

60041 - Imaging techniques and radiophysics

Syllabus Information

Academic year: 2024/25

Subject: 60041 - Imaging techniques and radiophysics

Faculty / School: 100 - Facultad de Ciencias

Degree: 538 - Master's in Physics and Physical Technologies
589 - Master's in Physics and Physical Technologies

ECTS: 5.0

Year: 1

Semester: Second semester

Subject type: Optional

Module:

1. General information

The subject is part of the set of subjects that offer a transversal training, to help the students develop the ability to know and use advanced tools of great actuality in their future work as a technologist in R&D&I departments in industries, laboratories, medical centers or research centers.

The main objective of the subject is to help students become familiar with the physical and mathematical principles of the various digital imaging and radiotherapy techniques and to enable them to solve problems arising in their scientific field through the appropriate use of computer tools based on these principles.

2. Learning results

- To apply digital image processing techniques for image enhancement, restoration or analysis.
- To describe the physical fundamentals of radiotherapy.
- To identify the technology involved in radiotherapy treatment.
- To calculate doses using physical models.
- To distinguish and describe the different evaluation and radiodiagnostic tests: X-rays, ultrasound scans, CT scans, mammograms, PET scans,...
- To evaluate dose for radiodiagnostics according to physical and biological period.

3. Syllabus

1. INTRODUCTION TO DIGITAL IMAGE PROCESSING
2. INTENSITY TRANSFORMATIONS AND SPATIAL FILTERING
3. FREQUENCY DOMAIN FILTERING
- 4.- IMAGE RESTORATION
- 5.- IMAGE SEGMENTATION
- 6.- COLOR IMAGE PROCESSING
- 7.- APPLICATIONS OF DIGITAL IMAGE PROCESSING
- 8.- IMAGING IN MEDICINE
- 9.- RADIOTHERAPY TECHNIQUES

4. Academic activities

- Theoretical classes on the main concepts (27 hours).
- Practical work in a computer room, in which the student learns to use the appropriate computer tools to develop the different processing techniques seen in the theoretical classes. (10 hours)
- Solving of exercises proposed during the practical classes. (6 hours)
- Laboratory practice in which the student will learn to characterize radiation detectors and their possible applications in radiotherapy and image production (5 hours).
- Preparation of internship reports (15 hours)
- Personal and supervised study (60 hours)
- Assessment tests (2 hours)

5. Assessment system

a) (70%) Continuous assessment of student learning through:

- solving of problems and issues
- works
- and other activities proposed by the faculty

b) (30%) Practical work in the laboratory and/or computer room.

The subject has been designed for students who attend the classroom and lab classes and perform the assessment activities described above. There will be a global assessment test of the subject, as indicated in the learning assessment regulations of the University of Zaragoza.

It will be a theoretical (70%) - practical (30%) test and will take place on the dates established by the Faculty of Sciences.

6. Sustainable Development Goals

4 - Quality Education