



## Teaching Guide

| Teaching Guide           |                                                                                                                                                                                                                                                                                                                                                                                                                                                         |        |                                   |           |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-----------------------------------|-----------|
| Identifying Data         |                                                                                                                                                                                                                                                                                                                                                                                                                                                         |        | 2019/20                           |           |
| Subject (*)              | Statistics of Polymer Physics, Light scattering techniques. Microscopy                                                                                                                                                                                                                                                                                                                                                                                  |        | Code                              | 730495012 |
| 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                | ,<br>Buhler , Eric                                                                                                                                                                                                                                                                                                                                                                                                                                      | E-mail | eric.buhler@univ-paris-diderot.fr |           |
| Web                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                         |        |                                   |           |
| General description      | The objective of this course is to teach the basic concepts of the architecture of the polymer chains, the fundamental aspects of the properties of polymer solutions, interactions and relationship with the chemical structure. It also provides an overview of the theory and experimental techniques of radiation scattering (light, X, neutrons), the analysis and interpretation of data relating to the characterization of polymeric materials. |        |                                   |           |

## Study programme competences

| Code | Study programme competences                                                                                                                                                                           |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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                                                   |
| A2   | Identify and evaluate the different types 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             |
| B8   | Applying a critical, logical and creative way of thinking                                                                                                                                             |
| B13  | Analysis-oriented attitude                                                                                                                                                                            |
| B17  | Analyze and decompose processes                                                                                                                                                                       |
| B21  | To assess the importance of research, innovation and technological developments in the socio-economic and cultural progress of society                                                                |
| 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 |
|-------------------|-----------------------------|
|                   |                             |



|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |     |      |     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|-----|
| The course offers an advanced polymer and soft matter physics and physical chemistry study: rationale and methods. The aim is to teach students the basics of architecture of the polymer chains, basic aspects of the properties of polymer solutions, interactions and relationship with the chemical structure, including phase behavior. It also aims to provide perspective on the experimental scattering techniques, analysis and interpretation of data relating to the characterization of materials. An introduction to the theory of diffraction and instrumentation is offered. In addition, selected examples of polymeric materials with a view to developing the experience and knowledge of practical aspects will be presented. | AR1 | BR1  | CR2 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | AR2 | BR2  | CR6 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | AR5 | BR4  | CR7 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |     | BR8  | CR8 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |     | BR13 |     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |     | BR17 |     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |     | BR21 |     |

| Contents                                                             |           |
|----------------------------------------------------------------------|-----------|
| Topic                                                                | Sub-topic |
| 1. Formation of single stranded (ideal chains, real chains)          |           |
| 2. mixing Thermodynamics                                             |           |
| 3. polymer solutions (good solvents, theta solvents, poor solvents)  |           |
| 4. Red and gelling                                                   |           |
| 5. Dynamic: dynamic cross-linked polymers and non-interlaced.        |           |
| 6. dispersive techniques (light scattering, X-ray and neutron)       |           |
| STRUCTURAL                                                           |           |
| 7. Factores shape and factors                                        |           |
| 8. Polymers and polymer systems: an example of analyzes and studies. |           |

| Planning                                                                                                                        |                     |                      |                               |             |
|---------------------------------------------------------------------------------------------------------------------------------|---------------------|----------------------|-------------------------------|-------------|
| Methodologies / tests                                                                                                           | Competencies        | Ordinary class hours | Student's personal work hours | Total hours |
| Guest lecture / keynote speech                                                                                                  | A2 A5 B1 B13 B21 C7 | 15                   | 15                            | 30          |
| Laboratory practice                                                                                                             | A1 B2 B4 B8 B17     | 15                   | 5                             | 20          |
| Supervised projects                                                                                                             | B13 B21 C2 C6 C8    | 3                    | 20                            | 23          |
| 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 presented 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                                                                                                                                                                                               |
| 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        | Description                                                                                               | Qualification |
| Guest lecture / keynote speech | A2 A5 B1 B13 B21 C7 | Examination or objective test.                                                                            | 50            |
| Laboratory practice            | A1 B2 B4 B8 B17     | Continuous assessment through monitoring of student work in the classroom, laboratory and / or tutorials. | 20            |
| Supervised projects            | B13 B21 C2 C6 C8    | Presentation (oral and written) of the supervised work.                                                   | 30            |

|                     |
|---------------------|
| Assessment comments |
|                     |

| Sources of information |  |
|------------------------|--|
| Basic                  |  |
| Complementary          |  |

|                                                          |
|----------------------------------------------------------|
| 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                                           |

[illegible]

(\*)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.