



Teaching Guide

Teaching Guide				
Identifying Data				2022/23
Subject (*)	Polymers		Code	610G04028
Study programme	Grao en Nanociencia e Nanotecnoloxía			
Descriptors				
Cycle	Period	Year	Type	Credits
Graduate	2nd four-month period	Third	Obligatory	6
Language	SpanishGalicianEnglish			
Teaching method	Face-to-face			
Prerequisites				
Department				
Coordinador	Martín Pérez, Jaime	E-mail	jaime.martin.perez@udc.es	
Lecturers	Martín Pérez, Jaime	E-mail	jaime.martin.perez@udc.es	
Web				
General description	This course is an introduction to the science of polymers. It will describe the different states of agregation, the characteristics of polymers in solution and molten, as well as for conducting and semiconducting polymers. Processing techniques, including mechanical ones, will be described. The electrical and optical properties of polymers and their applications in various nanotechnologies will be discussed.			

Study programme competences

Code	Study programme competences
A1	CE1 - Comprender los conceptos, principios, teorías y hechos fundamentales relacionados con la Nanociencia y Nanotecnología.
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.
A3	CE3 - Reconocer y analizar problemas físicos, químicos, matemáticos, biológicos en el ámbito de la Nanociencia y Nanotecnología, así como plantear respuestas o trabajos adecuados para su resolución, incluyendo el uso de fuentes bibliográficas.
A5	CE5 - Conocer los rasgos estructurales de los nanomateriales, incluyendo las principales técnicas para su identificación y caracterización
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.
B1	CB1 - Que los estudiantes hayan demostrado poseer y comprender conocimientos en un área de estudio que parte de la base de la educación secundaria general, y se suele encontrar a un nivel que, si bien se apoya en libros de texto avanzados, incluye también algunos aspectos que implican conocimientos procedentes de la vanguardia de su campo de estudio
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
B6	CG1 - Aprender a aprender
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.
B11	CG6 - Comportarse con ética y responsabilidad social como ciudadano/a y como profesional.
B12	CG7 - Comunicarse de manera efectiva en un entorno de trabajo.
C1	CT1 - Expresarse correctamente, tanto de forma oral como escrita, en las lenguas oficiales de la comunidad autónoma



C4	CT4 - Desarrollarse para el ejercicio de una ciudadanía respetuosa con la cultura democrática, los derechos humanos y la perspectiva de género
C7	CT7 - Desarrollar la capacidad de trabajar en equipos interdisciplinarios o transdisciplinarios, 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		
To know and understand the different aggregation states of polymers (structural aspects of polymeric materials)	A1 A7	B1 B6	C1 C8
To be able to understand and use structural models of polymers to study their properties	A2 A3	B2 B5 B7	C7
To know and understand the fundamental properties of polymers: thermal, mechanical, electrical	A5 A7	B2 B3 B6 B7 B8 B9 B10	C4
To understand the properties of (semi)conducting polymers and their devices.	A2 A5 A7	B4 B11 B12	C9

Contents	
Topic	Sub-topic
1. General introduction to polymer science.	Types of polymers Aggregation states (in solid and liquid states) Elastomers
2. The solid and liquid states	Amorphous polymeric materials Ordered polymeric materials: the semicrystalline state. Liquid crystals Moltens and solutions.
3. Properties of polymeric materials	Thermal properties Mechanical properties Electrical properties
4. Polymers in Nanoscience	Nanoparticles, nanowires. Nanostructured surfaces Block copolymers Resins for nanolithography
5. Semiconducting polymers	Optical and electronic properties Devices

Planning				
Methodologies / tests	Competencies	Ordinary class hours	Student's personal work hours	Total hours
Guest lecture / keynote speech	A1 A2 A3 A5 A7 B2 B3 B4 B7 B10 C8	28	51	79



Laboratory practice	A1 A2 A7 B1 B7 C1 C4	15	7	22
Mixed objective/subjective test	A1 A2 A7 B2 B3 B7	4	0	4
Directed discussion	B5 B6 B8 B11 B12 C7 C9	4	9	13
Seminar	A1 A2 A7 B2 B3 B7 B9	8	24	32
Personalized attention		0		0
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	Description
Guest lecture / keynote speech	Explanation with audiovisual support in which the fundamental aspects of the subject are presented, with the possibility of student participation.
Laboratory practice	Experimental projects directly related to the subject will be carried out. The planning of experiments, the obtaining of experimental results, their discussion and their presentation as a scientific document will be dealt with.
Mixed objective/subjective test	Combination of different types of questions: multiple-choice and problem, short answer or essay questions, showing knowledge, reasoning skills and critical thinking.
Directed discussion	This activity is designed to be carried out in as small groups as possible, with the aim of exploring the different topics in a dynamic and argumentative way. Its success depends on active participation. Real experimental data related to the subject will be discussed.
Seminar	This activity is designed to be carried out in as small groups as possible, with the aim of exploring the different topics in a dynamic and argumentative way. Its success depends on active participation.

