Degree competences to which the subject contributes

Specific:
1. CHE: Knowledge of material and energy balances, biotechnology, the transfer of materials, separation operations, chemical reaction engineering, the design of reactors, and the reuse and transformation of raw materials and energy resources.

Teaching methodology

- Face-to-face lecture sessions.
- Face-to-face practical work sessions.
- Independent learning and exercises.

In the face-to-face lecture sessions, the lecturer will introduce the basic theory, concepts, methods and results for the subject and use examples to facilitate students' understanding.

Practical class work will be covered in three types of sessions:

a) Sessions in which the lecturer will provide students with guidelines to analyse data for solving problems by applying methods, concepts and theoretical results (85%).

b) Sessions in which students give presentations of group work (9%).

c) Examination sessions (6%).

Students will be expected to study in their own time so that they are familiar with concepts and are able to solve the exercises set, whether manually or with the help of a computer.

Group work will consist of longer, more complex exercises that require the application of the concepts covered in class. All group members (maximum three students) will be expected to work together to complete the exercises, especially in applications that require knowledge of many different concepts.

Students may come to office hours to resolve any doubts that may arise from the theoretical or applied content presented in class.

Learning objectives of the subject

In this subject, students will learn the fundamentals of the unit operations of chemical engineering. After a general
overview, we will delve into the particulars of each operation. We will adapt, for the purposes of chemical engineering, operations that are not strictly chemical in nature but are applied in chemistry, and whose fundamentals are well understood (for example, dimensional analysis, heat transfer and fluid transport).

In addition, we will develop applications that provide a practical overview of the subject's theoretical content—a fundamental objective for any chemical engineer.

Groups of students will work on both theoretical and applied content.

### Study load

<table>
<thead>
<tr>
<th></th>
<th>Hours large group:</th>
<th>Hours medium group:</th>
<th>Hours small group:</th>
<th>Guided activities:</th>
<th>Self study:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total learning time:</strong></td>
<td>150h</td>
<td>30h</td>
<td>30h</td>
<td>0h</td>
<td>90h</td>
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<td></td>
<td>20.00%</td>
<td>20.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>60.00%</td>
</tr>
</tbody>
</table>
### Content

<table>
<thead>
<tr>
<th>SEPARATION PROCESSES</th>
<th>Learning time: 150h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 30h</td>
</tr>
<tr>
<td></td>
<td>Practical classes: 30h</td>
</tr>
<tr>
<td></td>
<td>Self study: 90h</td>
</tr>
</tbody>
</table>

#### Description:
- Introduction to mass transfer
- Distillation
- Flash distillation
- Continuous distillation with reflux
- Design of plate columns
- Packet columns
- Batch distillation
- Multicomponent distillation
- Absorption of gases
- Liquid-liquid extraction
- Humidification
- Drying
- Leaching
- Other Operations of Separation

#### Specific objectives:
- Understand the theoretical basis for calculation, design and selection of separation equipment.
- Understand, calculate and design distillation processes:
  - Understand and calculate the flash distillation
  - Understand and calculate the continuous distillation with reflux applying McCabe-Thiele and Ponchon-Savarit methods
  - Design a perforated plate column
  - Calculation of a packet column
  - Understand and calculate batch distillation
  - Study of multicomponent distillation
- Understand and calculate gas absorption process
- Understand and calculate humidification process
- Understand and calculate the drying process
- Understand and calculate leaching process
- Understand and calculate other unit operations

### Qualification system

- First examination: 25%
- Second examination: 25%
- Third examination: 25%
- Fourth examination: 25%

For those students who meet the requirements and submit to the reevaluation examination, the grade of the reevaluation exam will replace the grades of all the on-site written evaluation acts (tests, midterm and final exams) and the grades obtained during the course for lab practices, works, projects and presentations will be kept.

If the final grade after reevaluation is lower than 5.0, it will replace the initial one only if it is higher. If the final grade after reevaluation is greater or equal to 5.0, the final grade of the subject will be pass 5.0.
Regulations for carrying out activities

It is essential that students have knowledge of technical English, as it enables them to access a broader range of information on this subject. Therefore, the notes, PowerPoint slides and examinations for this subject will be in English.

Bibliography

Basic:


Complementary:


