| Teaching Guide | | | | | |
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| Identifying Data | | | | | 2023/24 |
| 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 | | | | |
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| Lecturers | Cabeza Gras, Oscar<br>Garcia-Garabal Mosquera, Sandra Maria<br>Ligero Martínez - Risco, Pablo<br>Rey Souto, Cora<br>Rilo Siso, Esther<br>Ruiz Bolaños, Isabel<br>Saavedra Bouza, Almudena<br>Segade Zas, Luisa Maria<br>Vázquez García, David<br>Vizoso Vázquez, Ángel José | | E-mail | oscar.cabeza@udc.es<br>sandra.garcia-garabal@udc.es<br>pablo.ligero@udc.es<br>cora.rey.souto<br>esther.rilo.siso@udc.es<br>isabel.ruiz@udc.es<br>almudena.saavedra@udc.es<br>luisa.segade@udc.es<br>david.vazquezg1@udc.es<br>a.vizoso@udc.es | |
| Web | campusvirtual.udc.gal/course/view.php?id=8993 | | | | |
| General description | Nesta materia eminentemente práctica o estudante comprenderá conceptos e metodoloxías fundamentais do traballo no laboratorio. Familiarizarase coas técnicas experimentais básicas de laboratorio de química, física e bioloxía, os tres módulos nos que está dividida a materia. Aprenderá o manexo do material básico dos distintos laboratorios e a forma de analizar, presentar e expresar os datos e observacións feitas nos distintos módulos. De forma transversal, insistirase nas medidas de seguridade e prevención de riscos nos laboratorios tanto químicos coma físicos e biolóxicos. | | | | |

| Study programme competences | |
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| Code | Study programme competences |
| 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. |

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| 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 | | | |
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| Learning outcomes | Study programme competences | | |
| 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<br>A6<br>A8 | B2<br>B3<br>B7<br>B10<br>B12 | C6<br>C7 |
| Learning about interpretation and presentation of experimental data through a personal portfolio. | A7 | B2<br>B5<br>B7<br>B9<br>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<br>A4<br>A8 | B2<br>B4<br>B5<br>B8<br>B12 | C6<br>C8 |

| Contents | |
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| Topic | Sub-topic |
| Module 1. Basic Technics in a Physics Science Laboratory. | - Calculation of direct and indirect experimental uncertainties.<br>- Correct expression of experimental physical magnitudes.<br>- Analysis and graphical representation of the experimental results.<br>- Density measurement with the pycnometer method.<br>- Viscosity measurement with Ostwald viscometer.<br>- Measurement of surface tension with the drop method.<br>- Measurement of the gravitational constant with the physical pendulum.<br>- Verification of the ideal gas laws.<br>- Association of resistances and Kirchhoff's laws.<br>- Measurement of ionic conductivity in electrolytes as a function of concentration.<br>- Calibration of 4 different thermometers (resistance, thermocouples, column and thermistors).<br>- Determination of the electrical equivalent of heat by calorimetry.<br>- Measurement of the refractive index using the optical bench. |

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| 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.<br>- General material in a chemical laboratory. Gravimetric and volumetric material.<br>- Registration and communication of laboratory work. The laboratory notebook.<br>- Preparation of solutions and review of concentration units.<br>- Acid-base titration<br>- Separation of liquids. Distillation.<br>- Separation of solids. Filtration.<br>- 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.<br>- Correct use of biological laboratory material.<br>- Preparation of biological buffer solutions.<br>- Serial and standard straight dilutions.<br>- Preparation of culture media.<br>- Cultivation of microorganisms.<br>- Operation and basic management of binocular loupes and microscopes.<br>- Use of pH meter and spectrophotometer.<br>- Extraction of macromolecules.<br>- Search for bibliographic information, citations and references. Databases and computer resources of interest in biology. |

| Planning | | | | |
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| Methodologies / tests | Competencies | Ordinary class hours | 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 | |
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| 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 | |
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| Methodologies | Description |

