.W., **Microbiology and Technology of Fermented Foods**, First ed., IFT Press. Blackwell Publishing, 2008.

Singh V, **Microbial Cell Factories Engineering for Production of Biomolecules**, 978012821487, First ed., Elsevier, 2021

Complementary Bibliography

Primrose S.B. and Twyman R.M., **Principles of gene manipulation and genomics**, 7th ed., Blackwell Science, 2014.

Bora S.K., Sarma K. and Das S., **An Approach to Microbial Biotechnology. A Laboratory Handbook**, First ed., LAP Lambert Academic Publishing, 2013.

Recommendations

Subjects that are recommended to be taken simultaneously

Quality management and control/V02G030V01911

Subjects that it is recommended to have taken before

Genetics II/V02G030V01505

Microbiology II/V02G030V01605

Advanced techniques in biology/V02G030V01504

Microbiology I/V02G031V01204

IDENTIFYING DATA				
Análise e diagnóstico medioambiental				
Subject	Análise e diagnóstico medioambiental			
Code	V02G031V01413			
Study programme	Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4	1c
Teaching language	Castelán			
Department				
Coordinator	Delgado Núñez, Cristina			
Lecturers	Calviño Cancela, María Delgado Núñez, Cristina Muñoz Sobrino, Castor Noguera Amoros, Jose Carlos Soto González, Benedicto			
E-mail	cdelgado.cristina@gmail.com			
Web				
General description	Esta materia pretende suministrar os coñecementos necesarios e ferramentas básicas para a análise e diagnóstico do medioambiente. Horarios: http://bioloxia.uvigo.es/es/docencia/horarios/			

Resultados de Formación e Aprendizaxe

Code				
A2	Que os estudantes saiban aplicar os seus coñecementos ao seu traballo ou vocación dunha forma profesional e posúan as competencias que adoitan demostrarse por medio da elaboración e defensa de argumentos e a resolución de problemas dentro da súa área de estudo.			
A3	Que os estudantes teñan a capacidade de reunir e interpretar datos relevantes (normalmente dentro da súa área de estudo) para emitir xuízos que inclúan unha reflexión sobre temas relevantes de índole social, científica ou ética.			
B2	Xestionar información científico-técnica de calidade utilizando fontes diversas. Analizar datos e documentos e interpretalos de forma crítica e rigorosa, incluíndo reflexións sobre a súa relevancia social e no ámbito profesional da Bioloxía.			
B4	Elaborar e redactar informes, documentos e proxectos relacionados coa Bioloxía. Proceder á súa presentación e debate no ámbito docente e especializado, poñendo de manifesto as competencias da titulación			
C1	Resolver problemas aplicando o método científico, os conceptos e a terminoloxía específica da Bioloxía, os modelos matemáticos e as ferramentas estatísticas e informáticas.			
C7	Muestrear, caracterizar, catalogar e xestionar recursos naturais e biolóxicos (poboacións, comunidades e ecosistemas).			
C8	Describir, avaliar e planificar o medio físico, usar bioindicadores e identificar problemas ambientais. Achegar solucións para o control, seguimento e restauración dos ecosistemas.			
C10	Identificar procesos biolóxicos e biotecnolóxicos e a súa posible aplicabilidade, en particular nos ámbitos sanitario, agroalimentario e ambiental.			
C12	Redactar informes e memorias técnicas, así como dirixir e executar proxectos en temas relacionados coa bioloxía e as súas aplicacións			
C21	Aplicar técnicas de análises e diagnóstico ambiental e desenvolver estudos de impacto ambiental. Propoñer medidas de prevención, protección e mitigación de efectos negativos sobre o medioambiente e realizar informe.			
C23	Comprender a proxección social da problemática ambiental nos seus diferentes niveis de aplicación (analítico, avaliación, xestión) e a súa repercusión no exercicio profesional			
D1	Comprender o significado e aplicación da perspectiva de xénero nos distintos ámbitos de coñecemento e na práctica profesional co obxectivo de alcanzar unha sociedade máis xusta e igualitaria.			
D2	Comunicarse por oral e por escrito en lingua galega.			
D3	Comprometerse coa sustentabilidade e medio ambiente. Uso de forma equitativa, responsable e eficiente dos recursos.			

Resultados previstos na materia

Expected results from this subject	Training and Learning Results			
Listar e recoñecer os principios básicos da Análise e Diagnóstico Ambiental.	C12			
Identificar os distintos tipos de mostras ambientais, as técnicas de mostraxe e asociar aos principais métodos analíticos que se empregan en análises e diagnóstico ambiental.	A2	B2	C7	D1
	A3	B4		
Adquirir os coñecementos necesarios para interpretar correctamente as probas analíticas.	A2		C1	D3
	A3			
Recoñecer a lexislación relativa a saúde e protección ambiental e Análise e Diagnóstico Ambiental.	A3	B2	C10	

Aplicar o coñecemento de análise e diagnóstico ambiental para illar, identificar, manexar e analizar espécimes e mostras de orixe biolóxica.	B4	C1	D3
Analizar e interpretar o funcionamento dos seres vivos.	B2	C1 C7	D2
Seleccionar e aplicar coñecementos e técnicas propios da Análise e Diagnóstico Ambiental en diferentes procesos relacionados coa xestión do medio ambiente.	A2 A3	B2 B4	C7 C8
Empregar coñecementos e tecnoloxía relativos á Análise e Diagnóstico Ambiental en aspectos relacionados coa análise e diagnóstico de procesos e recursos biolóxicos.	A3	B4	C10
Obter información, desenvolver experimentos e interpretar resultados.	A3	C7	D1 D3
Comprender a proxección social da Análise e Diagnóstico Ambiental e a súa repercusión no exercicio profesional.		C23	D1 D2 D3
Desenvolver coñecementos de Análises e Diagnóstico Ambiental para asesorar, supervisar e peritar sobre aspectos científico-técnicos, éticos, legais e socio-económicos relacionados cos seres vivos e medio ambiente.		C8 C21	
Coñecer e manexar os conceptos, terminoloxía e instrumentación científico-técnica relativos á Análise e Diagnóstico Ambiental.		C21	D1

