



Teaching Guide

| Identifying Data | | | | | 2020/21 |
|--------------------------|--|--------|------------------------------|---------|---------|
| Subject (*) | Applications of Nanomaterials and New Materials | Code | 610509316 | | |
| Study programme | Mestrado Universitario en Investigación Química e Química Industrial (Plan 2020) | | | | |
| Descriptors | | | | | |
| Cycle | Period | Year | Type | Credits | |
| Official Master's Degree | 2nd four-month period | First | Optional | 3 | |
| Language | SpanishGalicianEnglish | | | | |
| Teaching method | Face-to-face | | | | |
| Prerequisites | | | | | |
| Department | Química | | | | |
| Coordinador | Castro Garcia, Socorro | E-mail | socorro.castro.garcia@udc.es | | |
| Lecturers | Castro Garcia, Socorro | E-mail | socorro.castro.garcia@udc.es | | |
| Web | | | | | |
| General description | <p>This course aims to provide an overview of the applications of nanomaterials and new materials, relating the rest of the subjects in this module to each other and contextualizing the most important aspects of them. It will also put in context and relate nanomaterials and new materials with the rest of disciplines with which it interacts, given that their study only makes sense in an interdisciplinary context, understanding that their purpose is the understanding and development of nanomaterials and new materials to optimize and achieve new properties, so that they can be applied in fields as varied as biomedicine, electronics, optics, energy, catalysis, food, cosmetics, textiles, environment, engineering, etc.</p> | | | | |
| Contingency plan | <p>1. Modifications in the contents. In principle, the contents are maintained in their entirety. If necessary for reasons of force majeure, it will be possible to opt for a more general presentation, which in any case will cover all the most relevant aspects of the subject.</p> <p>2. Methodologies * Teaching methodologies that are maintained The methodologies will be maintained, but will be carried out in "online mode", i.e. using the TIC tools available to the institution. In the case that part of the students cannot connect and follow the classes in real time, asynchronous methods will be used (e-mail, recordings of the exhibition sessions, more personalized tutorials...).</p> <p>* Teaching methodologies that change Objective tests will be online tests that will be conducted using Moodle or equivalent tools, tracked by TEAMS.</p> <p>3. Mechanisms of personalized attention to students. Students will receive tutorials through the Teams platform or by corporate email.</p> <p>4. Modifications in the evaluation. If all students could continue with the non-presential teaching without difficulty, it will be evaluated in the same way as in the presential teaching. Students who are unable to follow synchronous activities online will be assessed for equivalent activities performed asynchronously.</p> <p>* Evaluation observations: None.</p> <p>5. Modifications to the bibliography or webgraphy. There are no changes in the bibliography / webgraphy.</p> | | | | |

Study programme competences / results

| Code | Study programme competences / results |
|------|---------------------------------------|
|------|---------------------------------------|

| | |
|-----|---|
| A1 | Define concepts, principles, theories and specialized facts of different areas of chemistry. |
| A4 | Apply materials and biomolecules in innovative fields of industry and chemical engineering. |
| A9 | Promote innovation and entrepreneurship in the chemical industry and in research. |
| B1 | Possess knowledge and understanding to provide a basis or opportunity for originality in developing and / or applying ideas, often within a research context |
| B2 | Students should apply their knowledge and ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their field of study. |
| B4 | Students should be able to communicate their conclusions, and the knowledge and the reasons that support them to specialists and non-specialists in a clear and unambiguous manner |
| B6 | Innovate in the different areas of chemistry, demonstrating initiative and entrepreneurship |
| B7 | Identify information from scientific literature by using appropriate channels and integrate such information to raise and contextualize a research topic |
| B10 | Use of scientific terminology in English to explain the experimental results in the context of the chemical profession |
| C1 | CT1 - Elaborar, escribir e defender publicamente informes de carácter científico e técnico |
| C3 | CT3 - Traballar con autonomía e eficiencia na práctica diaria da investigación ou da actividade profesional. |
| C4 | CT4 - Apreciar o valor da calidade e mellora continua, actuando con rigor, responsabilidade e ética profesional. |

| Learning outcomes | | | |
|--|---------------------------------------|---|-------------------|
| Learning outcomes | Study programme competences / results | | |
| The student will acquire an overview of the most relevant and current applications of Nanomaterials and New Materials, their main areas of activity, achievements, limitations, goals and future prospects. The student will know the main strategies for the search, design and developing of Nanomaterials and New Materials. The student will understand the relationships between composition-structure-microstructure-bonds-properties and applications of Nanomaterials and New Materials. The student will obtain an overview of the new trends in synthetic methodologies, characterization and reactivity of Nanomaterials and New Materials. | AC1 AC4 AC9 | BC1 BC2 BC4 BC6 BC7 BC10 | CC1 CC3 CC4 |

| Contents | |
|----------|--|
| Topic | Sub-topic |
| Unit I | <ul style="list-style-type: none"> - Introduction. Trends in Nanomaterials and New Materials. - Classification of Nanomaterials and New Materials. - Challenges in Nanomaterials and New Materials - Applications of Nanomaterials and New Materials in the context of current perspectives in Research and Industry. |
| Unit II | <ul style="list-style-type: none"> - Applications of Nanomaterials and New Materials: - Applications in Biomedicine. - Applications in electronics, optoelectronics and photonics. - Applications in energy. - Heterogeneous catalysis applications. - Applications in food, cosmetics and textiles. - Environmental applications. - Structural applications. - Applications in art and other trends. |

| Planning | | | | |
|--------------------------------|------------------------|--------------------------------------|-------------------------------|-------------|
| Methodologies / tests | Competencies / Results | Teaching hours (in-person & virtual) | Student?s personal work hours | Total hours |
| Guest lecture / keynote speech | A1 A4 A9 B1 C4 | 12 | 0 | 12 |
| Seminar | B2 B4 B6 B7 B10 C1 | 7 | 0 | 7 |



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|------------------------|--------------------------|---|----|----|
| Supervised projects | A1 C1 C3 C4 | 2 | 0 | 2 |
| Problem solving | B2 C1 C3 | 0 | 18 | 18 |
| Document analysis | B10 B7 C3 | 0 | 20 | 20 |
| Objective test | A1 A4 B1 B2 B4 B10 C4 | 1 | 15 | 16 |
| Personalized attention | | 0 | 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 | Interactive lectures by the teacher, with active participation of the students. |
| Seminar | Seminars with master's or guest professors, from other institutions, as well as with experts in the field. They will be interactive sessions. |
| Supervised projects | Individual or small group tutoring. |
| Problem solving | Solution to problems or development of short projects, proposed by the teacher, or by the student himself (if deemed appropriate). |
| Document analysis | Personal study based on the different sources of information. |
| Objective test | One or several tests for the verification of the acquisition of knowledge and acquisition of the skills and attitudes proposed for this subject. |

| Personalized attention | |
|-----------------------------------|-------------------------------|
| Methodologies | Description |
| Objective test Problem solving | Individual or group tutoring. |

| Assessment | | | |
|--------------------------------|--------------------------|---|---------------|
| Methodologies | Competencies / Results | Description | Qualification |
| Objective test | A1 A4 B1 B2 B4 B10 C4 | 55% of the overall rating | 60 |
| Problem solving | B2 C1 C3 | LECTURES, SEMINARS, PROBLEM SOLVING: compute together (45% of the overall rating) | 40 |
| Guest lecture / keynote speech | A1 A4 A9 B1 C4 | LECTURES, SEMINARS, PROBLEM SOLVING: compute together (45% of the overall rating) | 0 |
| Seminar | B2 B4 B6 B7 B10 C1 | LECTURES, SEMINARS, PROBLEM SOLVING: compute together (45% of the overall rating) | 0 |

| Assessment comments |
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The evaluation of this subject will be done through continuous assessment and a final exam. Access to the exam is conditioned to the participation in at least 80% of the compulsory attendance teaching activities (theoretical classes, seminars and tutorials).

The teacher will verify class attendance according to the official attendance control system established in each Centre or University. Absences must be justified by documentation. Justified absences will count as attendance at teaching activities, for the purposes of being able to take the exam.

CONTINGENCY PLAN:

Depending on the evolution of the COVID 19 health crisis, there are three different scenarios:

- SCENARIO 1: adapted normality:

The assessment will consist of two parts:

- a) Continuous evaluation with a weight of 40%, corresponding to seminars, tutorials, exercises given to the teacher.
- b) Final examination of the subject: 60%.

The final exam will be face-to-face.

- SCENARIO 2: Distance (partial restriction to physical presence):

The assessment will be carried out as in scenario 1.

The final exam will preferably be a non-attendance exam.

- SCENARIO 3: closure of the facilities

The assessment will be carried out as in Scenario 1 and 2, except that the final examination will necessarily be non-presential.

In any of the three scenarios, if the continuous assessment is not successful, a final examination with 100% weighting will be conducted.

The second opportunity, in any of the 3 scenarios, will be a final examination with 100% weighting (face-to-face in the case of scenario 1, non-face-to-face in scenario 3, and preferably non-face-to-face in scenario 2).

Indication referring to plagiarism and the improper use of technology in the performance of tasks or tests: "In cases of fraudulent performance of exercises or tests, the provisions of the Regulations on the Evaluation of Students' Academic Performance and the Review of Grades shall apply".



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| Basic | <p>- D. Vollath. "Nanomaterials: an introduction to synthesis, properties and applications". Wiley-VCH, 2013.- G. Cao: "Nanostructures and Nanomaterials: Synthesis, Properties and Applications". Imperial College Press, 2004. - A.R. West: "Solid State Chemistry and its Applications". Wiley, 2014. - R. Tilley: "Understanding solids: the science of materials". Wiley, 2004.- L.E. Smart, E.A. Moore: "Solid State Chemistry: An Introduction". CRCPress, 2012.- J.A. Schwarz, C.I. Contescu, K. Putyera (Editores): "Dekker Encyclopedia of nanoscience and nanotechnology" (5 vols.). Marcel Dekker, 2004. - D. Vollath. "Nanomaterials: an introduction to synthesis, properties and applications". Wiley-VCH, 2013.- G. Cao: "Nanostructures and Nanomaterials: Synthesis, Properties and Applications". Imperial College Press, 2004. - A.R. West: "Solid State Chemistry and its Applications". Wiley, 2014. - R. Tilley: "Understanding solids: the science of materials". Wiley, 2004.- L.E. Smart, E.A. Moore: "Solid State Chemistry: An Introduction". CRCPress, 2012.- J.A. Schwarz, C.I. Contescu, K. Putyera (Editores): "Dekker Encyclopedia of nanoscience and nanotechnology" (5 vols.). Marcel Dekker, 2004.</p> |
| Complementary | <p>Revistas periódicas de máximo impacto nas áreas de "nanomateriais" e "novos materiais" accesibles a través de bibliotecas universitarias (Nature Review Materials, Nature Materials, Nature Nanotechnology, Advanced Materials, Materials Today, Nano Today, etc.)Ademais, recomendaranse textos complementarios (artigos, páxinas web, textos específicos) para cada tema no momento en que se imparta a materia.</p> |

Recommendations

Subjects that it is recommended to have taken before

Subjects that are recommended to be taken simultaneously

Subjects that continue the syllabus

Other comments

(*)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.