1. BASIC INFORMATION

Course	Radioprotection
Degree program	Degree in Dentistry
School	Ciencias Biomédicas y de la Salud
Year	5
ECTS	2 ECTS
Credit type	Mandatory
Language(s)	Castellano/Inglés
Delivery mode	Campus-based
Semester	First/second semester
Academic year	2024/2025
Coordinating professor	Victor Díaz-Flores García

2. PRESENTATION

The use of ionizing radiation in clinical practice has been an unthinkable advance decades ago in the diagnosis and treatment of various diseases.

Dentistry has been one of the medical specialties that has benefited most from advances in diagnostic imaging, however, this use means an increase in the dose suffered by both the patient and the one who performs the radiographic test. The dental professional must be aware of the limitations and protection measures against ionizing radiation.

The ICRP (International Commission on Radiation Protection) has warned of this fact and insists (in its publications 103, 105 and 113) on the need for those who perform diagnostic procedures using ionising radiation to have an adequate level of training.

In this course, the fundamentals of radiation production, the criteria of radioprotection and radiobiology, the legislation applicable in Spain to producers of ionising radiations and the techniques applicable in dentistry will be presented. All this to train the future professional who will use radiation as one of his most common diagnostic means. The basis for the training of this subject will be in the educational material of the ICRP and the European Commission. In addition, and as a complement to the course, the latest advances in diagnosis will be shown and experts in various specialties will explain how radiology and other newly emerging technologies can help achieve better diagnosis and treatment.

3. COMPETENCIES AND LEARNING OUTCOMES

Basic competencies:

- CB2: That students know how to apply their knowledge to their work or vocation in a professional way and have the skills that are usually demonstrated through the development and defense of arguments and problem solving within their area of study.
- CB3: Students have the ability to collect and interpret relevant data (usually within their area of study) to make judgments that include reflection on relevant social, scientific or ethical issues.

- CB4: That students can transmit information, ideas, problems, and solutions to a specialized and non---specialized public.
- CB5: That students have developed the necessary learning skills to undertake further studies with a high degree of autonomy.
- Transversal competences:
- CT1 --- Autonomous learning: Process that allows the person to be the author of his or her own development, choosing the paths, strategies, tools and moments that he or she considers most effective in order to learn and put into practice independently what has been learned. The freelance learner, in short, selects the best strategies to achieve his or her learning objectives.
- CT2 --- Self---confidence: Ability to value our own results, performance, and capabilities with the internal conviction that we can do things and the challenges we face.
- CT4 --- Capacity for analysis and synthesis: Analysis is the method of reasoning that allows complex situations to be broken down into their constituent parts, as well as evaluating other alternatives and perspectives to find optimal solutions. Synthesis seeks to reduce complexity to better understand it and/or solve problems.
- CTC7 --- Awareness of ethical values: Ability to think and act according to universal principles based on the value of the person, which are aimed at his/her full development and involve commitment to certain social values.
- • CT8 --- Information Management: Ability to search, select, analyze, and integrate information from diverse sources.
- CT9 --- Interpersonal relationship skills: To relate positively to other people by verbal and non---verbal means through assertive communication, understood as the ability to express, or transmit what one wants, thinks, or feels without disturbing, attacking or hurting the other person's feelings.
- • CT10 --- Initiative and entrepreneurship: Preference for taking on and carrying out activities. Ability to undertake difficult or risky actions with resolution. Ability to anticipate problems, propose improvements and persevere in achieving them.

General competencies:

- GC1 Know the essential elements of the dentist profession, including ethical principles and legal responsibilities.
- GC2 Understand the importance of such principles for the benefit of the patient, society, and profession, with special attention to professional secret.
- GC3 Know how to identify the patient's concerns and expectations, as well as communicate effectively and clearly, both orally and in writing, with patients, family members, the media, and other professionals.
- GC6 Understand the importance of developing a professional practice with respect to the patient's autonomy, their beliefs and culture.

- GC7 Promote autonomous learning of new knowledge and techniques, as well as motivation for quality.
- GC11 Understand the basic biomedical sciences on which Dentistry is based to ensure correct oral care.
- GC14 Know about the general processes of the disease, among which are infection, inflammation, alterations of the immune system, degeneration, neoplasia, metabolic alterations, and genetic disorders.
- GC16 Understand the fundamentals of action, indications, and efficacy of drugs and other therapeutic interventions, knowing their contraindications, interactions, systemic effects, and interactions on other organs, based on the available scientific evidence
- GC17 Understand and recognize the principles of ergonomics and safety at work (including control of cross infection, radiation protection and occupational and biological diseases).
- GC18 Know, critically assess, and know how to use the sources of clinical and biomedical information to obtain, organize, interpret, and communicate scientific and health information.
- GC21 Knowing how to perform a complete oral examination, including appropriate radiographic and complementary examination tests, as well as obtaining adequate clinical references.

Specific Competences

- SC7. Know the risk of ionising radiation and its effects on biological tissues, together with the legislation regulating its use. Manage oral radiodiagnosis facilities.
- SC14. Know dental biomaterials: their handling, properties, indications, allergies, biocompatibility, toxicity, waste disposal and environmental impact.
- SC17. Apply the principles of ergonomics in dental work, both individually and within the work team where appropriate, as well as in the principles of occupational risk prevention associated with dental practice.
- SC26. Recognize that the patient is the center of care and that all interactions, including prevention, diagnosis, treatment planning and implementation, and maintenance, should be in the patient's best interests, avoiding discrimination of any kind and respecting confidentiality. Identify signs and attitudes that suggest possible abuse.

Learning outcomes:

- RA1: Mastery of radiological unit management concepts. To know the danger of ionizing radiation and its effects on biological tissues, together with the legislation regulating its use. Running oral radiodiagnostic facilities. To interpret the images obtained and to know other relevant diagnostic imaging techniques.
- RA2: To know the clinical and laboratory diagnostic procedures and tests, to know their reliability and diagnostic validity and to be competent in the interpretation of their results.
- RA3: Recognize normalcy and oral pathology, as well as evaluation of semiological data.

- RA4: Identify the main reason for consultation and the history of the current disease. Take a general medical history of the patient and a medical record that accurately reflects the patient's records.

The table below shows the relationship between the competences developed in the subject and the learning outcomes pursued:

The following table shows the relationship between the competencies developed during the course and the learning outcomes pursued:

Competencies	Learning outcomes
CB2, CB3, CB4, CB5, CT1, CT2, CT4, CT9, CE3, CE6	RA1: Knowledge of radiological unit management concepts. To know the danger of ionizing radiation and its effects on biological tissues, together with the legislation regulating its use. Running oral radiodiagnostic facilities. To interpret the images obtained and to know other relevant diagnostic imaging techniques.
CB4, CT1, CT2, CT4, CT8, CE2, CE3, CE6, CE7	RA2: To know the clinical and laboratory diagnostic procedures and tests, to know their reliability and diagnostic validity and to be competent in the interpretation of their results.
CB3, CT4, CT8, CT10, CE1, CE16, CE17	RA3: Recognize normalcy and oral pathology, as well as evaluation of semiological data.
CT2, CT7, CT8, CE11, CE14, CE18, CE 20 CE21	RA4: Identify the main reason for the visit and the history of the current illness. Take a general medical history of the patient and a medical record that accurately reflects the patient's records.
CB2, CB3, CB4, CB5, CT1, CT2, CT4, CT9, CE3, CE6	RA1: Knowledge of radiological unit management concepts. To know the danger of ionizing radiation and its effects on biological tissues, together with the legislation regulating its use. Running oral radiodiagnostic facilities. To interpret the images obtained and to know other relevant diagnostic imaging techniques.
CB4, CT1, CT2, CT4, CT8, CE2, CE3, CE6, CE7	RA2: To know the clinical and laboratory diagnostic procedures and tests, to know their reliability and diagnostic validity and to be competent in the interpretation of their results.

4. CONTENT

The subject is organized into eleven learning units.
Unit 1.
Atomic structure
Unit 2.
Interaction of radiation with matter. Physical characteristics of X-ray beams and equipment.
Unit 3.
Physical characteristics of radiodiagnostic equipment.
Unit 4.
The radiation beam. X-ray spectrum. Radiation quantities and measurement.
Unit 5.
Magnitudes and units.
Unit 6.
Radiation detection and dosimetry. Biological effects of ionizing radiation.
Unit 7.
Biological effects of ionizing radiation. Basic regulations and legislation on radiodiagnosis facilities.
Unit 8.

Spanish legislation applicable to radiodiagnosis facilities. Basic radiological protection.
Unit 9.
Radiation protection. General criteria
Unit 10.
Operational radiation protection. Specific radiological protection in radiodiagnosis facilities.
Unit 11.
Specific radiation protection in dental radiodiagnostic facilities. Quality assurance program
Unit 12.
Quality assurance and control in dental radiodiagnosis facilities.
Unit 13.
Technical-administrative requirements.

5. TEACHING-LEARNING METHODOLOGIES

The types of teaching---learning methodologies that will be applied are listed below:

Master Class

Cooperative Learning

6. LEARNING ACTIVITIES

Listed below are the types of learning activities and the number of hours the student will spend on each one:

Campus-based mode:

Learning activity	Number of hours
Master Class	13
Case Studies	2
Practical exercises	8
Study and autonomous work	21
Tutorials	4
Knowledge tests	2
TOTAL	**50**

7. ASSESSMENT

Listed below are the assessment systems used and the weight each one carries towards the final course grade:

Campus-based mode:

Assessment system	Weight
Knowledge test	50%
Portfolio	40%
Practical Exercises/Performance Observation	10%

When you access the course on the *Campus Virtual*, you'll find a description of the assessment activities you have to complete, as well as the delivery deadline and assessment procedure for each one.

7.1. First exam period

In order to pass the course in the ordinary exam, it is necessary to obtain a grade higher or equal to 5.0 out of 10.0 in all the evaluable activities of the course.
- The knowledge test may consist of one or more of the following formats: multiple-choice test with 30 questions with 4 answers, only one of which is correct (each wrong answer will deduct 0.33 from the mark); short-question essay test: test of true/false questions and reasoning of the answer; long-question essay test or other assessment methodologies. The type of knowledge test will be announced on the virtual campus one month before the assessment takes place.
- During the course there will be 11 online tests of the subject. The student must have a grade of 5 in each of them to pass this part of the course. At the end of the ordinary exam, students who have not taken or have failed a maximum of two tests will be allowed to recover them. If the student has not taken or has failed more than two tests, he/she will have to make them up during the follow-up period of the extraordinary exam.
- The participation in the forums of the course is mandatory and will be considered in the evaluation system within the item "observation of performance". It will be controlled through the instruments of the virtual campus. The lack of participation in the forum will be considered as a lack of performance observation, which must be recovered during the follow-up period of the extraordinary call.
- During the course there will be several activities that must be presented in time and form previously indicated by the professor. Failure to complete these activities must be made up during the follow-up period of the extraordinary exam.
Disciplinary action will be taken in case of:

- Use of cell phones or any other electronic device, during evaluation tests. Those students who are in a "suspicious" situation during the evaluation tests and who are carrying any electronic device (on or off) will be sanctioned according to the internal regulations of the University.
- Plagiarism of the professor's intellectual property. Any means of recording (voice, image, presentations...), may be considered cause for sanction.
- Disrespect (physical or verbal) to any member of the University (teaching staff, non-teaching staff or students).

In case of fraud, article 6.12 of the Evaluation Regulations of the official undergraduate degrees of the Universidad Europea de Madrid will be applied: "Any student that uses or benefits from unlawful means during an evaluation test or that unduly attributes the author of the academic work required for the assessment will be graded as a "fail" (0) and may similarly be the object of a sanction, subject to the opening of disciplinary proceedings. In the case of the Final Graduation Project, the plagiarism or the lack of originality of the project, will automatically be graded as a "fail" (0) in the corresponding course in both

ordinary and extraordinary periods. Likewise, the student will lose their status as a student during six months according with the General Standards for Graduation Projects and Master's Thesis in its Article 5." (https://universidadeuropea.com/resources/media/documents/6. Reglamento evaluacion titulaciones oficiales grado UEM v2.pdf).

7.2. Second exam period

In order to pass the course in the extraordinary call, a grade higher or equal to 5.0 out of 10.0 must be obtained in all the evaluable activities of the course.
The activities that were not passed in the ordinary exam must be handed in, after having received the corresponding corrections from the teacher, or those that were not handed in.
The activities failed or not completed in the ordinary period will be recovered in person within the period of monitoring of the subject, in the schedule that is marked for such recovery.
The activities may vary in format or content, but always corresponding to the lesson or unit corresponding to the activity to be recovered.
As for the format of the recovery of the ordinary objective test, the format may vary. It will be announced in advance on the virtual campus.

