Course guide
205083 - 205083 - Smart Sensors and Actuators for Internet of Things (Iot)

Last modified: 02/04/2024

Unit in charge: Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit: 712 - EM - Department of Mechanical Engineering.

Degree: MASTER'S DEGREE IN AUTOMATIC SYSTEMS AND INDUSTRIAL ELECTRONICS (Syllabus 2012). (Optional subject).
MASTER'S DEGREE IN INDUSTRIAL ENGINEERING (Syllabus 2013). (Optional subject).
MASTER'S DEGREE IN AERONAUTICAL ENGINEERING (Syllabus 2014). (Optional subject).
MASTER'S DEGREE IN SPACE AND AERONAUTICAL ENGINEERING (Syllabus 2016). (Optional subject).

Academic year: 2024 **ECTS Credits:** 3.0 **Languages:** English

LECTURER

Coordinating lecturer: JASMINA CASALS TERRE

Others: Primer quadrimestre:
JASMINA CASALS TERRE - 1
XAVIER SOL TORRES - 1

TEACHING METHODOLOGY

The course is develops through lectures including theoretical sessions imparted with the aid of powerpoint presentations and more applicative and more visual sessions with videos, stellar catalogues and simulations.
Most of the sessions will be done in the MicroTech Lab with hands on sessions.

LEARNING OBJECTIVES OF THE SUBJECT

- To understand the behavior of fluids at a micro scale
- To know how to design microfluidic circuits
- To know the methods of integration of microfluidic systems with MEMS sensors

STUDY LOAD

Type	Hours	Percentage
Hours large group	18,0	24.00
Hours small group	9,0	12.00
Self study	48,0	64.00

Total learning time: 75 h

CONTENTS

Module 1: Mechanics and Fluid mechanics at micron scale

Description:
Introduction to Fluid mechanics. Newtonian, nonNewtonian fluids, Flow over infinite plates, laminar and turbulent flow, Compressible and Incompressible flows. Types of flows. Flow rate calculations.

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

Module 2: Introduction to micromechanic and microfluidic behavior

Description:
Introduction Nanotechnology and MEMS, MEMS design, and fabrication technology – Lithography, Etching, MEMS material, Bulk micromachining, Surface micromachining, Microactuator, electrostatic actuation.

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

Module 3: Biosensor structure

Description:
Review of sensing principles and micro/nano devices for bio-sensing: a. Basic principle of biosensors. b. Bioelectric potentials and typical bio-targets. c. Amperometric, potentiometric and impedimetric biosensors. d. Electrochemical sensors and FET-based biosensors. e. Acoustic and piezoelectric biosensors. f. Optical biosensors.

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

Module 4: Design and simulation of the biosensor fluidic behavior

Description:
Finite element modelling of a microfluidic mixer.

Full-or-part-time: 21h
Laboratory classes: 9h
Self study : 12h

GRADING SYSTEM

50% - Home works
50% - Lab report. After each lab session the students will handle a short lab report.

BIBLIOGRAPHY

Basic:
- Giri, Basant. Laboratory methods in microfluidics. Amsterdam: Elsevier, 2017. ISBN 9780128132357.