



## Teaching Guide

| Teaching Guide      |                                                                                                                                                                                                                                                                                                                                          |        |                                                        |           |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|--------------------------------------------------------|-----------|
| Identifying Data    |                                                                                                                                                                                                                                                                                                                                          |        |                                                        | 2023/24   |
| Subject (*)         | Chemical Technology                                                                                                                                                                                                                                                                                                                      |        | Code                                                   | 730G04051 |
| Study programme     | Grao en Enxeñaría en Tecnoloxías Industriais                                                                                                                                                                                                                                                                                             |        |                                                        |           |
| Descriptors         |                                                                                                                                                                                                                                                                                                                                          |        |                                                        |           |
| Cycle               | Period                                                                                                                                                                                                                                                                                                                                   | Year   | Type                                                   | Credits   |
| Graduate            | 1st four-month period                                                                                                                                                                                                                                                                                                                    | Third  | Obligatory                                             | 6         |
| Language            | SpanishGalician                                                                                                                                                                                                                                                                                                                          |        |                                                        |           |
| Teaching method     | Face-to-face                                                                                                                                                                                                                                                                                                                             |        |                                                        |           |
| Prerequisites       |                                                                                                                                                                                                                                                                                                                                          |        |                                                        |           |
| Department          | Enxeñaría Naval e IndustrialQuímica                                                                                                                                                                                                                                                                                                      |        |                                                        |           |
| Coordinador         | Filgueira Vizoso, Almudena                                                                                                                                                                                                                                                                                                               | E-mail | almudena.filgueira.vizoso@udc.es                       |           |
| Lecturers           | Filgueira Vizoso, Almudena<br>Robles Iglesias, Raúl                                                                                                                                                                                                                                                                                      | E-mail | almudena.filgueira.vizoso@udc.es<br>raul.robles@udc.es |           |
| Web                 | https://campusvirtual.udc.gal/login/index.php                                                                                                                                                                                                                                                                                            |        |                                                        |           |
| General description | In this subject students are shown physical separation systems, transfer operations, physical separation systems as well as transfer operations, all applied to industrial chemical processes. Know and design the equipment needed for solid-gas separation<br><br>To understand the storage possibilities and the problems of the same |        |                                                        |           |

## Study programme competences

| Code | Study programme competences                                                                                                                                                                                                                                                                                                                                                          |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A28  | TEQ3 Capacidade para o deseño e xestión de procedementos de experimentación aplicada, especialmente para a determinación de propiedades termodinámicas e de transporte, e modelado de fenómenos e sistemas no ámbito da enxeñaría química, sistemas con fluxo de fluídos, transmisión de calor, operacións de transferencia de materia, cinética das reaccións químicas e reactores. |
| B4   | CB4 Que os estudantes poidan transmitir información, ideas, problemas e solucións a un público tanto especializado como leigo                                                                                                                                                                                                                                                        |
| B6   | B3 Ser capaz de concibir, deseñar ou poñer en práctica e adoptar un proceso substancial de investigación con rigor científico para resolver calquera problema formulado, así como de comunicar as súas conclusións ?e os coñecementos e razóns últimas que as sustentan? a un público tanto especializados como leigo dun xeito claro e sen ambigüidades                             |
| B7   | B5 Ser capaz de realizar unha análise crítica, avaliación e síntese de ideas novas e complexas                                                                                                                                                                                                                                                                                       |
| B8   | B7 Deseñar e realizar investigacións en ámbitos novos ou pouco coñecidos, con aplicación de técnicas de investigación (con metodoloxías tanto cuantitativas como cualitativas) en distintos contextos (ámbito público ou privado, con equipos homoxéneos ou multidisciplinares etc.) para identificar problemas e necesidades                                                        |
| C3   | C5 Entender a importancia da cultura emprendedora e coñecer os medios ao alcance das persoas emprendedoras.                                                                                                                                                                                                                                                                          |
| C4   | C6 Valorar criticamente o coñecemento, a tecnoloxía e a información dispoñible para resolver os problemas cos que deben enfrontarse.                                                                                                                                                                                                                                                 |
| C6   | C8 Valorar a importancia que ten a investigación, a innovación e o desenvolvemento tecnolóxico no avance socioeconómico e cultural da sociedade.                                                                                                                                                                                                                                     |

## Learning outcomes

| Learning outcomes                                                                                                                                                                                                                                                         | Study programme competences |                      |                |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|----------------------|----------------|
| Know the physical separation systems as well as the transfer operations applied to the Industrial chemical processes. To know and design the equipment necessary for the development of the Solid-gas separation. Understand storage possibilities and associated issues. | A28                         | B4<br>B6<br>B7<br>B8 | C3<br>C4<br>C6 |

## Contents

| Topic | Sub-topic |
|-------|-----------|
|-------|-----------|



|                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Blocks or topics to develop the levels laid down in the verification of memory tab | <p>Auxiliary services in industries: introduction to chemical technology, materials protection, water, gas distribution networks. Operations handling: storage of fluids, flow of fluids, measuring and pumping of fluids, piping and accessories, operations with solids.</p> <p>Separation operations: introduction to systems solid, separation (sedimentation and flotation) solid-liquid, solid-liquid separation (filtration and centrifugation), separation of solids and liquids into gases. Transfer operations: solid-liquid extraction, extraction liquidoliquido; Distillation, absorption, adsorption and ion exchange.</p> |
| AUXILIARY SERVICES IN INDUSTRIES                                                   | <p>Introduction to chemical technology</p> <p>Water distribution networks</p> <p>Gases</p> <p>Protection of materials</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| HANDLING OPERATIONS                                                                | <p>Fluid storage</p> <p>Fluid flow</p> <p>Measuring and pumping fluids</p> <p>Pipes and fittings</p> <p>Operations with solids</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| SEPARATION OPERATIONS                                                              | <p>Introduction to solid-fluid systems</p> <p>Solid-liquid separation: sedimentation, flotation, filtration and centrifugation</p> <p>Separation of solids and liquids into gases</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| MATERIAL TRANSFER OPERATIONS                                                       | <p>Solid-liquid extraction</p> <p>Liquid-liquid extraction</p> <p>Distillation</p> <p>Absorption</p> <p>Adsorption and ion exchange</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

| Planning                                                                                                                        |                   |                      |                               |             |
|---------------------------------------------------------------------------------------------------------------------------------|-------------------|----------------------|-------------------------------|-------------|
| Methodologies / tests                                                                                                           | Competencies      | Ordinary class hours | Student's personal work hours | Total hours |
| Supervised projects                                                                                                             | B6 B7 B8 C3 C4 C6 | 12                   | 24                            | 36          |
| Mixed objective/subjective test                                                                                                 | A28 B6 B7         | 0                    | 10                            | 10          |
| Problem solving                                                                                                                 | B7 C4 C6          | 10                   | 6                             | 16          |
| ICT practicals                                                                                                                  | B7 C4             | 1                    | 4                             | 5           |
| Guest lecture / keynote speech                                                                                                  | A28 B4 B6 B7      | 38                   | 38                            | 76          |
| Personalized attention                                                                                                          |                   | 7                    | 0                             | 7           |
| (*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students. |                   |                      |                               |             |

| Methodologies                   |                                                                                                                                                                                                                                                                            |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Methodologies                   | Description                                                                                                                                                                                                                                                                |
| Supervised projects             | <p>It is an option based on the resolution by the students of the responsibility for their own learning.</p> <p>This teaching system is based on two basic elements: the independent learning of the students and the monitoring of this learning by the teacher-tutor</p> |
| Mixed objective/subjective test | Exam that integrates standard questions and objective type questions. As for the former, it includes open-ended questions of development, the latter can combine multiple-choice, ranking, short-answer, discrimination, completion and association questions.             |
| Problem solving                 | Technique through which a specific problem situation has to be solved, based on the knowledge that has been worked on, which may have more than one possible solution                                                                                                      |



|                                |                                                                                                                                                                                                                                                                              |
|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ICT practicals                 | Practice-based learning method for theoretical subject content using ICT resources (demonstrations, simulations, etc.) ICT is an excellent medium for practical knowledge applications and information processing, and a key aid to student learning and skills development. |
| Guest lecture / keynote speech | Oral presentation complemented by the use of audiovisual media in order to transmit knowledge and facilitate learning.                                                                                                                                                       |

| Personalized attention                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Methodologies                                         | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Guest lecture / keynote speech<br>Supervised projects | <p>Tutored works: assistance to personalized tutorials is recommended. The student will receive guidance on how to start and carry out the work according to the criteria specified below.</p> <p>Oral presentation: made with the support of slides and each group of students will have a set time for it.</p> <p>In case of academic dispensation the student will contact the teachers of the subject to agree on the planning of teaching activities, meeting the needs that the student may have within the existing possibilities.</p> |

| Assessment                      |                   |                                                                                                                                                                                                         |               |
|---------------------------------|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Methodologies                   | Competencies      | Description                                                                                                                                                                                             | Qualification |
| Mixed objective/subjective test | A28 B6 B7         | Exam                                                                                                                                                                                                    | 70            |
| Supervised projects             | B6 B7 B8 C3 C4 C6 | Protected works will be carried out by the students with the help of teachers of the subject. These works must provide to teachers both in paper format by email or platform designated by the faculty. | 30            |

| Assessment comments                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Students with a qualification greater than 4 in the mixed test will go on to weighing with the rest of the evaluation methodologies. In the event that any of the above methodologies is not carried out, the qualification of that methodology will pass to the mixed test. In the first evaluation opportunity, the qualification of the works and the mixed test will be taken into account as long as in this the minimum of 4. The same criterion will be applicable for the second opportunity. For the advanced call, the mixed test will have a value of 100% of the qualification. The fraudulent performance of the tests or evaluation activities will directly imply the failure grade "0" in the matter in the corresponding call, thus invalidating any grade obtained in all the evaluation activities for the extraordinary call. |

| Sources of information |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Basic                  | <ul style="list-style-type: none"> <li>- J.M.Coulson (1988). Ingeniería química. Reverté</li> <li>- Andrés Arévalo (1991). Tecnología química. ETSII, Sección de Publicaciones</li> <li>- Ángel Vian Ortuño (1979). Introducción a la química industrial. Alhambra</li> <li>- Eugenio Muñoz Camacho (2012). Ingeniería química. Universidad Nacional de Educación a Distancia</li> <li>- Nueva Calleja Pardo, Guillermo; García Herruzo, Francisco (2016). Ingeniería Química. Síntesis</li> <li>- McCabe, Warren L. (2007). Operaciones unitarias en ingeniería química. McGraw-Hill</li> <li>- Costa López, J. (2004). Curso de ingeniería química : introducción a los procesos, las operaciones unitarias y los fenómenos de transporte en la ingeniería química . Reverté</li> <li>- Ocón García, Joaquín (2004). Problemas de ingeniería química. Operaciones básicas. Aguilar</li> <li>- Costa Novella, E (1988). Ingeniería química. Alhambra</li> <li>- Felder, Richard M. (1978). Elementary principles of chemical processes. John Wiley &amp; Sons</li> <li>- Himmelblau, David M (2004). Basic principles and calculations in chemical engineering. Pearson Education International</li> </ul> <p>Apuntes de clase e traballosApuntes de clase e traballos</p> |
| Complementary          | <br />                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |



| Recommendations                                          |
|----------------------------------------------------------|
| Subjects that it is recommended to have taken before     |
| QUÍMICA/730G04005                                        |
| Subjects that are recommended to be taken simultaneously |
|                                                          |
| Subjects that continue the syllabus                      |
|                                                          |
| Other comments                                           |



1. The delivery of the documentary works carried out in this matter:
  - 1.1. It will be requested in virtual format and / or computer support.
  - 1.2. It will be done through Moodle, in digital format without the need to print them
  - 1.3. If done on paper:
    - No plastics will be used.
    - Double-sided prints will be made.
    - Recycled paper will be used.
    - Draft printing will be avoided.
- 2.- A sustainable use of resources and the prevention of negative impacts on the natural environment must be made.
- 3.- The importance of ethical principles related to the values of sustainability in personal and professional behavior must be taken into account.
- 4.- As stated in the different regulations of application for university teaching, the gender perspective must be incorporated in this matter (non-sexist language will be used, bibliography of authors of both sexes will be used, intervention in class of students will be encouraged and students ...).
- 5.- Work will be done to identify and modify prejudices and sexist attitudes, and the environment will be influenced to modify them and promote values of respect and equality.
6. Situations of discrimination based on gender must be detected and actions and measures will be proposed to correct them.
7. The full integration of students who for physical, sensorial, psychic or sociocultural reasons, experience difficulties to adequate, equal and beneficial access to university life will be facilitated.

(\*)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.