Teaching Guide				
Identifying Data				2024/25
Subject (*)	Integrated Basic Laboratory		Code	610G04004
Study programme	Grao en Nanociencia e Nanotecnoloxía			
Descriptors				
Cycle	Period	Year	Type	Credits
Graduate	1st four-month period	First	Basic training	6
Language	SpanishGalicianEnglish			
Teaching method	Face-to-face			
Prerequisites				
Department	BioloxíaFísica e Ciencias da TerraQuímica			
Coordinador	Beceiro Novo, Saúl	E-mail	saul.beceiro@udc.es	
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Web	campusvirtual.udc.gal/course/view.php?id=8993			
General description	In this eminently practical subject, the student will understand fundamental concepts and methodologies of laboratory work. You will become familiar with the basic laboratory experimental techniques of chemistry, physics and biology, the three modules in which the subject is divided. You will learn how to handle the basic material of the different laboratories and how to analyse, present and express the data and observations made in the different modules. On a transversal basis, emphasis will be placed on safety and risk prevention measures in both chemical, physical and biological laboratories.			

Study programme competences / results	
Code	Study programme competences / results
A2	CE2 - Aplicar los conceptos, principios, teorías y hechos fundamentales relacionados con la Nanociencia y Nanotecnología a la resolución de problemas de naturaleza cuantitativa o cualitativa.
A4	CE4 - Desarrollar trabajos de síntesis y preparación, caracterización y estudio de las propiedades de materiales en la nanoescala.
A6	CE6 - Manipular instrumentación y material propios de laboratorios para ensayos físicos, químicos y biológicos en el estudio y análisis de fenómenos en la nanoescala.
A7	CE7 - Interpretar los datos obtenidos mediante medidas experimentales y simulaciones, incluyendo el uso de herramientas informáticas, identificar su significado y relacionarlos con las teorías químicas, físicas o biológicas apropiadas.
A8	CE8 - Aplicar las normas generales de seguridad y funcionamiento de un laboratorio y las normativas específicas para la manipulación de la instrumentación y de los productos y nanomateriales.
B2	CB2 - Que los estudiantes sepan aplicar sus conocimientos a su trabajo o vocación de una forma profesional y posean las competencias que suelen demostrarse por medio de la elaboración y defensa de argumentos y la resolución de problemas dentro de su área de estudio
B3	CB3 - Que los estudiantes tengan la capacidad de reunir e interpretar datos relevantes (normalmente dentro de su área de estudio) para emitir juicios que incluyan una reflexión sobre temas relevantes de índole social, científica o ética
B4	CB4 - Que los estudiantes puedan transmitir información, ideas, problemas y soluciones a un público tanto especializado como no especializado
B5	CB5 - Que los estudiantes hayan desarrollado aquellas habilidades de aprendizaje necesarias para emprender estudios posteriores con un alto grado de autonomía
B7	CG2 - Resolver problemas de forma efectiva.
B8	CG3 - Aplicar un pensamiento crítico, lógico y creativo.
B9	CG4 - Trabajar de forma autónoma con iniciativa.
B10	CG5 - Trabajar de forma colaborativa.

B12	CG7 - Comunicarse de manera efectiva en un entorno de trabajo.
C6	CT6 - Adquirir habilidades para la vida y hábitos, rutinas y estilos de vida saludables
C7	CT7 - Desarrollar la capacidad de trabajar en equipos interdisciplinares o transdisciplinares, para ofrecer propuestas que contribuyan a un desarrollo sostenible ambiental, económico, político y social.
C8	CT8 - Valorar la importancia que tiene la investigación, la innovación y el desarrollo tecnológico en el avance socioeconómico y cultural de la sociedad
C9	CT9 - Tener la capacidad de gestionar tiempos y recursos: desarrollar planes, priorizar actividades, identificar las críticas, establecer plazos y cumplirlos

Learning outcomes			
Learning outcomes	Study programme competences / results		
Apply skills to use, under safe conditions, experimental techniques in physical, chemical and biological laboratories, at the same time it is a training to develop other more complex skills.	A4 A6 A8	B2 B3 B7 B10 B12	C6 C7
Learning about interpretation and presentation of experimental data through a personal portfolio.	A7	B2 B5 B7 B9 B12	C9
Demonstrate sufficient knowledge and experimental skills to correctly and safely use the most common products, material and instruments in physical, chemical and biological laboratories, being aware of their most important characteristics, including danger and possible risks.	A2 A4 A8	B2 B4 B5 B8 B12	C6 C8

Contents	
Topic	Sub-topic

Module 1. Basic Technics in a Physics Science Laboratory.	- Calculation of direct and indirect experimental uncertainties. - Correct expression of experimental physical quantities. - Analysis and graphic representation of experimental results. - Presentation of scientific results. All these skills will be developed in the study of different physical experiences such as the following: - Density measurement with pycnometers or Archimedes' principle. - Viscosity measurement with an Ostwald viscometer. - Measurement of the surface tension of a liquid. - Measurement of ionic conductivity in electrolytes as a function of concentration. - Calibration of thermometers. - Determination of the electrical equivalent of heat by calorimetry. - Measurement of the refractive index of materials. - Measurement of the gravitational constant with the physical pendulum. - Verification of ideal gas laws. - Association of resistances and Kirchhoff's laws. - Measure of the half-life of a radioisotope. - Optical interference - Study of oscillations.
Module 2. Basic Technics in a Chemistry Science Laboratory.	- Safety in the Chemistry laboratory. Classification, packaging and labeling of chemical products. Security sheets. Reagent quality. Waste management in the laboratory. Use of protective equipment. - General material in a chemical laboratory. Gravimetric and volumetric material. - Registration and communication of laboratory work. The laboratory notebook. - Preparation of solutions and review of concentration units. - Acid-base titration - Separation of liquids. Distillation. - Separation of solids. Filtration. - Calorimetry. Determination of heats of reaction in a calorimeter.
Module 3. Basic Technics in a Biology Science Laboratory.	- Basic rules of safe work in the biological laboratory. - Correct use of biological laboratory material. - Preparation of biological buffer solutions. - Serial and standard straight dilutions. - Preparation of culture media. - Cultivation of microorganisms. - Operation and basic management of binocular loupes and microscopes. - Use of pH meter and spectrophotometer. - Extraction of macromolecules. - Search for bibliographic information, citations and references. Databases and computer resources of interest in biology.

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student?s personal work hours	Total hours
Introductory activities	C6 C7 C8	1	0	1
Laboratory practice	A4 A6 A8 B2 B4 B5 B8	60	48	108
Objective test	A2 B3 B10 B12 C9	2	18	20

Student portfolio	A7 B7 B9	0	18	18
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 different modules of the subject will be presented, including its objectives, the way in which it will be developed, as well as the calendar and other information of interest.
Laboratory practice	Practical sessions in the respective laboratory, where specific material will be handled for the different practices, which cover a wide range of basic Physical, Chemical and Biological techniques. The students will receive a script of the specific practice that they will carry out in that session through Moodle, where the objectives of the same, the available material and the pertinent health and safety recommendations will be indicated.
Objective test	It will consist of an exam of short questions or test type that will be carried out on the dates set in the exam calendar approved by the Faculty.
Student portfolio	It refers to what is known as laboratory notebook. The student must note in it the development of the practice and the data or observations requested. In addition, the analysis and representation of the data will be done if requested. This portfolio will be delivered to each teacher of each module of the subject for evaluation and qualification.

Personalized attention	
Methodologies	**Description**
Laboratory practice Student portfolio	The professors' tutorials, which will preferably be virtual, will be an essential resource so that the students can consult all the doubts that arise, which will result in the better quality of their laboratory portfolios. That is why they are of paramount importance in the subject.

Assessment			
Methodologies	**Competencies / Results**	**Description**	**Qualification**
Student portfolio	A7 B7 B9	O caderno de laboratorio é o elemento principal na avaliación da materia, tendo en conta o seu carácter eminentemente práctico. O caderno recolle tanto o traballo realizado polo/a alumno/a no laboratorio, coma a súa capacidade de transmitir as súas observacións, analizar os resultados e obter conclusións baseadas nos datos. O prazo de entrega do caderno de cada módulo, para a súa avaliación polo profesorado correspondente, será unha semana despois de rematar as prácticas do módulo.	70
Objective test	A2 B3 B10 B12 C9	A proba obxectiva consistirá nun exame tipo test ou de preguntas cortas, de cada un dos módulos. A finalidade desta proba é comprobar a asimilación dos coñecementos adquiridos no laboratorio. A proba terá lugar na data marcada no calendario de exames oficiais da Facultade.	30

