

**COURSE DATA****DATA SUBJECT**

**Code:** 46812  
**Name:** Radioactivity Measurement Techniques  
**Cycle:** Master's Degree  
**ECTS Credits:** 3  
**Academic year:** 2025-26

**STUDY (S)**

Degree	Center	Acad. year	Period
2273 - Master's Degree in Environmental Radiation Protection	Facultat de Física	1	Annual

**SUBJECT-MATTER**

Degree	Subject-matter	Character
2273 - Master's Degree in Environmental Radiation Protection	Técnicas de medida de la radiactividad	COMPULSORY

**COORDINATION**

DIAZ MEDINA JOSE

**SUMMARY**

The subject "Radioactivity Measurement Techniques" belongs to the Module of theoretical subjects that forms part of the Master's Degree in Environmental Radiation Protection. This course presents the basic aspects, both theoretical and experimental, of the different methodologies commonly used in the measurement of radionuclides. The aim of this course is for students to learn the fundamentals, technical characteristics and stages of the main methods for measuring  $\alpha$ ,  $\beta$  and  $\gamma$  radiation, as well as the most commonly used detection techniques in these analyses.

**PREVIOUS KNOWLEDGE****RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE**

There are no specified enrollment restrictions with other subjects of the curriculum.

**OTHER REQUIREMENTS**

No requirements have been established for this subject.



## COMPETENCES / LEARNING OUTCOMES

-

Be able to apply the appropriate scientific concepts and data processing tools in the diagnosis and solution of problems arising from environmental radioactivity.

Have basic skills in instrumentation methods and data processing techniques for determining relevant quantities for the analysis of problems arising from environmental radioactivity.

Have the learning skills that allow students to continue to study in a manner that may be largely self-directed or autonomous.

Identify, state and comprehensively analyse the problems arising from environmental radioactivity.

Identify and apply technologies, tools and techniques in the field of environmental radiation protection.

## DESCRIPTION OF CONTENTS

Block 1: Fundamentals of Radiation Detection

1. Fundamentals of radiometric detection.
2. Gas filled detectors.
3. Liquid scintillation detectors.
4. Solid scintillation detectors.
5. Semiconductor detectors.
6. Nuclear electronics.
7. Active and passive shielding.

Block 2: Radionuclide measurement techniques.

8. Alpha, beta and gamma spectrometric techniques.
9. Calibration, verification and maintenance of detectors.



10. Activity measurements and calculations.
11. Real-time in situ measurements.
12. Analytical equipment (AAS, ICP-MS, AMS, microscope).

## WORKLOAD

### PRESENCIAL ACTIVITIES

Activity	Hours
Theory	30,00
<b>Total hours</b>	<b>30,00</b>

### NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	0,00
Independent study and work	37,00
Preparation of lessons	0,00
Preparation for assessment activities	0,00
Resolution of case studies	8,00
<b>Total hours</b>	<b>45,00</b>

## TEACHING METHODOLOGY

MD1	Participative lectures
MD3	Problem solving and group discussion of problems and practical exercises
MD4	Individual or group tutorials, with teacher-student interaction
MD5	Planning, carrying out, tutoring and presentation of works
MD6	Assessments and examinations



## EVALUATION

### Examination

Description: AF11 Assessment and self-assessment (synchronous virtual). Methodology: MD6 Assessments and exams. There will be a written exam, in which several problems and questions of direct application of the theory seen in the course will be posed. A minimum mark of 5.0 is required to pass the course.

Hours: 4

Evaluation criteria: SE1 Individual written tests of knowledge and resolution of exercises and practical cases. The basic criteria for correction will be the adequacy of the procedures applied in the resolution of the proposed problems, and the accuracy of the solution obtained. Learning outcomes CM1, CM2, and CM5 are assessed.

### Monitoring of the distance assessment: Examination monitoring software.

At the time of enrolment, students agree to comply with the conditions established for exam invigilation.

#### Examination invigilation conditions

In order to ensure that the assessment tests are carried out with the maximum guarantees and with the minimum risk of fraud, students undertake to:

- Identify themselves by means of DNI, NIE, passport, university card or other reliable means.
- Accept the measures adopted by the teaching staff to avoid fraud in the assessment, such as limiting the use of electronic devices, books, notes and other available objects.
- - Comply with the regulations on academic fraud in the assessment process.

### Specifically, in the case of the MPRA:

Install, at the beginning of the academic year, the software provided by the university for exam invigilation (Proctoring).

Have two cameras (one of which can be a mobile phone camera).



The final grade for this subject will be calculated by weighting the results of the following evaluation activities, taking into account the observations indicated at the bottom of the table. In order for the subject to be considered passed, the final grade must be equal to or higher than 5.0 on a scale of 0 to 10.

Assessment activities	Weight of the final grade	Recoverable (Yes/No)	Minimum mark*	Validation mark**
Submission of reports and practical and problem-solving reports	20%	No		
Submission and defence of tutored work	30%	No		
Individual written tests of knowledge and the resolution of exercises and case studies.	50%	Yes	5,0	

\* The minimum mark is the mark required for the assessment element to be considered in the average mark (with its corresponding weight). If it is not exceeded, it will be marked with 0 points. The student can pass the subject if the final grade is sufficient.

\*\* The validation mark is the mark required for the assessment element to be considered in the average mark (with its corresponding weight). If it is not passed, it will be marked with 0 points. The student cannot pass the subject.

## REFERENCES



Basic bibliography

- G. F. Knoll, Radiation Detection and Measurement. John Wiley & Sons, Inc., 4e, 2010
- García León, Detecting Environmental Radioactivity. Springer

Further reading

- N. Tsoulfanidis, S. Landsberg, Measurements and detection of radiation, 4e, CRC Press, 2015.
- R. Tykva, J. Sabol, Low-Level Environmental Radioactivity, Technomic Publishing, 1995.
- P. Theodórsson, Measurements of Weak Radioactivity, World Scientific, 1996.
- W. R. Leo, Techniques for Nuclear and Particles Physics experiments, 2e, Springer Verlag, 1994

Other resources

Material available on the web page of the subject in Aula Digital and didactic material supplied by the teaching staff.

"The downloading, dissemination, distribution or disclosure of class recordings and particularly their sharing on social networks or note-sharing services violates the fundamental right to data protection, the right to one's own image and intellectual property rights. These uses are considered prohibited and could lead to disciplinary, administrative and civil liability for the offender. Only the reproduction of the virtual classes recorded on the media provided by the University is authorised and only through Aula digital".