Contidos

Topic	
Tema 1. 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 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 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 6: Análise e diagnóstico dos servizos ecosistémicos.	Parámetros indicadores e estado dos servizos ecosistémicos.
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 objetivas con preguntas tipo test e de resposta curta, nun exame final escrito.	40	A3	B2	C1 C10	D1 D3
Prácticas de laboratorio	Valoraranse mediante preguntas obxectivas os coñecementos adquiridos en prácticas mediante preguntas en cuestionarios que deberán ser entregados o profesorado.	30	A2	B4	C7 C8 C21	
Traballo tutelado	Os traballos tutelados evaluarase mediante a entrega dun primeiro borrador do traballo (con exposición oral) e dun traballo escrito. Valorarase a capacidade de análise, de síntese e de expresión, a relevancia da bibliografía consultada, así como o dominio dos temas tratados na asignatura.	20	A3	B2 B4	C7 C8 C10 C12	D2 D3
Debate	Debatirase na aula sobre diferentes temas de actualidade e sobre os traballos tutelados presentados polos diferentes grupos.	10		B2 B4	C8 C10 C23	D2

Other comments on the Evaluation

A asistencia a todas as sesións prácticas e a entrega das memorias de prácticas e obrigatoria. Precísase alcanzar unha nota mínima de 5 en cada unha das calificacións (exame final e traballo) para aprobar a asignatura. Se non se supera esa calificación 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.

Datas 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 optarase nesta materia, por unha avaliación non presencial con un exame escrito a realizar a través das plataformas da Universidade de Vigo ou un exame oral.

Bibliografía. Fontes de información

Basic Bibliography

Carretero Peña, A., **Aspectos ambientales. Identificación y evaluación**, 2ª edición, Aenor,

Capó, M., **Principios de ecotoxicología: Diagnóstico, tratamiento y gestión del medio ambiente**,

Darbra M., Ronza A., Casal J., Stojanovic T.A., Wooldridge C., **The Self Diagnosis Method: A new methodology to assess environmental management in sea ports**, Elsevier, 2004

Delgado C., Pardo I. & García L., **Diatom communities as indicators of ecological status in Mediterranean temporary streams (Balearic Islands, Spain)**, Elsevier, 2012

Complementary Bibliography

Aguiló Alonso, M. et al., **Guía para la elaboración de estudios del medio físico: contenido y metodologías.**, Ministerio de Medio Ambiente,

van de Bund, W.J. (ed.), **Water Framework Directive intercalibration technical report. Part 1: Rivers.**, JRC Scientific and Technical Reports,

Poikane, S. (ed.), **Water Framework Directive intercalibration technical report. Part 2: Lakes**, JRC Scientific and Technical Reports,

Newman, M.C., William Henry Clements, W. H. Boca Raton, **Ecotoxicology: a comprehensive treatment.**, CRC Press, Sibly, R. M.; Walker, C. H., **Principles of ecotoxicology**, CRC,

Lal, R., **Soil Quality and Agricultural Sustainability**, Ann Arbor Press,

Sullivan, P., **El Manejo Sostenible de Suelos**, NCAT,

Recomendacións

Subjects that are recommended to be taken simultaneously

Biodiversidade: Xestión e conservación/V02G030V01905

Avaliación de impacto ambiental/V02G030V01904

Xestión e conservación de espazos/V02G030V01910

Subjects that it is recommended to have taken before

Ecoloxía I/V02G030V01501

Ecoloxía II/V02G030V01601

IDENTIFYING DATA**Environmental impact evaluation**

Subject	Environmental impact evaluation			
Code	V02G031V01414			
Study programme	Grado en Biología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	1st
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	Olabarria Uzquiano, Celia			
Lecturers	Fernández Covelo, Emma Muñoz Sobrino, Castor Olabarria Uzquiano, Celia Velando Rodríguez, Alberto Luís			
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	
A2	Students should know how to apply their knowledge to their work or vocation in a professional way. They also should have the competences that are usually proved through the elaboration and defence of arguments and the resolution of problems within their study field.
A4	Students should able to communicate information, ideas, issues and solutions to all audiences (specialist and unskilled audience).
B2	Manage scientific-technical information using diverse and reliable sources. Analyze data and documents and interpret them critically and rigorously, including considerations on their social relevance and in the professional field of Biology.
B6	Develop analysis and synthesis, critical reasoning and argumentation skills, applying them in Biology and other scientific-technical disciplines.
C1	Solve problems by applying the scientific method, the concepts and terminology specific to biology, mathematical models and statistical and computer tools.
C7	Sampling, characterising, cataloguing and managing natural and biological resources (populations, communities and ecosystems).
C8	Describe, assess and plan the physical environment, use bio-indicators and identify environmental problems. Provide solutions for the control, monitoring and restoration of ecosystems.
C9	Identify resources of biological origin and assess their efficient and sustainable use in order to obtain products of interest. Propose and implement improvements in production systems.
C12	Writing reports and technical dossiers, as well as directing and executing projects on topics related to biology and its applications.
C14	Advise, assess and supervise scientific-technical, ethical, legal and socio-economic aspects related to biology and its applications.
C21	The ability to apply environmental analysis and diagnosis techniques and develop environmental impact studies. Propose measures for the prevention, protection and mitigation of negative effects on the environment and draw up reports.
C23	Understanding the social projection of environmental problems at different levels of application (analysis, evaluation, management) and their repercussions on professional practice.
D4	Collaborate and work in teams or multidisciplinary groups, promote negotiation skills and the ability to reach agreements.
D5	Communicate effectively and appropriately, including the use of computer tools and English.

Expected results from this subject

Expected results from this subject	Training and Learning Results			
To know the administrative procedure of Environmental Impact Assessment as a technical instrument for environmental management.	A2 A4	B2	C7 C12 C14 C23	D4 D5
To identify, predict and assess in an integrated manner the impacts on ecosystems, their components, natural resources and the quality of human life in the execution of projects, works and installations, as well as their alternatives.	A2	B2	C7 C8 C9 C21 C23	D4
To identify the measures for the prevention, protection, correction and compensation of the negative effects on the environment of the execution of projects, works and installations.	A2	B2 B6	C1 C12 C14 C21	D5
Knowing the methods for monitoring environmental impacts and being able to assess the effectiveness of corrective measures of environmental impacts of projects, works and installations.	A2	B2 B6	C7 C21	D4 D5
Applying knowledge of Environmental Impact Assessment to identify, handle and analyze specimens and samples of biological origin.	A2 A4		C7	
Applying knowledge and techniques of Environmental Impact Assessment in different processes related to environmental management.	A4	B2 B6	C2 C5 C14 C21 C23	D3 D5
Applying knowledge and technology related to Environmental Impact Assessment in aspects related to the quality control of environmental impact studies, corrective measures projects and monitoring reports.	A2	B2	C9 C14 C23	D4
To obtain information, develop experiments and interpret results.	A2	B2 B6	C1 C9	D4
To understand the social projection of Environmental Impact Assessment and its repercussions on professional practice.	A4	B2	C23	D5
To know and use the concepts, terminology and scientific-technical instrumentation related to Environmental Impact Assessment.	A2	B2	C7 C8 C9 C21	D4 D5

Contents

Topic	
Block A. Conceptual and practical bases professional of the Evaluation of environmental impact (EIA)	1. Conceptual and objective bases of the evaluation of environmental impact (EIA). The paper of the EIA in the management of the natural resources: environmental strategic evaluation (ESE), environmental auditing (EA). General concepts: environment, impact, evaluation. Typology of the impacts. Typology of the evaluations. (2 hours) 2. The study of environmental impact (EIS).- Objective and structure. Organisational aspects of the EIS: group 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, archaeologic, employment, economic cost of the degradation).- Election of the relevant factors , calculation of socioeconomic environmental indexes, methodology of measurement of socioeconomic factors. Identification and prediction of impacts. (2 hours)
10. Phase 4 of the EIS (continuation): assessment of impacts.- Quantitative assessment, qualitative assessment. Uncertainty of the assessment. Integration of impacts (functions of transformation). (4 hours)
11. Phase 5 of the EIS.- Establishment of protective and corrective measures of the EIS.- Program of environmental surveillance. (1 hour)
13. Phase 7 of the EIS.- Document of synthesis. (1 hour)

Planning			
	Class hours	Hours outside the classroom	Total hours
Mentored work	0	26	26
Studies excursion	2.5	1.5	4
Laboratory practical	7.5	7.5	15
Lecturing	25	75	100
Problem and/or exercise solving	2	0	2
Essay	1	0	1
Systematic observation	1	0	1
Presentation	1	0	1
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Mentored work	The work consists in that the students in groups of reduced size (3-4) will carry out an environmental impact assessment study based on a real case study. This work includes the presentation of a written report and a brief oral defence (10 minutes) in front of the rest of students and lecturers.
Studies excursion	The field course will be around the lake at Campus Lagoas-Marcosende and in the Budiño Gandaras. Students will do a matrix to evaluate impacts
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 will be done.
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	A2	B2	C1	B6 C12
Essay	The written report will be evaluated. The written report (4 points, 40% of the final note) will be evaluated in three phases: first draft (5%), second draft (10%) and final report (25%).	40	A4	B2	C1	D4 B6 C7 D5 C8 C9 C12 C14 C21 C23
Systematic observation	The attendance and active participation of students in theoretical classes, demonstrations and seminars will be taken into account. The exercises proposed by the teachers will also be taken into account. Attendance at demonstrations is compulsory and students must attend at least 90% of the demonstrations and seminars so that this methodology can be evaluated.	5		B2	C1	D5 C7 C12
Presentation	The oral presentation will be evaluated (2 points, 20%). The oral defence of the written report will be done during 10 minutes in presence of the rest of the students and of the teaching staff of the subject. After the oral defence, there will be a turn of questions of 5 minutes.	20	A2	B2	C1	D4 A4 B6 C8 D5 C21

Other comments on the Evaluation

In order to pass the subject, the student must pass each of the parts independently, and for this they must obtain a score of at least half the value of each one of them. If the student fails any of the parts, the final grade is divided by 2. For the July call, the pass will be kept in each of the parts considered in the evaluation system (theory and essay). Once the course is finished, in the case of failing in the two available calls, enrolling in the new course requires repeating everything.

The qualification of **Not presented** is considered when the student body does not appear for the theory exam and/or does not participate in some of the phases of the essay (delivery of reports and/or oral presentation of the essay).

Assistance to laboratory demonstrations and field trip:

In the case of unjustified absences to these sessions, there will be no right to recover these methodologies in the second opportunity (July call).

Exam dates:

The official dates of the exams, updated and approved by the Xunta de Facultade, can be consulted at <http://bioloxia.uvigo.es/es/docencia/examen>

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

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- 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>,
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- Ministerio de Medio Ambiente, **Libro blanco de la educación ambiental en España en pocas palabras**, Gestión y Estudios Ambientales, S. C. L., 1999
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- Hawkins, A.D., Pembroke, A.E., Popper, A.N., **Information gaps in understanding the effects of noise on fishes and invertebrates**, 25, Review in Fish Biology and Fisheries, 2015
- 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
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- 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

Drafting and execution of projects/V02G030V01801

Subjects that are recommended to be taken simultaneously

Environmental analysis and diagnosis/V02G030V01902

Pollution/V02G030V01906

Management and Conservation of spaces/V02G030V01910

Subjects that it is recommended to have taken before

Ecology I/V02G030V01501

Ecology II/V02G030V01601

IDENTIFYING DATA				
Biodiversidade: Xestión e conservación				
Subject	Biodiversidade: Xestión e conservación			
Code	V02G031V01415			
Study programme	Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4	1c
Teaching language	Inglés			
Department				
Coordinator	Garrido González, Josefa			
Lecturers	Caballero Rúa, Armando Garrido González, Josefa Gomez Brandon, Maria Navarro Echeverría, Luis			
E-mail	jgarrido@uvigo.es			
Web				
General description	Estudo dos conceptos básicos que implican coñecer a xestión e conservación da biodiversidade			
	http://bioloxia.uvigo.es/gl/docencia/horarios			

