Course guide
295602 - DEMU - Design of Medical Wearables Devices

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). (Optional subject).
Academic year: 2022  ECTS Credits: 6.0  Languages: Catalan, Spanish, English

LECTURER
Coordinating lecturer: Bogonez Franco, Francisco
Others: Bogonez Franco, Francisco

PRIOR SKILLS
Knowledge of C language programming, introductory level of electronics, electronic instrumentation and biomedical signal processing. Have passed Sensors and Signals Conditiones (SCSB), (SHB), (FIB) and (PSB)

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
CEBIO-22. Identify, Understand and apply the principles of sensors, conditioners and biomedical signal acquisition systems.
CEBIO-240. Apply analytic techniques and interpret biomedical signals and images.
CEBIO-27. Manage health and safety in hospitals.

Transversal:
05 TEQ N1. TEAMWORK - Level 1. Working in a team and making positive contributions once the aims and group and individual responsibilities have been defined. Reaching joint decisions on the strategy to be followed.
07 AAT N2. SELF-DIRECTED LEARNING - Level 2: Completing set tasks based on the guidelines set by lecturers. Devoting the time needed to complete each task, including personal contributions and expanding on the recommended information sources.

TEACHING METHODOLOGY
Lectures, cooperative work, autonomous learning and project based learning.

LEARNING OBJECTIVES OF THE SUBJECT
Knowledge of principles, design, risk analysis and validation of medical wearable devices.

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Hours small group</td>
<td>30,0</td>
<td>20.00</td>
</tr>
<tr>
<td>Self study</td>
<td>90,0</td>
<td>60.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>30,0</td>
<td>20.00</td>
</tr>
</tbody>
</table>

Total learning time: 150 h
## CONTENTS

### Introduction

**Description:**
- Definition.
- Type of wearables.
- Structure/characteristics of wearable medical device.

**Full-or-part-time:** 4h  
**Theory classes:** 4h

### Power systems

**Description:**
- Batteries.
- Solar energy.
- Thermal energy.
- Kinetic energy.
- Electromagnetic energy.

**Full-or-part-time:** 4h  
**Theory classes:** 4h

### Controller

**Description:**
- Microprocessor.
- Microcontroller.
- FPGA.
- SoC.

**Full-or-part-time:** 2h  
**Theory classes:** 2h

### Communication protocols

**Description:**
- RFID.
- NFC.
- BlueTooth.
- LoRa.
- Sigfox.
- Wi-Fi.

**Full-or-part-time:** 4h  
**Theory classes:** 4h
Sensors

Description:
Temperature.
Humidity.
Pressure.
ECG.
EEG.
EMG.
Movement.
Radiation.
Pulse oximetry.

Full-or-part-time: 4h
Theory classes: 4h

Development

Description:
Development stages.
Standards.
Risk management.
Hardware.
Software.
Project management.

Full-or-part-time: 4h
Theory classes: 4h

Cloud services

Description:
Introduction.
Protocols.
Security

Full-or-part-time: 4h
Theory classes: 4h

Workspace.

Description:
Development board.
Programming workspace.
Repository.
Cloud access.

Full-or-part-time: 4h
Theory classes: 4h
GRADING SYSTEM

Laboratory practices and project.
The laboratory groups will be formed by 3 students.

EXAMINATION RULES.

Three laboratory practices and 1 project.

BIBLIOGRAPHY

Basic:

Complementary: