295124 - 295I334 - Wearable Devices

Coordinating unit: 295 - EEBE - Barcelona East School of Engineering
Teaching unit: 710 - EEL - Department of Electronic Engineering
Academic year: 2019
Degree: MASTER'S DEGREE IN INTERDISCIPLINARY AND INNOVATIVE ENGINEERING (Syllabus 2019). (Teaching unit Optional)
ECTS credits: 6
Teaching languages: English

Teaching staff
Coordinator: Cosp Vilella, Jordi
Others: Martinez Garcia, Herminio
Nescolarde Selva, Lexa Digna

Opening hours
Timetable: To be determined

Prior skills
Electronic Systems, Computing

Requirements
Data acquisition & Instrumentation

Degree competences to which the subject contributes

Specific:
CEMUEII-19. Develop translational applications with the aim of achieving a better understanding of physiological phenomena of clinical relevance and for the design of new applications in areas that have an impact on the health care of people. (Specific competence of the Healthcare and Biomedical Applications specialty)

General:
CGMUEII-01. Participate in technological innovation projects in multidisciplinary problems, applying mathematical, analytical, scientific, instrumental, technological and management knowledge.
CGMUEII-05. To communicate hypotheses, procedures and results to specialized and non-specialized audiences in a clear and unambiguous way, both orally and through reports and diagrams, in the context of the development of technical solutions for problems of an interdisciplinary nature.

Transversal:
05 TEO. TEAMWORK. Being able to work as a team player, either as a member or as a leader. Contributing to projects pragmatically and responsibly, by reaching commitments in accordance to the resources that are available.
06 URI. EFFECTIVE USE OF INFORMATION RESOURCES. Managing the acquisition, structure, analysis and display of information from the own field of specialization. Taking a critical stance with regard to the results obtained.
03 TLG. THIRD LANGUAGE. Learning a third language, preferably English, to a degree of oral and written fluency that fits in with the future needs of the graduates of each course.
The aim of this course is to train students in methods to design and use wearable systems.

**Study load**

<table>
<thead>
<tr>
<th>Study load</th>
<th>Total learning time: 150h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours large group:</td>
<td>22h 14.67%</td>
</tr>
<tr>
<td>Hours medium group:</td>
<td>0h 0.00%</td>
</tr>
<tr>
<td>Hours small group:</td>
<td>22h 14.67%</td>
</tr>
<tr>
<td>Guided activities:</td>
<td>4h 2.67%</td>
</tr>
<tr>
<td>Self study:</td>
<td>102h 68.00%</td>
</tr>
</tbody>
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### Content

<table>
<thead>
<tr>
<th>Wearable sensors technologies</th>
<th>Learning time: 28h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 4h</td>
</tr>
<tr>
<td></td>
<td>Laboratory classes: 4h</td>
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<tr>
<td></td>
<td>Self study: 20h</td>
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</tbody>
</table>

**Description:**
Introduction to wearable systems. Instrumentation, implementation, available technologies, measure of physiological signals

**Related activities:**
Lectures and application exercises.
Laboratory exercises:
Wearable system

**Specific objectives:**
Introduction to wearable systems and the signal acquisition chain

<table>
<thead>
<tr>
<th>Microcontrollers and programmable system-on-a-chip devices</th>
<th>Learning time: 30h</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 4h</td>
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<tr>
<td></td>
<td>Laboratory classes: 4h</td>
</tr>
<tr>
<td></td>
<td>Guided activities: 2h</td>
</tr>
<tr>
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<td>Self study: 20h</td>
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**Description:**
The microcontroller system and programmable devices. Constituent elements Comparison and criteria for the election.

**Related activities:**
Lectures and application exercises.
Laboratory exercises:
Introduction to the devopment system for wearable devices

**Specific objectives:**
Understand the different available programmable systems with their advantages and disadvantages for wearable devices
### Wireless communication and data storage

**Learning time:** 30h  
Theory classes: 6h  
Laboratory classes: 4h  
Self study: 20h

**Description:**  
Característiques i ús dels diferents protocols de comunicació sense fil: NFC, bluetooth, ANT

**Related activities:**  
Lectures and application exercises.  
Laboratory exercises:  
Wireless communication system

**Specific objectives:**  
Know the different protocols of communications for wearable devices and use them correctly

### Microcontroller programming

**Learning time:** 30h  
Theory classes: 4h  
Laboratory classes: 6h  
Self study: 20h

**Description:**  
Programming the microcontroller. Use of the input / output ports and communication with the sensors.

**Related activities:**  
Lectures and application exercises.  
Laboratory exercises:  
Programming a wearable device

**Specific objectives:**  
Program microcontrollers and establish communications with the sensors

### Design and implementation phases

**Learning time:** 32h  
Theory classes: 4h  
Laboratory classes: 4h  
Guided activities: 2h  
Self study: 22h

**Description:**  
Concept, faeasibility, validation, verification, product, regulations.

### Qualification system

Final exam, Group assessments, Laboratory assessments
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Regulations for carrying out activities

To be determined

Bibliography

Basic:
