240IMA11 - Biomaterials

Coordinating unit: 240 - ETSEIB - Barcelona School of Industrial Engineering
Teaching unit: 702 - CMEM - Department of Materials Science and Metallurgy
Academic year: 2017
Degree: MASTER'S DEGREE IN INDUSTRIAL ENGINEERING (Syllabus 2014). (Teaching unit Optional)
ECTS credits: 4.5
Teaching languages: English

Teaching staff

Coordinator: Ginebra Molins, Maria Pau

Degree competences to which the subject contributes

Specific:
CEE0002. Design and develop biomaterials for medical applications, with therapeutic purposes or diagnosis, able to substitute and/or regenerate the living tissues, whether by themselves or integrated in complex devices.

Teaching methodology

- Participative lectures
- Invited lectures
- Lab practices
- Online questionnaires
- Cooperative learning: group work

Learning objectives of the subject

The course presents the study of biomaterials and materials for medical applications, designed to substitute and/or regenerate living tissues, with therapeutic or diagnostic aims. We review the different types of biomaterials, their characteristics and the interactions between biomaterials and the host organism. We also describe the techniques to assess the biocompatibility of materials.

The specific objectives are:
- To become familiar with common characteristics and distinctive features of different types of materials used in medicine.
- To know the basic principles of biocompatibility of materials for medical applications.
- To identify the basic criteria that must be met for a material to be implanted in the human body.
- Understanding the biological principles that affect the body's interactions with biomaterials receptor (receptor response in the body) and relate them to the service behavior of biomaterial (biomaterial response and degradation).

Study load

<table>
<thead>
<tr>
<th>Total learning time: 112h 30m</th>
<th>Hours large group: 27h</th>
<th>24.00%</th>
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<tbody>
<tr>
<td></td>
<td>Hours small group: 13h 30m</td>
<td>12.00%</td>
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<tr>
<td></td>
<td>Guided activities: 0h</td>
<td>0.00%</td>
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<tr>
<td></td>
<td>Self study: 72h</td>
<td>64.00%</td>
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## Content

### Introduction

<table>
<thead>
<tr>
<th><strong>Learning time:</strong></th>
<th>4h 30m</th>
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<tbody>
<tr>
<td>Theory classes:</td>
<td>1h 30m</td>
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<tr>
<td>Self study:</td>
<td>3h</td>
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**Description:**
Concept of biomaterial and biocompatibility. Historical evolution of biomaterials

**Related activities:**
Participative lecture

### Properties of the biological tissues

<table>
<thead>
<tr>
<th><strong>Learning time:</strong></th>
<th>24h 30m</th>
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<tbody>
<tr>
<td>Theory classes:</td>
<td>7h 30m</td>
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<tr>
<td>Laboratory classes:</td>
<td>2h</td>
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<tr>
<td>Self study:</td>
<td>15h</td>
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</table>

**Description:**

**Related activities:**
Participative lectures  
Laboratory sessions

### Materials for clinical applications

<table>
<thead>
<tr>
<th><strong>Learning time:</strong></th>
<th>39h</th>
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<tbody>
<tr>
<td>Theory classes:</td>
<td>17h</td>
</tr>
<tr>
<td>Laboratory classes:</td>
<td>2h</td>
</tr>
<tr>
<td>Self study:</td>
<td>20h</td>
</tr>
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**Description:**

**Related activities:**
Participative lectures  
Invited lectures from clinical doctors  
Laboratory session
240IMA11 - Biomaterials

**Interactions host-biomaterial**

**Learning time:** 13h 30m
- Theory classes: 4h 30m
- Self study: 9h

**Description:**

**Related activities:**
Participative lecture

**Applications of biomaterials in implants and medical devices**

**Learning time:** 28h
- Theory classes: 8h
- Guided activities: 20h

**Description:**
Applications in orthopedic surgery and traumatology. Applications in dentistry. Applications in Gastrointestinal Surgery. Applications in cardiovascular surgery. Applications in devices for dispensing controlled drugs. Applications in Tissue Engineering.

**Related activities:**
Cooperative learning: group work
Oral presentation of the work

**Bibliography**

**Basic:**

**Others resources:**
- Audiovisual material
- Presentacions PPT
  - Support material for the lectures