Assessment comments

Attendance at the scheduled sessions is mandatory. More than one unexcused absence will result in failure to pass the subject. Students who arrive more than 10 minutes late to a session without justification will be counted as no-shows for that practice. Justified absences require written documentation (doctor´s note, etc) and, when properly justified must be made up in another group whenever possible.
The overall grade will be the average of the grades for each of the 3 modules. To pass the subject it is necessary to achieve a minimum of 5/10 in each and every one of the modules. If a student does not pass any of the modules, they will have to take the second opportunity, in which the grade of the modules that they pass will be maintained.
Students who go to the second opportunity will have to correct the corresponding laboratory notebook(s) and submit them for a new evaluation within 30 days from the publication of the final grades of the first opportunity. The grade of this review together with the grade of the second exam will be the grade of the 2nd opportunity, maintaining the percentages of 70% notebook and 30% exam as in the first opportunity. If a student wants to save the grade of the notebook or the exam from the first opportunity and only redo the other part in the second chance, they could do only one of the parts and save the grade obtained in the other part in the first opportunity.
The teaching guide that will be applied to students who request the early call for December will be that of the course in force and will follow the same procedure of improving the notebooks and repeating the exams of each part as the second chance.
All aspects related to "academic exemption", "dedication to study", "permanence" and "academic fraud" will be governed in accordance with the current academic regulations of the UDC

Sources of information	
Basic	- Torrecilla, M.I. (1994). Prácticas de Física General.. Zaragoza. Prensas Universitarias de Zaragoza. - Ortega Girón, M.R. (1980). Prácticas de laboratorio de física general.. Barcelona - Insausti, M.J., Redondo, P., Charro E. (1999). Manual de Experimentación Básica en Química. Valladolid, Universidad de Valladolid - Petrucci, R. H.; Harwood, W. S.; Herring, F. G (2003). Química General. . Madrid, 8ªEd, Pearson Educación - Cerdán Villanueva, M. E., Freire Picos, M. A., González Siso, M. I. & Rodríguez Torres, A. M. (1997). Biología Molecular. Avances y Técnicas generales. . A Coruña. Universidade da Coruña - Karp, G. (2011). Biología Celular y Molecular. Conceptos y experimentos. . McGraw-Hill Interamericana Eds. - Tortora, A, G.J., Funke, B. R. & Case, C.L (2017). Introducción a la Microbiología . McGraw-Hill Interamericana Eds. 12 ed.
Complementary	- H. Kennet (2014). Cambridge IGCSE physics. Laboratory practical book.. Hodder Educational. Londres. - J.D. Wilson (2015). Physics laboratory experiments.. Boston, MA : Cengage Learning. - A. Amengual Colom (2003). Prácticas virtuales de física básica.. Palma de Mallorca. Universitat de les Illes Balears. - Varios (2007). Manual de Seguranza e Saúde no Laboratorio. . Universidade da Coruña - Singer (2001). Experiments in Applied Microbiology. . Academic Pres. - Ninfa, A. J. (2010). Fundamental laboratory approaches for biochemistry and biotechnology.. Hoboken: John Wiley and Sons - Loyola-Vargas, V.M. y Vázquez-Flota F. (2006). Plant cell culture protocols. . Humana Press. 2nd Edition.

Recommendations
Subjects that it is recommended to have taken before
Subjects that are recommended to be taken simultaneously
Cell Biology/610G04003 Chemistry: Structure and Bonding/610G04005 Physics: Mechanics and Waves/610G04002
Subjects that continue the syllabus

Techniques of Characterisation of Nanomaterials 1/610G04025 Kinetic and Catalysis/610G04026 Thermodynamics: Equilibrium and Phases/610G04018 Structural Biochemistry/610G04019 Molecular and Metabolic Biochemistry/610G04023 Physics: Electricity and Magnetism/610G04007 Chemistry of the Elements/610G04011 Chemistry: Equilibrium and Change/610G04008
Other comments
Green Campus Program Faculty of SciencesTo help achieve a sustainable immediate environment and comply with point 6 of the "Environmental Declaration of the Faculty of Sciences (2020)", the documentary work carried out in this matter:to They will mostly be requested in virtual format.b. To be done on paper:- Plastics will not be used.- Double-sided printing will be carried out.- Recycled paper will be used.Gender perspective: as stated in the transversal competences of the degree (C4), the development of a critical, open and respectful citizenship with diversity in our society will be encouraged, highlighting the equal rights of students without discrimination for reasons of gender or sexual condition.