205060 - Biomedical Instrumentation

Coordinating unit: 205 - ESEIAAT - Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit: 710 - EEL - Department of Electronic Engineering
Academic year: 2018
Degree: MASTER'S DEGREE IN INDUSTRIAL ENGINEERING (Syllabus 2013). (Teaching unit Optional)
MASTER'S DEGREE IN AERONAUTICAL ENGINEERING (Syllabus 2014). (Teaching unit Optional)
ECTS credits: 3
Teaching languages: English

Teaching staff
Coordinator: Lexa Nescolarde Selva

Teaching methodology
Expository methodology, group work and learning through guided activities

Learning objectives of the subject

Study load

<table>
<thead>
<tr>
<th>Total learning time: 75h</th>
<th>Hours large group:</th>
<th>27h</th>
<th>36.00%</th>
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<tbody>
<tr>
<td></td>
<td>Hours small group:</td>
<td>0h</td>
<td>0.00%</td>
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<tr>
<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>48h</td>
<td>64.00%</td>
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</tbody>
</table>
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## Content

<table>
<thead>
<tr>
<th><strong>Module 1: Basic Concepts of Medical Instrumentation</strong></th>
<th><strong>Learning time:</strong> 14h</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong></td>
<td><strong>Theory classes:</strong> 5h</td>
</tr>
<tr>
<td>Basic definitions. Biomedical instrumentation system general structure. Dynamic and static characteristics. Biomedical equipment definitory characteristics. Biomedical equipment classifications.</td>
<td></td>
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<tr>
<td><strong>Self study:</strong></td>
<td><strong>Self study:</strong> 9h</td>
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<tr>
<td>Classroom activity: Static and dynamic characterization of two measurement systems.</td>
<td></td>
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<tr>
<td>Deliverable 1: Characterization of a measurement systems.</td>
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</tbody>
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<table>
<thead>
<tr>
<th><strong>Module 2: Bioelectric Signals</strong></th>
<th><strong>Learning time:</strong> 14h</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong></td>
<td><strong>Theory classes:</strong> 5h</td>
</tr>
<tr>
<td><strong>Self study:</strong></td>
<td><strong>Self study:</strong> 9h</td>
</tr>
<tr>
<td>Classroom activities: Comparison of characteristics of biopotential amplifiers. Interference analysis in a biopotential measurement system.</td>
<td></td>
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<tr>
<td>Deliverable 2: Biopotential amplifier analysis.</td>
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Last update: 19-04-2018
### Module 3: Measurements of the cardiovascular system

**Learning time:** 14h  
- Theory classes: 5h  
- Self study: 9h

**Description:**  

**Related activities:**  
Lab 2: Measurement of the pulse wave and transit time.  
Classroom activity: Hydrostatic pressure effect on blood pressure estimation.  
Deliverable 3: Fick's method.

### Module 4: Measurement of the Respiratory System.

**Learning time:** 11h  
- Theory classes: 4h  
- Self study: 7h

**Description:**  
Respiratory pressure and flow measurement. Lung volume measurement. Respiratory mechanics.

**Related activities:**  
Lab 3: Breathing measurement and respiratory rhythm.  
Classroom activity: Comparison of spirometers.  
Deliverable 4: Apnea detection.

### Module 5: Medical Imaging System

**Learning time:** 11h  
- Theory classes: 4h  
- Self study: 7h

**Description:**  

**Related activities:**  
Lab 4: MRI and US in muscle assessment.  
Classroom activities: X-ray attenuation across tissues, resonant frequency on MRI.  
Deliverable 5: Transit time and Doppler shift in tissues.
Module 6: Therapy equipment

Learning time: 11h
- Theory classes: 4h
- Self study: 7h

Description:
Surgery, diathermy, cryotherapy and lithotripsy equipment

Related activities:
Classroom activity: electrosurgical units comparison.
Deliverable 6: Cardiac ablation systems.

Qualification system

The course will be graded based on:
* Attendance to lessons: 30%
* Class participation and class exercises: 20%
* Final project: 50%

Bibliography

Basic:

Complementary: