26951 - Nuclear Physics and Technology

Información del Plan Docente

Academic Year	2016/17
Academic center	100 - Facultad de Ciencias
Degree	447 - Degree in Physics
ECTS	5.0
Course	4
Period	Second semester
Subject Type	Optional
Module	---

1.Basic info

1.1.Recommendations to take this course

It is advised to have passed Nuclear and Particle Physics.

1.2.Activities and key dates for the course

Classes will start and finish in the dates indicated by the Faculty of Sciences.

Evaluation sessions: To be decided by the Faculty of Sciences and to be announced well in advance.

2.Initiation

2.1.Learning outcomes that define the subject

1 The student knows radiotherapy and diagnosis techniques, their applications, advantages and disadvantages

2 The student is able to design simple devices for industrial applications of radiations

3 The student knows simple models that describe the operation of a nuclear reactor

4 The student knows different types of nuclear reactors and their main characteristics

5 The student is able to identify risks of nuclear reactor operation and radioactive waste management

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6 The student knows the physics of a thermonuclear fusion reactor and the status and prospects for electrical power production

2.2.Introduction

In this course students are introduced to basic theoretical and practical aspects about the applications of radiations and radionuclides in medicine and industry, and about the physics and technology of nuclear fission and fusion for electrical power production.

3.Context and competences

3.1.Goals

To know theoretical and practically the main applications of nuclear physics and technology

3.2.Context and meaning of the subject in the degree

Radionuclides and nuclear technology are widely used in fields like medicine, industry, agriculture, electrical power production, research, etc.

3.3.Competences

1 Understand the use of radionuclides and ionizing radiation in medicine, industry and research

2 Understand the basic principles, consequences and applications of nuclear fission and fusion for electrical power production

3.4.Importance of learning outcomes

1 Understand the use of radionuclides and ionizing radiation in medicine, industry and research

2 Understand the basic principles, consequences and applications of nuclear fission and fusion for electrical power production

4.Evaluation

1 The course comprises practical sessions in the laboratory with elaboration of written reports (L mark). Reports must be delivered not later than 15 days before the theoretical-practical examination. The maximum score will be 10 points. A minimum of 4 points is necessary to pass the course. It contributes to a 25% of the final mark.

2 The course also comprises the elaboration of written reports (T mark). Students can, voluntarily, elaborate an additional report about a selected topic of the course. This written report should be defended in an oral presentation in the classroom. The maximum score will be 10 points. It contributes to a 25% of the final mark.

3 A continued evaluation (C mark), solving problems and questions during the classes, with a duration previously established, will take into account the personal work of the students throughout the course. The maximum score will be 10 points. It contributes to a 15% of the final mark.

4 The rest of the evaluation consists of a theoretical-practical examination in the date established by the Faculty of Sciences (P mark). The maximum score will be 10 points. It contributes to, at least, a 35% of the final mark.

The final mark will be the greatest of

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

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

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

$N = 0.25 * L + 0.75 * P$

A minimum of N=5 points is necessary to pass the course.

5.Activities and resources

5.1.General methodological presentation

This course is organized by combining different training activities:

- Theoretical lectures
- Interactive problem resolution classes
- Laboratory work
- Evaluation tests

5.2.Learning activities

The course is organized by combining theoretical and practical lessons. In order to achieve the intended goals the strategy chosen by the teaching staff consists of using lectures for presenting to the students the basic knowledge required to face the problem solving and laboratory work. Interactive problem resolution classes and laboratory sessions will be conveniently intertwined.

5.3.Program

1 Radionuclides in medicine. Radionuclide production. Nuclear medical imaging. Radiotherapy techniques.

2 Industrial and scientific applications. Tracers. Process control. Sterilization. Radioactive dating and analysing methods.

3 Nuclear fission: neutron interaction with matter, nuclear chain reaction, nuclear fission reactor, nuclear fuel cycle,

radioactive waste management.

4 Nuclear fusion: physics in a thermonuclear fusion reactor, plasma confinement, prospects for electrical power production.

5.4.Planning and scheduling

The course is organized in three training activities: theoretical lectures (3.5 ECTS); interactive problem resolution clasess (1 ECTS) and laboratory work (0.5 ECTS). Laboratory reports must be delivered not later than 15 days before the theoretical-practical examination.

Lectures of theory and problems: 4 sessions / week. Dates to be decided by the Faculty of Science.

Lab classes: They will be announced by the professor at the beginning of the course.

Evaluation sessions: To be decided by the Faculty of Sciences and to be announced well in advance.

5.5.Bibliography and recomended resources