26951 - Nuclear Physics and Technology

Información del Plan Docente

Academic Year	2017/18
Faculty / School	100 - Facultad de Ciencias
Degree	447 - Degree in Physics
ECTS	5.0
Year	4
Semester	Second semester
Subject Type	Optional
Module	---

1.General information

1.1.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.

1.2.Recommendations to take this course

It is advised to have passed Nuclear and Particle Physics.

1.3.Context and importance of this course in the degree

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

1.4.Activities and key dates

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.Learning goals

2.1.Learning goals

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

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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

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

2.2.Importance of learning goals

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.Aims of the course and competences

3.1.Aims of the course

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

3.2.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

4.Assessment (1st and 2nd call)

4.1.Assessment tasks (description of tasks, marking system and assessment criteria)

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.

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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.

Passing the course by a single global examination

The global evaluation consists on:

1 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 a 75% of the final mark.

2 A practical examination in the laboratory (**L mark**). 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.

The final mark will be the greatest of

N = 0.25 * L + 0.75 * P

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

5.Methodology, learning tasks, syllabus and resources

5.1.Methodological overview

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.

5.2.Learning tasks

The 5 ECTS assigned to the planned learning activities are as following:

- Theoretical lectures (3.5 ECTS): 35 hours

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- Interactive problem resolution classes (1 ECTS): 10 hours

- Laboratory work (0.5 ECTS): 5 hours

5.3.Syllabus

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.Course planning and calendar

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 recommended resources

- BB Glasstone, Samuel. Ingeniería de reactores nucleares / por Samuel Glasstone y Alexander Sesonske ; traducida por M. Carreira . [1a ed.] Barcelona [etc] : Reverté, 1968
- BB Murray, Raymond L.. Nuclear energy : an introduction to the concepts, systems, and applications of nuclear processes / Raymond L. Murray. - 6th ed. Burlington [Massachusetts] : Butterworth-Heinemann, cop. 2009 [Acceso a versión PDF]
- BB Ziessman, Harvey A.. Medicina nuclear : los requisitos en radiología / Harvey A. Ziessman, Janis P. O'Malley, Jamens H. Thrall ; [revisión, Isabel Lara Aguilera] . - [3ª ed.] Ámsterdan ; Barcelona; Madrid [etc.] : Elsevier, D.L. 2007