COURSE DATA

DATA SUBJECT

Code: 46814
Name: Ionising Radiation Dosimetry
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	Dosimetría de radiaciones ionizantes	COMPULSORY

COORDINATION

DIAZ MEDINA JOSE

SUMMARY

The subject "Dosimetry of Ionising Radiation" belongs to the Module of theoretical subjects that forms part of the Master's Degree in Environmental Radiation Protection. This course presents the basic theoretical and experimental aspects of dosimetry. The aim of this course is for students to learn the fundamentals, technical characteristics and stages of the main dosimetric methods, as well as the most commonly used dosimetric measurement techniques. In addition, it will provide the basis for introducing students to aspects related to environmental and occupational radiation protection.

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

2273 - Master¿s Degree in Environmental Radiation Protection

Assess and apply radiation protection measures to improve environmental quality and health.

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

Be able to develop projects in the field of environmental radiation protection.

Be able to integrate knowledge of the sources of radioactivity, its interaction with matter and its effects on living organisms and to handle the complexity of formulating judgements with incomplete or limited information, but that includes reflections on the social and ethical responsibilities linked to the application of knowledge and judgements.

Demonstrate knowledge and understanding of ionising radiations that provide a basis or opportunity to be original in developing or applying ideas, often in a research context in the field of 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.

Know how to apply knowledge and problem-solving abilities in new or unfamiliar environments within broader (or multidisciplinary) contexts related to the field of study.

Propose practical solutions, according to applicable environmental legislation, for suitable environmental management tools and assessment of environmental radiological risks.

DESCRIPTION OF CONTENTS

1. quantities and units describing the interaction of ionising radiation with matter: kerma, absorbed dose, transferred energy, exposure, quality factor, dose equivalent.

2. Equilibrium of radiation and charged particles.

3. Absorbed dose.

4. General characteristics of dosimeters. Charged particle and neutral particle dosimeters.

5. Ionisation chambers.

6. Calibration of dosimeters.

7. Integrating dosimeters.

8. Neutron dosimetry.

9. Internal dosimetry.

10. Dose calculation.

11. Radiobiology and biological effects of radiation.

12. Public exposure from natural and artificial sources.

13. Occupational exposures. Radiation protection and monitoring. Regulatory framework.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	30,00
Total hours	**30,00**

NON PRESENCIAL ACTIVITIES

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

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	Plaiming, carrying out, tutoring and presentation of assignments
MD6	Evaluations and Examinations

EVALUATION

1. Directed academic activities

Description: AF9 Directed academic activities. Methodology: MD5 Proposal, execution, tutoring and presentation of assignments. A project will be proposed, with the aim that students apply the knowledge acquired during the course to the resolution of a practical case. A report will be written and presented to the whole class.

Hours: 8

Evaluation criteria: SE3 Presentation and defence of tutored work. The structure and format of the work submitted will be assessed, as well as the correctness of the results. Learning outcomes CN2, CN3, HA1, HA3, HA4, HA5, CM3, CM6 will be assessed.

2. Problem solving sessions

Description: AF8 Problem solving sessions and/or case studies (synchronous virtual). Methodology: MD2 Computer classrooms. MD3 Resolution and group discussion of problems and practical exercises. In these classes, practical activities oriented to the acquisition of skills and integration of the contents of the course will be carried out.

Hours: 6

Assessment criteria: SE2 Presentation of practical and problem-solving reports. Each student will be assessed individually on the adequacy of the procedures applied to solve the proposed problems and the accuracy of the results obtained, as well as the effectiveness of the presentation format and the clarity of oral and/or written presentation. Learning outcomes CN1, CN2, CN3, HA1, HA2, HA4, HA5 will be assessed.

Examination

Description: AF11 Assessment and self-assessment (synchronous virtual). Methodology: MD6 Assessments and examinations. 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 4.0 is required to pass the course.

Hours: 2

Assessment criteria: SE1 Individual written tests of knowledge and the resolution of exercises and practical cases. The basic criterion for correction will be the adequacy of the procedures applied in solving the proposed problems, and the accuracy of the solution obtained. Learning outcomes CN1, CN2, HA1, HA4, CM1 and CM5 are assessed.

Monitoring of distance assessment: Examination invigilator 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 UIB's assessment processes (https://seu.uib.cat/fou/acord/13651/).

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).

To ensure the quality of distance learning, the MPRA has an exam proctoring software for non-face-to-face assessments (Smowl).

This programme is integrated in the Digital Classroom of each subject and is used for all the assessments of this subject. Test records and results are recorded in the Digital Classroom, where they are stored for two years. Incident records and image capture during the tests are stored in the software platform for one year.

In order for the surveillance during the evaluations to work correctly, students, at the beginning of the academic year, must undertake to install the software provided for the surveillance of exams (Proctoring) on their computer and to have two cameras, as the operation of this software allows:

- The detection of impersonation by verifying the identity of students and biometric monitoring during the test.

The detection of elements other than those necessary to carry out the assessment: books, other screens, information exchangers, active programmes, control of web browsing, use of copy-paste commands and virtual machines, by monitoring the computer.

- Detection of people other than the person being assessed by monitoring the environment using a second camera (which may be that of the mobile phone).

- Detection of audio and object disturbances, to ensure that students do not receive external assistance during the test; the microphone is activated each time it detects a noise that exceeds the defined threshold and, once activated, it records for 20 seconds and the recording is stored as an event.

- Automatic monitoring, which starts every time the user starts an online activity; the system records images every 60 seconds, in addition to the incidents detected during the whole test; the information is stored for one year on the company's servers and access to these images is restricted according to the company's security protocols.

- The availability of the incident report for the teaching staff after the test has been carried out.

- All the evaluations are carried out under the supervision of the subject's teaching staff; all the students, as well as the teaching staff, connect at the same time and carry out the test during the same timetable.

REFERENCES

Basic bibliography

1. Introduction to Radiological Physics and Radiation Dosimetry. F H. Attix. Wiley-VCH, 1986.
2. Introduction to Radiation Protection Dosimetry. J. Sabol and P.S. Weng- World Scientific, 1995.

Supplementary bibliography
3. Fundamentals of Ionizing Radiation Dosimetry. P. Andreo, D. T. Burns, A. E. Nahum, J. Seutjens, F. H. Attix, Wiley-VCH, 2017.
4. Radiobiology Textbook. Sarah Baatout, Springer, 2023.
5. The Physics of Radiology. H.E. Johns, J.R.Cunningham, 4e, 1983.
Other resources
Material available on the web page of the subject in Aula Digital and didactic material supplied by the teaching staff.