UNIVERSIDADE DA CORUÑA

| Teaching Guide | | | | |
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| Identifying Data | | | | 2021/22 |
| Subject (*) | Structured materials. Nanomaterials | | Code | 730495010 |
| Study programme | Mestrado Universitario en Materiais Complexos: Análise Térmica e Reoloxía (plan 2012) | | | |
| Descriptors | | | | |
| Cycle | Period | Year | Type | Credits |
| Official Master's Degree | 1st four-month period | First | Obligatory | 3 |
| Language | English | | | |
| Teaching method | Face-to-face | | | |
| Prerequisites | | | | |
| Department | | | | |
| Coordinador | López Beceiro, Jorge José | E-mail | jorge.lopez.beceiro@udc.es | |
| Lecturers | Carn , Florent<br>López Beceiro, Jorge José | E-mail | florent.carn@univ-paris-diderot.fr<br>jorge.lopez.beceiro@udc.es | |
| Web | | | | |
| General description | This subject introduces the latest strategies for structuring hard materials (nanoparticles, nanocomposites, porous monoliths hierarchically) by complex fluids. Complex fluids normally considered: solutions of large molecules (eg polymers) or supramolecular structures (eg, micelles ...) in ordinary liquids, foams or emulsions. The aim of this course is to illustrate the physical form of complex fluids and concepts that can be applied to the rational design of advanced materials. Emphasis will be placed for each system, in: the structure / properties of the final solid materials; the structure and stability of complex fluids and some specific characterization techniques are presented. | | | |
| Contingency plan | 1. Modifications to the contents<br>The contents are not modified<br><br>2. Methodologies<br>*Teaching methodologies that are maintained<br>Guest lecture/keynote speech (via Teams)<br>Supervised projects (tutored via Teams or email)<br><br>*Teaching methodologies that are modified<br>Laboratory practice. It is replaced by the presentation of practical cases in the Keynote sessions and the reading and discussion of scientific articles (analysis of documentary sources).<br><br>3. Mechanisms for personalized attention to students<br>- Email: Daily. Used to make queries, request virtual meetings to resolve doubts and monitor the work being supervised.<br>- Microsoft Teams: Personalized tutoring of students<br>- Moodle: This will be used as a repository for documentation provided to students.<br><br>4. Modifications in the evaluation<br>Keynote Sessions 60%<br>Supervised projects 30%<br>Analysis of documentary sources 10%<br><br>*Evaluation observations: -<br><br>5. Modifications to the bibliography or webgraphy<br>No change. | | | |

| Study programme competences / results | |
|---|---|
| Code | Study programme competences / results |
| A1 | Set up and conduct tests using the techniques of thermal analysis and rheology most appropriate in each case, within the scope of complex materials |
| A5 | Understanding the relationships between structure and properties of materials |
| B1 | Knowledge and understanding to provide a basis or opportunity for originality in developing and / or applying ideas, often in a research context |
| B2 | The students have the skill to apply their knowledge and their ability to solve problems in new or unfamiliar contexts within broader (or multidisciplinary) contexts related to their field of study |
| B4 | That the students can communicate their conclusions and the knowledge and last reasons behind that conclusions to specialized and non specialized audience in a clear and unambiguous way |
| B13 | Analysis-oriented attitude |
| B14 | Ability to find and manage the information |
| B17 | Analyze and decompose processes |
| B18 | Ability for abstraction, understanding and simplification of complex problems |
| B21 | To assess the importance of research, innovation and technological developments in the socio-economic and cultural progress of society |
| B22 | Understand the importance of protecting the environment |
| C2 | Have a good command of spoken and writing expression and understanding of a foreign language. |
| C6 | Critically assessing the knowledge, technology and information available to solve the problems they face with. |
| C7 | To assume as a professional and citizen the importance of learning throughout life. |
| C8 | To assess the importance of research, innovation and technological development in the socio-economic and cultural progress of society. |

