240656 - Chemical Processes From the Industrial Reality

Coordinating unit: 240 - ETSEIB - Barcelona School of Industrial Engineering
Teaching unit: 713 - EQ - Department of Chemical Engineering
Academic year: 2018
Degree: BACHELOR'S DEGREE IN INDUSTRIAL TECHNOLOGY ENGINEERING (Syllabus 2010). (Teaching unit Optional)
ECTS credits: 4,5
Teaching languages: English

Teaching staff
Coordinator: Rosa Maria Darbra Roman

Opening hours
Timetable: To be agreed with the professor

Degree competences to which the subject contributes

Specific:
1. Capacity to understand and apply basic knowledge principles of general chemistry, organic and inorganic chemistry and their engineering applications.
2. Basic knowledge of industrial production systems.

Transversal:
3. SELF-DIRECTED LEARNING. Detecting gaps in one's knowledge and overcoming them through critical self-appraisal. Choosing the best path for broadening one's knowledge.
4. EFFICIENT ORAL AND WRITTEN COMMUNICATION. Communicating verbally and in writing about learning outcomes, thought-building and decision-making. Taking part in debates about issues related to the own field of specialization.
5. THIRD LANGUAGE. Learning a third language, preferably English, to a degree of oral and written fluency that fits in with the future needs of the graduates of each course.
6. TEAMWORK. Being able to work as a team player, either as a member or as a leader. Contributing to projects pragmatically and responsibly, by reaching commitments in accordance to the resources that are available.

Teaching methodology
Chemical plants visits
Lectures
Practical classes
Seminars from invited speakers
Independent learning
Learning through projects, problems and case-studies (team project)

Learning objectives of the subject
The objective of this subject is to provide an overview of the chemical industry and also about its diversity of products. Therefore, it is essential to visit chemical plants to get acquainted with the production processes that will be explained in class. Special emphasis is made on the safety and environmental aspects related to these processes.

The specific objectives of this subject are:
1- Make the student aware of the diversity of products and industries related with the industrial chemistry.
2- Identify the raw materials and intermediate products used in the chemical production at large scale.
3- Understand the different physico-chemical processes that allow the transformation of these raw materials to a final product.
4- Describe relevant processes for the chemical industry.
5- Assess the safety and environmental aspects related to the chemical processes.

### Study load

<table>
<thead>
<tr>
<th>Total learning time: 112h 30m</th>
<th>Hours medium group:</th>
<th>45h</th>
<th>40.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self study:</td>
<td>67h 30m</td>
<td></td>
<td>60.00%</td>
</tr>
</tbody>
</table>
## Content

<table>
<thead>
<tr>
<th>Chapter 1. Introduction to Chemical Industry</th>
<th>Learning time: 8h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 2h</td>
</tr>
<tr>
<td></td>
<td>Practical classes: 2h</td>
</tr>
<tr>
<td></td>
<td>Self study: 4h</td>
</tr>
</tbody>
</table>

**Description:**
Chemical industry importance at Spanish level and at a global scale. Chemical process definition. Key aspects for its success. Environmental and safety aspects in the chemical industry.

**Related activities:**
- Lectures (2h)
- Practical exercises
- 1 home assignment
- Practical classes on environmental aspects in the industry (2h)
- 1 paper to read at home about the chemical engineer studies

**Specific objectives:**
- Objectives 1 and 5.

<table>
<thead>
<tr>
<th>Chapter 2. Raw materials used by the chemical industry</th>
<th>Learning time: 14h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 6h</td>
</tr>
<tr>
<td></td>
<td>Self study: 8h</td>
</tr>
</tbody>
</table>

**Description:**
Main natural sources of raw materials for the chemical industry: litosphere, hydrosphere, atmosphere and biosphere.

**Related activities:**
- Lectures (2h)
- Practical exercises
- Chemical plant visit (4h)

**Specific objectives:**
- Objectives 2 and 5.
### Chapter 3. Petroleum and Petrochemical industry

**Learning time:** 27h 30m  
Theory classes: 11h  
Self study: 16h 30m

**Description:**  

**Related activities:**  
Lectures (5h)  
Practical exercises  
1 home assignment  
2 papers to read at home  
Chemical Plant Visit (4h)  
Starting the team project preparation  
Seminar from an invited speaker (2h)

**Specific objectives:**  
Objectives 3, 4 and 5.

### Chapter 4. Detergents industry

**Learning time:** 15h  
Theory classes: 7h  
Self study: 8h

**Description:**  

**Related activities:**  
Lectures (3h)  
Practical exercises  
1 home assignment  
1 chemical plant visit (4h)  
Team project development

**Specific objectives:**  
Objectives 2, 3, 4 and 5.
### Chapter 5. Fertilizers industry

**Description:**
Fertilizers introduction. Sulphuric acid, Phosphoric acid and Nitric acid production. Environmental and safety aspects.