Resultados de Formación e Aprendizaxe	
Code	
A2	Que os estudantes saiban aplicar os seus coñecementos ao seu traballo ou vocación dunha forma profesional e posúan as competencias que adoitan demostrarse por medio da elaboración e defensa de argumentos e a resolución de problemas dentro da súa área de estudo.
A3	Que os estudantes teñan a capacidade de reunir e interpretar datos relevantes (normalmente dentro da súa área de estudo) para emitir xuízos que inclúan unha reflexión sobre temas relevantes de índole social, científica ou ética.
A5	Que os estudantes desenvolven aquelas habilidades de aprendizaxe necesarias para emprender estudos posteriores cun alto grao de autonomía.
B1	Desenvolver a aprendizaxe autónoma, identificando as súas propias necesidades formativas e organizando e planificando as tarefas e o tempo.
B3	Aplicar o coñecemento adquirido na titulación e empregar a instrumentación científico-técnica e as TIC en contextos propios da Bioloxía e/ou no exercicio da profesión.
B6	Desenvolver as capacidades de análises e sínteses, de razoamento crítico e argumentación, aplicándoas en contextos propios da Bioloxía e outras disciplinas científico-técnicas.
C7	Muestrear, caracterizar, catalogar e xestionar recursos naturais e biolóxicos (poboacións, comunidades e ecosistemas).
C13	Impartir formación, participar en proxectos de I+D+i, comunicar resultados e divulgar coñecementos. Contribuír á proxección social da Bioloxía e á sensibilización polo medio ambiente
C22	Organizar e xestionar espazos naturais e realizar estudos de biodiversidade. Establecer criterios para a conservación e restauración de ecosistemas e planificar o uso sostible dos seus recursos
C23	Comprender a proxección social da problemática ambiental nos seus diferentes niveis de aplicación (analítico, avaliación, xestión) e a súa repercusión no exercicio profesional
D2	Comunicarse por oral e por escrito en lingua galega.
D3	Comprometerse coa sustentabilidade e medio ambiente. Uso de forma equitativa, responsable e eficiente dos recursos.
D4	Colaborar e traballar en equipo ou en grupos multidisciplinares, fomentar a capacidade de negociación e de alcanzar acordos.
D5	Comunicar de maneira eficaz e adecuada, incluíndo o uso de ferramentas dixitais e o inglés.

Resultados previstos na materia	
Expected results from this subject	Training and Learning Results
Coñecer as diferentes formas de expresión, avaliación e significado da diversidade biolóxica de diferentes niveis de organización (poboacións, ecosistemas, paisaxe).	A2 B1 C7 D2
	A3 B3 C13 D3
	A5 B6 C22 D4 C23 D5
Aprender a diferenciar os instrumentos técnicos de xestión e conservación de poboacións, especies e comunidades biolóxicas.	A3 B1 C7 D3
	A5 B3 C22 D4
	B6
Coñecer os factores de control e estratexias de conservación e uso da diversidade de especies dos ecosistemas.	A3 B1 C7 D3
	A5 B3 C22
	B6 C23

Comprender os efectos de especies invasoras e pragas sobre a conservación da biodiversidade e as técnicas de control biolóxico en ecosistemas naturais e explotados polo home.	A3 A5	B1 B3 B6	C7 C13 C22 C23	D3
Aplicar o coñecemento da biodiversidade para identificar, manexar e analizar espécimes e mostras de orixe biolóxica.	A3 A5	B1 B3 B6	C7 C23	D3 D5
Analizar e interpretar o comportamento dos seres vivos e a súa adaptación ao medio.	A5	B3	C7 C22	D3
Aplicar coñecementos e técnicas propios da biodiversidade en diferentes procesos relacionados coa xestión do medio.	A3 A5	B1 B3 B6	C7 C13 C22 C23	D3
Obter información, desenvolver experimentos e interpretar resultados.	A3 A5	B1 B6	C13 C23	D4 D5
Comprender a proxección social da biodiversidade e a súa repercusión no exercicio profesional.	A2 A3 A5	B1 B3 B6	C13 C23	D5
Coñecer e manexar os conceptos, terminoloxía e instrumentación científico-técnica relativos á biodiversidade.	A2 A3 A5	B3	C7 C23	D3 D4

Contidos

Topic	
FUNDAMENTOS CONCEPTUAIS DA BIODIVERSIDADE	Biodiversidade: Conceptos básicos. Indicadores e medidas da biodiversidade. Biodiversidade e Ecosistemas
CAUSAS E CONSECUENCIAS DA PERDA DE BIODIVERSIDADE	Patróns de extinción e ameazas á Biodiversidade. Impacto biolóxico do cambio global.
XESTIÓN E CONSERVACIÓN DA DIVERSIDAD BIOLÓXICA	Conservación e seguimento de poboacións e especies. Xenética da Conservación. Ferramentas para o inventario de flora e fauna. Seguimento de poboacións de plantas e animais. Plans de conservación de especies. Biodiversidade e Sociedade.

Planificación

	Class hours	Hours outside the classroom	Total hours
Prácticas con apoio das TIC	4	8	12
Traballo tutelado	3	24	27
Lección maxistral	23	46	69
Prácticas de campo	20	20	40
Exame de preguntas obxectivas	2	0	2

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

Metodoloxía docente

	Description
Prácticas con apoio das TIC	Analízanse datos simulados e reais de genealoxías 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 realízase nas saídas ao campo, así como no laboratorio no momento de realizar as identificacións da fauna e flora recollidas. Nestas actividades, a función do profesor é orientar no proceso de aprendizaxe do alumnado e axudalo a realizar con éxito o traballo autónomo correspondente.

Avaliación							
	Description	Qualification	Training and Learning Results				
Prácticas con apoio das TIC	Avaliaranse as prácticas realizadas na Aula de Informática xunto coas prácticas de campo.	5	A2	B1	C7	D2	
			A3	B3	C22	D4	
			A5	B6	C23	D5	
Traballo tutelado	O traballo realizado polo alumno será avaliado, ben individualmente ou en grupo, en función do número de alumnos matriculados.	20	A2	B1	C7	D2	
			A3	B3	C22	D4	
			A5	B6	C23	D5	
Prácticas de campo	Avaliaranse as saídas de campo e os traballos no laboratorio (o valor é do 35% para as áreas de Zooloxía e Botánica).	35	A2	B1	C7	D2	
			A3	B3	C13	D3	
			A5	B6	C22	D4	
					C23	D5	
Exame de preguntas obxectivas	O exame final consistirá en preguntas sobre os distintos conceptos ou tarefas desenvolvidas en calquera das actividades da materia. Computará o 40% da nota global.	40	A2	B1	C13	D2	
			A3	B3		D5	
			A5	B6			

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 acollerse a unha única avaliación global, entendendo como tal a que se realiza nun só acto académico, que poderá incluír tantas probas como necesario acreditar que o alumnado adquiriu todos os Resultados de Formación e Aprendizaxe descritos nesta Guía Docente.

