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 SPACE AND AERONAUTICAL ENGINEERING (Syllabus 2016). (Teaching unit Optional)
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: 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>
# 205060 - Biomedical Instrumentation

## 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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<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:**

**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:**  
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: