Degree competences to which the subject contributes

Specific:
3. An understanding of the basic principles of general, organic and inorganic chemistry and the ability to apply this knowledge in engineering

Learning objectives of the subject

The main objective is to develop contents of materials and solid state chemistry knowledge not discussed before in extent in the previous chemistry courses. So we will elaborate structural, reactivity, synthetic and analytical questions, covering also property and application concerns.

We will pay special attention to frontier research and development of new products in materials chemistry. Materials
products with market definitive implementation could also be studied, taking into account possible alternatives. This objective will be specially achieved by a directed research work, developed individually by the student, or in a two team.

<table>
<thead>
<tr>
<th>Study load</th>
<th>Theory classes:</th>
<th>Self study:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total learning time:</strong> 75h</td>
<td>30h</td>
<td>45h</td>
</tr>
<tr>
<td></td>
<td>40.00%</td>
<td>60.00%</td>
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</tbody>
</table>
# Content

<table>
<thead>
<tr>
<th>Topic</th>
<th>Learning time:</th>
</tr>
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<tbody>
<tr>
<td><strong>Solid state chemistry (inorganic examples)</strong></td>
<td>37h</td>
</tr>
<tr>
<td><strong>Organic polymers</strong></td>
<td>13h</td>
</tr>
<tr>
<td><strong>Biomaterials and biomedical polymers</strong></td>
<td>12h 30m</td>
</tr>
</tbody>
</table>

## Solid state chemistry (inorganic examples)

**Description:**
Inorganic polymers, fibres, inorganic solids, semiconductors, superconductors, ceramics, glasses, pigments, coatings, hydrogen storage systems, thin films by chemical vapour deposition (CVD), imaging agents for magnetic resonance, catalysts, surface science and connections with chemical process technology.

**Related activities:**
These inorganic examples will be developed explaining first the fundamental theory, afterwards discussing case studies in seminars, then solving numerical problems in practical classes, and finally pointing at bibliographic sources for further information (for research work).

## Organic polymers

**Description:**
Specialty and high performance polymers, liquid crystalline polymers, elastomers, synthetic and natural fibres.

**Related activities:**
These examples of organic polymers will be develop explaining first the fundamental theory, afterwards discussing case studies in seminars, then solving numerical problems, and finally pointing at bibliographic sources for further information (for research work).

## Biomaterials and biomedical polymers

**Description:**
Biocomposites, biomimetics, natural and modified fibres (natural and artificial nanomaterials; biomaterials from renewable resources; biomineralization).

**Related activities:**
These examples of biomaterials and biomedical polymers will be develop explaining first the fundamental theory, afterwards discussing case studies in seminars, then solving numerical problems, and finally pointing at bibliographic sources for further information (for research work).
The final grade depends on the following assessment criteria:

\[ F = 0.2 \text{AEP} + 0.4\text{AEF} + 0.4\text{RW} \]

F: final evaluation
AEP: evaluation exam partial
AEF: evaluation exam final
RW: Research work)

- **Heterogeneous catalysis and physical techniques in materials chemistry characterization**

**Learning time:** 12h 30m
- Theory classes: 6h
- Self study: 6h 30m

**Description:**
Physical techniques to characterise materials. Case studies covering the following techniques:

- X-ray diffraction (XRD)
- Scanning Electron Microscopy (SEM)
- Raman and infrared spectroscopy
- Nuclear Magnetic Resonance
- Colorimetry

**Related activities:**
These examples of heterogenous catalysts and physical techniques will be develop explaining first the fundamental theory, afterwards discussing case studies in seminars, then solving numerical problems, and finally pointing at bibliographic sources for further information (for research work).

**Qualification system**

The final grade depends on the following assessment criteria:
Bibliography

Basic:


Others resources:

Course notes available in Atena platform.