UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Biomedicina, Neuroscienze e Diagnostica avanzata
ACADEMIC YEAR	2022/2023
MASTER'S DEGREE (MSC)	MEDICINE AND SURGERY
SUBJECT	IMAGE DIAGNOSTICS
TYPE OF EDUCATIONAL ACTIVITY	B
AMBIT	50411-Discipline radiologiche e radioterapiche
CODE	02324
SCIENTIFIC SECTOR(S)	MED/36
HEAD PROFESSOR(S)	BRANCATELLI GIUSEPPE Professore Ordinario Univ. di PALERMO CARUSO GIUSEPPE Professore Associato Univ. di PALERMO GALIA MASSIMO Professore Ordinario Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	5
INDIVIDUAL STUDY (Hrs)	75
COURSE ACTIVITY (Hrs)	50
PROPAEDEUTICAL SUBJECTS	13246 - SYSTEMATIC PATHOLOGY I - INTEGRATED COURSE 13248 - SYSTEMATIC PATHOLOGY II - INTEGRATED COURSE 13257 - SYSTEMATIC PATHOLOGY IV - INTEGRATED COURSE 13253 - SYSTEMATIC PATHOLOGY III - INTEGRATED COURSE
MUTUALIZATION	
YEAR	4
TERM (SEMESTER)	2° semester
ATTENDANCE	Mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**BRANCATELLI GIUSEPPE** Monday 10:00 11:00 UFFICIO 131 SECONDO PIANO SEZIONE SCIENZE RADIOLOGICHE **CARUSO GIUSEPPE** Monday 14:00 15:00 Dipartimento Diagnostica per Immagini Policlinico Palermo Tuesday 13:00 14:00 Cefpas Caltanissetta **GALIA MASSIMO** Monday 9:00 12:00 Sezione di Scienze Radiologiche, stanza n. 93, primo piano.Dipartimento di Biomedicina, Neuroscienze e Diagnostica avanzata.

PREREQUISITES	The student must have knowledge in the field of physics, anatomy, physiology and pathology in order to understand the content and the learning objectives of the course.
LEARNING OUTCOMES	1. KNOWLEDGE AND CAPACITY OF COMPREHENSION To learn the basics of the different diagnostic methods for images. To understand the biological effects of ionizing radiation. To know the possibilities and limits, indications, contraindications and risks of the various methods of investigation. To keep elementary knowledge on radiologic semeiology of the major pathologies with reference to different organs and apparatus. To have general notions on techniques and indications of interventional radiology, nuclear medicine and radiotherapy. 2. CAPACITY TO APPLY KNOWLEDGE AND COMPREHENSION To know how to recognize the main normal anatomical structures for a conventional x-ray examination, ultrasound, computer tomography and magnetic resonance imaging. To be able to find epidemiological and clinical information before making the choice of the diagnostic test to be used. To keep adequate knowledge and understanding of the main imaging techniques. To be able to require the most appropriate diagnostic test in the different clinical scenarios, according to criteria that provide basic principles of cost benefit, radiation protection, land availability and invasiveness of diagnostic methods. To know how to apply the major integrated diagnostic algorithms for assessing the most serious or common clinical situations. To be able to choose the best strategies and tools to get a proper diagnosis and to properly use the therapeutic options offered by interventional radiology, nuclear medicine, and radiation therapy. 3. AUTONOMY OF JUDGMENT To evaluate autonomously the professional issues related to the notions of the course; Ability to evaluate scientifically and autonomously the basic knowledge provided by the module; Ability to face general themes related to image diagnostics. 4. COMMUNICATION SKILLS Ability to communicate and disseminate the notions acquired during the module in professional field with scientific / clinical methodology. 5. LEARNING CAPACITIES The method used is to provide the student with the basic knowledge of the discipline with targeted insights useful for performing the functions of the profession of the medical doctor. The student will be able to independently learn any concepts, solutions and updates that may be required during his / her training and profession.
ASSESSMENT METHODS	Tests will take place through an oral exam or a written questionnaire with multiple-choice questions. The evaluation is expressed in 30/30 with the following evaluation method: 30-30 and laude: Excellent knowledge of the subject matter, good analytical ability, the student is able to apply the knowledge to solve the problems proposed. 26-29: Good knowledge of arguments, the student is able to apply knowledge to solve the proposed problems. 24-25: Basic knowledge of the main topics, with limited ability to apply knowledge to the problem. 21-23: The student is not able to analyze the main subjects of the discipline but retains fair knowledge, with poor ability to apply the acquired knowledge independently. 18-20: Minimum knowledge of the main topics of the course, little or no ability to apply the acquired knowledge independently. Insufficient: the student does not have an acceptable knowledge of the contents of the topics covered in the course. The questionnaire will consist of a few dozen of questions with multiple possible answers, only one of which will be correct. The test will be aimed at ensuring the expected learning outcomes. The exam duration is 30 minutes.
EDUCATIONAL OBJECTIVES	Ability to use the theoretical knowledge in a practical context. To learn about the management of the workflow in radiology department. To display the way 'of execution of traditional radiology exams, ultrasound, CT, MRI. To view the reporting of traditional radiology exams, ultrasound, CT, MRI. To identify the key radiographic findings in the light of the report. To display image processing techniques in CT and MR.
TEACHING METHODS	Case based interactive discussions based on a problem solving approach. Digital tools such as Kahoot! and SLIDO will be used by the students to interact with the teacher and to test their knowledge
SUGGESTED BIBLIOGRAPHY	Diagnostica per immagini e radioterapia di Cittadini Giorgio - Cittadini Giuseppe - Sardanelli Francesco Editore: EDRA – MASSON Genere: scienze mediche. medicina Argomento: diagnostica medica, radioterapia

SYLLABUS

Hrs	Frontal teaching
4	PHYSICS OF RADIATION - TECHNIQUES AND METHODOLOGY - CONTRAST MEDIA -Properties 'and mode' of production of X-rays and ionizing radiation (electromagnetic and corpuscular). -Radiation Nonionizing: physical characteristics and applications in Diagnostic Imaging. -Principles Of image formation (analog and digital).
2	Contrast media: classification and characteristics; clinical applications; adverse reactions and related measures.
3	Computed tomography: principles.
3	Ultrasound: the physics of ultrasound and general notions on the equipment.
3	Magnetic resonance imaging: physical principles and general notions on the equipment.
2	Nuclear Medicine: physical principles and general notions on the equipment.
2	Vascular and Interventional Radiology: generality and major procedures.
4	Radiobiology and Radiotherapy -Interaction between ionizing radiation and matter. direct and indirect-action of ionizing radiation. -Distribution Of the dose over time (curves isoefficacia). -Radiosensibilita 'Cell and cell survival curves. -Effect Oxygen. -Agents Radiosensitizers and radioprotective. -Damage (Acute and chronic) to ionizing radiation. biological -Effects of non-ionizing radiation. -Principles Of the worker and patient radiation protection and regulatory references. Interstitial and intracavitary radiation therapy. Major radiotherapy equipments (with high energy and conventional energy).
3	IMAGING TECHNIQUES OF RESPIRATORY SYSTEM
3	IMAGING TECHNIQUES OF DIGESTIVE SYSTEM
3	IMAGING TECHNIQUES OF LIVER - BILIARY tract - pancreas - spleen
3	IMAGING TECHNIQUES OF Urinary system, genital system and adrenal glands
2	IMAGING TECHNIQUES OF THYROID - BREAST - SOFT PARTS
3	IMAGING TECHNIQUES OF OSTEOARTICULAR SYSTEM
2	IMAGING TECHNIQUES OF CARDIOVASCULAR, LYMPHATIC, AND HEMATOPOIETIC SYSTEMS
3	IMAGING TECHNIQUES OF NERVOUS SYSTEM
5	DEFINITION OF DIAGNOSTIC ALGORITHMS IN MORE COMMON DISEASES

PREREQUISITES	Knowledge of Human Anatomy ; Knowledge of Physiology and Pathophysiology ; Pathology knowledge
LEARNING OUTCOMES	Knowledge and understanding At the end of the course, students will be able to learn about the functioning Hardware and clinicoapplicativo of different diagnostic technologies. will be able to know the characteristics of the different pathologies with semeiological a semantic knowledge of terminologies. Applying knowledge and understanding The knowledge gained will allow to properly direct the future allapplicazione professionals to correct diagnostic algorithms with a high ability to apply knowledge and understanding of the issues. Making judgments Each student will be able to recognize, starting from the clinic and from Radiological semiotics, the object of study diseases and to evaluate the different severity and prognosis with full autonomy in the management of problems diagnostic, with knowledge of the diagnostic algorithms. Communication skills The student will be able to interact with colleagues, on diseases, and will be able to express themselves in a detailed and comprehensive in the description, of the symptoms and signs, not to mention the ability to communicate with patients. Llearning ability Through lectures and discussions in the classroom with questions and answers "free" in classroom, will increase the ability to learn immediately, reserving the rote learning and study the need for purely doctrinal raise the cultural level of the student.
ASSESSMENT METHODS	It is made an oral test that has the task of dealing with different teaching chapters. They will be carried out at least three questions that will focus on physics and radiobiology, equipment and clinical applications starting from the symptom. They will be assessed the knowledge, the ability 'to link with other diseases / topics, the exhibition capacitadi synthesis and knowledge of the diagnostic algorithms. Criteria used for evaluation: Rating: Excellent; vote 30 to 30 cum laude; the student has excellent knowledge of the topics, excellent properties' of language, good capacity 'analytic, students and' able to apply knowledge to solve problems proposed. Rating: very good. 26-29 vote. The student demonstrates good command of the topics, full ownership 'of language, the student and' able to apply knowledge to solve problems proposed. Rating: Good. Rating: 24-25. The student demonstrates basic knowledge of the main topics, discreet property 'language, with limited ability' to independently apply the knowledge to the solution of the proposed problems Rating: satisfactory. Vote: 21 to 23: The student does not have full command of the main teaching subjects but it has the knowledge, satisfactory properties 'language, poor ability' to independently apply the knowledge acquired Rating: enough. Rating: 18-20. The student shows minimal basic knowledge of the main teaching and technical language issues, very little or no ability 'to independently apply the knowledge acquired Rating: Not enough: The student does not have an acceptable knowledge of the topics contained treated in teaching
EDUCATIONAL OBJECTIVES	The educational aims of the course are aimed at providing students with the necessary knowledge about the radiological semiotics of different diagnostic equipment (X-rays , ultrasound , CT, MRI , MN , PET) , and their use in the clinical setting by following objective criteria and with the best cost benefit both the patient and the health care resources , respecting the clinical protocols and leveraging the clinical knowledge . They must also demonstrate knowledge of the diagnostic algorithms in surgical and medical conditions . They will be provided notions concerning the main radiation treatments the sources used .
TEACHING METHODS	Frontal lessons; online lessons; practical exercises in the Radiology Department.
SUGGESTED BIBLIOGRAPHY	Diagnostica per immagini e radioterapia di Cittadini Giorgio - Cittadini Giuseppe - Sardanelli Francesco Editore: EDRA – MASSON Genere: scienze mediche. medicina Argomento: diagnostica medica, radioterapia Edizione: VII 2015 Pagine: 1150 ISBN: 8821440001 ISBN-13: 9788821440007 Data pubblicazione: 2015 Passariello – Simonetti Idelson Gnocchi

SYLLABUS

Hrs	Frontal teaching
3	General concepts of atomic physics
2	Radiation physics
3	Interaction of radiation with matter
3	Radiobiology
1	effects of radiation on humans
8	X-ray equipment and image formation in ultrasound traditional radiology multislice CT, MR
4	radiological examination of the central and peripheral nervous system
2	endocrine glands
2	pulmonary tract
4	heart and vessels
2	digestive
4	liver and spleen
2	pancreas
3	urinary
1	lymphatic
2	muscle and skeletal
2	Principles of conformal radiotherapy
1	Brachytherapy
1	linear accelerator