Personalized attention	
Methodologies	Description
Mixed objective/subjective test	Students will be able to attend tutorials with teachers on specific dates. The aim will be to guide students in understanding the problem posed and the strategies to solve it.
Directed discussion	It will be set jointly between teachers and students according to their needs and will take place in the deans' offices or classrooms specifically designed for this purpose.
Seminar	
Guest lecture / keynote speech	

Assessment			
Methodologies	Competencies	Description	Qualification
Mixed objective/subjective test	A1 A2 A7 B2 B3 B7	Final exam with two parts, a theoretical part (50%) which includes multiple-choice, short answer and/or essay questions, and a problem-solving part (50%), in which the ability to apply the theoretical content to solve problems will be assessed.	60
Directed discussion	B5 B6 B8 B11 B12 C7 C9	Assessment is based on the ability to apply the different experimental and theoretical concepts seen in the subject.	15
Seminar	A1 A2 A7 B2 B3 B7 B9	Assessment includes: operational aspects, understanding of the strategies and methodologies used to solve the cases, critical analysis of the results obtained.	10
Laboratory practice	A1 A2 A7 B1 B7 C1 C4	Evaluation includes experimental planning, operational aspects, understanding of the strategies and methodologies used in project implementation, rigor and reproducibility in obtaining experimental results, critical analysis of results, ability to extract regularities, generalize and draw conclusions from the discussion of the obtained results.	15

Assessment comments

The aim is to assess students' acquisition of knowledge, critical capacity, synthesis, comparison, elaboration, application and originality. In order to make the best use of the subject, students must attend all the face-to-face activities.

The completion of the practicals is a basic criterion for passing the course. Without the completion of the practicals, it will not be possible to pass the course, regardless of the weight of these in the evaluation.

* First opportunity. In order for the case study and oral presentation activities to be taken into account, a minimum mark of 4.0/10 must be obtained in the mixed test. The final mark is obtained by applying the established percentages and the previously established restrictions.

* Second chance. The parts of the mixed exam that have not been passed may be repeated. The activities related to the work done in the seminars are considered unrepeatable. The final mark is obtained by applying the established percentages and the previously established restrictions.

In any case, if a minimum mark of 4.0/10 is not achieved in each of the parts of the mixed exam, the course will be failed even if the final mark, calculated according to the corresponding percentages, is equal to or higher than 5. In this case, the final mark will be 4.5 / 10.

Honours: in the event that there are several students with the same degree who are eligible for the MH, and the number of MH available is less than the number of students, a written test will be held. Students assessed at the second opportunity will only be eligible for the MH if the number of MHs was not fully covered at the first opportunity.

No-show" grade: applies to students who have participated in evaluable activities that account for less than (

Sources of information

Basic	- U W Gedde (2005). Polymer Physics. Chapman and Hall
Complementary	- C Marco, L Ibarra, L Garrido (2004). Ciencia y Tecnología de Materiales Poliméricos. Madrid: Instituto de Ciencia y Tecnología de Polímeros - M. Beltrán, A. Marcilla (2012). Tecnología de polímeros. . Alicante: Publicaciones Universidad de Alicante - J. Padilla, R. García, A.J. Fernández, A. Urbina (2010). Polímeros conductores.. Barcelona: Reverté

Recommendations

Subjects that it is recommended to have taken before

Thermodynamics: Equilibrium and Phases/610G04018

Solid State/610G04022

Organic Reactivity /610G04012

Subjects that are recommended to be taken simultaneously

Subjects that continue the syllabus

Other comments

- It is not recommended to study just for marks. It is advisable to prepare your own materials by completing the notes.- It is strongly recommended to use the tutorial hours to clarify doubts and deepen knowledge.- Green Campus Programme of the Faculty of Science. In order to contribute to achieve an immediate sustainable environment and comply with point 6 of the "Environmental Declaration of the Faculty of Science (2020)", the work of this subject will be requested in virtual format and computer support.

(*)The teaching guide is the document in which the URV publishes the information about all its courses. It is a public document and cannot be modified. Only in exceptional cases can it be revised by the competent agent or duly revised so that it is in line with current legislation.