Course guide
300269 - BODYSEN - Body Sensor Nodes

Unit in charge: Castelldefels School of Telecommunications and Aerospace Engineering
Teaching unit: 710 - EEL - Department of Electronic Engineering.

Degree: MASTER’S DEGREE IN APPLIED TELECOMMUNICATIONS AND ENGINEERING MANAGEMENT (MASTEAM) (Syllabus 2015). (Optional subject).
MASTER’S DEGREE IN ADVANCED TELECOMMUNICATION TECHNOLOGIES (Syllabus 2019). (Optional subject).

Academic year: 2022  ECTS Credits: 3.0  Languages: English

LECTURER

Coordinating lecturer: Serrano Finetti, Ernesto
Others: Serrano Finetti, Ernesto
Casanella Alonso, Ramon

PRIOR SKILLS

DC and AC circuit analysis, linear system theory, analysis and design of basic analog, digital and mixed-signal electronic circuits, random signal analysis, electric and magnetic fields

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
08 MTM. (ENG) Diseñar e implementar redes de sensores inalámbricas para cualquier aplicación de cualquier ámbito social.

General:
03 DIS. (ENG) Diseñar aplicaciones de alto valor añadido basadas en las Tecnologías de la Información y las Comunicaciones (TIC), aplicadas a cualquier ámbito de la sociedad.
06 RES. (ENG) Resolver problemas y mejorar procesos en cualquier ámbito social a partir de la aplicación de las TIC, integrando conocimientos de diversos ámbitos y aplicando ingeniería de alto nivel tecnológico.

Transversal:
05 TEQ. 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.
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.

Basic:
CB7. (ENG) CB7 - Que los estudiantes sepan aplicar los conocimientos adquiridos y su capacidad de resolución de problemas en entornos nuevos o poco conocidos dentro de contextos más amplios (o multidisciplinares) relacionados con su área de estudio.
CB9. (ENG) CB9 - Que los estudiantes sepan comunicar sus conclusiones y los conocimientos y razones últimas que las sustentan a públicos especializados y no especializados de un modo claro y sin ambigüedades.
CB6. (ENG) CB6 - Poseer y comprender conocimientos que aporten una base u oportunidad de ser originales en el desarrollo y/o aplicación de ideas, a menudo en un contexto de investigación.

TEACHING METHODOLOGY

Lectures in the classroom, project design and implementation work in the laboratory, autonomous work outside the classroom and the laboratory.
LEARNING OBJECTIVES OF THE SUBJECT

At the end of the course, the student should be able to:
1) Describe the principles of operation of sensors intended for the non-invasive measurement of physiological parameters.
2) Design electronic interfaces for those sensors and evaluate their performance.
3) Understand the origin, description and analysis of interference in systems based on those sensors.
4) Understand and apply common methods to reduce that interference and evaluate the results.
5) Conceive, implement and experimentally verify sensor nodes for common physiological parameters.

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self study</td>
<td>48.0</td>
<td>64.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>27.0</td>
<td>36.00</td>
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</tbody>
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Total learning time: 75 h

CONTENTS

1. Physiological sensors.

Description:
Photoplethysmography. Pulse oximetry. Bioimpedance measurement and applications. Other physiological signals from mechanical origin.

Related activities:
All activities

Full-or-part-time: 18h
Theory classes: 6h
Self study: 12h

2. Signal conditioning and data acquisition

Description:

Related activities:
All activities

Full-or-part-time: 18h
Theory classes: 6h
Self study: 12h
3. Design and implementation of body sensor nodes

Description:
Performance assessment of some commercial sensors for ECG and PPG. Design specifications and work plan for an own-built biopotential amplifier. Concept design. Physical design, implementation and experimental assessment. Interference assessment. Front-ends for mechanical signals using accelerometers and gyroscopes. Interface sensors to microcontrollers for wearable applications. All these activities will be carried out at the laboratory.

Related activities:
Activities 2 and 4

Full-or-part-time: 36h
Laboratory classes: 24h
Self study: 12h

GRADING SYSTEM
Mid-term written exam test (30 %), lab work and results (35 %) and a final written exam (35 %).

BIBLIOGRAPHY

Basic:

Complementary: