

Course guide

220219 - 220219 - Fundamentals of Nuclear Engineering

Last modified: 11/04/2025

Unit in charge: Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit: 748 - FIS - Department of Physics.

Degree: MASTER'S DEGREE IN INDUSTRIAL ENGINEERING (Syllabus 2013). (Optional subject).
MASTER'S DEGREE IN AERONAUTICAL ENGINEERING (Syllabus 2014). (Optional subject).
MASTER'S DEGREE IN INDUSTRIAL ENGINEERING (Syllabus 2025). (Optional subject).

Academic year: 2025 **ECTS Credits:** 3.0 **Languages:** English

LECTURER

Coordinating lecturer: Josep Sempau

Others:

TEACHING METHODOLOGY

The course is divided into:

1. Face-to-face activities. Lectures will be given on selected topics. Guided work on problems, cases and theoretical topics will be carried out by the students, with guidance from the teacher. Short presentations by students can occasionally be requested.

2. Autonomous work. Self-study, readings, problem solving, etc., either individually or in group.

Continuous assessment can occasionally be used by defining deliverables.

LEARNING OBJECTIVES OF THE SUBJECT

Learning outcomes:

- Define radioactivity and describe the main features of radioactive processes.
- Identify and explain the effects of the passage of ionizing radiation through matter.
- Solve basic problems related to nuclear structure, radioactivity and interaction of ionizing radiation with matter.
- Identify some of the nuclear reactions of interest to nuclear engineering.
- Enumerate the main features of a nuclear reactor.

STUDY LOAD

Type	Hours	Percentage
Hours large group	27,0	36.00
Self study	48,0	64.00

Total learning time: 75 h

CONTENTS

Fundamentals of Nuclear Engineering

Description:

Topics:

1. Historical background
2. Atomic and nuclear structure. Radioactivity
3. Radiation transport
4. Photon interactions with matter
5. Charged particle interactions with matter
6. Neutron interactions with matter. Fission chain reaction
7. Radiation detection
8. Nuclear reactors
9. Fuel cycle and nuclear waste management

Full-or-part-time: 75h

Theory classes: 13h 20m

Practical classes: 7h

Guided activities: 6h 40m

Self study : 48h

GRADING SYSTEM

The assessment of the learning process is based on the following activities, each one having a weight of 25% in the final grade:

1. A written test, with both theoretical and practical questions.
2. A set of exercises to be delivered in written form along the extent of the course.
3. Oral presentations of the work done.
4. Short quizzes posed during class sessions.