UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Diagnostic Imaging Techniques I

2425-1-I0303D006

Aims

The course aims to provide the student with:
? knowledge relating to the main conventional radiological equipment, their operation and their physical and structural characteristics, including knowledge relating to some important dedicated radiological systems.
? knowledge relating to the main digital systems and related quality controls.
? basic theoretical, technical and practical skills for carrying out all the main conventional radiological investigations using direct methods
? basic theoretical, technical and practical skills for the execution of all the main conventional radiological investigations using contrastographic methods
? the fundamental elements of radiological semiotics in the musculoskeletal system
? the fundamental elements of radiological semiotics in the study of the thorax and abdomen

Contents

The student will have to:
? know the physical laws that underlie the production, propagation and interaction with matter of X-rays, and be able to describe the mechanisms that regulate these phenomena; must be able to illustrate the characteristics of conventional radiological equipment, dedicated systems and the various analogue radiological devices analyzed during the lessons and must be able to indicate and comment on the main qualitative parameters that define a radiographic image
? be able to illustrate the characteristics of the different digital radiological devices analyzed during the lessons; must be able to illustrate the quality controls used to guarantee the correct functioning of the equipment and devices studied.
The student will also be required to demonstrate knowledge of:
? direct radiographic projections illustrated in class, with particular attention to the definition of the correctness criteria in carrying out a planar radiological examination. He/she must also have acquired the necessary skills regarding the definition of normality and pathology, in the planar radiological field, of the organs and anatomical

structures treated during the course
? the contrastographic techniques and methodologies illustrated in class, with particular attention to the definition of the criteria of correctness in carrying out a radiological examination. He/she must also have acquired the necessary skills regarding the definition of normality and pathology of the organs and anatomical structures treated during the course
? radiographic anatomy, clinical indications of the elements of radiological semiotics in the study of the musculoskeletal system.
? radiographic anatomy, clinical indications of the elements of radiological semiotics in the study of the thorax and abdomen.

Detailed program

? Production of X-rays and X-ray tube. Characterization of an X beam: quality and quantity of a beam (kVp and mAs). Interaction of X-rays with matter and formation of radiological images; physical and technological bases of diagnostic radiology.
? Essential components of a conventional x-ray machine. Main types of conventional radiological equipment. Diffuse radiation; beam limiting devices: collimation; anti-diffusion grilles.
? X-ray film: optical density, characteristic curve, contrast index and sensitivity index; sensitometer and photodensitometer; calculation of the physical parameters relating to the sensitometric curve. Treatment of sensitive products; developers. Reinforcement screens: physical principles of fluorescence, characteristics of fluorescent materials, speed classes, screen-film coupling. Image quality: spatial resolution and MTF, MTF measurement mode; noise, variance and Wiener spectrum. Penumbra, blur and distortion. Synthetic quality indices.
? Digital image, size of the image matrix, gray levels, windowing and level, image format, comparison with analogue image, dynamic range, compression. Operating principles of Computed Radiography, Direct Radiography systems with indirect conversion and direct conversion. Technological aspects of the following equipment: column stand, wall unit, folding X-ray table, teleradiograph, stratigraph, seriegraph, craniostat, mobile
? Fluoroscopic systems. Image intensifier. Dedicated radiological equipment: the mammograph and mammographic devices.
? Difference between reinforcement screens and photostimulated luminescence screens; photostimulable phosphors used in digital radiography.
? Operating principles of Computed Radiography. Notes on analog-digital conversion; the pixel and the voxel. Direct digital systems. Printers and monitors.
? Notes on radiation protection. Italian legislation regarding quality controls; quality controls of radiographic accessories and radiological equipment.
? Anatomical plans and radiological plans. Review of anatomical positional and movement terminology. Radiological positions of the patient, planar orientation of the radiographic projections, direction of the beam (orthogonality and obliquity) and its incidence.
? Conventional radiology in the study of the chest: the lung, the pleura, the mediastinum. Radiographic projections for the study of the chest. Conventional radiology in the study of the abdomen. Direct radiographic projections for the study of the abdomen. Conventional radiology in the study of the osteo-articular and muscular systems. The main radiographic projections for the study of the skull and facial massif. The main radiographic projections for the study of the spine. The main radiographic projections for the study of the pelvic girdle and the lower limb. The main radiographic projections for the study of the shoulder girdle and the upper limb.
? Mammographic techniques Theoretical foundations of stratigraphic techniques.
? Orthopantomography.
? Plesiography

Prerequisites

Organs and Functions

Teaching form

Teaching takes place in attendance, with frontal and interactive lessons and exercises

Textbook and teaching resource

F.MAZZUCATO: “Anatomia Radiologica. Tecniche e Metodologie in Radiodiagnostica” Ed.Piccin

R.PASSARIELLO "Radiologia, Elementi di Tecnologia". Idelson Gnocchi

Teachers will provide other educational material.

Semester

Second semester

Assessment method

Written and oral exam to evaluate preparation on the exam programme, the ability to organize knowledge in a short discussion and communication skills in a disciplinary context.
Monza
The written test will consist of open questions, multiple choice questions and exercises for the Conventional Equipment and Analog Systems and Digital Systems and Quality Control modules.
The oral exam will cover the modules of Conventional and Dedicated Radiological Techniques, Planar Contrastographic Radiological Techniques, Musculoskeletal Radiological Semeiotics, Radiological Semeiotics of the Thorax and Abdomen and Digital Systems and Quality Control.
Bergamo
The written test will consist of multiple choice questions for the Conventional Equipment and Analog Systems module.
The oral test will cover all teaching modules.

Office hours

By appointment required by mail

Sustainable Development Goals

GOOD HEALTH AND WELL-BEING | QUALITY EDUCATION