PREREQUISITES	The student must have knowledge in physics, anatomy, physiology and general pathology in order to understand the contents and learning objectives of the course.
LEARNING OUTCOMES	1. KNOWLEDGE AND UNDERSTANDING To Know the physical bases of the different diagnostic imaging methods. Understanding the biological effects of ionizing radiation. To Know possibilities and limits, indications, contraindications and risks of the different methods of investigation. To possess elementary knowledge on radiological semeiology of the main pathologies with reference to the various organs and systems. To possess general notions on techniques and indications of interventional radiology, medicine nuclear and radiotherapy. 2. ABILITY TO APPLY KNOWLEDGE AND UNDERSTANDING To Know how to recognize the main normal anatomical structures on an examination of traditional radiology, ultrasound, computed tomography and resonance imaging magnetic. To be able to find epidemiological and clinical information before making the choice of diagnostic test to use. To possess adequate knowledge and understanding of major imaging techniques, and to know how to request the most appropriate diagnostic test in different clinical scenarios, according to criteria that favor the elementary principles of cost benefit, of radiation protection, local availability and invasiveness of the methods diagnostic. To Know how to apply the main integrated diagnostic algorithms for evaluations of the most serious or most common clinical situations. To be able to independently choose the best strategies and tools to achieve correct diagnosis, and correctly use the therapeutic options offered from interventional radiology, nuclear medicine and radiotherapy. 3. AUTONOMY OF JUDGMENT Independently assess the professional problems related to the notions of course; ability to scientifically and independently evaluate basic knowledge provided by the form; ability to deal with general issues relating to diagnostic imaging. 4. COMMUNICATION SKILLS Ability to communicate and disseminate the knowledge acquired during the module in own professional field with scientific / clinical methodology in the context of diagnostic imaging. 5. LEARNING SKILLS The teaching method used aims to provide the student with the knowledge of basis of the discipline with targeted insights useful for carrying out the functions of the professional figure of the surgeon. The student will be in able to independently learn any concepts, solutions e updates, which may become necessary in the course of its path educational and professional.
ASSESSMENT METHODS	The assessment of students' learning level will consist of a written test, through the solution of multiple closed questions, of which a correct one, proposals on topics covered in the course, to be completed in thirty minutes. To successfully pass the assessment of learning, the student must demonstrate, through the test, that he has understood the concepts presented in the course, thus possessing a basic knowledge of the technologies covered in the course, as well as having developed an adequate familiarity 'with the topics covered. A score between zero and thirty will be assigned to the written test. The overall grade, out of thirty, will be rounded upwards. The assessment will be based on the following score table: Indicator - Knowledge and competence of contents Descriptor and score range: Excellent 10 Autonomous and effective 8-9 Acceptable 6-7 Fragmentary or partly superficial 4-5 Inadequate 0-3 Indicator - Applicative skill, precision, logical-thematic coherence Descriptor and score range: Excellent 10 Adequate 8-9 Acceptable also if partly driven 6-7 Limited 4-5 Inadequate 0-3 Indicator - Reprocessing skills and multi-disciplinary connections Descriptor and score range: Excellent 10 Effective and well-structured 8-9 Generally satisfactory 6-7 Hesitant and rough 4-5 Inadequate 0-3 Alternatively, the learning assessment may consist of an oral test: some questions will be asked to the student about the program with reference to the lessons and recommended texts. This verification will aim to assess if the student has knowledge and understanding of the topics covered, exhibition skills and arguments. The greater this knowledge and capacity, the more positive the evaluation will be. In order for the overall outcome of the assessment to be positive, the student must achieve at least the sufficiency, equal to eighteen points. The maximum evaluation will be achieved by demonstrating a thorough knowledge of the course contents. Praise will be reserved for students who have completed the written test or the oral exam correctly and completely. The

	assessment will be based on the following score table: Indicator - Knowledge and competence of contents Descriptor and score range: Excellent 10 Autonomous and effective 8-9 Acceptable 6-7 Fragmentary or partly superficial 4-5 Inadequate 0-3 Indicator - Applicative skill, precision, logical-thematic coherence Descriptor and score range: Excellent 10 Adequate 8-9 Acceptable also if partly driven 6-7 Limited 4-5 Inadequate 0-3 Indicator - Expression and terminology, reprocessing skills and multi-disciplinary connections Descriptor and score range: Excellent 10 Effective and well-structured 8-9 Generally satisfactory 6-7 Hesitant and rough 4-5 Inadequate 0-3
EDUCATIONAL OBJECTIVES	To use theoretical knowledge in the reference practical context. To learn about the workflow management of a diagnostic section of imaging. To show the execution modalities of traditional radiology exams, ultrasound, CT, MRI. To show the reports of traditional radiology exams, ultrasound, CT, MRI. To identify key radiographic findings in light of the report. To show image processing techniques in CT and MRI.
TEACHING METHODS	Classroom lessons.
SUGGESTED BIBLIOGRAPHY	Diagnostica per immagini e radioterapia di Cittadini Giorgio - Cittadini Giuseppe - Sardanelli Francesco Editore: EDRA – MASSON Genere: scienze mediche. medicina Argomento: diagnostica medica, radioterapia Edizione: VII 2015 Pagine: 1150 ISBN: 8821440001 ISBN-13: 9788821440007 Data pubblicazione: 2015 Verranno indicati alcuni argomenti da approfondire mediante lo studio di passi scelti nel testo, da integrare con il materiale didattico fornito dal docente.

