Universidad Zaragoza

Academic Year/course: 2023/24

26951 - Nuclear Physics and Technology

Syllabus Information

Academic year: 2023/24
Subject: 26951 - Nuclear Physics and Technology
Faculty / School: 100 - Facultad de Ciencias
Degree: 447 - Degree in Physics
ECTS: 5.0
Year:
Semester: Second semester
Subject type: Optional
Module:

1. General information

Radioisotopes and nuclear technology have countless applications in fields as diverse as medicine, industry, agriculture, energy production and research.

The objective of this subject is to provide the student with the fundamental knowledge and tools of the different applications of nuclear physics and technology.

Its approaches and objectives are aligned with the following Sustainable Development Goals (SDGs) of the United Nations Agenda 2030 (https://www.un.org/sustainabledevelopment/es/), in such a way that the acquisition of the learning results of the subject provides training and competence to contribute to some extent to their achievement:

- Goal 4: Quality Education.
- Goal 9: Industry, Innovation and Infrastructure.

Although it is not essential, it is recommended to have taken Nuclear and Particle Physics.

2. Learning results

- To know the types of radiodiagnosis and radiotherapy, their application ranges, advantages and disadvantages.
- To design simple mechanisms to control some industrial processes.
- To apply simple models to describe the behaviour of a nuclear reactor.
- To know the fundamentals and main characteristics of different types of fission reactors.
- To recognize risk situations during the operation, waste management and service life of a fission reactor.
- To know the fundamentals and current status of fusion energy production and its prospects as an energy source

3. Syllabus

- Radioisotopes in medicine. Radioisotope production. Imaging techniques. Radiotherapy techniques.
- Industrial and scientific applications. Tracers. Process control. Sterilization. Dating techniques. Methods of analysis.
- Nuclear fission. Neutron-matter interaction. Chain reaction and nuclear reactors. Nuclear fuel cycle. Waste management.
- Nuclear fusion. Physics of a fusion reactor. Plasma confinement. Prospects for the production of electricity.

4. Academic activities

The subject includes 5 ECTS organized as follows:

- Theory classes (3.5 ECTS): 35 hours
- Problem classes (1 ECTS): 10 hours
- Laboratory practices (0.5 ECTS): 5 hours

Students must submit a written report of the work done in the laboratory at least fifteen days before the date of the theoretical-

practical test.

Students may prepare papers on a subject related to the subject to be presented during class time.

Throughout the term, students will solve problems and practical questions raised during the development of the classes, which will serve for their continuous evaluation.

5. Assessment system

- Evaluation of laboratory reports (grade L).
- Monographic works(note T).
- Continuous evaluation based on the resolution of problems and practical questions posed during the development of the classes (grade C).
- Completion of a theoretical-practical test on a date pre-established by the center (grade P). Students who have not submitted the lab report on time will also take a practical lab test which will be their L grade.

Each activity is evaluated up to 10 points and the final grade is the highest of

N = 0.25 * L + 0.25 * T + 0.15 * C + 0.35 * P

N = 0.25 * L + 0.25 * T + 0.50 * P

N = 0.25 * L + 0.15 * C + 0.60 * P

N = 0.25 * L + 0.75 * P

the grade must be higher or equal to 5 points in order to pass the subject.

Passing the subject by means of a single global test:

Alternatively, students may pass the subject by means of the theoretical-practical test on the date pre-established by the center and the practical laboratory test.