UNICAMILLUS

Degree in Medicine and Surgery

Integrated teaching: Diagnostic Imaging and Radiotherapy
SSD: MEDS-22/A
Professor responsible:
Total CFU: 4

Module: **Diagnostic Imaging**
SSD: **MEDS-22/A**
Professor: Alessia Guarnera E-mail: alessia.guarnera@unicamillus.org
CFU: **2**

Module: **Radiotherapy**
SSD: **MEDS-22/A**
Professor: Antonella Ciabattoni E-mail: antonella.ciabattoni@unicamillus.org
CFU: **2**

PREREQUISITES
Knowledge of human anatomy and basic understanding of medical pathologies.
Notions of General Pathology.

LEARNING OBJECTIVES
The course aims to educate students on the physical principles of radiation, on the equipment used in Radiology, on the radiological semeiotic and semantics in relation to radiological anatomy and pathology, on the diagnostic approach to the main pathologies (neuro, head-neck, chest, abdomen, pelvis, breast, musculoskeletal system), and the basic principles of Radioprotection. Teaching such applications is crucial for the development of specific professional skills.
The course will also describe the principles and techniques of the use of ionizing radiation in Radiotherapy, starting from the general concepts of Radiobiology, with particular reference to the interaction of radiation with cells, up to the clinical use of radiotherapy in different neoplastic and non-neoplastic diseases. The main modalities of radiation treatment, the integrated pathways between radiotherapy and other oncological treatments, the side effects and the equipment currently used for the treatment will also be described.
An introduction to the general principles of Nuclear Medicine is also planned, with particular regard to radiopharmaceuticals, equipment and main indications.

LEARNING OUTCOMES

Knowledge and understanding
At the end of this course, the student should be able to :

- Know the physical principles of radiation
- Know the biological interactions between radiation and cells
- Know the machines and equipment used in Radiology, Radiotherapy and Nuclear Medicine

- Gain basic knowledge of the radiological semantics and semeiotic
- Know the diagnostic approach to the main pathologies
- Gain basic knowledge of Radioprotection

- Know the main indications, techniques and applications of Radiotherapy
- Know the general principles of Nuclear Medicine

Applying knowledge and understanding
At the end of the course, the student will be able to correctly apply radiations in Radiology, Radiotherapy and Nuclear Medicine and to identify the optimal exam for various pathologic conditions. Students will also know the fields of application of Radiotherapy, the main indications, the possible side effects and the expected benefits of the treatment.

Communication skills
At the end of the course, the student should be able to:

- appropriately use scientific terminology
- apply his/her knowledge to guarantee adequate professional and communication skills in a professional setting

Making judgements
At the end of the course the student should know:

- how to make general assessments of the discussed topics

Learning Skills
At the end of the course, the student will have acquired skills and learning methods suitable for the deepening and improvement of his/her skills, also through the consultation of scientific literature.

COURSE SYLLABUS

DIAGNOSTIC RADIOLOGY

- Basic Principles of Radiations
- Radiological Equipment and Techniques (X-Ray, CBM, Mammography, US, CT, MRI)
- Radiological Semeiotics and Semantic
- Diagnostic approach to the main pathologies (neuro, head-neck, chest, abdomen, pelvis, breast, musculoskeletal system)
- Basic of Interventional Radiology
- Basic principles of Radioprotection
- Seminar: The role of computed tomography in trauma: international protocols and clinical applications

RADIOTHERAPY

• General concepts of radiobiology and the interaction of radiation with cells

• Dose fractionation, stochastic and deterministic effects
• General concepts of Oncological Radiotherapy: modalities, therapeutic integrations, indications
• Association of radiotherapy with other therapies (surgery, chemotherapy, biological therapies)
• Equipment for external beam radiotherapy

- Special techniques (IMRT, Stereotactic Radiotherapy, Intraoperative Radiotherapy)
- Brachytherapy and Protons

- Seminar: Clinical integration in the Breast Unit pathway: radiotherapy of breast tumors

NUCLEAR MEDICINE

- General principles of Nuclear Medicine
- Radiopharmaceuticals and equipment

INTERNSHIP OBJECTIVES

- Techniques and methods of study in Diagnostic Imaging in major pathological changes of organs and apparatuses.
- Criteria of choice and progressive order of radiological order examinations in diagnostic problems.
- Knowledge of: Aims of radiotherapy treatment - Indications for radiotherapy in major malignancies
- Acute and late toxicity of radiotherapy treatment
- Equipment for the administration of treatment radiotherapy
- Technical aspects related to different types of radiotherapy treatment (3D-CRT, IMRT, IGRT, IORT,
- Radiosurgery and Stereotactic Radiotherapy, Hadrontherapy, Brachytherapy and volumes of radiotherapy interest (GTV-CTV-PTV) in radiotherapy planning.

COURSE STRUCTURE

The course is structured into 40 hours of frontal teaching divided into 20 hours of Diagnostic Imaging and 20 hours of Radiotherapy and Nuclear Medicine. Lectures will include theoretical lessons and seminars. The Professors will use didactic tools such as presentations organized in power-point files with explanatory diagrams, illustrations, and images. Attendance is mandatory.

COURSE GRADE DETERMINATION

The exam will include a written test on topics discussed in the theoretical lectures and seminars, consisting of multiple choice questions with only one correct answer. The student will answer 31 questions related to all the teaching modules of the Course in Diagnostic Imaging and Radiotherapy. The student will pass the written test with 18/31. The written exam is mandatory to access the oral exam, which is optional and allows the student to demonstrate his/her preparation

by discussing the topics related to the various teaching modules of the Degree Course in Diagnostic Imaging and Radiotherapy proving to have acquired the ability to make connections and express

themselves with an adequate scientific language. In case of accessing the oral test, the final evaluation will be a weighted average between the written and oral exams.

The exam will be evaluated according to the following criteria:

Not suitable: crucial deficiencies and/or inaccuracies in the knowledge and understanding of the topics; limited ability of analysis and synthesis, frequent generalizations.
18-20: sufficient knowledge and understanding of the topics, with possible imperfections; sufficient synthesis, analysis skills and judgment autonomy.
21-23: knowledge and understanding of routine topics; ability to correct analysis and synthesis with coherent logical topics.
24-26: good knowledge and understanding of the topics; good analytical skills and synthesis with arguments expressed in a rigorous way.
27-29: complete knowledge and comprehension of the arguments; remarkable analytical skills, synthesis. Good autonomy of judgment.
30-30L: excellent knowledge and understanding of the topics; remarkable ability of analysis and

synthesis, and autonomy of judgment; topics expressed in an original way.

OPTIONAL ACTIVITIES

Students will have the opportunity to carry out theoretical/practical exercises and attend seminars. Professors will provide constant support during and after the lessons

BOOKS AND REFERENCES

Didactic documents provided by the Professors.

Mettler, *Essential of Radiology,* Elsevier – Health Sciences Division
Passariello, Simonetti, *Compendio di Radiologia*, Idelson-Gnocchi

V. Donato et al, *Radioterapia Oncologica, Nuove Strategie* Antonio Delfino Ed.