205226 - Surface Chemistry for Industrial Applications Design

Coordinating unit: 205 - ESEIAAT - Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit: 713 - EQ - Department of Chemical Engineering
Academic year: 2019
Degree: BACHELOR’S DEGREE IN INDUSTRIAL TECHNOLOGY ENGINEERING (Syllabus 2010). (Teaching unit Optional)
BACHELOR’S DEGREE IN AEROSPACE TECHNOLOGY ENGINEERING (Syllabus 2010). (Teaching unit Optional)
BACHELOR’S DEGREE IN AEROSPACE VEHICLE ENGINEERING (Syllabus 2010). (Teaching unit Optional)
BACHELOR’S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Teaching unit Optional)
BACHELOR’S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Teaching unit Optional)
BACHELOR’S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Teaching unit Optional)
BACHELOR’S DEGREE IN CHEMICAL ENGINEERING (Syllabus 2009). (Teaching unit Optional)
BACHELOR’S DEGREE IN AUDIOVISUAL SYSTEMS ENGINEERING (Syllabus 2009). (Teaching unit Optional)
BACHELOR’S DEGREE IN TEXTILE TECHNOLOGY AND DESIGN ENGINEERING (Syllabus 2009). (Teaching unit Optional)
BACHELOR’S DEGREE IN INDUSTRIAL DESIGN AND PRODUCT DEVELOPMENT ENGINEERING (Syllabus 2010). (Teaching unit Optional)
ECTS credits: 3
Teaching languages: English

Teaching staff
Coordinator: MANUEL-JOSE LIS ARIAS

Opening hours
Timetable: Monday and Friday from 9 to 12 h

Prior skills
Multidisciplinar approach of the subject makes that the competences aquired until third curs should be enough. Advanced studies in third curs and totally passed the second course would be recommended. This condition is not a way to exclude students.

Teaching methodology
Some activities that correspond to the six groups of items in which subject has been divided. After summarized theoretical approach to each group, there will be some real problems to be solved

Learning objectives of the subject
Real industrial systems require, for their modification or for new design of a transversal vision about the phenomena involved in the whole process. The majority of industrial applications involve heterogeneous systems that act just depending on the chemical characteristics of the components in contact. The main objective of this subject is to define every phenomenology involved in this type of industrial systems
## Study load

<table>
<thead>
<tr>
<th>Total learning time: 75h</th>
<th>Hours large group: 14h</th>
<th>18.67%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group: 8h</td>
<td>10.67%</td>
</tr>
<tr>
<td></td>
<td>Hours small group: 8h</td>
<td>10.67%</td>
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<tr>
<td></td>
<td>Guided activities: 0h</td>
<td>0.00%</td>
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<tr>
<td></td>
<td>Self study: 45h</td>
<td>60.00%</td>
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</tbody>
</table>
## Content

### Interfaces in industrial systems

**Learning time:** 12h 30m

- Theory classes: 1h
- Practical classes: 2h
- Laboratory classes: 2h
- Self study: 7h 30m

**Description:**
Chemical characteristics of heterogeneous systems. Electric potential and diffusional layers. Colloidal systems. Amphoteric molecules and surface activity molecules: micelles, mixed micelles, biological membranes. Relationship between chemical structure and properties depending on (viscosity, dipolar moment,...) Interfacial tension. Couy-Chapman Theory for different interfaces.

**Related activities:**
Case 1: For an specific system, detect and study the relationship between interfaces

**Specific objectives:**
To establish the relationship between chemical structure and surface properties

### Gas-liquid

**Learning time:** 12h 30m

- Theory classes: 1h
- Practical classes: 2h
- Laboratory classes: 2h
- Self study: 7h 30m

**Description:**

**Specific objectives:**
To establish the basic phenomena involved in the contact between bubbles and liquids

### Non-miscible liquid systems

**Learning time:** 11h 30m

- Theory classes: 4h
- Self study: 7h 30m

**Description:**

**Related activities:**
Case 2: For an specific case, to establish and define the methodology to follow to make a disperse system

**Specific objectives:**
To become familiar with two non-miscible liquids and know how to manage to mix them
## Non porous solids-liquids

**Learning time:** 11h 30m
- Theory classes: 4h
- Self study: 7h 30m

**Description:**

**Specific objectives:**
To define the chemical interactions between non-porous solids and liquids.

## Porous solids-liquids

**Learning time:** 13h 30m
- Theory classes: 2h
- Practical classes: 2h
- Laboratory classes: 2h
- Self study: 7h 30m

**Description:**

**Related activities:**
Case 3: For specific cases, define the strategy to improve the adhesion phenomena

**Specific objectives:**
To differentiate the behaviour of the solid interface when the solid is porous.

## Gas-solid systems

**Learning time:** 13h 30m
- Theory classes: 2h
- Practical classes: 2h
- Laboratory classes: 2h
- Self study: 7h 30m

**Description:**
Porosity effects on solid-gas systems. Membrane effect. Filtration. Retention capability of gases by membranes, depending on their chemical characteristics.

**Related activities:**
Case 4: For an specific system, define and determine the interactions between solid and gas

**Specific objectives:**
To establish the interactions between solid and gases.
Qualification system

Developed that will weigh 25% each. Written delivery and oral presentation

Regulations for carrying out activities

The written report for each case and the oral presentations will be scheduled

Bibliography

Basic:


Others resources:

For every case, some articles and specific bibliography will be delivered