Teaching Guide					
Identifying Data					2021/22
Subject (*)	Physics			Code	610G02002
Study programme	Grao en Bioloxía				
Descriptors					
Cycle	Period	Year		Type	Credits
Graduate	2nd four-month period	First		Basic training	6
Language	SpanishGalicianEnglish				
Teaching method	Face-to-face				
Prerequisites					
Department	Física e Ciencias da Terra				
Coordinador	Domínguez Pérez, Montserrat		E-mail	montserrat.dominguez.perez@udc.es	
Lecturers	Domínguez Pérez, Montserrat Martín Pérez, Jaime Segade Zas, Luisa Maria		E-mail	montserrat.dominguez.perez@udc.es jaime.martin.perez@udc.es luisa.segade@udc.es	
Web					
General description	Physics subject try to teach the basic concepts of physics and its applicability to Biology. Those concepts are necessary to understand many natural phenomena that will be studied in other fields and subjects of the Biology Grade.				

Contingency plan	1. Modifications to the contents From the items included in the (initial) programme we will eliminate the chapters dealing with Radiation and radioactivity and the one about Notions of Optics. 2. Methodologies *Teaching methodologies that are maintained - Introductory activities. - Document analysis. - Problem solving (qualifies in the final mark) - Supervised projects (qualifies in the final mark) *Teaching methodologies that are modified - Objective test: Throughout the course, two partial tests (theoretical content and problem solving) will be carried out through the Virtual Campus, which will account for 20% of the total mark. Each of these tests will be worth up to a maximum of 1 point (10% for each test). At the end of each test, students must send an attached pdf file justifying their answers. The final exam (June and/or July opportunity) will account for 50% of the total mark. In order to pass the course, the sum of the two partial test and the final exam must have a minimum of 4 out of 10 points. The marks of the partial tests will be kept for the July exam. - Guest lecture: The detailed content of the different chapters will be uploaded in Virtual Campus, or will be shared in the Teams groups by the teachers of the different student groups (Morning group, English group and Afternoon group). Also, the basic content of each chapter will be explained using videos with oral explanations or videoconferences using the Teams platform. In the event that the classes are face-to-face, but the capacity of the classroom assigned to the subject is exceeded, the Faculty foresees the assignment of two or more classrooms and the teaching of the classes will be through Teams for the students who are not in the classroom with the teacher. In the case of practical activities, the groups will be split in order to adapt to the capacity of the laboratory. - Laboratory Practice: They will be based on the analysis of the experimental data that the teachers will share with the different lab groups (together with the corresponding script for each practice). Every student must deliver in the given time a report on each practice including the work done and the data analysis. An introductory lecture on data analysis and representation will be given before the laboratory sessions. 3. Mechanisms for personalized attention to students - E-mail (daily basis): It will be used to communicate with the teacher in order to solve problems, ask questions, organise virtual meetings and supervise the development of practices and projects. - Virtual Campus (weekly basis): It will be used as the main tool for providing students with information and contents. It will also be used by the student to submit tasks such as laboratory practices reports and supervised projects. - Teams (weekly basis): Two sessions for each student group to explain the theoretical content of the different chapters and one weekly session with every reduced group to solve exercises and practical cases following the official Faculty timetable. In addition, teams will also be used in order to solve the different doubts students may have regarding the different activities of the course. 4. Modifications in the evaluation - Laboratory practice (15%): Attendance to the introductory lecture and the presentation of lab reports will be mandatory in order to be evaluated. - Objective test: the evaluation of the objective test on the theoretical subjects and the resolution of the exercises will account for 70% of the final grade. 20% of the final grade will correspond to partial tests and 50% to the final test. The sum of all the tests must reach a minimum of 4 points (out of 10) in order to pass the subject. *Evaluation observations: All observations included in teaching guide (hybrid teaching method) will be maintained, with one exception: All students will need to attend to the introductory lecture to the lab practices and submit the practices report in order to pass the

course.

5. Modifications to the bibliography or webgraphy

There are no changes. The students will have all working materials in Virtual Campus, and they can use the majority of bibliography in electronic format.

Study programme competences	
Code	Study programme competences
A22	Describir, analizar, avaliar e planificar o medio físico.
A26	Deseñar experimentos, obter información e interpretar os resultados.
A30	Manexar adecuadamente instrumentación científica.
A31	Desenvolverse con seguridade nun laboratorio.
B1	Aprender a aprender.
B2	Resolver problemas de forma efectiva.
B3	Aplicar un pensamento crítico, lóxico e creativo.
B4	Traballar de forma autónoma con iniciativa.
B5	Traballar en colaboración.
B8	Sintetizar a información.
B10	Exercer a crítica científica.

Learning outcomes			
Learning outcomes	Study programme competences		
To know the basic concepts of the different parts of Physics, such as: Mechanics, Fluids, Waves, Thermodynamics, Electromagnetism and Optics.	A22	B2	
To know how to relate the basic concepts of Physics to biological phenomena.	A26	B10	
To apply the theoretical knowledge acquired to the resolution of basic physical problems, mainly focused on resolving biological phenomena.	A22 A26	B1 B2 B8	
To know and to use the methodologies, bibliographic sources and technical concepts corresponding to Physics, applying the scientific method to its study.	A30	B3 B4	
To learn some of the basic Physics Laboratory techniques, such as measuring fundamental physical magnitudes (density, viscosity, surface tension, specific heat...).	A26 A30 A31	B5 B8	

Contents	
Topic	Sub-topic
Introduction to Physics	Physical Magnitudes Measurements, dimensions and units
Vector Analysis	Vectors. Types. Components Operations with vectors Momentum of a vector
Kinematics	Movement. Characteristics Speed and acceleration Types of movements.
Dynamics	Newton Movement Laws Linear momentum Gravity Force Types of forces Friction
Statics	Principles of Statics Center of mass Moment of inertia. Steiner Theorem

Biomecanics	Muscular strength. Momentum Scale Laws. Metabolic Rate
Mecanical Energy. Conservation	Work and Power Kinetic and Potential Energy Energy Conservation
Deformed Media	Elasticity. Hooke's Law Traction. Young's Module Lateral Contraction. Poisson Coefficient Compresibility Coefficient Flexion Cutting Torsion
Ideal Fluids. Statics and Dynamics	Density Pressure. Magnitudes, unities and measurement Fundamental Equation of Hydrostatics Pascal and Archimedes Principles Continuity Equation Bernouilli`s Theorem. Aplications
Real Fluids	Viscosity Fluids Flow modes Reynolds' Number Laminar Regime. Poiseuille Equation Viscosity Measurement. Ostwald Viscometer Movement of solids through fluids
Surface Phenomena	Molecular Forces. Surface Tension Laplace's Law Capillarity. Jurin's Law
Harmonical and Wavy Movements	Simple Harmonic Movement. Pendulum Wave Types Wavy Movement Equation Speed of wave propagation Energy and intensity of the wavy movement Doppler Effect
Acoustics	Speed of Sound Noise Quality Sound Sensation Reverberation Ultrasounds
Thermodynamics and temperature	Thermodynamical Systems Thermodynamical variables Thermodynamical processes Zero Principle of Thermodynamics. Temperature. Temperature Measurement. Escales and thermometers
Gas Study	Ideal Gases. Laws Equation of state Real Gases. Van der Waals' Equation Kinetic Theory of Gas

Heat and work	Thermodynamic work pV Diagram Effects of heat on matter Heat transfer
First Principle of Thermodynamics	First Principle of Thermodynamics Internal Energy Ideal gas transformations
Second Principle of Thermodynamics	Thermal Machine Concept Two forms for the Second Principle of Thermodynamics Carnot Cicle Entropy Concept. Entropy Calculation
Concepts on electricity and bio-magnetism	Electrical Charge. Coulomb's Law Electrical Field and Potential Dipoles Capacity. Capacitors Current Intensity. Ohm's Law Electrical resistivity and conductivity Electrical current Energy Magnetic Forces Laplace's and Faraday's laws Alternating current
Radiation and radioactivity	De Broglie's relationship Bonding Energy. Mass Loss Fision and fusion Radiactivity. Atom Splitting Physical and Biological Dosimetry Biological Effects of Radiation
Notions on Optics	Electromagnetic waves Lens and Mirrors Optical Instruments

Planning				
Methodologies / tests	Competencies	Ordinary class hours	Student?s personal work hours	Total hours
Introductory activities	B1	1	0	1
Document analysis	A26 B8	0	3	3
Laboratory practice	A26 A30 A31 B5 B8	14	14	28
Problem solving	A22 A26 B1 B2 B8	8	24	32
Objective test	A22 A26 B2 B10	4	0	4
Guest lecture / keynote speech	A22 B1 B3 B10	28	42	70
Supervised projects	B3 B4 B5 B8 B10	0	9	9
Personalized attention		3	0	3
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	Description

Introductory activities	The first day of class the teacher will facilitate the program of the subject, the methodology and the assessment criteria, as well as a detailed calendar of each of the activities. This information will remain available for the student in the Moodle platform.
Document analysis	We will inform the students of the necessary bibliographical sources, both for problems, theory and assisted assignments. Thus, they will be able to revise and build on the aspects explained in the classroom. The individual tutorial sessions will also help to better understand the contents of the course.
Laboratory practice	Along the six Laboratory sessions students will carry out different practices. A guide for each practice will be given to the student, and they will have all the necessary materials in order to complete the task. At all times students will be assisted by the teacher to resolve any doubts and receive assistance if necessary. At the end of laboratory course, each student will present a report including the completed tasks and the obtained results. Prior to the Laboratory sessions there will be a room session to explain the basis of experimental uncertainties and graphical representations.
Problem solving	After each lesson, there will be Seminars (with a reduced number of students) in order to apply the studied concepts through solving problems. The proposed problems for each lesson will be given to the students beforehand as bulletins. There, we will include the numerical solution of each problem, so students can assess their own skills. Those bulletins will be of two different types: some of them are general, the same for all students of the three groups, and some are complementary, specific for each seminar group. Not all problems will be completely resolved in the Seminars, but only the more difficult ones.
Objective test	There will be two written exams about the theory and numerical problems saw in classroom. The first one at the middle of the course and the second one at the end. The students who pass each of those exams will have that part of the subject passed for the Final exams of June (and July).
Guest lecture / keynote speech	The basic content of the different parts of the course will be explained by the teacher in these sessions, trying to involve students in the learning process. The materials used at each session will be available in the Moodle platform after the session.
Supervised projects	The students will be able to complete complementary supervised projects on a voluntary basis. These tasks will conducted in pairs and they will be focused on applications of Physics to Biology.

Personalized attention	
Methodologies	**Description**
Document analysis Laboratory practice Supervised projects	Students will be attended individually to help them to understand and resolve all problems related with the subject they can have, including: bibliography, problems of the bulletin, the complementary work... . STUDENTS WITH ACADEMIC DISPENSATIONS: these students will receive a specific orientation to schedule their tasks weekly.

Assessment			
Methodologies	**Competencies**	**Description**	**Qualification**
Laboratory practice	A26 A30 A31 B5 B8	The total score of the practices will represent 1.5 points on the final grade and the evaluation will be based on the submitted report. Attendance to the introductory lecture and to all laboratory sessions is a necessary condition to be evaluated, therefore, they are mandatory. Practices will be considered passed when reaching a minimum of 0.7 points out of 1.5.	15
Problem solving	A22 A26 B1 B2 B8	Participation in the Seminars will represent 0.5 points on the final mark.	5
Objective test	A22 A26 B2 B10	The maximum qualification of the theoretical tests carried out during the course is 21% of the final mark, while the corresponding to the exercises tests represents 49% of the final mark. The student must achieve a minimum sum of 4 points out of 10 (theory and exercises) in order to pass the course.	70
Supervised projects	B3 B4 B5 B8 B10	The score of the supervised project will be a maximum of 1 point on the final grade.	10

