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>
</tr>
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<tbody>
<tr>
<td>Hours small group:</td>
<td>0h</td>
<td></td>
<td>0.00%</td>
</tr>
<tr>
<td>Guided activities:</td>
<td>0h</td>
<td></td>
<td>0.00%</td>
</tr>
<tr>
<td>Self study:</td>
<td>48h</td>
<td></td>
<td>64.00%</td>
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</tbody>
</table>
## 205060 - Biomedical Instrumentation

### Content

<table>
<thead>
<tr>
<th>Module 1: Basic Concepts of Medical Instrumentation</th>
<th>Learning time: 14h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 5h</td>
</tr>
<tr>
<td></td>
<td>Self study : 9h</td>
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</tbody>
</table>

**Description:**
Basic definitions. Biomedical instrumentation system general structure. Dynamic and static characteristics. Biomedical equipment definitory characteristics. Biomedical equipment classifications.

**Related activities:**
- Classroom activity: Static and dynamic characterization of two measurement systems.
- Deliverable 1: Characterization of a measurement systems.

<table>
<thead>
<tr>
<th>Module 2: Bioelectric Signals</th>
<th>Learning time: 14h</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 5h</td>
</tr>
<tr>
<td></td>
<td>Self study : 9h</td>
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**Description:**

**Related activities:**
- Lab 1: ECG measurement, QRS detection and heart rate variability.
- Classroom activities: Comparison of characteristics of biopotential amplifiers. Interference analysis in a biopotential measurement system.
- Deliverable 2: Biopotential amplifier analysis.
### 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:
- Classroom activities: X-ray attenuation across tissues, resonant frequency on MRI.
- Deliverable 5: Transit time and Doppler shift in tissues.
Module 6: Therapy equipment

<table>
<thead>
<tr>
<th>Learning time: 11h</th>
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<tbody>
<tr>
<td>Theory classes: 4h</td>
</tr>
<tr>
<td>Self study: 7h</td>
</tr>
</tbody>
</table>

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 exercices: 20%
* Final project: 50%

Bibliography

Basic:

Complementary: