Degree competences to which the subject contributes

Specific:
1. Understand mass and energy balances, biotechnology, mass transfer, separation operations, chemical reaction engineering, the design of reactors, and the recovery and processing of raw materials and energy resources.

Transversal:
2. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 3. Communicating clearly and efficiently in oral and written presentations. Adapting to audiences and communication aims by using suitable strategies and means.

Learning objectives of the subject

To Acquire the necessary theoretical knowledge for the calculation and design industrial plants both mass transfer and simultaneous transfer of heat and matter, such as distillation, rectification continuous and discontinuous, solids drying, gas absorption, liquid-liquid extraction, etc..

To acquire analytical skills and ability to use information sources to solve exercises and problems of all these processes and facilities.

Prior skills

Find relevant information in the field of chemical engineering and correct oral and written expression, interpret graphs and diagrams, knowledge of transmission of heat and physicochemical requirements.

Requirements

OPERACIONS BÀSIQUES I - Prerequisite
820528 - OBA2 - Unit Operations II

### Study load

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group: 60h</th>
<th>40.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group: 0h</td>
<td>0.00%</td>
</tr>
<tr>
<td></td>
<td>Hours small group: 0h</td>
<td>0.00%</td>
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<tr>
<td></td>
<td>Guided activities: 0h</td>
<td>0.00%</td>
</tr>
<tr>
<td></td>
<td>Self study: 90h</td>
<td>60.00%</td>
</tr>
</tbody>
</table>
# Content

1. **Introduction to the operations with mass transfer**  
**Learning time:** 2h  
**Theory classes:** 2h  
**Description:**  
Introduction to the operations with mass transfer. Diffusion. Film and double-film theories. Mass transfer coefficient.

2. **Distillation**  
**Learning time:** 10h  
**Theory classes:** 10h  
**Description:**  

3. **Air-water interaction**  
**Learning time:** 4h  
**Theory classes:** 4h  
**Description:**  
Humidity, dew point, humid temperature and adiabatic saturation temperature, enthalpy of air-water systems. Psychrometric diagram. Humidification, cooling, etc.

4. **Cooling towers**  
**Learning time:** 4h  
**Theory classes:** 4h  
**Description:**  
Industrial cooling circuits: open, closed and half open. Differential characteristics between them. Cooling towers: problematic and their specific characteristics.

5. **Solids drying**  
**Learning time:** 6h  
**Theory classes:** 6h  
**Description:**  
Drying kinetics: critical humidity, precritical and postcritical periods. Drying rate. Humidity removal mechanisms in both mentioned periods. Drying time in each period and total duration of drying.
## 6. Absorption

**Description:**

**Learning time:** 8h
- Theory classes: 8h

## 7. Liquid-liquid extraction

**Description:**
Liquid-liquid extraction of binary mixtures in one stage of equilibrium and in various stages of equilibrium. Specific diagrams. Mass balance and design equations.

**Learning time:** 8h
- Theory classes: 8h

## 8. Solid-liquid extraction

**Description:**

**Learning time:** 6h
- Theory classes: 6h

## 9. Adsorption

**Description:**

**Learning time:** 8h
- Theory classes: 8h
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**Bibliography**

**Basic:**


**Complementary:**


**Others resources:**