820022 - BMTB - Biomaterials

Coordinating unit: 295 - EEBE - Barcelona East School of Engineering
Teaching unit: 702 - CEM - Department of Materials Science and Engineering
Academic year: 2019
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

Teaching staff

Coordinator: DANIEL RODRÍGUEZ RIUS
Others: Primer quadrimestre:
  MONTSERRAT ESPAÑOL PONS - T11
  JORDI LLUMA FUENTES - T11

Segon quadrimestre:
  JUDIT BUAXADERA PALOMERO - M11, M13
  MONTSERRAT ESPAÑOL PONS - M11, M12, M13, M14
  JORDI LLUMA FUENTES - M12, M14

Opening hours

Timetable: Published in Atenea.

Requirements

FISIOLOGIA - Prerequisite

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.
820022 - BMTB - Biomaterials

Teaching methodology

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

An important component of learning is based on the realization of a practical project in groups. 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.

Study load

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group: 37h 30m</th>
<th>25.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group: 0h</td>
<td>0.00%</td>
</tr>
<tr>
<td></td>
<td>Hours small group: 22h 30m</td>
<td>15.00%</td>
</tr>
<tr>
<td></td>
<td>Guided activities: 0h</td>
<td>0.00%</td>
</tr>
<tr>
<td></td>
<td>Self study: 90h</td>
<td>60.00%</td>
</tr>
</tbody>
</table>

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

An important component of learning is based on the realization of a practical project in groups. 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.

Study load

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group: 37h 30m</th>
<th>25.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group: 0h</td>
<td>0.00%</td>
</tr>
<tr>
<td></td>
<td>Hours small group: 22h 30m</td>
<td>15.00%</td>
</tr>
<tr>
<td></td>
<td>Guided activities: 0h</td>
<td>0.00%</td>
</tr>
<tr>
<td></td>
<td>Self study: 90h</td>
<td>60.00%</td>
</tr>
</tbody>
</table>
# Content

## 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:**  
Practical experience: 1.  
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>Definition: Description of biocompatibility and description of the techniques used for its evaluation.</td>
<td>Theory classes: 4h</td>
</tr>
<tr>
<td>Related activities: Practical experience: 4.</td>
<td>Laboratory classes: 2h</td>
</tr>
<tr>
<td>Specific objectives: Definition of Biocompatibility. Evaluation of Biocompatibility.</td>
<td>Self study : 8h</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Use of biomaterials in biomedical applications</th>
<th>Learning time: 35h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description: A description of the main applications of biomaterials as components to implant in the human body.</td>
<td>Theory classes: 12h</td>
</tr>
<tr>
<td>Specific objectives: Biomaterials for hard tissue. Biomaterials for soft tissue. Biomaterials in contact with the cardiovascular system.</td>
<td>Self study : 19h</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>New trends in biomaterials</th>
<th>Learning time: 29h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description: Description of the recent trends in biomaterials research, their aims and future developments.</td>
<td>Theory classes: 9h</td>
</tr>
<tr>
<td>Related activities: Final control.</td>
<td>Self study : 20h</td>
</tr>
<tr>
<td>Specific objectives: Recent trends in biomaterials development.</td>
<td></td>
</tr>
</tbody>
</table>
Partial controls (2): 30%
Final control: 35%
Laboratory: 10%
Lab practicum and generic competences: 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: