UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Applications of Physics To Medicine

2223-1-F1701Q126

Aims

The aim of the course is to present the physical foundations on which Diagnostic Imaging and Radiotherapy are based, including the methodologies and technologies used and their limits of application. The program will focus on the state of the art, with also snapshots on recent developments in the field. The course is suitable for students who wish to start a career in scientific research, continue their studies to become medical physicists, or pursue a path in the biomedical industry.

Contents

Imaging and Radiotherapy: physical principles, instrumental equipment, Image processing and quantitative assessments.

Detailed program

Radiation-matter interaction: electrons, positrons, X-rays and neutrons
The physics of X-ray radiography
Computed tomography with X-rays
Medical imaging with synchrotron radiation: specificity and state of the art
Functional Imaging: Positron Emission Tomography (PET)
Functional Imaging: Single Photon Emission Computed Tomography (SPECT)
The physics of magnetic resonance imaging
Molecular imaging
Image reconstruction techniques, artefacts and their corrections, extraction of quantitative parameters
X-ray radiotherapy techniques: total body radiation, brachytherapy, radiosurgery

Radiotherapy with synchrotron radiation: specificity and state of the art
Introduction to hadrontherapy

Prerequisites

None

Teaching form

Frontal lectures (3 CFU / 21 hours)
Exercises (3 CFU / 24 hours)

Textbook and teaching resource

Notes, software, data and scientific articles provided to students during the course

Semester

First semester

Assessment method

The exam consists of an oral interview aimed at verifying the student's level of knowledge of the topics covered during the course. Monographic homeworks will be proposed on subjects directly related (or not) to the classes, to treat specific aspects of medical physics (scientific papers, book chapters etc). To these monographic works students may adhere on a voluntary basis: if they will choose to do so, then the oral interview will include a discussion on the homework.

Office hours

Always, after fixing an appointment by email.

Sustainable Development Goals

QUALITY EDUCATION | CLEAN WATER AND SANITATION