



# UNIVERSITÀ DEGLI STUDI DI PALERMO

<b>DEPARTMENT</b>	Biomedicina, Neuroscienze e Diagnostica avanzata		
<b>ACADEMIC YEAR</b>	2021/2022		
<b>BACHELOR'S DEGREE (BSC)</b>	MEDICAL AND IMAGE DIAGNOSTICS AND RADIOTHERAPY TECHNIQUES		
<b>INTEGRATED COURSE</b>	RADIOLOGICAL EQUIPMENT - INTEGRATED COURSE		
<b>CODE</b>	01361		
<b>MODULES</b>	Yes		
<b>NUMBER OF MODULES</b>	3		
<b>SCIENTIFIC SECTOR(S)</b>	MED/50, FIS/07		
<b>HEAD PROFESSOR(S)</b>	SALERNO SERGIO	Professore Associato	Univ. di PALERMO
<b>OTHER PROFESSOR(S)</b>	SALERNO SERGIO	Professore Associato	Univ. di PALERMO
	MARRALE MAURIZIO	Professore Associato	Univ. di PALERMO
	LA TONA GIUSEPPE	Professore Associato	Univ. di PALERMO
<b>CREDITS</b>	15		
<b>PROPAEDEUTICAL SUBJECTS</b>			
<b>MUTUALIZATION</b>			
<b>YEAR</b>	1		
<b>TERM (SEMESTER)</b>	2° semester		
<b>ATTENDANCE</b>	Mandatory		
<b>EVALUATION</b>	Out of 30		
<b>TEACHER OFFICE HOURS</b>	<p><b>LA TONA GIUSEPPE</b> Wednesday 9:00 12:00 Sezione di Scienze Radiologiche - BIND</p> <p><b>MARRALE MAURIZIO</b> Thursday 15:00 17:00 Dipartimento di Fisica e Chimica "Emilio Segre" Viale delle Scienze, Edificio 18. Tel diretto 09123899073. Si prega di richiedere appuntamento almeno tre giorni prima via e-mail (maurizio.marrale@unipa.it).</p> <p><b>SALERNO SERGIO</b> Monday 14:00 17:00 Dipartimento BIND Plesso di Radiologia Il piano stanza 132 Tuesday 14:00 17:00 Dipartimento BIND Plesso di Radiologia Il piano stanza 132</p>		

**DOCENTE:** Prof. SERGIO SALERNO

<b>PREREQUISITES</b>	none
<b>LEARNING OUTCOMES</b>	Knowledge of main diagnostic imaging apparatus and knowledge in biological effects of ionizing radiation. Apply: be confident with different imaging apparatus and risks. Judgement: for reducing patient exposure. Ability in communicating to medical staff, patients and relatives physical principle of different procedure and instruments used for imaging. Ability in update knowledge in different apparatus and guidelines in radiation protection.
<b>ASSESSMENT METHODS</b>	Oral test on the different diagnostic apparatus used in imaging procedure, practical activity in diagnostic radiology, written test on physics. The numerical evaluation of the integrated course will be calculated as the average of the scores obtained by the student in the single moduli. Scores will be ranked as follows: 18-23: sufficient; 24-26: good; 27-30: excellent; 30 cum laude: brilliant.
<b>TEACHING METHODS</b>	lessons

**MODULE**  
**IMAGE DIAGNOSTICS, IMAGE DIAGNOSTICS TECHNIQUES I**

*Prof. GIUSEPPE LA TONA*

**SUGGESTED BIBLIOGRAPHY**

Manuale di tecnica, metodologia e anatomia radiografica tradizionali  
di Mazzucato - Giovagnoni • 2019  
ISBN 9788829929597

<b>AMBIT</b>	10342-Scienze e tecniche di radiologia medica per immagini e radioterapia
<b>INDIVIDUAL STUDY (Hrs)</b>	45
<b>COURSE ACTIVITY (Hrs)</b>	30

**EDUCATIONAL OBJECTIVES OF THE MODULE**

Depth knowledge of Radiological Anatomy and general and detailed anatomical imaging training.  
Production knowledge of radiological images with traditional and digitalized techniques without m.d.c.