O calendario de exames e horarios pódese consultar nas seguintes ligazóns:

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

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

Bibliografía. Fontes de información

Basic Bibliography

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

Bioloxía: Ferramentas informáticas en bioloxía/V02G031V01110

Bioloxía: Técnicas básicas de campo/V02G031V01109

Estatística: Bioestatística/V02G031V01107

Botánica I: Algas e fungos/V02G031V01202

Botánica II: Arquegoniadas/V02G031V01207

Zooloxía I: Invertebrados non artrópodos/V02G031V01205

Zooloxía II: Invertebrados artrópodos e cordados/V02G031V01210

Ecoloxía I/V02G031V01301

Ecoloxía II/V02G031V01306

Xenética II/V02G031V01304

IDENTIFYING DATA				
Management and Conservation of spaces				
Subject	Management and Conservation of spaces			
Code	V02G031V01416			
Study programme	Grado en Biología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	1st
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	Calviño Cancela, María			
Lecturers	Calviño Cancela, María Soto González, Benedicto			
E-mail	maria@uvigo.es			
Web				
General description	This subject is focused on natural areas, their management and conservation, as a basis for an ecosystem-centered conservation of biodiversity, in contrast with the the more conventional approach of species-centered conservation. The subject encompasses general topics about natural areas, types of protected areas and general principles for their design and planning, their socio-economic context as well as planning and management tools. English Friendly subject: International students may request from the teachers: a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English. Schedules: http://bioloxia.uvigo.es/gl/docencia/horarios			

Training and Learning Results	
Code	
A2	Students should know how to apply their knowledge to their work or vocation in a professional way. They also should have the competences that are usually proved through the elaboration and defence of arguments and the resolution of problems within their study field.
A3	Students should prove ability for information-gathering and interpret important data (usually within their study field) to judge relevant social, scientific or ethical topics.
A5	Students should develop the necessary learning skills to undertake further studies with a high degree of autonomy.
B1	Developing autonomous learning by identifying their own training need and organizing and planning tasks and time.
B4	Draft and write reports, documents and projects related to Biology. Proceed to their presentation and debate in the teaching and specialized areas, highlighting the competences of the degree.
B6	Develop analysis and synthesis, critical reasoning and argumentation skills, applying them in Biology and other scientific-technical disciplines.
C7	Sampling, characterising, cataloguing and managing natural and biological resources (populations, communities and ecosystems).
C8	Describe, assess and plan the physical environment, use bio-indicators and identify environmental problems. Provide solutions for the control, monitoring and restoration of ecosystems.
C12	Writing reports and technical dossiers, as well as directing and executing projects on topics related to biology and its applications.
C22	The ability to organise and manage natural spaces and carry out biodiversity studies. Establish criteria for the conservation and restoration of ecosystems and plan the sustainable use of their resources.
C23	Understanding the social projection of environmental problems at different levels of application (analysis, evaluation, management) and their repercussions on professional practice.
D1	Understand the meaning and use of the gender perspective in the different fields of knowledge and in professional practice with the aim of achieving a fairer and more equal society.
D2	Communicate speaking and in writing in Galician.
D3	Commitment to sustainability and the environment. Equal, sensible and efficient use of resources.

Expected results from this subject		
Expected results from this subject	Training and Learning Results	
To know the principles of global sustainability and the importance of environmental management for sustainable development.	C23	D2
To know the ecological criteria and techniques for the management and restoration of ecosystems and the conservation of natural resources.	C22	D2

To be able to differentiate the control factors of landscape architecture and the instruments of protection and conservation.	A2 A3 A5	C8 C22	D2 D3
To know the instruments of territorial planning and the methods of evaluation of its aptitudes and management.	A2 A3 A5	C7 C8	D1 D2 D3
To be aware of how protected areas are selected, designed and managed.		C22	D1 D2 D3
Applying knowledge and techniques specific to the management and conservation of spaces in different processes related to environmental management.	A2	C8 C22	D1
To obtain information, develop experiments and interpret results.	A2 A3 A5	B1 B4 B6	C8
Understanding the social projection of the management and conservation of spaces and its repercussions on professional practice.		C23	D1 D2 D3
To know and use the concepts, terminology and scientific-technical instruments related to the management and conservation of spaces.	A2 A3	C8 C12	

Contents

Topic

Part I. Soil and Water Conservation	Chapter 1. Soil degradation and loss. Chapter 2. Soil Conservation Methods. Chapter 3. Land planning tools. Chapter 4. Water Conservation. Chapter 5. River and Riverbank Restauration.
Part II. Habitat loss, biological integrity and ecosystem conservation.	Chapter 6. Habitat destruction, fragmentation and degradation. Chapter 7. Ecosystem-centred conservation.
Part III. Ecosystem Management and Restauration.	Chapter 8. Principles of ecosystem management, uncertainty, and adaptive management. Chapter 9. Replacement, rehabilitation, restauration and improvement of ecosystems.
Part IV. Selection, design and planning of protected areas.	Chapter 10. Selection of priority conservation areas. Chapter 11. Principles of protected area design. Chapter 12. Protected areas types and uses. Chapter 13. Socio-economic aspects of protected areas. Protected areas planning: planning tools in the Spanish legislation.
Field trip and computer session.	We will make a field trip to a protected natural area with diverse uses and aims in order to familiarize become familiar with its management. We will make one computer session to work with useful tools for management and planning of protected natural areas.

Planning

	Class hours	Hours outside the classroom	Total hours
Seminars	3	0	3
Field practice	11	0	11
Practices through ICT	3	0	3
Problem solving	6	0	6
Mentored work	2	30	32
Lecturing	12	34	46
Lecturing	13	36	49

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

Methodologies

	Description
Seminars	Critical discussions about controversies related with natural areas conservation and management.
Field practice	Field trip to a protected natural area with diverse uses and aims in order to familiarize become familiar with its management.
Practices through ICT	Computer session to work with useful tools for management and planning of protected natural areas.
Problem solving	Pblems to familiarize students with concepts related to conservation and management of soil and water.
Mentored work	The students will prepare an assignment related to topics of interest for conservation and management of natural areas.

Lecturing	All subject chapters will be explained in the class.
Lecturing	Explanation by the teacher of the theoretical syllabus of Blocks II, III and IV, taught by the Area of Ecology.