| Learning outcomes | | | |
|---|---|---|---|
| Learning outcomes | Study programme competences / results | | |
| This course introduces recent strategies for structuring hard materials (nanoparticles, nanocomposites and hierarchically porous monoliths) by complex fluids. Complex fluids that are typically considered: solutions of large molecules (eg polymers.) Or supramolecular structures (eg micelles..) In ordinary liquids, foams or emulsions. The aim of this course is to illustrate how complex physical concepts of fluid can be applied to the rational design of advanced materials. For each system, the emphasis will be on: structure / properties of the final solid materials; the structure and stability of the complex fluids. Some specific characterization techniques presented. | AR1<br>AR5 | BR1<br>BR2<br>BR4<br>BR13<br>BR14<br>BR17<br>BR18<br>BR21<br>BR22 | CR2<br>CR6<br>CR7<br>CR8 |

| Contents | |
|---|---|
| Topic | Sub-topic |
| 1. Fundamentals of physicochemical Interfaces | Fundamentos físico químicos de interfases |
| 2. Solid hierarchically porous | Sólidos xerárquicamente porosos |
| 3. Nanoparticles | Nanopartículas |
| 4. Nanocomposites | Materiais nanocompostos |
| 5. Biogels | Bioxeles |

| Planning | | | | |
|---|---|---|---|---|
| Methodologies / tests | Competencies / Results | Teaching hours (in-person & virtual) | Student?s personal work hours | Total hours |
| Guest lecture / keynote speech | A1 A5 B14 | 12.5 | 12.5 | 25 |
| Laboratory practice | A1 B2 B17 B18 C8 | 20 | 4 | 24 |

| | | | | |
|---|---|---|---|---|
| Supervised projects | B1 B4 B13 B21 B22 C2 C6 C7 | 4 | 20 | 24 |
| Personalized attention | | 2 | 0 | 2 |
| (*)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 | Presentation given by the professor, on a schematic basis, focusing on the main topics, covering both theoretical and practical issues. |
| Laboratory practice | Performance of practical activities such as demonstrations, exercises, experiments, etc.. |
| Supervised projects | Activities whose purpose is that the students enlarge the study of the topics pesented in the program and consolidate their acquired knowledge and capabilities. These activities should also help the students learn and improve their capabilities in literature survey. |

| Personalized attention | |
|---|---|
| **Methodologies** | **Description** |
| Guest lecture / keynote speech<br>Laboratory practice<br>Supervised projects | The personalized attention to students, understood as a support in the teaching-learning process, will take place in the hours of tutoring of the professor.<br><br>No academic dispensation is accepted. |

| Assessment | | | |
|---|---|---|---|
| **Methodologies** | **Competencies / Results** | **Description** | **Qualification** |
| Guest lecture / keynote speech | A1 A5 B14 | Continuous assessment through monitoring of student work in the classroom, laboratory and / or tutorials. | 50 |
| Laboratory practice | A1 B2 B17 B18 C8 | Continuous assessment through monitoring of student work in the classroom, laboratory and / or tutorials. | 20 |
| Supervised projects | B1 B4 B13 B21 B22 C2 C6 C7 | Presentation (oral and written) of the supervised work. | 30 |

| Assessment comments |
|---|
| No academic dispensation is accepted.<br>The evaluation criteria for the second opportunity and the extraordinary opportunity are the same as for the first opportunity. |

| Sources of information | |
|---|---|
| **Basic** | |
| **Complementary** | - R.K. Iler (1979). The Chemistry of Silica. Wiley, New York<br>- J.P. Jolivet (1994). De la solution à l?oxyde. C.N.R.S. Editions, E.D.P. Sciences, Paris<br>- C. J. Brinker, G. W. Scherer (1990). Sol-Gel Science. Academic Press, San Diego |

| 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** |
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| **Subjects that continue the syllabus** |
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| **Other comments** |

To help achieve a sustained immediate environment and meet the objective of action number 5: "Healthy and sustainable environmental and social teaching and research" of the "Green Campus Ferrol Action Plan:The delivery of the documentary work carried out in this subject:They will be requested in virtual format and/or computer supportIt will be done through Moodle, in digital format without the need to print them.If it is necessary to make them on paper:- Plastics shall not be used- Double-sided printing shall be carried out.- Recycled paper will be used.- Printing of drafts shall be avoided.- A sustainable use of resources and the prevention of negative impacts on the natural environment must be made.- It will work to identify and change gender biases and attitudes, and influence the environment to change them and promote values of respect and equality.- Situations of discrimination should be identified and actions and measures proposed to correct them.