SYLLABUS

Hrs	Frontal teaching
4	PHYSICS OF RADIATIONS - TECHNIQUES AND METHODOLOGY - CONTRAST MEDIA - Properties and methods of production of X-rays and ionizing radiations (electromagnetic and corpuscular). - No radiation ionizing agents: physical characteristics and applications in Diagnostic Imaging.
2	Contrast media: classification and characteristics; clinical applications; adverse reactions and related therapy.
3	Computed Tomography: basic principles.
3	Ultrasound: ultrasound physics and general notions on equipment.
3	Magnetic Resonance: physical principles and general notions on equipment.
2	Nuclear Medicine: physical principles and general notions on equipment.
2	Vascular and interventional radiology: generalities and main procedures.
4	RADIOBIOLOGY AND RADIOTHERAPY -Interaction between ionizing radiation and biological tissues. -Direct and indirect action of ionizing radiation. - Dose distribution over time (iso-efficacy curves). -Cellular radiosensitivity and cell survival curves. -Oxygen effect. - Radiosensitizing and radioprotective agents. - Damage (acute and chronic) from ionizing radiation. -Biological effects of non-ionizing radiation. -Principles of worker and patient radiation protection and references regulatory. -Interstitial and endocavitary radiotherapy. - Notes on the main radiotherapy equipment (with high conventional energies and energies).
3	RESPIRATORY SYSTEM -Techniques of study of the chest and mediastinum. - Pomonary opacity and hyper-transparency. -Interstitial disease. - Expansive processes of the lung and mediastinum: study protocols. -Radio-isotope study of the respiratory system. - Pleural pathology. - Diaphragmatic pathology.

SYLLABUS

Hrs	Frontal teaching
3	DIGESTIVE SYSTEM -Double contrast examination: technique and indications. - Esophageal pathology: study techniques and indications. -Carcinoma of the esophagus: study protocols and semeiotics. -Peptic disease: study methods and semeiotics. - Stomach carcinoma: study protocols and semeiotics. -Hernias of the iatus: classification and semeiotics. -Neoplasms of the small intestine: study protocols and semeiotics. -Crohn's disease: study protocols and semeiotics. -Ulcerative colitis: study and semeiotic protocols. -Diverticular disease: study protocols and semeiotics. -Neoplasms of the colon: study protocols and semeiotics. Acute abdomen: study techniques and methodology.
3	LIVER - BILIARY TRACT - PANCREAS - SPLEEN -Methods of study of the gallbladder and biliary tract. - Biliary lithiasis and cholecystosis. - Jaundice: study protocols. -Hepatic cirrhosis and portal hypertension: study methods. -Hepatic expansive processes: study protocols and semeiotics. -Pancreatitis. -Pancreatic cancer: study protocols. -Radio-isotope study of the liver and biliary tract. -Techniques and methods of study of the spleen.
3	URO-GENITAL SYSTEM AND ADRENALS - Study techniques of the urogenital system. -Hematuria: study protocols. - Renovascular hypertension; angioplasty of the renal arteries. -Urinary lithiasis: study protocols. -Acute and chronic inflammation of the urinary tract. -Renal expansive processes: study protocols and semeiotics. -Indications and methods of study of bladder pathology. -Indications and methods of study of prostatic pathology. - Ovarian pathology. -Hysterosalpingography and study of female infertility. -Radio-isotope study of the urinary system. -Techniques and methods of study of the adrenal glands; elementary semeiotics of the main adrenopathies.
2	THYROID - BREAST - SOFT PARTS -Radio-isotopic study of the thyroid. - Thyroid ultrasound: indications and limits. -Ecocolor Doppler in thyroid and breast pathology. - Breast ultrasound: indications and limits. -Mammography: technique and indications. - Nodular breast pathology: study protocols.
3	MUSCOLO-SKELETAL SYSTEM -Main methods of radiological and radioisotope study of the skeleton. -Fundamental alterations of bone density and structure: semiotic elementary, osteonecrosis, osteomyelitis and main osteodysplasia. -Scoliosis. -Fractures and dislocations: main radiological features. - Primary and secondary bone tumors. - Methods of study of the joints. -Arthritis and arthrosis. -Techniques of radiological study of the cranial theca, of the maxillofacial skeleton (including the paranasal cavities) and the stomatognathic system (including the temporomandibular joint). Elementary semeiotics of main affections.
2	CARDIOVASCULAR, LYMPHATIC AND HEMOPOIETIC SYSTEM - Conventional radiological study of the heart and great vessels. - Angiographic and phlebographic methods (with reference to the procedures interventional). -Doppler and color-Doppler. - Cardiological radio-isotopic diagnostics. -Main congenital heart disease. -Aneurisms and aortic dissections. -Lymphography: technique and clinical indications. - Staging of lymphomas

SYLLABUS

Hrs	Frontal teaching
3	CENTRAL NEURVOUS SYSTEM -Brain: main imaging study techniques. -Radio-isotope study of the brain. - Intracranial hypertension syndrome. - Intracranial expansive processes: study protocols. -Brain vascular accidents: hemorrhagic and thrombotic stroke. - Radiological study of the pituitary gland. - Spinal cord: main study methods and indications.
5	DIAGNOSTIC ALGORITHMS OF THE MOST COMMON DISEASES OF ORGANS AND SYSTEMS