

## 29349 - Radiation Safety

### Syllabus Information

**Academic Year:** 2019/20

**Subject:** 29349 - Radiation Safety

**Faculty / School:** 229 - Facultad de Ciencias de la Salud y del Deporte

**Degree:** 442 - Degree in Odontology

**ECTS:** 3.0

**Year:** 5

**Semester:** Second semester

**Subject Type:** Optional

**Module:** ---

### 1.General information

#### 1.1.Aims of the course

#### 1.2.Context and importance of this course in the degree

#### 1.3.Recommendations to take this course

### 2.Learning goals

#### 2.1.Competences

#### 2.2.Learning goals

#### 2.3.Importance of learning goals

### 3.Assessment (1st and 2nd call)

#### 3.1.Assessment tasks (description of tasks, marking system and assessment criteria)

The student must demonstrate that he has achieved the anticipated learning outcomes through the following assessment activities:

**Theorists:** Final exam type test (60 unique test questions with 4 possible answers). There will be two intermediate exams of 10 short questions each.

**Practical:** Assistance and Realization of memories.

The subject is approved with a 90% attendance to theoretical classes, attendance to all practices, with at least 45 correct answers in the final exam and with a final grade higher than 5. The final grade of the subject will be the average between the note of the final exam and the average of the two partial exams.

### 4.Methodology, learning tasks, syllabus and resources

#### 4.1.Methodological overview

The learning process designed for this subject is based on the following:

- Promote self-learning new knowledge, skills and motivation in order to get the best quality.
- Be able to share information with other health professionals and to work as a team.
- Understand and recognize the principles of ergonomics and safety at work (including cross-infection control, radiation protection and occupational and biological diseases).

#### 4.2.Learning tasks

The program the student is offered in order to help you to achieve the expected results includes the following activities ...

Theoretical sessions:

Area 1. Basics:

X-ray production and qualities. X-ray nature. X-ray interaction with matter: basic concepts. Attenuation of radiation. Radiological image shaping.

Area 2. Physical features of the equipment and x-ray beams:

Generator. Tube. Associated devices. Radiation produced by X-ray tubes imaging systems features.

Area 3. Magnitudes and measurement of radiation:

Radiological magnitudes applicable to radiodiagnostic. Dose concept. Radiation detection and measurement. Physical fundamentals. Measurement equipment. Direct beam dose measurement. Dose area measurement. Personal dosimeters.

Area 4. Biological impacts of ionizing radiation:

General aspects of the interaction between radiation and the biological environment. Somatic and genetic effects. Stochastic and non-stochastic effects.

Area 5. Radio-diagnostic facilities basic regulations and legislation.

Area 6. Basic Radiological Protection: Goals. Principles: Justification; optimization; Dose limitation system. Operational radiation protection basic standards (Regulation on health protection against ionizing radiation). General criteria for dose reduction.

Area 7. Specific radiological protection in dental or podiatry radiology facilities:

General considerations. Facilities design. Diagnostic radiology rooms technical features. Operational radiation protection development. Organization and control. Preventive and corrective maintenance. Methods to reduce dose to patients. Radiation protection considerations on facilities.

Using particular techniques: digital radiology: Concept and applications.

Fundamentals and techniques of radiological examination using equipment with digital technology. Pediatric techniques. Other diagnostic and interventional techniques.

Specific comments regarding the protection of the patient.

Area 8. Quality assurance program.

Area 9. Technical-administrative requirements:

Declaration and registration procedure of the equipment and facilities of X-ray medical diagnosis. Technical Specifications Operating Personnel requirements. Performance standards. Logbook. Files and reports. Periodic and special inspections. Devices and protective clothing.

Content of the practical sessions:

Management of different types of radiation monitors used in radiology, interpretation of measurement results. Criteria for the use of suitable equipment in each case.

Estimation of doses that operating personnel and members of the public could receive, considering the weekly workload and the results of measurements of environmental radiation. Use and occupancy factors. Testing the effectiveness of structural armor and personal protection.

Classification and signaling installation areas of radiology.

Checking the variation of dose intensity due to scattered radiation, depending on the size of the irradiated field and operating parameters (kVp, milliamperage, time) and also relative to the operator's position relative to the focus and to the patient.

Applying basic operating procedures involving dose reduction and avoid repetition of plates (collimation, proper technique).

Knowledge of parameters of a processing operation in order to exercise control thereof, such as temperature, pH and regeneration of developer liquids. Interpretation of the results of some basic quality controls (kVp, shooting time, reproducibility, reciprocity, agree cia fields of light and radiation, performance).

Application of criteria to estimate the quality of radiographic images, using suitable patterns. Management of obtaining and recording images systems.

### **4.3.Syllabus**

Theoretical program:

LESSON 1. ATOMIC STRUCTURE AND ELECTROMAGNETIC RADIATION

LESSON 2. INTERACTION WITH CHARGED PARTICLE MATTER (1)

LESSON 3. INTERACTION WITH CHARGED PARTICLE MATTER (2)

LESSON 4. INTERACTION OF photons with matter (1)

LESSON 5. INTERACTION OF photons with matter (2)

LESSON 6. PHYSICAL FEATURES OF RADIOLOGY EQUIPMENT.

LESSON 7. X. RAY BEAM SPECTRUM RX.

LESSON 8. QUANTITIES AND RADIATION UNITS.

LESSON 9. DETECTION AND radiation dosimetry.

LESSON 10. BIOLOGICAL IMPACT OF IONIZING RADIATION.

LESSON 11. PROTECTION AGAINST RADIATION.

LESSON 12. OPERATIONAL RADIATION PROTECTION.

LESSON 13. RADIATION PROTECTION ASPECTS IN VARIOUS DENTAL RADIOLOGY UNITS.  
LESSON 14. QUALITY ASSURANCE AND QUALITY CONTROL FACILITIES IN DENTAL RADIOLOGY.  
LESSON 15. ESTIMATED DOSE IN DENTAL RADIOLOGIA.  
LESSON 16. APPLICABLE SPANISH LEGISLATION TO FACILITIES RADIODIAGNOSTICS (1).  
LESSON 17. APPLICABLE SPANISH LEGISLATION TO FACILITIES RADIODIAGNOSTICS (2).  
LESSON 18. PREGNANCY AND MEDICAL RADIATION.  
LESSON 19. COMPARISON OF RISK.  
LESSON 20. GUIDELINES, RECOMMENDATIONS AND INTERNATIONAL STANDARDS SCOPE (1)  
LESSON 21. GUIDELINES, RECOMMENDATIONS AND INTERNATIONAL STANDARDS SCOPE (2)

Practical program:

1st SESSION. Radiation monitors and personal dosimeters description and management.

Radiation monitor management. Indications interpretation. Estimation of dose depending on the indications.

2nd SESSION. X-ray tube and control devices operation.

3rd SESSION. Quality control equipment RX (kVp, milliamperes, shooting time, performance, reproducibility, filtration ...). Checking variation of the dose rate of scattered radiation according to the size of the irradiated field of the operating parameters (kVp, milliamperage, time) and to the operator's position relative to the focus and the patient. Registration systems, visualization and image storage.

4TH SESSION: Radiation protection in a dental radiology facility. Weekly dose assessment in different parts of the room. Estimation of doses that operating personnel and members of the public could receive, considering the weekly workload and the results of measurements of environmental radiation. Use and occupancy factors. Classification of areas and personnel. Testing the effectiveness of structural armor and personal protection. Applying basic operating procedures involving dose reduction and avoid repetition of plates (collimation, proper technique).

#### **4.4.Course planning and calendar**

Second term.

Calendar of theoretical and practical sessions will be published on moodle platform.

Lectures in the afternoon.

#### **4.5.Bibliography and recommended resources**

- BB1. Curso de PR para DIRIGIR instalaciones de Rayos X con fines de diagnóstico médico (IRD) ESPECIALIDAD: DENTAL CSN-CIEMAT 2009. <http://csn.ciemat.es/MDCSN/>
- BC 1. Guidance notes for dental practitioners on the safe use of x-ray equipment. NRPB 2001.
- BC 2. Radiation Protection 136 European guidelines on radiation protection in dental radiology The safe use of radiographs in dental practice. 2004.
- BC 3. Report nº 145. Radiation protection in dentistry. NRPB. 2003.
- BC 4. Publicación ICRP-84. EMBARAZO E IRRADIACIÓN MÉDICA.
- BC 5. Protección radiológica 118 Guía de indicaciones para la correcta solicitud de pruebas de diagnóstico por imagen. CE 2000.