

Academic Year: ( 2022 / 2023 )

Review date: 10/06/2021 07:36:19

Department assigned to the subject: Bioengineering Department

Coordinating teacher: RIPOLL LORENZO, JORGE

Type: Electives ECTS Credits : 3.0

Year : 1 Semester : 2

## REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

It is recommended to have completed the following courses:

- Biomedical Image Processing

## OBJECTIVES

CB6 Having and understanding the knowledge that provides a basis or opportunity to be original in the development and/or application of ideas, often in a research context

CB7 Students know how to apply their acquired knowledge and problem-solving skills in new or unfamiliar settings within broader (or multidisciplinary) contexts related to their field of study.

CB8 Students are able to integrate knowledge and to face the complexity of making judgments based on information that, being incomplete or limited, includes reflections on the social and ethical responsibilities linked to the application of their knowledge and judgments.

CB9 Students know how to communicate their conclusions and the knowledge and ultimate reasons behind them to specialised and non-specialised audiences in a clear and unambiguous way.

CB10 Students have the learning skills that will enable them to continue studying in a way that will be largely self-directed or autonomous.

### General competences

CG2 Ability to apply the knowledge of skills and research methods related to engineering.

CG3 Ability to apply the knowledge of research skills and methods related to Life Sciences.

CG4 Ability to contribute to the widening of the frontiers of knowledge through an original research, part of which merits publication referenced at an international level.

CG5 Ability to perform a critical analysis and an evaluation and synthesis of new and complex ideas.

CG6 Ability to communicate with the academic and scientific community and with society in general about their fields of knowledge in the modes and languages commonly used in their international scientific community.

### Specific competences

CE6 Ability to understand the basis of the main technologies involved in biomedical imaging systems.

CE7 Ability to solve a biomedical problem from an engineering perspective based on the acquisition and processing of biomedical images

## DESCRIPTION OF CONTENTS: PROGRAMME

- Radiation-matter interaction, Radiation protection and dosimetry, and introduction to medical imaging.
- Introduction to medical imaging: contrast sources, resolution, signal / noise ratio, quantification.
- Main Imaging Modalities: Optical imaging (Microscopy and endoscopy)
- Main Image Modalities: Optical image. Microscopy image analysis (resolution, quantification). Laboratory practices.

- Main Image Modalities:

X-rays: Physical Principles and Reconstruction, Artifacts, Signal / Noise, Resolution, and Quantification, Practices

- Main Image Modalities:

Nuclear: Physical Principles, Production of isotopes, tracers, Detectors, scintigraphy, SPECT and PET. artifacts, signal / noise, resolution, and quantization.

- Main Image Modalities:

MR: Physical Principles, Description of MR equipment and MR Modalities. Image reconstruction, artifacts, quantization, resolution, signal-to-noise ratio. Semi-practical session on the control of an MRI tomograph

- Main Image Modalities:

Visit to the medical imaging facilities at the HGGM

- Main Image Modalities:

Ultrasound and Photoacoustics: Physical Principles and Image Generation. Practice example and reconstruction

## LEARNING ACTIVITIES AND METHODOLOGY

AF3	Theoretical practical classes
AF4	Laboratory practices
AF5	Tutorials
AF6	Team work
AF7	Student individual work
AF8	Partial and final exams

Activity code	total hours number	presencial hours number	% Student Presence
AF3	134	134	100%
AF4	42	42	100%
AF5	24	0	0%
AF6	120	0	0%
AF7	248	0	0%
AF8	16	16	100%
SUBJECT TOTAL	600	184	30,66%

## ASSESSMENT SYSTEM

<b>% end-of-term-examination/test:</b>	60
<b>% of continuous assessment (assignments, laboratory, practicals...):</b>	40

SE1	Participation in class
SE2	Individual or team works made during the course
SE3	Final exam

Evaluation systems (%)	Minimum weighting (%)	Maximum Weighting
SE1	0	20
SE2	0	100
SE3	0	60