Personalized assistance

Methodologies	Description
Lecturing	All the students queries related to this part will be attended in the class or tutorials, done by appointment requested by email to the teachers: maria@uvigo.es and edbene@uvigo.es, also available at https://moovi.uvigo.gal/ .
Seminars	All the students queries related to this part will be attended in the class or tutorials, done by appointment requested by email to the teachers: maria@uvigo.es and edbene@uvigo.es, also available at https://moovi.uvigo.gal/ .
Field practice	All the students queries related to this part will be attended in the class or tutorials, done by appointment requested by email to the teachers: maria@uvigo.es and edbene@uvigo.es, also available at https://moovi.uvigo.gal/ .
Practices through ICT	All the students queries related to this part will be attended in the class or tutorials, done by appointment requested by email to the teachers: maria@uvigo.es and edbene@uvigo.es, also available at https://moovi.uvigo.gal/ .
Mentored work	All the students queries related to this part will be attended in the class or tutorials, done by appointment requested by email to the teachers: maria@uvigo.es and edbene@uvigo.es, also available at https://moovi.uvigo.gal/ .
Problem solving	All the students queries related to this part will be attended in the class or tutorials, done by appointment requested by email to the teachers: maria@uvigo.es and edbene@uvigo.es, also available at https://moovi.uvigo.gal/ .
Lecturing	

Assessment

	Description	Qualification	Training and Learning Results			
Practices through ICT	The students will have to solve an exercise in the computer session that will be assessed.	5	A2 A3 A5	B6	C7 C8	
Problem solving	The approach used to solve the problem as well as the correction of the result will be assessed.	10	A2 A3 A5	B1 B4 B6	C8 C12	D1 D2 D3
Mentored work	The assessment of this part will be based on the ability for synthetize, analyse and correctly express in writing the contents of the topic chosen as well as knowledge on the topics relevant to the subject.	20	A2 A3 A5	B1 B4 B6	C7 C8 C12 C22 C23	
Lecturing	The assessment of this part will be based on the knowledge the student has acquired on the topics explained in the lectures regarding Part I, given by the Area of Edaphology, as demonstrated in a short-questions exam.	26	A2 A3 A5	B6	C7 C8	
Lecturing	The assessment of this part will be based on the knowledge the student has acquired on the topics explained in the lectures regarding Parts II, III and IV, given by the Area of Ecology, as demonstrated in a short-questions exam.	39	A2 A3 A5	B6	C7 C8	

Other comments on the Evaluation

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

Complementary Bibliography

Ausden, Malcolm, **Habitat management for conservation : a handbook of techniques**, 2007,
Calviño Cancela, María, **Conservación de espacios protegidos**, Ecología, Conservación I,
Eagles, Paul F. J., **Turismo sostenible en áreas protegidas: directrices de planificación y gestión.**,
Lucas, P. H. C., **Protected landscapes : a guide for policy-makers and planners**, Chapman & Hall,
Mitsch & Jorgensen, **Ecological Engineering and Ecosystem Restoration**,
Shafer, Craig L., **Nature reserves : island theory and conservation practice**, Smithsonian Institution Press,
Thomas & Packham, **Ecology of Woodlands and Forests**,
Dudley, N., **Directrices para la aplicación de las categorías de gestión de áreas protegidas**,
Begon, M.; Harper, J.L.; Townsend, C.R., **Ecología**,
Bennet, A.F., **Enlazando el paisaje. El papel de los corredores y la conectividad en la conservación de la vida silvestre**,
Chape, S.; Spalding, M.; Jenkins, M., **The world's protected areas. Status values and prospects in the 21st century**,
Hunter, M.L.; Gibbs, J., **Fundamentals of conservation biology**,
Primack, R.B.; Ros, J., **Introducción a la biología de la conservación**,
Sodhi, Navjot S.; Ehrlich, Paul R., **Conservation Biology for all**,
Whittaker, J.; Fernandez-Palacios, J.M., **Island biogeography. Ecology, evolution and conservation**,
Sutherland, William; Hill, David, **Managing Habitats for Conservation**,
Richard J. Hobbs, Eric S. Higgs, Carol M. Hall, **Novel ecosystems : intervening in the new ecological world order**, 2013

Recommendations

Subjects that are recommended to be taken simultaneously

Environmental analysis and diagnosis/V02G030V01902
Biodiversity: management and conservation/V02G030V01905
Environmental impact evaluation/V02G030V01904

Subjects that it is recommended to have taken before

Ecology I/V02G030V01501
Ecology II/V02G030V01601

IDENTIFYING DATA				
Internships				
Subject	Internships			
Code	V02G031V01981			
Study programme	Grado en Biología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	#EnglishFriendly Spanish Galician English			
Department				
Coordinator	Pérez Fernández, Juan			
Lecturers	Pérez Fernández, Juan			
E-mail	jperezf@uvigo.es			
Web	http://cursos.faitic.uvigo.es/tema1516/claroline/course_description/index.php			
General description	The internships will allow students to acquire skills related to the performance of the biologist's professional profiles. In addition, this subject will facilitate direct contact between the Faculty and the professional world, to which the graduates should be incorporated. English Friendly subject: International students may request from the teachers: a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.			

Training and Learning Results	
Code	
A2	Students should know how to apply their knowledge to their work or vocation in a professional way. They also should have the competences that are usually proved through the elaboration and defence of arguments and the resolution of problems within their study field.
A3	Students should prove ability for information-gathering and interpret important data (usually within their study field) to judge relevant social, scientific or ethical topics.
B2	Manage scientific-technical information using diverse and reliable sources. Analyze data and documents and interpret them critically and rigorously, including considerations on their social relevance and in the professional field of Biology.
B3	Apply the knowledge acquired in the degree and use the scientific-technical instrumentation and CIT in contexts of Biology and/or related to the professional practice.
B4	Draft and write reports, documents and projects related to Biology. Proceed to their presentation and debate in the teaching and specialized areas, highlighting the competences of the degree.
B5	Develop capacities for creativity, innovation and entrepreneurship, in academic and social relevant fields as well as in interaction with the productive sector.
B7	To aim for quality objectives in the development of the activity done and incorporate ethical principles, which should prevail in the professional practice of Biology.
C1	Solve problems by applying the scientific method, the concepts and terminology specific to biology, mathematical models and statistical and computer tools.
C12	Writing reports and technical dossiers, as well as directing and executing projects on topics related to biology and its applications.
C13	Provide training, participate in R+D+i projects, communicate results and disseminate knowledge. Contribute to the social projection of biology and to raising awareness of the environment.
D1	Understand the meaning and use of the gender perspective in the different fields of knowledge and in professional practice with the aim of achieving a fairer and more equal society.
D5	Communicate effectively and appropriately, including the use of computer tools and English.