**Related activities:**
- Lectures (3h)
- Practical exercise
- 1 chemical plant visit (4h)
- Team project development

**Specific objectives:**
Objectives 3, 4 and 5.

**Learning time:**
- Theory classes: 7h
- Self study: 9h

### Chapter 6. Cement industry

**Description:**

**Related activities:**
- Lectures (2h)
- Practical exercises at class
- 1 paper to read at home
- Practical class on safety at the industry (2h)
- Final redaction of the team project report

**Specific objectives:**
Objectives 2, 3, 4 and 5.

**Learning time:**
- Theory classes: 2h
- Practical classes: 2h
- Self study: 11h
## Chapter 7. Paper industry

### Description:

### Related activities:
- Lectures (2h)
- 1 home assignment
- Preparation of the team project presentations
- Team project presentations at class (4h)
- Self study

### Specific objectives:
Objectives 2, 3, 4 and 5

<table>
<thead>
<tr>
<th>Learning time:</th>
<th>17h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory classes:</td>
<td>6h</td>
</tr>
<tr>
<td>Self study :</td>
<td>11h</td>
</tr>
</tbody>
</table>
### Planning of activities

<table>
<thead>
<tr>
<th>Activity</th>
<th>Hours: 20h</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LECTURES</strong></td>
<td>Theory classes: 16h</td>
</tr>
<tr>
<td><strong>Description:</strong></td>
<td>Self study: 4h</td>
</tr>
<tr>
<td><strong>Support materials:</strong></td>
<td>Slides, exercises and papers. All the material is available on-line (atenea).</td>
</tr>
<tr>
<td><strong>Description of the assignments due and their relation to the assessment:</strong></td>
<td>Home assignments. Mid-term exam and Final exam.</td>
</tr>
<tr>
<td><strong>Specific objectives:</strong></td>
<td>To comply with those set in this subject.</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Activity</th>
<th>Hours: 20h</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>VISITS</strong></td>
<td>Theory classes: 16h</td>
</tr>
<tr>
<td><strong>Description:</strong></td>
<td>Self study: 4h</td>
</tr>
<tr>
<td><strong>Support materials:</strong></td>
<td>The one provided by the company.</td>
</tr>
<tr>
<td><strong>Specific objectives:</strong></td>
<td>Objectives from 1 to 6.</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Activity</th>
<th>Hours: 6h</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PRACTICAL CLASSES</strong></td>
<td>Practical classes: 4h</td>
</tr>
<tr>
<td><strong>Description:</strong></td>
<td>Self study: 2h</td>
</tr>
<tr>
<td><strong>Support materials:</strong></td>
<td>Slides on-line (atenea)</td>
</tr>
<tr>
<td><strong>Description of the assignments due and their relation to the assessment:</strong></td>
<td>Final test</td>
</tr>
<tr>
<td><strong>Specific objectives:</strong></td>
<td>Objective 5</td>
</tr>
</tbody>
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<thead>
<tr>
<th>Activity</th>
<th>Hours: 34h</th>
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<tbody>
<tr>
<td><strong>TEAM PROJECT</strong></td>
<td>Theory classes: 4h</td>
</tr>
<tr>
<td><strong>Description:</strong></td>
<td>Self study: 30h</td>
</tr>
</tbody>
</table>
Description:
Each team will focus on a different chemical product used in the every day life. The students will learn its production process from the raw material to the final product. They will explain this to the rest of the class.

Support materials:
Bibliographic research, chemical plant visits, professors inquiries, etc.

Descriptions of the assignments due and their relation to the assessment:
Final report and presentation delivery at the end of the term.

Specific objectives:
The students will face a new challenge: the production of a product that it is unknow. They will have to find the way to understand and explain this process to the rest of the class.

Qualification system
First-term exam: 35% of the final qualification
Second-term exam: 35% of the final qualification
Team project: 20% of the final qualification
Visits report: 10% of the final qualification
Practical classes: 10% of the final qualification

Regulations for carrying out activities
- Each exam is independent. The first-one assesses the topics explained up to mid-term and the final exam, the rest of topics until the end of the course.
- The second term exam will be done the day of the final exam.
- The reevaluation exam will only substitute the qualifications obtained in the mid-term and second-term exams. The final work, the practical classes and the visits reports are not reevaluated. The student have to do at least one evaluation event to obtain a final qualification.
- The visits to chemical plants are not compulsory, but they are another class. Therefore, their content can be asked in the exams.
Bibliography

Basic:


Complementary: