240508 - Inorganic Chemical Systems Technology Forward

Coordinating unit: 240 - ETSEIB - Barcelona School of Industrial Engineering
Teaching unit: 713 - EQ - Department of Chemical Engineering
Academic year: 2017
Degree: BACHELOR'S DEGREE IN MATERIALS ENGINEERING (Syllabus 2010). (Teaching unit Optional)
ECTS credits: 3
Teaching languages: Catalan, Spanish

Degree competences to which the subject contributes

Transversal:
1. 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.

Teaching methodology

Teaching is developed through classes including both theoretical presentations and resolution of exercises. Lectures complemented with practical cases that will be resolved in the classroom. Furthermore, independent learning will be promoted through the use of bibliographic material supplied by the teacher. This will allow the student to relate the knowledge acquired in both the theoretical classes and the lectures with the latest technological applications in the field of Engineering.

Learning objectives of the subject

General goal
Relate the chemical principles with technology and environmental impact of recent applications.

Specific goals
- Use of the periodic properties and the chemical bond concept to predict the macroscopic behavior of the chemical elements and their main compounds.
- Understand the principles of some of the most technologically relevant processes involving inorganic and organic chemical compounds, such as chemisorptions, transport, surface phenomena and electrochemical processes.

Study load

<table>
<thead>
<tr>
<th>Total learning time: 75h</th>
<th>Hours large group: 30h</th>
<th>40.00%</th>
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<tr>
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<td>Hours medium group: 0h</td>
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<td>Hours small group: 0h</td>
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<td>Guided activities: 0h</td>
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<td>Self study: 45h</td>
<td>60.00%</td>
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## Content

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
<th>Learning time</th>
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| **1. DESCRIPTIVE CHEMISTRY AND REDOX PROPERTIES OF THE ELEMENTS** | Periodicity of the physical properties of the elements. Chemistry of the transition elements. Oxidation states. Latimer diagrams. Frost diagrams. pe-pH diagrams. Technologically and environmentally relevant applications. | **Learning time:** 10h  
Theory classes: 3h  
Practical classes: 2h  
Self study: 5h |
Theory classes: 3h  
Practical classes: 2h  
Self study: 5h |
| **3. COORDINATION COMPOUNDS** | Bonding theories for coordination compounds. Properties of coordination compounds: color, magnetic and thermodynamic properties. Applications. | **Learning time:** 10h  
Theory classes: 3h  
Practical classes: 2h  
Self study: 5h |
Theory classes: 3h 30m  
Practical classes: 1h 30m  
Self study: 5h |
### 5. CHEMISTRY OF SURFACES

**Learning time**: 10h
- Theory classes: 3h 30m
- Practical classes: 1h 30m
- Self study: 5h

**Description:**
- The interface
- Curved interfaces
- Capillary systems
- Superficial films in liquids
- Adsorption of gases onto solid surfaces
- Superhydrophilic and superhydrophobic surfaces
- Membranes for Tissue Engineering
- Treatments to modify and/or protect the surface

### 6. ELECTROCHEMICAL SYSTEMS AND CORROSION

**Learning time**: 10h
- Theory classes: 3h 30m
- Practical classes: 1h 30m
- Self study: 5h

**Description:**
- Electrochemical systems
- Wet and dry corrosion
- Galvanic cells
- Reversible electrodes
- Categorization of galvanic cells
- Liquid junction potentials
- Strategies to prevent the corrosion
- Electrochemical systems to store charge
- Applications: Supercapacitors, ultracapacitors and batteries
- Nano and microcapacitors

### Qualification system

The final mark (NF) is calculated as:

\[
NF = 0.3 \text{Np1} + 0.3 \text{Np2} + 0.4 \text{Nef}
\]

where

- Np1: it is the mark corresponding to items 1-3, composed of questions, exercises, presentations and deliverables
- Np2: it is the mark corresponding to items 4-6, composed of questions, exercises, presentations and deliverables
- Nef: It is Final exam: exam involving the whole subject made of theoretical questions and exercises. The maximal time required by this exam will be 3 hours.
Bibliography

Complementary:


Others resources:

- Slides used by the teachers (Campus Digital).