



IDENTIFYING DATA

Physics: Physics of biological processes

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

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

Expected results from this subject

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

Contents

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

Planning

	Class hours	Hours outside the classroom	Total hours
Seminars	8	6	14
Laboratory practical	20	20	40
Mentored work	0	10	10
Lecturing	20	30	50
Autonomous problem solving	0	20	20
Essay questions exam	2	12	14
Self-assessment	0	2	2

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

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

Personalized assistance

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

Assessment

	Description	Qualification	Training and Learning Results			
Seminars	Seminar activities complement the knowledge of the different parts and are evaluated in each one. The assessment is partly performed in the written essays and/or examinations.	4	A1 A3	B2 C1 C8	D1 D2	
Laboratory practical	Laboratory practices and the result of practices is 20% of the mark.	20	A1 A3	B2 B6 C3 C6	D2 D4	
Mentored work	There will be a group work, including an oral presentation of it, that represents 15% of the mark.	15	A1 A3	B2 B6 C1	D1 D2 D4	
Lecturing	The contents exposed in the theory lessons suppose an important part of the global note. Its evaluation will be integrated in the context of the test assignments and/or examinations, accounting for 20%. There are two theory tests that can free matter, but each of them owed to be surpassed with one minimum of 4 points on 10, so that they are taken into account in the continuous evaluation.	20	A1	B2 C6	D2	
Essay questions exam	Problems suppose an important part of the global note. Its evaluation will be integrated in the context of the test assignments and/or examinations, accounting for 38%. There are two problems tests that can free matter, but each of them owed to be surpassed with one minimum of 3,5 points on 10, so that they are taken into account in the continuous evaluation.	38	A1 A3	B2 B6 C1	D1 D2	
Self-assessment	A self-assessment writing will be up to 3% of the mark.	3	A1 A3	B6 C1	D1 D2 D4	

Other comments on the Evaluation

CONTINUOUS EVALUATION:

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

Theory tests account for 20% of the global note; problem tests, 38%; laboratory practices, 20%; self-evaluation, 3%; seminars, 4%; and the group work, together with its corresponding oral exposition, 15%. Each theory or problems test owes to be surpassed with a 4 or 3,5, respectively, on 10 for power do average in the continuous evaluation system. The 1st theory test together with the 2nd problems one, can be compensated to obtain a minimum of 5 points (passed). Equally for the 3rd (theory) and 4th (problems) tests. Any of them that do not surpass 3,5 or 4, correspondingly, points on 10 --and that could not had been compensated-- must be passed, with a minimum mark of 5, in the final examination of the subject. That final examination is NOT to go up mark, since all the tests free matter along the course in continuous evaluation system. Attending to seminars, and the realization and delivery of all the practices, are mandatory to pass the subject.

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

2nd OPPORTUNITY:

The same applies in the July examination.

GLOBAL EVALUATION:

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

EXAMINATION DATES FOR COURSE 2023-2024 IN THE FACULTY WEB (#http://bioloxia.uvigo.es/*gl/*docencia/examinations)

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

Sources of information

Basic Bibliography

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

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

Complementary Bibliography

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

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

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

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

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

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

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

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

Recommendations

Other comments

The general schedules/timetables can be found in the WEB page of the FACULTY OF BIOLOGY:

<http://bioloxia.uvigo.es/en/teaching/timetables/>