COURSE DATA

DATA SUBJECT

Code: 43073
Name: Radiation dosimetry
Cycle: Master's Degree
ECTS Credits: 5
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
2140 - Master's Degree in Medical Physics	Facultat de Física	1	First quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
2140 - Master's Degree in Medical Physics	Dosimetry and radiation protection	COMPULSORY

COORDINATION

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SUMMARY

Radiation dosimetry is the branch of science that attempts to quantitatively relate specific measures made in a radiation field to physical, chemical and / or biological changes that radiation would produce in a target. Radiation dosimetry is essential for quantifying the impact of various biological changes as a function of the amount of radiation received (dose-effect relationships), for comparing different experiments, for monitorizing the radiation exposure of individuals, and for surveillance of the environment. This course describes the main concepts upon which radiation dosimetry is based and presents methods for their practical use, and subsequently this content is used in \"Radiological Protection in Medicine\", \" Physical aspects of radiotherapy\" and \" Imaging systems for medical diagnosis\".

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

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

OTHER REQUIREMENTS

COMPETENCES / LEARNING OUTCOMES

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Acceder a herramientas en el área de Física que puedan ser susceptibles de aplicación a la Medicina y valorar su aplicabilidad e interés.

Aplicar los modelos físicos de cálculo de dosis.

Be able to access the information required (databases, scientific articles, etc.) and to interpret and use it sensibly.

Be able to access to information tools in other areas of knowledge and use them properly.

Critically analyze both his/her work and that of the colleagues.

Planificar y gestionar la utilización de las técnicas físico-médicas teniendo en cuenta los principios básicos de control de calidad, prevención de riesgos, seguridad y sostenibilidad.

Project the knowledge on specific problems and know how to summarize and extract the most relevant arguments and conclusions for their resolution.

Seleccionar la instrumentación apropiada para el estudio a realizar y aplicar sus conocimientos para utilizarla de manera correcta.

Students should apply acquired knowledge to solve problems in unfamiliar contexts within their field of study, including multidisciplinary scenarios.

Students should be able to integrate knowledge and address the complexity of making informed judgments based on incomplete or limited information, including reflections on the social and ethical responsibilities associated with the application of their knowledge and judgments.

Students should communicate conclusions and underlying knowledge clearly and unambiguously to both specialized and non-specialized audiences.

Students should demonstrate self-directed learning skills for continued academic growth.

Students should possess and understand foundational knowledge that enables original thinking and research in the field.

To acquire a critical attitude that allows you to make reasoned judgments and defend them with rigor and tolerance.

Use the different exhibition techniques oral, written, presentations, panels, etc., to communicate the knowledge, proposals and positions.

Utilizar la tecnología implicada en la producción y posterior detección de las radiaciones ionizantes.

Valorar el binomio riesgo-beneficio asociado a las técnicas físicas aplicadas al diagnóstico y la terapia,

buscando optimizar el beneficio y minimizar el riesgo.

DESCRIPTION OF CONTENTS

1. Classification of Radiations

(a) Basic physical quantities and units used in radiation physics
(b) Types and sources of directly and indirectly ionizing radiations
(c) Description of ionizing radiation fields

2. Quantities and Units Used for Describing Radiation Fields

(a) Fluence and fluence rate
(b) Energy fluence and energy fluence rate
(c) Monoenergetic and polyenergetic spectra

3. Quantities and Units Used for Describing the Interaction of Ionizing Radiation with Matter

(a) Terma, kerma, collisional kerma, radiative kerma
(b) Absorbed dose
(c) Energy transferred, net energy transferred, energy imparted
(d) Equivalent dose and quality factor
(e) Exposure
(f) Dose equivalent
(g) Recommendations of the ICRU

4. Charged Particle and Radiation Equilibrium

(a) Radiation equilibrium
(b) Charged particle equilibrium (CPE)
(c) Relationships between absorbed dose, collisional kerma, and exposure under CPE
(d) Conditions that enable CPE or cause its failure

(e) Transient CPE

5. Radiation dosimetry

(a) Types and general characteristics of dosimeters
(b) ICRU definitions of dosimetry quantities and units
(c) Absolute vs. relative dosimetry techniques
(d) Interpretation of dosimeter measurements

6. Laboratory work

- Dosimetry by OLS

- Dosimetry by radiochromic films

- Dosimetry by Monte Carlo: Penelope

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	30,00
Other activities	4,00
Laboratory	16,00
Total hours	**50,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	8,00
Independent study and work	35,00
Preparation of lessons	21,00
Preparation for assessment activities	10,00
Resolution of case studies	5,00
Total hours	**79,00**

TEACHING METHODOLOGY

MD1 - Study material based on textbooks (ebook).
MD2 - Videoconferences to solve doubts about theory topics.
MD3 - A questionnaire with conceptual questions and numerical exercises will be proposed for each of the topics.
MD4 - Videoconferences to resolve doubts of the questionnaires and exercises.
MD5 - Practical laboratory classes. The students will present a small memory with the results of each practice.
MD6 - Videoconferences of experts in the subjects on topical issues in dosimetry. Optional. Not evaluable.

EVALUATION

Assessment will take place throughout the course. Written tests, either in-person and/or online, will be carried out. For this purpose, questionnaires will be opened during each topic, and students will be required to complete them within a set time frame. The weighting of the different assessment components in both examination sessions will be:

- Written tests carried out throughout the course: 60%

- Written tests on calculation-based lab work: 10%

- Reports on the contents developed during the practical sessions: 30%

Attendance at the in-person practical sessions is mandatory in order to pass the course in both the first and second calls, and the minimum passing grade for the course is 5 out of 10.

Students who do not achieve a minimum grade of 4 out of 10 in the written tests during the course must sit an examination during the official assessment period, both in the first and second calls.

Evidence of copying or plagiarism will result in failure to pass the subject and in appropriate disciplinary action being taken. Please note that, in accordance with article 13. d) of the Statute of the University Student (RD 1791/2010, of 30 December), it is the duty of students to refrain from using or participating in dishonest means in assessment tests, assignments or university official documents.

In the event of fraudulent practices, the ¿**Action Protocol for fraudulent practices at the University of Valencia**¿ will be applied (ACGUV 123/2020):

https://www.uv.es/sgeneral/Protocols/C83sp.pdf

REFERENCES

- P. Andreo, D. T. Burns, Alan E. Nahum, J. Seuntjens and Frank H. Attix, Fundamentals of Ionizing Radiation Dosimetry. John Wiley & Sons. 2017

- James E. Turner, Atoms, Radiation and Radiation Protection. Wiley-VCH. 2nd edition. 2004.