820022 - BMTB - Biomaterials

Coordinating unit: 295 - EEBE - Barcelona East School of Engineering
Teaching unit: 702 - CMEM - Department of Materials Science and Metallurgy
Academic year: 2017
Degree: BACHELOR’S DEGREE IN BIOMEDICAL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory) BACHELOR’S DEGREE IN BIOMEDICAL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
ECTS credits: 6

Teaching languages: Catalan

Coordinator: DANIEL RODRÍGUEZ RIUS
Others: DANIEL RODRÍGUEZ RIUS
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Lluma Fuentes, Jordi

Opening hours
Timetable: Published in Atenea.

Requirements
Ciencia i Tecnologia de Materials (pre-requirement)
Fisiologia (pre-requirement)
Processament d’imatges biomèdiques (co-requirement)

Degree competences to which the subject contributes

Specific:
CEBIO-34. Discern the fundamental criteria that a material must meet before it can be implanted.

CEBIO-250. Identify the fundamental concepts and application principles of biomaterials and apply them to biomedical engineering problems.

Transversal:
1. 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.

Teaching methodology

The methods employed are:
- 30% presental lessons
- 5% directed presental work (problems)
- 10% laboratory classes
- 55% self-study

An important component of learning is based on the realization of a practical project in groups developed in conjunction with the course "Biomedical image processing". It includes preparation and implementation of mechanical testing of biomaterials and programming and processing of the acquired data. It is an activity initially guided, but later the student must develop it more independently and linked to the knowledge acquired in the course.

Learning objectives of the subject
Upon completion of the course, the student shall be able to:
- understand the basic requirements of a biomaterial and the basic tests for its characterization.
- understand the fundamental basis and concepts of biomaterial application within biomedical engineering.
- be able to perform experimental testing on biomaterials.

<table>
<thead>
<tr>
<th>Study load</th>
<th>Hours large group:</th>
<th>45h</th>
<th>30.00%</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Hours medium group:</td>
<td>0h</td>
<td>0.00%</td>
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<tr>
<td></td>
<td>Hours small group:</td>
<td>15h</td>
<td>10.00%</td>
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<td></td>
<td>Guided activities:</td>
<td>0h</td>
<td>0.00%</td>
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<tr>
<td></td>
<td>Self study:</td>
<td>90h</td>
<td>60.00%</td>
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</table>
### Definition, classification and properties of biomaterials

**Learning time:** 50h  
Theory classes: 17h  
Laboratory classes: 4h  
Self study: 29h

**Description:**  
Presentation of the characteristics of biomaterials: what is a biomaterial, how is it classified and what are their most important properties. Description of the main techniques used for biomaterial characterization.

**Related activities:**  
Practice: Activity 2.  
Partial control.

**Specific objectives:**  
Definition of Biomaterials.  
Classification of biomaterials.  
Properties of Biomaterials.

### Biomaterials' behaviour in biological systems

**Learning time:** 20h  
Theory classes: 7h  
Laboratory classes: 2h  
Self study: 11h

**Description:**  
Study the response of biomaterials implanted in a biological environment, the interaction with tissues and the mechanisms of degradation of implanted biomaterials.

**Related activities:**  
Practice: Activity 3.

**Specific objectives:**  
Properties of materials.  
Surface characterization of materials.  
Biomaterial-tissue interaction.  
Degradation of biomaterials in service.
<table>
<thead>
<tr>
<th>Definition and evaluation of biocompatibility</th>
<th>Learning time: 14h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description:</td>
<td>Theory classes: 4h</td>
</tr>
<tr>
<td></td>
<td>Laboratory classes: 2h</td>
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<td>Self study: 8h</td>
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**Related activities:**
Practical experience: 4.

**Specific objectives:**
- Definition of Biocompatibility.
- Evaluation of Biocompatibility.

<table>
<thead>
<tr>
<th>Use of biomaterials in biomedical applications</th>
<th>Learning time: 35h</th>
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</thead>
<tbody>
<tr>
<td>Description:</td>
<td>Theory classes: 12h</td>
</tr>
<tr>
<td></td>
<td>Laboratory classes: 4h</td>
</tr>
<tr>
<td></td>
<td>Self study: 19h</td>
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</tbody>
</table>

**Related activities:**
- Practical experience: 5.
- Practical experience: 6.
- Partial control.

**Specific objectives:**
- Biomaterials for hard tissue.
- Biomaterials for soft tissue.
- Biomaterials in contact with the cardiovascular system.

<table>
<thead>
<tr>
<th>New trends in biomaterials</th>
<th>Learning time: 29h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description:</td>
<td>Theory classes: 9h</td>
</tr>
<tr>
<td></td>
<td>Self study: 20h</td>
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</tbody>
</table>

**Related activities:**
Final control.

**Specific objectives:**
Recent trends in biomaterials development.
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Qualification system

Partial controls (2): 30%
Final control: 35%
Laboratory: 10%
Coordinated work with generic competence: 25%
This subject does not include a reevaluation test.

Regulations for carrying out activities

The use of devices with communication capabilities is not allowed.

Bibliography

Basic:


Complementary: