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.

Teaching methodology

- Theory sessions: In these sessions the necessary theoretic concepts of the module will be introduced. Taught with the help of visual means.
- Problems sessions: In these sessions theoretic concepts will be applied to solve problems involving and encouraging students to participate.

Direct activities: Complementary work to problems or theory sessions, which strive to strengthen the student's relationship to certain topics will be treated in regular sessions. They will be either individual or group exercises.

Learning objectives of the subject

1. Understanding the atomic structure and studying different types of bindings between inorganic materials such as: metals, ionic solids and covalent and mixed composites.
2. Applying previous structural knowledge to determine both physical and chemical properties of inorganic material. Considering its applications from an industrial point of view and their use in the engineering field.
3. Understanding structure and bindings of organic materials. Studying composition and constitution of carbon derived compounds, as well as their constitution and formation.
4. Studying the different organic compounds families, their physical properties and the most important chemical reactions.
5. Applying previous structural and functional knowledge into using organic compounds in the chemical industry and the engineering field.
240024 - Chemistry II

### Study load

<table>
<thead>
<tr>
<th>Total learning time: 112h 30m</th>
<th>Hours large group: 45h 40.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group: 0h 0.00%</td>
</tr>
<tr>
<td></td>
<td>Hours small group: 0h 0.00%</td>
</tr>
<tr>
<td></td>
<td>Guided activities: 0h 0.00%</td>
</tr>
<tr>
<td></td>
<td>Self study: 67h 30m 60.00%</td>
</tr>
</tbody>
</table>
# Content

## TOPIC 1. Covalent binding

**Learning time:** 17h  
Theory classes: 4h  
Practical classes: 3h  
Guided activities: 2h 30m  
Self study: 7h 30m

**Description:**  
- Covalent binding theories. Hybridization.  
- Distances, energies and binding angles.  
- Polarities and molecular binding.  
- Intermolecular forces. Physical properties and aggregation states

## TOPIC 2. Ionic binding

**Learning time:** 13h  
Theory classes: 3h  
Practical classes: 2h  
Guided activities: 2h 30m  
Self study: 5h 30m

**Description:**  
- Ionic packaging.  
- Solid dissolutions.  
- Ionic binding. Reticular energy.  
- Properties of ionic compounds. Applications in engineering.

## TOPIC 3. The metallic binding

**Learning time:** 13h  
Theory classes: 3h  
Practical classes: 2h  
Guided activities: 2h 30m  
Self study: 5h 30m

**Description:**  
- Introduction to chemical metallic  
- Metallic packaging. Polymorphism.  
- Introduction to alloys.  
- Metallic bindings. Bands model.  
- Metal's properties. Engineering applications
### TOPIC 4. Introduction to Organic Chemistry

<table>
<thead>
<tr>
<th><strong>Learning time:</strong></th>
<th>22h 30m</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Theory classes:</strong></td>
<td>5h</td>
</tr>
<tr>
<td><strong>Practical classes:</strong></td>
<td>4h</td>
</tr>
<tr>
<td><strong>Guided activities:</strong></td>
<td>3h 30m</td>
</tr>
<tr>
<td><strong>Self study:</strong></td>
<td>10h</td>
</tr>
</tbody>
</table>

**Description:**
- The carbon atom. Simple, double and triple bindings.
- Functional groups. Formulation and nomenclature.
- Constitutional isomerism and stereoisomerism.
- Electronic effects.

### TOPIC 5. Hydrocarbons

<table>
<thead>
<tr>
<th><strong>Learning time:</strong></th>
<th>17h</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Theory classes:</strong></td>
<td>4h</td>
</tr>
<tr>
<td><strong>Practical classes:</strong></td>
<td>3h</td>
</tr>
<tr>
<td><strong>Guided activities:</strong></td>
<td>2h</td>
</tr>
<tr>
<td><strong>Self study:</strong></td>
<td>8h</td>
</tr>
</tbody>
</table>

**Description:**
- Physical properties. Chemical properties.
- Hydrocarbons and derivatives with industrial interest. Acetylene, polyethylene, polypropylene and PVC.
- Environmental implications.

### TOPIC 6. Oxygenated compounds

<table>
<thead>
<tr>
<th><strong>Learning time:</strong></th>
<th>19h</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Theory classes:</strong></td>
<td>4h</td>
</tr>
<tr>
<td><strong>Practical classes:</strong></td>
<td>4h</td>
</tr>
<tr>
<td><strong>Guided activities:</strong></td>
<td>2h</td>
</tr>
<tr>
<td><strong>Self study:</strong></td>
<td>9h</td>
</tr>
</tbody>
</table>

**Description:**
- Alcohols and ethers. Physical and chemical properties.
- Carbonyl compounds. Physical and chemical properties.
- Carboxylic acids and derivatives. Physical and chemical properties.
- Products with industrial interest. Polyesters.
TOPIC 7. Nitrogenous compounds

Learning time: 11h
Theory classes: 2h
Practical classes: 2h
Guided activities: 2h
Self study: 5h

Description:
- Amines, amides, nitriles and nitroderivatives. Physical and chemical properties.
- Products with industrial interest. Polyamides and polyurethanes

Qualification system

1- A final three hour exam will take place at the end of the semester. (Nef)
2- A partial test will take place in the middle of the semester. It will be compulsory. (Npp)
3- During regular sessions on short test will take place. (Nec)

Final mark (NF) will be:
NF = max (Nef, 0,30 Npp + 0,10 Nec + 0,6 Nef)

The retake exam (ReAv) will replace the final mark.

Regulations for carrying out activities

Presencial activities will consist in projects that complement the theoretic part taught during regular sessions, or solving applied problems that reinforce acquired knowledge during regular sessions. Any queries the student may have, will be solved by the professor in the tutoring time.

In the evaluation activities it will not be allowed to consult notes, formularies or periodic table. All necessary data will be included in the exercises and problems wordings that the student will have to solve. Programmable calculator is forbidden.
Bibliography

Basic:

Complementary:

Others resources:
Teaching files, solved examples of partial tests and final exams in ATENEA