Universidad Zaragoza

Academic Year/course: 2024/25

69726 - Radiotherapy technologies

Syllabus Information

Academic year: 2024/25
Subject: 69726 - Radiotherapy technologies
Faculty / School: 110 - Escuela de Ingeniería y Arquitectura
Degree: 633 - Master's Degree in Biomedical Engineering
ECTS: 3.0
Year: 1
Semester: Second semester
Subject type: Optional
Module:

1. General information

The main objective of the subject is that the student acquires the ability to formulate and solve problems that facilitate the treatment of diseases. In particular, it focuses on the planning of cancer treatments with radiotherapy, through the prior establishment of radiation models and the subsequent resolution of the problem. A generalist approach is given in order to facilitate the application of the techniques presented to other clinical settings and medical applications.

2. Learning results

- To know the basic principles and fundamentals of radiotherapy, as well as the biological effects of ionizing radiation.
- To know the different radiotherapy modalities and understand the physical meaning of the dose specifications prescribed by the medical specialist in a cancer treatment.
- To be able to formulate the radiotherapy planning problem in mathematical terms and learn to impose constraints on the problem statement.
- To be familiar with modern radiation emitting equipment used in dose administration processes, as well as recent advanced radiotherapy techniques.
- To acquire practical knowledge in the laboratory, and be able to plan a cancer treatment with radiotherapy in some real examples.
- To be able to extrapolate the knowledge of this subject to other biomedical applications that require treatment planning.

3. Syllabus

- UNIT 1. Introduction and general concepts.
- UNIT 2. Radiation models: primary model and Pencil Beam based models.
- UNIT 3. Planning of external radiotherapy: problem statement. Dose specifications. Objective function. Physical limitations and imposition of restrictions.
- UNIT 4. Dose management processes: MLC Technology. Monitor segments and units.

4. Academic activities

The subject is presented with a strong practical approach, through the use of Problem Based Learning (PBL) strategies.

Planned activities include:

- **Participative master classes**: 20 hours

The contents of the subject will be presented with a practical orientation.

- **Problem solving and case studies**: 4 hours

The approach and resolution of different problems and cases is addressed, encouraging a critical spirit.

- **Laboratory practices:** 6 hours

Real cases will be analysed, performing radiotherapy treatment planning in some specific cancer cases.

- **Study and personal work:** 30 hours
- **Teaching assignments:** 12 hours
- **Assessment tests:** 3 hours**.**

5. Assessment system

The subject will be assessed by the continuous assessment system by means of the following activities:

- **Final written test and optional intermediate test (40% of the grade).**

It consist of questions and open-ended questions, in order to assess the degree of maturity acquired by the student according to the type of solution provided.

- **Laboratory practices (25% of the grade).**

The evaluation of the practical sessions will be based on the solutions provided and the preparation of a brief report of conclusions on the their contents.

- **Subject work on application and/or research (35 % of the grade).**

There will be a free-choice assignment that is directly related to the contents of the subject. In it, the student will provide a personal view and/or constructive criticism of the same. The contribution of new ideas or proposals that may improve current radiotherapy treatments will be highly valued.

If the student has not passed any of these activities during the semester, they will have the opportunity to pass it by means of a global test in any of the two official calls.

6. Sustainable Development Goals

3 - Good Health & Well-Being
8 - Decent Work and Economic Growth
9 - Industry, Innovation and Infrastructure