**SYLLABUS**

Hrs	Frontal teaching
1	Definition and description of anatomical radiographic plans, positions and radiographic projections of the impact .
7	Evaluation - with reference to: the radiographic anatomy, the indications, the preparation and the patient's position, the centering and the collimation of the x-ray beam, the focus-film distance, the type of cassette to be used, the use of the grid and of correctness criteria of the following radiographic views:: Skull: L.-L .; P.-A .; A.-P .; occipital-nose-chin; axial; oblique to the optical holes; oblique to the zygomatic bone; Tangential to the zygomatic arch; Axial for zygomatic arches; L.-L. and axial to the nasal bones; Side-oblique to the jaw; OPG; teleradiography of the head; trans-maxillary, TLO and stratigraphy mouth open and closed for TMJ study.
3	Evaluation - with reference to: the radiographic anatomy, the indications, the preparation and the patient's position, the centering and the collimation of the x-ray beam, the focus-film distance, the type of cassette to be used, the use of the grid and of correctness criteria- of the following radiographic projections.Cervical spine: A.-P .; L.-L .; oblique trans-buccal; dynamics; for the stretch of cervico-dorsal transition. dorsal spine: A.-P .; L.-L lumbar spine: A.-P .; L.-L .; oblique; frontal and sagittal dynamics. Sacrum and coccyx: A-P and L-L in toto Column: A.-P .; L.-L
8	Evaluation - with reference to: the radiographic anatomy, the indications, the preparation and the patient's position, the centering and the collimation of the x-ray beam, the focus-film distance, the type of cassette to be used, the use of the grid and of correctness criteria- of the following radiographic projections. Clavicle: A.-P .; P.-A .; caudal-cranial and cranio-caudal: Scapula: A.-P .; L.-L Articulation shoulder joint: A.-P .; lateral; Y-Joint acromioclavicular: second Zanca technique. Homer: A.-P .; L.-L Elbow: A.-P .; L.-L and axial. Forearm: A.-P .; L.-L Wrist: A.-P .; L.-L; oblique and for the study of the scaphoid. Hand: A.-P .; L.-L; oblique. Fingers: A.-P .; L.-L
3	Evaluation - with reference to: the radiographic anatomy, the indications, the preparation and the patient's position, the centering and the collimation of the x-ray beam, the focus-film distance, the type of cassette to be used, the use of the grid and of correctness criteria- of the following radiographic projections.Chest: A.-P .; L.-L; oblique and for the study of the apices. Sternum: L.-L; oblique. Articulation sternum-clavicular: according to Zimmer technique. Ribs: A.-P .; P.-A .; oblique.Belly:.; P.-A .; L.-L; Tangential. kidneys: A.-P.
8	Evaluation - with reference to: the radiographic anatomy, the indications, the preparation and the patient's position, the centering and the collimation of the x-ray beam, the focus-film distance, the type of cassette to be used, the use of the grid and of correctness criteria- of the following radiographic projections.Basin: A.-P .; inlet; outlet. Sacroiliac joint: A.-P .; L.-L; oblique. iliac wing: oblique obturator and wing. Symphysis pubis: A.-P. Articulation coxofemoral: A.-P. and axial. Femur: A.-P .; L.-L. Knee: A.-P .; L.-L .; P.-A. down. Patella: Axial. Lower limbs: A.-P. under load. Leg: A.-P .; L.-L. Articulation ankle: A.-P .; L.-L; oblique; axial to the heel. Foot: A.-P .; L.-L; oblique lateral-medial, lateral in the standing position; bipodalic dorsal-plantar load.