Assessment comments
STUDENTS QUALIFIED AS "NOT PRESENT": The NP (not present) qualification will be given to those students who do not participate in all Laboratory sessions, and who have not attended the final exams. Students who sucessfully complete the laboratory course but choose not sit for the exam will not pass the course. All pass qualifications received in the course (laboratory, seminars, etc.) will be kept for the second opportunity (July). LAB PRACTICES: Sinceattendance to laboratory sessions is required to pass the course, failure to attend without justification (see the list of valid reasonsin Article 12 of the "Normas da avaliación, revisión e reclamación dascualificacións dos estudos de Grao e Mestrado Universitario" vixente)involves the following: a) Missing one of the sessions without justification implies a 50% reduction of the final grade, b) Missing more than one session implies failing the course. Labpractices will be performed exclusively during the official schedule. STUDENTS WITH ACADEMIC DISPENSATIONS: Theevaluation will be distributed as follows: a) The labpractices represent a maximum value of 1.5 points. They are mandatory and canbe made within the official calendar on any morning or afternoon shift. In thecase of unexcused absence, the same criteria as described above for full-time studentswill be applied. b) The supervisedproject represents a maximum of 1 point. It is optional. c) Theobjective test represents a maximum value of 7.5 points. The same criteria as described for full-timestudents will be applied, proportionally. STUDENTS WITH ACADEMIC ADAPTATIONS:In the case of students with specific learning needs, and in accordance with the indications of the University Unit for Attention to Diversity (ADI), the teacher will adapt the continuous and compulsory assessment activities so that the student can pass the subject. FAILING MARK: If a student, having an average qualification higher than 5, fails the minimum qualification in any activity, they will have a qualification of 4.5, i.e., fail. EARLY CALL FOR DECEMBER The teaching guidethat will be applied to students who apply for the early December call will bethat of the current academic year.

Sources of information	
Basic	- Kane y Sternheim (1994). Física. Barcelona. Reverté. - Cussó, López y Villar (2004). Física de los procesos biológicos. Barcelona. Ariel - Jou, Llebot y Pérez (1994). Física para las ciencias de la vida . Barcelona. Mc. Graw- Hill - Young and Geller (2007). Sears and Zemansky's College Physics. Pearson International Edition
Complementary	- Tippler, P (2005). Fisica I y II. Barcelona. Reverté - Ortuño (1996). Física para biología, medicina, veterinaria y farmacia . Barcelona. Crítica - Burbano y Burbano (1991). Problemas de Física . Barcelona. Mira - Feynman, R. P. (2005). The Feynman lectures on physics. Vol. I, II and III. Addison-Wesley - Serway, R.A. and Jewitt, J.W. (2014). Physics for Scientist and Engineers. USA. Cengage Learning - Young, H.D. and Geller, R.M. (2007). Sears and Zemansky's College Physics. USA. Pearson - Wilson, J.D. and Hernández-Hall, C.A. (2015). Physics Laboratory Experiments. USA. Cengage Learning - Hewitt, Suchocki and Hewitt (2010). Conceptual Physical Science Explorations. Pearson International Edition - Hewitt, Suchocki y Hewitt (2016). Física conceptual. Pearson

Recommendations
Subjects that it is recommended to have taken before
Mathematics/610G02003
Subjects that are recommended to be taken simultaneously
Subjects that continue the syllabus

Other comments
GREEN CAMPUS PROGRAMME FACULTY OF SCIENCETo help achieve animmediate sustainable environment and to comply with point 6 of the"Faculty of Science Environmental Statement (2020)" the documentarywork to be carried out in this area will: a) They shall berequested mostly in a virtual format and in electronic form.   b) If on paper: - Plastics shall not be used.   - Double-sided printing will be carried out.   - Recycled paper will be used.   - Drafting will be avoided.