Course guide
820025 - EMDTB - Monitoring, Diagnostic and Therapeutic Equipment

Unit in charge: Barcelona East School of Engineering
Teaching unit: 710 - EEL - Department of Electronic Engineering.
Degree: BACHELOR’S DEGREE IN BIOMEDICAL ENGINEERING (Syllabus 2009). (Compulsory subject).
Academic year: 2023  ECTS Credits: 6.0  Languages: Catalan, Spanish

LECTURER
Coordinating lecturer: FRANCISCO JAVIER ROSELL FERRER
Others: Primer quadrimestre: LEXA DIGNA NESCOLARDE SELVA - T11, T12
FRANCISCO JAVIER ROSELL FERRER - T11, T12
Segon quadrimestre: LEXA DIGNA NESCOLARDE SELVA - M11, M12, M13, M14
FRANCISCO JAVIER ROSELL FERRER - M11, M12, M13, M14

PRIOR SKILLS
To have passed the subject on Sensors, Conditioning and Acquisition of Biomedical Signals

REQUIREMENTS
ENGINYERIA CLÍNICA, SEGURETAT HOSPITALÀRIA - Irequisits
SENSORS I CONDICIONADORS DE SENYALS - Prerequisit

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES
Specific:
2. Identify, Understand and apply the principles of the equipment and systems used for monitoring, diagnosing and treating patients.

Transversal:
1. EFFECTIVE USE OF INFORMATION RESOURCES - Level 3. Planning and using the information necessary for an academic assignment (a final thesis, for example) based on a critical appraisal of the information resources used.

TEACHING METHODOLOGY
Expository methodology, group work and learning through guided activities

LEARNING OBJECTIVES OF THE SUBJECT
To understand the concept of instrumentation systems. To know specific characteristics of biomedical systems and equipment. To understand and analyze monitoring, diagnostic and therapy biomedical systems and equipment datasheets
 STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours large group</td>
<td>45.0</td>
<td>30.00</td>
</tr>
<tr>
<td>Self study</td>
<td>90.0</td>
<td>60.00</td>
</tr>
<tr>
<td>Hours small group</td>
<td>15.0</td>
<td>10.00</td>
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</tbody>
</table>

Total learning time: 150 h

CONTENTS

**Topic 1: Measurement systems introduction**

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

Specific objectives:
To understand the special characteristics of biomedical measurement systems.

Related activities:
Classroom activity: static and dynamic characterization of two measurement systems
Deliverable 1: Characterization of a measurement systems

Full-or-part-time: 11h
Theory classes: 6h
Self study : 5h

**Topic 2: Bioelectric signals**

Description:

Specific objectives:
To know the characteristics of the most important bioelectric signals and how they are acquired.

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.

Full-or-part-time: 25h
Theory classes: 9h
Laboratory classes: 3h
Self study : 13h
Topic 3: Measurements in the cardiovascular system

Description:

Specific objectives:
To know the signals to be measured and the measurement methods in the cardiovascular system.

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

Full-or-part-time: 17h
Theory classes: 6h
Laboratory classes: 3h
Self study : 8h

Topic 4: Measurement in the respiratory system

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

Specific objectives:
To know the signals and measurement methods used to evaluate the respiratory system

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

Full-or-part-time: 17h
Theory classes: 6h
Laboratory classes: 3h
Self study : 8h

Topic 5: Medical imaging equipment

Description:

Specific objectives:
To know the measurement principles of medical imaging systems and their particular characteristics

Related activities:
Classroom activities: X-ray attenuation across tissues, resonant frequency on MRI
Deliverable 5: Transit time and Doppler shift in tissues

Full-or-part-time: 15h
Theory classes: 9h
Self study : 6h
**Topic 6: Therapy equipment**

**Description:**
Surgery, diathermy, cryotherapy and lithotripsy equipment

**Specific objectives:**
To know the functional principles of therapy equipment

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

**Full-or-part-time:** 9h
- Theory classes: 5h
- Self study: 4h

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**Research project**

**Full-or-part-time:** 56h
- Theory classes: 4h
- Laboratory classes: 6h
- Self study: 46h

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**GRADING SYSTEM**

- Final exam: 35%
- Midterm exam: 20%
- Guided Lab: 20%
- Research Project: 25%

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**EXAMINATION RULES.**

The guided Lab and the Research Project are mandatory

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**BIBLIOGRAPHY**

**Basic:**

**Complementary:**