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: 2019
Degree: MASTER'S DEGREE IN AERONAUTICAL ENGINEERING (Syllabus 2014). (Teaching unit Optional)
MASTER'S DEGREE IN INDUSTRIAL ENGINEERING (Syllabus 2013). (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: 27h</th>
<th>36.00%</th>
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<tbody>
<tr>
<td></td>
<td>Hours small group: 0h</td>
<td>0.00%</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: 48h</td>
<td>64.00%</td>
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</table>
## Content

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

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# 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.

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# 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.
The course will be graded based on:

* Attendance to lessons: 30%
* Class participation and class exercises: 20%
* Final project: 50%

### Qualification system

**Module 6: Therapy equipment**

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

**Description:**

Surgery, diathermy, cryotherapy and lithotripsy equipment

**Related activities:**

Classroom activity: electrosurgical units comparison.

Deliverable 6: Cardiac ablation systems.

### Bibliography

**Basic:**


**Complementary:**