Expected results from this subject				
Expected results from this subject	Training and Learning Results			
To gain experience of the socio-occupational environment related to the fields of Biology and understand the applicability of the knowledge acquired throughout the degree.	A2	B2		
	A3	B5		
		B7		
To obtain information, develop experiments and interpret results.	A3	B2	C1	
		B3		
To take part in the execution of projects related to Biology.	A3	B2	C1	D5
		B3	C12	
		B4	C13	
		B5		
		B7		
Understanding the social projection of External Internships and their repercussions on professional practice.	B7	C13	D1	

Contents

Topic

The student will carry out an internship in some labour and professional real environments related with any of the fields in Biology (environment, production, health, research, development and innovation, etc), under the supervision of a tutor in the host institution and a tutor in the Faculty.

Planning

	Class hours	Hours outside the classroom	Total hours
Practicum, External practices and clinical practices	120	0	120
Report of practices, practicum and external practices(Repetida non usar)	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, it will devote 30 hours of work for 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(Repetida non usar)	Each student will have a tutor in the faculty (academic tutor) who will guide the student with the editorial of the internship memory.

Assessment

	Description	Qualification	Training and Learning Results			
Practicum, External practices and clinical practices	Daily follow-up by the tutor of the receptor institution ("external" tutor) of the activity developed by the student during the period of the internship. Then, the "external" tutor will evaluate the activity developed by the student during the period of the internship.	75	A2 A3	B2 B3 B4 B5 B7	C1 C13	D1 D5
Report of practices, practicum and external practices(Repetida non usar)	The "academic" tutor will review and will evaluate the memory of the internship drafted by the student. The "academic" tutor will do the final grade of the internship by considering the report of the tutor of the receptor institution (75 %) and the final memory drafted by the student (25 %).	25	A2	B2 B4	C12 C13	D5

Other comments on the Evaluation

The adjudication of honours will be between those students coursing the curricular internship and having the best qualifications. For this, those that wish to opt to the honour will have to do an oral presentation and defence of the internship memory in front of a committee

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.

The memory of the internship and the reports can be sent in pdf format by email.

Sources of information**Basic Bibliography****Complementary Bibliography**

Recommendations

Other comments

The student has to have surpassed a minimum of 120 ECTS to be allowed to initiate his/her external curricular internship.
The rule for the external extracurricular internship also contemplates the same requirement.

IDENTIFYING DATA				
Final Year Dissertation				
Subject	Final Year Dissertation			
Code	V02G031V01991			
Study programme	Grado en Biología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	12	Mandatory	4th	2nd
Teaching language	Spanish Galician			
Department				
Coordinator	Míguez Miramontes, Jesús Manuel			
Lecturers	Míguez Miramontes, Jesús Manuel			
E-mail	jmmiguez@uvigo.es			
Web	http://http://bioloxia.uvigo.es/gl/docencia/traballo-fin-de-grao			
General description	The Final Degree Project is part of the module called as "Work and Project End of Degree", which is completed in the last year of the degree program in Biology. The subject Final Degree Project consists of a work that each student will carry out autonomously under teacher tutoring, and will allow to demonstrate in an integrated way the acquisition of competences and skills associated with the title. Compliance with the regulations approved for the project is mandatory for all students of this subject. The management of all the processes corresponds to the Final Degree Project Committee, which has been appointed for this proposal by the Faculty. The subject does not have a fixed schedule in the academic calendar since all the activities can be develop throughout the second semester of the academic year.			

Training and Learning Results

Code	
A2	Students should know how to apply their knowledge to their work or vocation in a professional way. They also should have the competences that are usually proved through the elaboration and defence of arguments and the resolution of problems within their study field.
A3	Students should prove ability for information-gathering and interpret important data (usually within their study field) to judge relevant social, scientific or ethical topics.
A4	Students should able to communicate information, ideas, issues and solutions to all audiences (specialist and unskilled audience).
B1	Developing autonomous learning by identifying their own training need and organizing and planning tasks and time.
B2	Manage scientific-technical information using diverse and reliable sources. Analyze data and documents and interpret them critically and rigorously, including considerations on their social relevance and in the professional field of Biology.
B3	Apply the knowledge acquired in the degree and use the scientific-technical instrumentation and CIT in contexts of Biology and/or related to the professional practice.
B4	Draft and write reports, documents and projects related to Biology. Proceed to their presentation and debate in the teaching and specialized areas, highlighting the competences of the degree.
B6	Develop analysis and synthesis, critical reasoning and argumentation skills, applying them in Biology and other scientific-technical disciplines.
B7	To aim for quality objectives in the development of the activity done and incorporate ethical principles, which should prevail in the professional practice of Biology.
C1	Solve problems by applying the scientific method, the concepts and terminology specific to biology, mathematical models and statistical and computer tools.
C10	Identify biological and biotechnological processes and their potential applications, in particular in health, agri-food and environmental fields.
C12	Writing reports and technical dossiers, as well as directing and executing projects on topics related to biology and its applications.
C13	Provide training, participate in R+D+i projects, communicate results and disseminate knowledge. Contribute to the social projection of biology and to raising awareness of the environment.
C14	Advise, assess and supervise scientific-technical, ethical, legal and socio-economic aspects related to biology and its applications.
D1	Understand the meaning and use of the gender perspective in the different fields of knowledge and in professional practice with the aim of achieving a fairer and more equal society.
D3	Commitment to sustainability and the environment. Equal, sensible and efficient use of resources.
D5	Communicate effectively and appropriately, including the use of computer tools and English.

Expected results from this subject

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

To display the knowledge acquired in the degree and apply it to develop a project in the field of biology.	A2	B3 B4	C1 C10	D3
To apply the principles of the scientific method in the planning of a project and in work habits.	A2	B2	C1	D1
To manage ICT, carry out bibliographic searches and organize information on a project topic.	A3	B2 B3	C1	D3 D5
Ability to plan the work by adapting to previously stipulated objectives and deadlines.	A2	B1 B7		D3 D5
Working autonomously and following guidelines agreed with the supervisor.	A2	B1		
To interpret the results achieved in a project and write reports.	A3 A4	B2 B4	C10 C12 C14	D3 D5
To expose results publicly and debate them using scientific arguments.	A4	B2 B4 B6	C13	D5
To understand the social projection of Biology and its impact on the exercise of the profession.	A2 A4	B6 B7	C10 C12 C13 C14	D1 D3 D5

Contents

Topic

The subject Final Project will be organized on the (*)-basis of three activities that the student must perform properly:

1. Development of an original work related to one of the multiple fields of the working world of a biologist.

The works will be done under the supervision of a professor (tutor) assigned to the subject.

There are different types of final degree project for which students can choose:

-Type A: offered by professors of the degree. At the beginning of the academic year students should opt for a project theme among those offered. The Final Degree Project Committee will establish the norms and terms that will govern the award to the students of the topics proposed by the professors.

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

-Type C: proposed by students to be carried out in institutions other than the UVIGO with which there is an agreement. This type of work will imply the existence of an academic tutor from the institution and a person from the external entity who will act as a co-tutor.

-Type D: subject to students with special educational needs.

-Type E: developed by students within the framework of a mobility program.

The particular characteristics of each of these types of work, as well as the rules that govern them, are included in the regulations of the Final Degree Project in Biology.

2. Delivery of a written report in time. It will be focus on the project carried out by the student.

3. Presentation and defense of the work before an evaluation tribunal that will evaluate and qualify it.

The type of project should be limited to these sections:

-Experimental work that is developed in the laboratories of the center or in other research centers of the UVIGO of biological scope.

-Theoretical development (design, planning, applicability) of a project of economic, social, environmental, educational interest, etc., related to the field of biology, or technology based on biology.

-Review and bibliographical research work whose objective is a possible practical application (initial study for a project, innovative case, etc.)

-Other works corresponding to the offer of professors that do not specifically comply with the above modalities. They must be approved by the Final Degree Project Committee.

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

The characteristics of the report and the deadlines for delivery will be established sufficiently in advance by the Final Degree Project Committee.

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 address to a model used in the 2021-22 academic course, which can serve as a reference for the 2022-23 academic course. http://bioloxia.uvigo.es/docs/docencia/grado/tfg/TFG_informe_tutor.pdf	30	A2 B1 C1 D1 A3 B2 C10 D3 B3 C12 D5 B4 C14 B6 B7	
Project	The student must submit a report of the project in which the main details of the work done are included. In the following link it is possible to check the rules for the elaboration of the report in force in the academic year 2022-23, which can be used as a reference for the academic year 2023-24. https://bioloxia.uvigo.es/gl/docencia/traballo-fin-de-grao/ will be 0 points.	40	A2 B1 C1 D1 A3 B2 C10 B3 C12 B4 C14 B6 B7	
Presentation	The student must make a presentation of the project before the tribunal and discuss with its members about the aspects of the work done.	30	A4 B1 C1 D5 B4 C13 B7	

Other comments on the Evaluation

End of Degree Project Evaluation Board

It will consist of three professors of the degree and will be appointed at the proposal of the Final Degree Project Committee. As many boards as necessary will be set up, with their corresponding alternate members, to guarantee the proper conduct of the evaluation process.

End of Degree Project report

With sufficient time in advance, the TFG Committee will establish the deadlines for the submission of the defense application and the TFG report. Failure to submit the TFG report within the established deadlines will result in the non submission to the evaluation process of the subject. The guidelines included in the norms for the preparation of the TFG report, which will be published on the faculty website and on the teaching platform, will be followed.

Presentation and defense of the Final Degree Project

The Evaluating Board will publish in advance the score criteria, the exhibition order, place and time of celebration, being available to all students.

Ratings

At the end of the evaluation process, the Evaluation Board will publish jointly the grades received by the students enrolled in the subject.

If a student obtains a grade of suspense, the evaluating committee will give him and his tutor a report gathering the recommendations to improve the work towards a later evaluation. In particular, it will be emphasized if the negative grade obtained by the student can be recovered in a second opportunity of the same course or if, on the contrary, the student must complete all the work in another academic year.

Second call

The student may recover in a second opportunity of the same term those aspects that did not exceed in the first, as long as the report obtained by the Evaluating Board in that first opportunity so specified.

The Final Degree Project Committee will establish and make public in advance the terms that will govern the evaluation process in the second opportunity. It will include the deadlines for the submission of the defense request and the tutor's report. I will also specify the date, place and time of the presentation and defense of the project to the Committee.

Schedule:

The final degree project does not have an established schedule; each student will establish their schedule according to the supervisor, usually during the second term of the academic year.

Dates scheduled for the evaluation of the TFGs for the 2023-24 academic year:

Official dates were approved in the Faculty Board. See link: <http://bioloxia.uvigo.es/es/docencia/examenos>

Applicable regulations:

The Final Degree Project Regulations of the University of Vigo, approved in "Consello de Goberno" is available at: http://www.uvigo.gal/opencms/export/sites/uvigo/uvigo_gl/DOCUMENTOS/alumnado/TFGNovo_Def_Uvigo.pdf

The Regulations of the Faculty of Biology for the completion of the Final Degree Project, approved in "Xunta de Facultade" is available at: http://bioloxia.uvigo.es/docs/docencia/grado/tfg/normativa_TFG_facultad_biologia.pdf

Ethical issues

Plagiarism will be strictly prosecuted in the final degree projects, especially in the elaboration of the final report, being a reason for failure in the subject. The unjustified use of artificial intelligence programs is not allowed either.

Sources of information

Basic Bibliography

Complementary Bibliography

Recommendations

Other comments

Recommendation for inscription in the subject:

- Before to enroll in the Final Degree Project the student must have enrolled all the necessary credits to obtain the official title of degree, except those corresponding to the project itself, either by passing the corresponding subjects or by recognition.
- To be able to make the application for presentation and defense of the Final Degree Project, the student should have passed all the necessary credits to obtain the degree, except those corresponding to the project itself, either by overcoming the corresponding subjects or by recognition.

Therefore, it is highly recommended that students register for this subject only if they have a certain security of being able to overcome all the credits enrolled in the academic year.

Regulations of the Final Degree Project and information on the planning of the subject in the course is available at:
<http://bioloxia.uvigo.es/en/teaching/end-of-degree-project>

Mobility programs:

The final degree projects can be carried out within a student mobility program, stating their characteristics in the respective study contract. Students who opt for this modality must have the approval of the mobility coordinator of the center and the coordinator of the subject Final Degree Project. Therefore, it is recommended to start these processes well in advance.
