230485 - ADMAT - Advanced Materials

Coordinating unit: 230 - ETSETB - Barcelona School of Telecommunications Engineering
Teaching unit: 713 - EQ - Department of Chemical Engineering
Academic year: 2017
Degree: BACHELOR’S DEGREE IN ENGINEERING PHYSICS (Syllabus 2011). (Teaching unit Optional)
ECTS credits: 6
Teaching languages: Catalan, English

Teaching staff

Coordinator: CARLOS ENRIQUE ALEMAN LLANSO
Others: JORGE PUIGGALI BELLALTA

Opening hours

Timetable: By appointment

Degree competences to which the subject contributes

Specific:
FQES2. Knowledge of the interactions at different matter scales. Ability to analyze functional capabilities of physical systems at various scales.
FQES3. Knowledge of structural and functional applications of materials. Knowledge of the physical systems of low dimensionality. Ability to identify systems and/or materials suitable for different engineering applications.

General:
3. ABILITY TO IDENTIFY, FORMULATE, AND SOLVE PHYSICAL ENGINEERING PROBLEMS. Planning and solving physical engineering problems with initiative, making decisions and with creativity. Developing methods of analysis and problem solving in a systematic and creative way.

Transversal:
1. 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.
2. SELF-DIRECTED LEARNING - Level 3. Applying the knowledge gained in completing a task according to its relevance and importance. Deciding how to carry out a task, the amount of time to be devoted to it and the most suitable information sources.
3. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 3. Communicating clearly and efficiently in oral and written presentations. Adapting to audiences and communication aims by using suitable strategies and means.

Teaching methodology

Classes are divided into three categories: lectures, laboratory practical classes and discussion classes, in which the work done by the students is analyzed and discussed.

Learning objectives of the subject

Learn the basics about advanced materials with high performance technology and biotechnology. Acquire the theoretical foundations for understanding and design hybrid systems based on the combination of materials of different chemical nature. Learning to thinking about structure- properties relationships. Learn the patterns of reasoning that are applied at the level of research on advanced materials.
### Study load

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group:</th>
<th>65h</th>
<th>43.33%</th>
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<tbody>
<tr>
<td>Self study:</td>
<td>85h</td>
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<td>56.67%</td>
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Total learning time: 150h
## Content

| 1. Advanced ceramics | **Learning time:** 8h  
Theory classes: 6h 30m  
Guided activities: 1h 30m |
|----------------------|---------------------------------------------------------------------|

| 2. Biominerals | **Learning time:** 7h 30m  
Theory classes: 7h 30m |
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<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>Mineralization of biomolecules. Templating of minerals using biomolecules. Adsorption of biomolecules on inorganic surfaces. Encapsulation of biomolecules in inorganic minerals. Biomedical and biotechnological applications of biominerals: Transfection and tissue engineering.</td>
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| 3. Advanced polymers and biopolymers | **Learning time:** 9h 30m  
Theory classes: 7h 30m  
Laboratory classes: 2h |
|--------------------------------------|---------------------------------------------------------------------|

| 4. Nanofibers | **Learning time:** 9h 30m  
Theory classes: 7h 30m  
Laboratory classes: 2h |
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<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>Materials for the fabrication of nanofibers. Preparation of nanofibers. Functionalization of nanofibers. Applications of nanofibers.</td>
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<tr>
<td>Section</td>
<td>Learning time:</td>
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</table>
| 5. Ultra-thin membranes | 9h 30m | Theory classes: 7h 30m  
Laboratory classes: 2h  
| 6. Self-Assembled Materials | 9h 30m | Theory classes: 8h  
Guided activities: 1h 30m  
| 7. Dendrimers and dendronized polymers | 6h 30m | Theory classes: 6h 30m  
| 8. Advanced metals | 6h | Theory classes: 4h  
Laboratory classes: 2h  
Qualification system

NC = 0.15NL + 0.15NT + 0.20ND + 0.50NE
Where NC is the course mark, NL is the laboratory mark, NT is the mark of the work done during the course, ND is the mark from the discussion classes and NE is the final exam mark.

Regulations for carrying out activities

Laboratory: it is mandatory to attend 80% of practices corresponding and deliver questionnaires within established classes.
Jobs: NT is the average of the ratings associated with different work during the course.
Discussion: ND depends on the quality of the discussion provoked by each student in the different works, both in terms of questions and answers.
Final examination: it consists of several theoretical and practical questions related with the topics explained along the course.

Bibliography

Basic:


Others resources:

Audiovisual material

Nom recurs

Suitable bibliographic resources will be provided for each lesson through the ATENEA electronic system.