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| Laboratory practice<br>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 | | | |
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| Methodologies | Competencies | 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.<br>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.<br>A proba terá lugar na data marcada no calendario de exames oficiais da Facultade. | 30 |

| Assessment comments |
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| The global qualification will be the average of the qualifications of each one of the 3 modules. To pass the subject it is necessary to obtain a minimum of 5/10 in each and every one of the modules. If any module(s) is not approved, the student will have to resort to the second opportunity, in which the qualification of the approved modules will be maintained. The students who go to the second opportunity will have to correct the corresponding laboratory notebook(s), and submit them for a new evaluation within a period of 30 days from the publication of the final grades of the first opportunity. The grade for this review together with the grade for the July exam will be the grade for the 2nd opportunity, keeping the percentages of 70% notebook and 30% exam, the same as in the first opportunity.<br>"During the performance of the practical test, on either occasion, except as otherwise indicated, the use of any device with Internet access is prohibited. If during the performance of the practical test, there are indications of unauthorized use of these devices, the student will be expelled from the classroom, and will proceed, according to Law 3/2022, of February 24, of university coexistence and the disciplinary regulation of the UDC student body.<br>Fraudulent completion of the tests and/or activities will directly imply a failing grade ("0") in the subject in the corresponding call, invalidating any grade obtained in all the activities for the next opportunity, if any, within the same academic course. It is considered fraudulent to carry out the activities, proposed to be completed in person in the classroom, which are done from outside the classroom, proceeding according to the regulations indicated in the previous paragraph."<br>STUDENTS ENROLLED WITH ACADEMIC DISPENSATION OR PART-TIME REGISTRATION: All enrolled students have to do the internship as a compulsory requirement. However, to make it easier for students with waivers or partial enrollment, they can do them in the shift or shifts that best suit them, within the official calendar. In case of unjustified absence, the same criteria that were described for ordinary enrollment students will be applied<br>. |

| Sources of information |
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| **Basic** | - Torrecilla, M.I. (1994). Prácticas de Física General.. Zaragoza. Prensas Universitarias de Zaragoza.<br>- Ortega Girón, M.R. (1980). Prácticas de laboratorio de física general.. Barcelona<br>- Insausti, M.J., Redondo, P., Charro E. (1999). Manual de Experimentación Básica en Química. Valladolid, Universidad de Valladolid<br>- Petrucci, R. H.; Harwood, W. S.; Herring, F. G (2003). Química General. . Madrid, 8ªEd, Pearson Educación<br>- 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<br>- Karp, G. (2011). Biología Celular y Molecular. Conceptos y experimentos. . McGraw-Hill Interamericana Eds.<br>- 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.<br>- J.D. Wilson (2015). Physics laboratory experiments.. Boston, MA : Cengage Learning.<br>- A. Amengual Colom (2003). Prácticas virtuales de física básica.. Palma de Mallorca. Universitat de les Illes Balears.<br>- Varios (2007). Manual de Seguranza e Saúde no Laboratorio. . Universidade da Coruña<br>- Singer (2001). Experiments in Applied Microbiology. . Academic Pres.<br>- Ninfa, A. J. (2010). Fundamental laboratory approaches for biochemistry and biotechnology.. Hoboken: John Wiley and Sons<br>- Loyola-Vargas, V.M. y Vázquez-Flota F. (2006). Plant cell culture protocols. . Humana Press. 2nd Edition. |

| **Recommendations** |
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| **Subjects that it is recommended to have taken before** |
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| **Subjects that are recommended to be taken simultaneously** |
| Cell Biology/610G04003<br>Chemistry: Structure and Bonding/610G04005<br>Physics: Mechanics and Waves/610G04002 |
| **Subjects that continue the syllabus** |
| Techniques of Characterisation of Nanomaterials 1/610G04025<br>Kinetic and Catalysis/610G04026<br>Thermodynamics: Equilibrium and Phases/610G04018<br>Structural Biochemistry/610G04019<br>Molecular and Metabolic Biochemistry/610G04023<br>Physics: Electricity and Magnetism/610G04007<br>Chemistry of the Elements/610G04011<br>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. |