The technological revolution of the XX century second half is linked, in a great measure, to the industrial development of organic chemistry. Fuels, polymers, pharmaceuticals, materials and technological products are some industrial sectors that are based in the organic chemistry achievements. The reduced amount of credits assigned to general chemistry courses in the engineering study plans have lead to the consequence of a poor coverage of industrial organic chemistry issues.

This course is offered as a clear opportunity to develop the principles of structure and reactivity of organic compounds mainly connected to their corresponding industrial activities. As a matter of fact, benefits of superior technology knowledge in organic chemistry are multiple: lower cost raw materials, shorter synthesis routes, improved yields, selectivity and kinetics, resulting in better productivity. Furthermore, this course is also thought as an introduction to the unit operations technology in engineering, which is a subject especially developed in the Master Degree in Industrial Technologies in ETSEIAT. Besides it could be said that process safety is continually upgraded as more intimate knowledge of organic chemical reactions and other unit operations in chemical engineering is achieved. There is also the planned purpose to pay attention to environmental issues and sustainable technology concerns, as long as the organic chemistry sectors considered in this course are developed: petroleum refining, polymers and monomers, natural products industries and fuels.

### 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 CHEMICAL ENGINEERING (Syllabus 2009). (Teaching unit Optional)
- BACHELOR’S DEGREE IN AEROSPACE VEHICLE ENGINEERING (Syllabus 2010). (Teaching unit Optional)
- BACHELOR’S DEGREE IN AEROSPACE TECHNOLOGY ENGINEERING (Syllabus 2010). (Teaching unit Optional)
- BACHELOR’S DEGREE IN INDUSTRIAL TECHNOLOGY ENGINEERING (Syllabus 2010). (Teaching unit Optional)

### ECTS credits:
3

### Teaching languages:
English

### Teaching staff
- **Coordinator:** Josep Mª. Dagà
- **Others:** Josep Mª. Gibert

### Teaching methodology

The course is divided into parts:
- **Theory classes**
- **Practical classes**
- **Self-study for doing exercises and activities.**

In the theory classes, teachers will introduce the theoretical basis of the concepts, methods and results and illustrate them with examples appropriate to facilitate their understanding.

In the practical classes (in the classroom), teachers guide students in applying theoretical concepts to solve problems, always using critical reasoning. We propose that students solve exercises in and outside the classroom, to promote contact and use the basic tools needed to solve problems.

Students, independently, need to work on the materials provided by teachers and the outcomes of the sessions of exercises/problems, in order to fix and assimilate the concepts.

The teachers provide the syllabus and monitoring of activities (by ATENEA).

### Learning objectives of the subject

The technological revolution of the XX century second half is linked, in a great measure, to the industrial development of organic chemistry. Fuels, polymers, pharmaceuticals, materials and technological products are some industrial sectors that are based in the organic chemistry achievements. The reduced amount of credits assigned to general chemistry courses in the engineering study plans have lead to the consequence of a poor coverage of industrial organic chemistry issues. This course is offered as a clear opportunity to develop the principles of structure and reactivity of organic compounds mainly connected to their corresponding industrial activities. As a matter of fact, benefits of superior technology knowledge in organic chemistry are multiple: lower cost raw materials, shorter synthesis routes, improved yields, selectivity and kinetics, resulting in better productivity. Furthermore, this course is also thought as an introduction to the unit operations technology in engineering, which is a subject especially developed in the Master Degree in Industrial Technologies in ETSEIAT. Besides it could be said that process safety is continually upgraded as more intimate knowledge of organic chemical reactions and other unit operations in chemical engineering is achieved. There is also the planned purpose to pay attention to environmental issues and sustainable technology concerns, as long as the organic chemistry sectors considered in this course are developed: petroleum refining, polymers and monomers, natural products industries and fuels.
220130 - Industrial Organic Chemistry

### Study load

<table>
<thead>
<tr>
<th>Total learning time: 75h</th>
<th>Hours large group: 30h</th>
<th>40.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self study: 45h</td>
<td></td>
<td>60.00%</td>
</tr>
</tbody>
</table>
## Content

<table>
<thead>
<tr>
<th>Module 1: Petroleum. Oil refining processes and products.</th>
<th>Learning time: 18h 40m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description:</td>
<td></td>
</tr>
<tr>
<td>Theory classes: 7h 30m</td>
<td></td>
</tr>
<tr>
<td>Self study : 11h 10m</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Module 2: Monomers and dienes production. Polymerization processes. Fibers and composites.</th>
<th>Learning time: 18h 45m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description:</td>
<td></td>
</tr>
<tr>
<td>Theory classes: 7h 30m</td>
<td></td>
</tr>
<tr>
<td>Self study : 11h 15m</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Module 3: Natural products industries and pharmaceuticals. Carbohydrates. Lipids, oils and fats. Aminoacids.</th>
<th>Learning time: 18h 45m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description:</td>
<td></td>
</tr>
<tr>
<td>Position in the industry of fine chemicals such as advanced intermediates, pesticides, vitamins, flavor and fragrance chemicals, and of specialty chemicals such as pharmaceuticals, dyestuffs, perfumes and others. Production of dimethyl carbonate. Production of ibuprofen. Plants for the production of fine chemicals and pharmaceuticals. Batch reactor design. Fermentation technology-cell biomass (Bakers’ yeast production from sugars). Triglycerides. Fat industrial extraction. Soup saponification. Fat hydrogenation. Transesterification. Detergents and surfactants. Enzyme technology (biocatalysts for chemical transformations). Production of L-Aminoacids. Production of artificial sweeteners. Production of D-mannitol. Structure elucidation of natural products and fine chemicals by infrared (IR), visible-ultraviolet (UV), NMR and mass spectroscopies. X-Ray crystallography for structure determination of carbohydrates, proteins and other pharmaceuticals and natural products.</td>
<td></td>
</tr>
</tbody>
</table>
Module 4: Fuel production processes from petroleum, coal and biomass.

**Learning time:** 18h 50m
- Theory classes: 7h 30m
- Self study: 11h 20m

**Description:**

**Qualification system**
Final Grade = 0.25 Eval. partial exam + 0.5 Eval. final exam + 0.25 Research Work Project

Any student who cannot attend any of the written tests or that wants to improve the obtained grade, will have the opportunity by taking an additional global written exam that will take place the dated fixed in the calendar of final exams. The grade obtained in this test will range between 0 and 10, and will replace that of the previous tests only in case it is higher.

**Regulations for carrying out activities**
Because the contents of the partial exam are included in the final exam, passing the final exam implies having passed also the partial exam. In any case, the best average of the exams will remain.

**Bibliography**

**Basic:**

**Complementary:**