8. SCHEDULE

This table shows the delivery deadline for each assessable activity in the course:

Assessable activities	Deadline
Presentation Test	Week 2
Test Lesson 1	Week 3
Test Lesson 2	Week 4
Test Lesson 3	Week 5
Test Lesson 4	Week 6
Test Lesson 5	Week 7
Test Lesson 6	Week 8
Test Lesson 7	Week 10
Test Lesson 8-9	Week 11
Test Lesson 10-11	Week 12
Test Lesson 12-13	Week 13
Group activity	Week 16
Integration Theoretical knowledge	Week 17

This schedule may be subject to changes for logistical reasons relating to the activities. The student will be notified of any change as and when appropriate.

9. BIBLIOGRAPHY

The main reference work for this subject is:

- Goaz,Paul W.; White,Stuart C. Radiología oral: principios e interpretación. 1995, Mosby/Doyma Libros, Madrid, 4ª.

The recommended Bibliography is:

- Brocklebank,Laetitia. Dental radiology: aids to interpretation. 1997, Oxford University Press, Oxford; New York.
- Cavézian,Robert; Pasquet,G.; Bel i Queralt,Germà; Djian,Albert. Diagnóstico por la imagen en odontoestomatología: medios técnicos, anatomía normal, hallazgos patológicos. 1993, Masson, Barcelona.
- Farman,Allan G. Panoramic radiology: seminars on maxillofacial imaging and interpretation 2007, Springer, Berlin; New York.
- Miles,Dale A. Color atlas of cone beam volumetric imaging for dental applications. 2008, Quintessence Pub., Hanover Park, IL.
- Pasler,Friedrich Anton. Atlas de radiología odontológica. 1992, Ediciones Científicas y Técnicas, Barcelona.
- Pasler,Friedrich Anton; Visser,Heiko. Pocket atlas of dental radiology. 2007, Thieme, New York.
- Stafne,Edward C.; Gibilisco,Joseph A.; Turlington,Eastwood G. Diagnóstico radiológico en odontología. 1999, Editorial Médica Panamericana, Buenos Aires.
- Whaites,Eric. Radiología odontológica. 2010, Médica Panamericana, Buenos Aires.
- Whaites,Eric; Whaites,Eric; Cawson,Roderick A. Essentials of dental radiography and radiology. 2013, Churchill Livingstone, Edinburgh.
- White,Stuart C.; Wagner,I.V.; van der Stelt,P.F. DS X-ray: decision support for interpretation of radiographic lesions and clinical management. 2003, Quintessenz, Berlin.
- Zoller,Joachim E.; Neugebauer,Jörg. Cone-beam volumetric imaging in dental, oral and maxillofacial medicine: fundamentals, diagnostics and treatment planning. 2008, 214, Quintessence, London.

10. EDUCATIONAL GUIDANCE AND DIVERSITY UNIT

From the Educational Guidance and Diversity Unit we offer support to our students throughout their university life to help them reach their academic achievements. Other main actions are the students inclusions with specific educational needs, universal accessibility on the different campuses of the university and equal opportunities.

From this unit we offer to our students:

1. Accompaniment and follow-up by means of counselling and personalized plans for students who need to improve their academic performance.
2. In terms of attention to diversity, non-significant curricular adjustments are made in terms of methodology and assessment for those students with specific educational needs, pursuing an equal opportunities for all students.
3. We offer students different extracurricular resources to develop different competences that will encourage their personal and professional development.

4. Vocational guidance through the provision of tools and counselling to students with vocational doubts or who believe they have made a mistake in their choice of degree.

Students in need of educational support can write to us at:
orientacioneducativa@universidadeuropea.es

11. ONLINE SURVEYS

Your opinion matters!

The Universidad Europea encourages you to participate in several surveys which help identify the strengths and areas we need to improve regarding professors, degree programs and the teaching-learning process.

The surveys will be made available in the “surveys” section in virtual campus or via e-mail.

Your assessment is necessary for us to improve.

Thank you very much for your participation.