



UNIVERSITÀ  
DEGLI STUDI DI MILANO-BICOCCA

## COURSE SYLLABUS

### Diagnostic Imaging and Radiation Oncology

2122-4-H4101D020-H4101D078M

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#### Aims

The course provides students with theoretical and practical knowledge for the correct use of diagnostic imaging, and for the fundamental radiation treatment of the most frequent malignant diseases. It also provides tools for evaluating the appropriateness of the main diagnostic procedure based on the clinical question, and for correct completion of requests for diagnostic imaging of first level. Finally, the course illustrates radiotherapy applications in clinical oncology, exclusively or integrated with other therapeutic modalities

#### Contents

**DIAGNOSTIC IMAGING:** Reference to anatomy and physiology of major organs. Conventional and digital radiology, digital and conventional angiography, CT, MRI, Ultrasonography. Nuclear Medicine techniques with radioactive tracers: SPECT, PET, CT/PET. Integrated role of Nuclear Medicine and Radiological techniques. Interventional Radiology.

**RADIOTHERAPY AND RADIOMETABOLIC THERAPY:** Biological and clinical rationale for the use of radiation in oncology, integration of radiotherapy with other cancer therapies. Stages of radiation treatment and conditions of delivery of radiation dose: external beam radiotherapy, brachytherapy, radiometabolic therapy. Staging of tumors and defining volumes of interest in radiation therapy: target volume and organs of respect. Efficacy, acute and late toxicity of radiotherapy. Principles of radioimmunotherapy. Principles of Clinical Methodology.

**RADIOBIOLOGY AND RADIATION PROTECTION:** Biological effects of radiation. Principles of radio pathology. Principles of radiation protection: the patients, the workers, the population as a whole, the environment. The current Italian legislation and international recommendations.

#### Detailed program

## ° IMAGE DIAGNOSTICS

- Review of anatomy and physiology of the main organ
- Human application of radiological techniques with and without contrast media: conventional and digital radiography, conventional and digital angiography, computed tomography, magnetic resonance, ultrasound
- Application to man of nuclear-medical techniques with radioactive tracers: Static and dynamic scintigraphy, Single photon emission tomography - SPECT, Positron emission tomography - PET
- Integrated role of radiological and medical-nuclear techniques in the diagnosis of the main pathologies of the apparatuses: cardiovascular, respiratory, gastroenteric, urogenital, locomotor, of the Central Nervous System, of endocrinological pathologies and of pediatric and haematological diseases
- Interventional Radiology: Methods and clinical applications with particular regard to diagnosis (biopsies) and treatment (drainage, percutaneous ablation, alcoholization) of neoplasia and angiography (embolization, angioplasty)

## RADIOTHERAPY and RADIOMETABOLIC THERAPY

- Biological and clinical rationalization of the use of radiation in oncology
- Assumptions of the integration of radiotherapy with other cancer treatments
- Technical aspects: the phases of radiant treatment from the prescription to the execution
- Method of delivery of the radiant dose: external beam radiotherapy, brachytherapy, metabolic radiotherapy
- Criteria for staging of neoplasms and definition of volumes of radiotherapy interest: concept of target volume and organs at risk
- Efficacy, acute toxicity and late toxicity of radiotherapy
- Main techniques and clinical use of radiometabolic therapy
- Principles of radioimmunotherapy
- Principles of clinical methodology.

## RADIOBIOLOGY AND RADIOPROTECTION

- Biological effects of radiation at the molecular, cellular, tissue, and complex biological systems
- Physical and biological factors that influence the effectiveness of radiation
- Concept of dose of exposure and absorbed dose
- Principles of radiopathology: acute, chronic and late effects, at low and high doses
- Deterministic and stochastic effects
- Somatic and hereditary effects
- Protection of the patient, of the workers, of the population as a whole, of the environment
- Regulations in force in Italy and international recommendations with particular reference to the criteria of justification and optimization

## **Prerequisites**

None

## **Teaching form**

Lectures

## **Textbook and teaching resource**

### Suggested textbooks

1. R. Passariello - G. Simonetti: "Compendio di Radiologia: con 2172 figure a colori e b/n e 41 tabelle" Ed. Idelson-Gnocchi 2010.
2. P. Torricelli e M. Zompatori: "Manuale di Diagnostica per Immagini: per il corso di laurea in Medicina e Chirurgia" Ed. Esculapio 2016.
3. G. Cittadini: "Diagnostica per immagini e Radioterapia" Ed. Edra 2015
4. Perez & Brady: "Principles and Practice of Radiation Oncology" 2013
5. Lecture notes of Nuclear Medicine lessons

## **Semester**

II Semester

## **Assessment method**

Written test on topics of the module, included in the final examination that consists on 30 multiple choice questions of which only one correct (1 point for each correct answer) and a subsequent oral interview on the topics covered in the lessons, to verify the knowledge and skills acquired, to which the student can access only if the written test is passed (minimum score = 18/30). There are no ongoing test.

## **Office hours**

By appointment, by e-mail contact.

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