**MODULE**  
**MEDICAL PHYSICS FOR RADIOPROTECTION**

*Prof. MAURIZIO MARRALE*

**SUGGESTED BIBLIOGRAPHY**

Basic Textbook

D. Scannicchio: Fisica Biomedica. EdiSES. ISBN: 978-8879597814 (<http://www.edises.it>).

Supplementary Textbooks

• Diagnostic radiology physics: a handbook for teachers and students: International Atomic Energy Agency, 2014. ISBN 978–92–131010–1

• Bushberg, J. T., Seibert, J. A., Leidholdt, E. M., & Boone, J. M. The essential physics of medical imaging (3rd ed.). Lippincott Williams and Wilkins, 2011, ISBN : 978-0781780575

<b>AMBIT</b>	10337-Scienze propedeutiche  10342-Scienze e tecniche di radiologia medica per immagini e radioterapia
<b>INDIVIDUAL STUDY (Hrs)</b>	90
<b>COURSE ACTIVITY (Hrs)</b>	60

**EDUCATIONAL OBJECTIVES OF THE MODULE**

Objective of the module is to provide the treatment of the physical principles and descriptions of the physical techniques which are in diagnosis and therapy and make use of ionizing radiation (IR ) and non-ionizing radiations (NIR) and the principles of radiation protection of patients and workers needed for proper use and application of such techniques .

**SYLLABUS**

<b>Hrs</b>	<b>Frontal teaching</b>
6	Recalls of electromagnetism. Units of Measure, orders of magnitude and relations of Fundamental quantities of atomic and nuclear Physics
4	Corpuscular nature of light. Planck hypothesis and blackbody spectrum.
4	Photoelectric effect. Compton effect. Atomic models. Quantum numbers.
4	Wave nature of matter. Uncertainty principle. Atomic spectra. X-rays and atomic numbers.
6	Structure and properties of the atomic nucleus. Binding energy and nuclear forces. Ionizing radiations and their classification. Natural and artificial radioactivity. Radioactive decay: alpha, beta and gamma decays.
4	Interaction of heavy charged particles and light with matter.
6	Interaction of photons with matter.
2	Interaction of neutrons with matter .
6	Detectors of ionizing radiation: gas detectors, scintillators, semiconductor detectors, thermoluminescence detectors, electron spin resonance detectors, photographic detectors.
3	Basis of dosimetry. Dosimetric quantities. Personal and environmental radiation monitors. Biological effects of ionizing radiation: stochastic effects, deterministic and genetic effects.
5	Description of the following techniques and their equipment used in diagnostic radiography, fluoroscopy, computed tomography (CT).
3	Nuclear medicine (SPECT, PET).
3	Magnetic resonance imaging ( MRI ).
2	Description of the following techniques and related equipments used in therapy: Radiation therapy with electron and photon beams, radiation therapy s with proton and neutron beams .
2	Principles of Radiation Protection. Legislation related to ionizing radiation use. Quality assurance. Diagnostic reference levels. Dose limits for exposed workers and the population .

**MODULE**  
**IMAGE DIAGNOSTICS, IMAGE DIAGNOSTICS EQUIPMENT I**

*Prof. SERGIO SALERNO*

**SUGGESTED BIBLIOGRAPHY**

Clark's Pocket Handbook for Radiographers - 2016 by Charles Sloane, Ken Holmes, Craig Anderson and A. Stewart Whitley. ISBN 9781498726993

Vanzulli A, Torricelli P Manuale di RM per TSRM – 2018 Poletto Editore. ISBN: 8895033744

Golfieri R, Trenti R Manuale di TC per 2019 Poletto Editore. ISBN: 8895033779

Mazzucato F Giovagnoni A Manuale di tecnica, metodologia e anatomia radiografica tradizionali 2018, Piccin Editore. ISBN: 978-88-299-2959-7

<b>AMBIT</b>	10342-Scienze e tecniche di radiologia medica per immagini e radioterapia
<b>INDIVIDUAL STUDY (Hrs)</b>	90
<b>COURSE ACTIVITY (Hrs)</b>	60

**EDUCATIONAL OBJECTIVES OF THE MODULE**

Known principal diagnostic imaging apparatus. Knowledge of basic principle of biological effect of ionizing radiation and basic principle for workers and patients. Common knowledge of risks associated to different ionizing radiations.

**SYLLABUS**

Hrs	Frontal teaching
8	X ray: principles for diagnostic imaging and risks
8	X ray apparatus for imaging
8	Radiologic images, generators and remote control,
6	Special apparatus for diagnostic imaging
6	Angio suite
8	Digital system CR -DR
8	MDCT, gantry , consolle and work station, dose reduction system, iterative algorithm
8	Magnetic resonance, Colis, gantry and consolle, MR sequence basis, fast sequence