Course guide
295124 - 295II334 - Wearable Devices

Last modified: 02/10/2025

Unit in charge: Barcelona East School of Engineering
Teaching unit: 710 - EEL - Department of Electronic Engineering.

Degree: MASTER'S DEGREE IN INTERDISCIPLINARY AND INNOVATIVE ENGINEERING (Syllabus 2019). (Optional subject).

Academic year: 2025 **ECTS Credits:** 6.0 **Languages:** English

LECTURER

Coordinating lecturer: JORDI COSP VILELLA - SERGIO GIRALDO MUÑOZ

Others: Primer quadrimestre:
SERGIO GIRALDO MUÑOZ - Grup: T1, Grup: T2

PRIOR SKILLS

Electronic Systems, Computing

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)

Generical:
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 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.
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.

TEACHING METHODOLOGY

Lectures
Laboratory classes
Laboratory practical work
Individual and group work

LEARNING OBJECTIVES OF THE SUBJECT

The aim of this course is to train students in methods to design and use wearable systems

STUDY LOAD

Type	Hours	Percentage
Hours small group	21,0	14.00
Self study	108,0	72.00
Hours large group	21,0	14.00

Total learning time: 150 h

CONTENTS

Introduction to wearable devices

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

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

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

Sensors for wearable devices

Description:
Description and use of the most commonly used sensors in wearable devices.

Specific objectives:
To know and use sensors used in wearable devices.

Full-or-part-time: 18h
Theory classes: 4h
Laboratory classes: 2h
Self study : 12h

Human movement detection using intertial sensors

Description:
Use of inertial sensors to detect the human movement and application of the necessary algorithms to process the acquired signals.

Specific objectives:
Use inertial sensors and apply the adequate algorithms to detect the human movement.

Full-or-part-time: 28h
Theory classes: 6h
Laboratory classes: 4h
Self study : 18h

Photoplethysmography

Description:
Use of optical sensors to detect magnitudes related to blood preassure and application of the necesssary algorithms to process the acquired signals.

Specific objectives:
To know and design photoplethysmographic systems.

Full-or-part-time: 28h
Theory classes: 6h
Laboratory classes: 4h
Self study : 18h

Energy Harvesting

Description:
Power sources available in the environment for wearable systems: temperature gradient, light, movement. Energy and power issues.

Specific objectives:
To know and use the power sources available in the environment.

Full-or-part-time: 18h
Theory classes: 4h
Laboratory classes: 2h
Self study : 12h

Wireless communication and data storage

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

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

Related activities:
Lectures and application exercises.
Laboratory exercicises:
Wireless communicatin system

Full-or-part-time: 18h
Theory classes: 4h
Laboratory classes: 2h
Self study : 12h

Guided project

Description:
Practical project on an aspect of wearable devices to be developed during in the final part of the course.

Specific objectives:
Integrate the knowledge acquired throughout the course.

Full-or-part-time: 38h
Laboratory classes: 8h
Self study : 30h

GRADING SYSTEM

30% final exam, 30% lab exercises, 40% guided project

EXAMINATION RULES.

To be determined

BIBLIOGRAPHY

Basic:
- Di Paolo Emilio, Maurizio. Data acquisition systems : from fundamentals to applied design [on line]. New York, NY: Springer, 2013 [Consultation: 14/04/2020]. Available on: http://dx.doi.org/10.1007/978-1-4614-4214-1. ISBN 9781461442141.
- Zhu, Yifeng. Embedded systems with ARM cortex-M microcontrollers in assembly language and C. 3rd ed. E-Man Press LLC, 2017. ISBN 9780982692660.