

Academic Year: (2022 / 2023)

Review date: 19-05-2022

Department assigned to the subject: Electronic Technology Department

Coordinating teacher: ACEDO GALLARDO, PABLO

Type: Compulsory ECTS Credits : 3.0

Year : 4 Semester : 1

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Electromagnetism and Optics
Solid State Fundamentals for Engineering
Electronic Engineering Fundamentals
Statistical Physics
Instrumentation and Measurements
Photonics

OBJECTIVES

To know the fundamentals behind MEMS and MOEMS based sensors, as well as the latest developments in new materials and manufacturing processes for sensors, and their field of application.

To know the fundamentals of microfluidic systems and their use in instrumentation and measurement systems in biomedical and biological environments.

To know various instruments and experimental techniques of general use in research and development of devices and instruments of high added value: microscopy and spectroscopy among others.

DESCRIPTION OF CONTENTS: PROGRAMME

1.- MEMS. Microelectromechanical Systems
Introduction. Scaling laws.
Microsystems design fundamentals. Examples.
MEMS Sensors examples and applications
2.- Optical MEMS (MOEMS).
Introduction and classification.
Micromirror-based devices and scanning applications
MOEMS for signal processing and communications
3.-Microfabrication processes and techniques for MEMS and other sensors.
Bulk micromachining
Surface micromachining
Additive manufacturing of microstructures.
4.-New materials and components for sensors.
Organic electronics and photonics.
Flexible electronics
Surface functionalization and biosensors.
5.-Microfluidic Sensors.
Revision: microfluidics fundamentals and components
Microfluidic Sensors examples
Lab-on-a-chip and organ-on-a-chip
6.-Advanced instrumentation and experimental techniques
Optical microscopy, fluorescence microscopy and confocal microscopy.
Spectroscopy

LEARNING ACTIVITIES AND METHODOLOGY

AF1. THEORETICAL-PRACTICAL CLASSES.
AF3. STUDENT INDIVIDUAL WORK OR GROUP WORK.
AF8. WORKSHOPS AND LABORATORY SESSIONS.
AF9. FINAL EXAM.
MD1. THEORY CLASS.
MD2. PRACTICAL CLASS.

ASSESSMENT SYSTEM

SE1. FINAL EXAM. 50%.

SE2. CONTINUOUS EVALUATION.

Partial exam: 30%

Laboratory: 20%

% end-of-term-examination: 50

% of continuous assessment (assignments, laboratory, practicals...): 50

BASIC BIBLIOGRAPHY

- Liu C. Foundations of MEMS. Second Edition, Prentice Hall , 2012

ADDITIONAL BIBLIOGRAPHY

- Kaajakari V. Practical MEMS, Small Gear Publising , 2009

- Tkachenko N.V. Optical Spectroscopy. Methods and Instrumentations, Elsevier, 2006