



FACULTY OF MEDICINE

STUDY PROGRAM 0912.1 MEDICINE

DEPARTMENT OF RADIOLOGY AND IMAGING

APPROVED

at the meeting of the Commission for Quality Assurance and Evaluation of the Curriculum Faculty Medicine II

Minutes No. 1 of 16.09.21

Chairman, PhD, Professor
Suman Serghei

APPROVED

at the Council meeting of the Faculty Medicine II

Minutes No. 1 of 21.09.21

Dean of Faculty Medicine II,
MD, PhD, Associate Professor
Bețiu Mircea

APPROVED

at the meeting of the Chair of Radiology and Imaging
Minutes No. 5 of 10.09.2021

Head of Chair PhD, Associate Professor
Codreanu Ion

SILLABUS

**DISCIPLINE MEDICAL IMAGING (CARDIO-PULMONARY AND
LOCOMOTOR SYSTEM)**

Integrated studies, Cycle I

Type of course: **Compulsory discipline**

Curriculum developed by the team of authors:

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Codreanu Ion, PhD of med., associate professor



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I. INTRODUCTION

- General presentation of the discipline: place and role of the discipline in the formation of the specific competences of the professional / specialty training program.
Discipline Medical Imaging is a clinical discipline in the process of preparing the future specialist. At present, no field of modern medicine can be imagined to be successive without the use of data obtained using medical imaging methods for the purpose of diagnosing or controlling the efficacy of the treatment. The emergence of modern diagnostic methods (CT, MRI, SPECT, PET, etc.) makes diagnostic imaging a part of disciplinary complex.
- Mission of the curriculum (aim) in professional training:
Selection of the optimal imaging method of investigation in various pathologies for differential diagnostic purposes, including the following compartments: pulmonology, cardiology, pneumophthisiology, neurology, nephrology, urology, ophthalmology, traumatology and orthopedics, endocrinology, rheumatology.
- Language (s) of the course: Romanian, English;
- Beneficiaries: students of the 4th year, Faculty of Medicine.

II. MANAGEMENT OF THE DISCIPLINE

Code of the discipline	S.07.O.063		
Name of the discipline	Medical imaging (cardio-pulmonary and locomotor system)		
Person(s) in charge of the discipline	dr. în medicină, conf. univ. Oxana Malîga dr. hab. în medicină, conf. univ. Ion Codreanu		
Year	IV	Semester	VII
Total number of hours: 60 , including:			60
Curs	10	Practical work	10
Seminars	10	Self-training	30
Form of assessment	E	Number of credits	2

III. TRAINING AIMS WITHIN THE DISCIPLINE



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At the end of the discipline study, the student will be able to:

- **at the level of knowledge and understanding:**
 - ✓ to know the imaging methods used in medical practice,
 - ✓ to know clinical criteria on the basis of which diagnostic procedures will be indicated,
 - ✓ to know criteria and ways of selecting the diagnostic method in relation to the specificity and severity of the pathology,
 - ✓ to understand ways to combine imaging methods to perform differential diagnosis,
 - ✓ to know the radioimaging and anatomo-physiological particularities of children and newborns,
 - ✓ to understand the importance of indicating imaging methods in relation to patient's accusations, value and limits of each method;
 - ✓ to understand the importance of using imaging methods in monitoring of chronic disease and detection of acute phase.
- **at the application level:**
 - ✓ to be able to establish indications and contraindications for different imaging methods of investigation,
 - ✓ to be able to assess the risks to which patients are exposed when performing specific diagnostic procedures,
 - ✓ to be able to apply the elements of differential imaging diagnosis.
- **at the integration level:**
 - ✓ to appreciate the importance of Medical Imaging in the context of Medicine,
 - ✓ to have skills to implement and integrate the accumulated knowledge into fundamental and clinical disciplines,
 - ✓ to assimilate new imaging achievements to be implemented in imaging diagnosis.

IV. PROVISIONAL TERMS AND CONDITIONS

- Knowledge of human anatomy and physiology,
- Knowledge of material of Radiology and Radioprotection course,
- Knowledge of clinical and paraclinical signs of diseases studied in the respective clinical disciplines.

V. THEMES AND ESTIMATE ALLOCATION OF HOURS

Lectures, practical hours/ laboratory hours/seminars and self-training

Nr. d/o	THEME	Number of hours		
		Courses	Practical work	Self-training
1.	Medical imaging in cardiology	1	2	3
2.	Medical imaging in urology	1	2	3
3.	Medical imaging in nephrology	1	2	3
4.	Medical imaging in pulmonology	1	2	3
5.	Medical imaging in pneumophtiziology	1	2	3
6.	Medical imaging in ophthalmology	1	2	3



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Nr. d/o	THEME	Number of hours		
		Courses	Practical work	Self-training
7.	Medical imaging in neurology	1	2	3
8.	Medical imaging in traumatology and orthopedics.	1	2	3
9.	Medical imaging in endocrinology	1	2	3
10.	Medical imaging in rheumatology	1	2	3
Total		10	20	30

VI. PRACTICAL SKILLS PURCHASED AT THE END OF THE COURSE

Mandatory essential practical skills are:

- Standard chest radiograph. Modifications of pulmonary vascular pattern.
- Standard chest radiograph. Cardio-thoracic ratio.
- Echocardiography. Appreciation of the investigation modality. Appreciation of the section plan.
- Angio CT. Coronary artery pathology.
- Myocardial scintigraphy. Ischemia. Necrosis.
- Renal CT. Assessment of the scanning phase.
- Ultrasonography of the kidneys. Acute pyelonephritis. Chronic pyelonephritis. Urolithiasis.
- CT of the abdomen. Urinary system masses.
- CT of the abdomen. Lithiasis of the renal system.
- CT of the abdomen. Hydronephrosis.
- Standard chest radiograph. Pneumothorax.
- Standard chest radiograph. Pleural effusion.
- Standard chest radiograph. Pneumonia.
- CT. Lung masses.
- Standard chest radiograph. CT. Primary tuberculosis.
- Standard chest radiograph. CT. Disseminated tuberculosis.
- Standard chest radiograph. CT. Fibro-cavitary tuberculosis
- Standard chest radiograph. CT. Tuberculous tracheobronchial lymphadenopathy.
- Standard radiograph. Fracture of orbit walls.
- CT. Facial bone fracture.
- CT. Intraorbital / intraocular foreign bodies.
- MRI of the skull in T1p mode. Intraocular hemorrhage.
- MRI of the skull. Orbital masses.
- Focht method. Location of the intraorbital radiopaque foreign body.
- Komberg-Baltin method. Location of the intraorbital radiopaque foreign body.
- Metal probe method. Location of the intraorbital radiopaque foreign body.
- CT. Hemorrhagic stroke.
- CT. Ischemic stroke.
- MRI. Disk herniation.
- CT. Skull fractures with hematoma.
- CT. Fractures of the ribs with pneumothorax.



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- CT. Fractures of the vertebral bodies.
- Ultrasonography of the thyroid gland. Thyroid node
- CT. Adenoma of the adrenal gland.
- MRI. Pituitary adenoma.
- Standard radiography. Rheumatoid arthritis.
- Standard radiography. Gout.
- Standard radiography. Osteoarthritis.
- Standard chest radiograph. Lung changes in lupus erythematosus.

VII. OBIECTIVE DE REFERINȚĂ ȘI UNITĂȚI DE CONȚINUT

Objectives	Content units
Theme (chapter) 1. Medical imaging in cardiology.	
<ul style="list-style-type: none">• to know the value of different imaging methods in assessing patients with cardiovascular pathology,• demonstrate abilities to indicate optimal imaging investigations based on suspected pathology and degree of emergency,• demonstrate ability to analyze the results,• to apply elements of differential imaging diagnosis,• to integrate the gained knowledge in other clinical disciplines	1. Radiological methods in the diagnosis of heart diseases (standard radiography, cardiac catheterization and angiography, computed tomography). Indications. Advantages, disadvantages, limits.
	2. Transthoracic echocardiography. Standard views. Acoustic windows. Transesophageal echocardiography. Indications. Advantages, disadvantages.
	3. Methods of nuclear medicine in the diagnosis of cardiovascular pathology. Indications, contraindications. Radionuclides used. Peculiarities of acquisition.
	4. Magnetic resonance imaging in cardiovascular pathology. Basic indications. Advantages, disadvantages. Absolute and relative contraindications.
	5. Imaging diagnosis of ischemic heart disease.
	6. Imaging diagnosis of rheumatic valvulopathy.
	7. Imaging diagnosis of pericarditis.
Theme (chapter) 2. Medical imaging in nephrology.	
<ul style="list-style-type: none">• to know the value of different imaging methods in assessing patients with renal pathology,• to know advantages and disadvantages of different imaging methods in nephrology,• demonstrate abilities to indicate optimal imaging investigations based on suspected pathology and degree of emergency,• demonstrate ability to analyze the results,• to apply elements of differential imaging diagnosis,• to integrate the gained knowledge in other clinical disciplines	1. Computed tomography in the diagnosis of renal pathology. Scanning phases. Indications.
	2. Imaging methods of investigation in renal pathology of inflammatory origin.
	3. Acute pyelonephritis, chronic pyelonephritis. Differential diagnosis.
	4. Imaging diagnosis in acute and chronic renal failure.
	5. Imaging evaluation of renal transplant.
Theme (chapter) 3. Medical imaging in urology.	
<ul style="list-style-type: none">• to know the value of different imaging methods in assessing of urinary system,• demonstrate abilities to indicate optimal imaging investigations	1. Spiral computed tomography in the assessment of urogenital system pathology. Scanning phases. Advantages, disadvantages, indications, contraindications.
	2. Magnetic resonance imaging of the kidney, prostate. Advantages, disadvantages, indications, contraindications.
	3. Ultrasound investigation of kidneys, prostate. Advantages, disadvantages, limitations of the method.



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Objectives	Content units
<ul style="list-style-type: none">based on suspected pathology and degree of emergency,demonstrate ability to analyze the results,to apply elements of differential imaging diagnosis,to integrate the gained knowledge in other clinical disciplines	4. Renal Angiography. Advantages, disadvantages, indications, contraindications.
	5. Imaging diagnosis of congenital urogenital malformations.
	6. Imaging diagnosis in urogenital system trauma. Imaging methods of first choice, differential diagnosis.
	7. Diagnostic imaging of urolithiasis.
	8. The differential imaging diagnosis of urinary tract tumors (nephroblastoma, hypernephroma, basinet, ureter, bladder tumors).
9. The imaging diagnosis of prostate tumors.	
Theme (chapter) 4. Medical imaging in pulmonology.	
<ul style="list-style-type: none">to know the value of different imaging methods in assessing patients with pulmonary pathology,demonstrate abilities to indicate optimal imaging investigations based on suspected pathology and degree of emergency,demonstrate ability to analyze the results,to apply elements of differential imaging diagnosis,to integrate the gained knowledge in other clinical disciplines	1. Computerized tomography of the chest in pulmonary pathology.
	2. The role of MRI, ultrasonography, nuclear medicine methods and angiography in the diagnosis of pulmonary pathology.
	3. Algorithm of differential diagnosis of pneumonia (franco-lobar pneumonia, interstitial pneumonia, bronchopneumonia, destructive pneumonia, autoimmune processes).
	4. Pulmonary node: notion, classification. Algorithm of differential diagnosis in pulmonary nodules.
	5. Pulmonary atelectasis: notion, classification, algorithm of differential imaging diagnosis. Pulmonary atelectasis: notion, classification, algorithm of differential imaging diagnosis.
	6. Pleural effusion, differential imaging diagnosis.
	7. Pneumothorax, differential imaging diagnosis.
Theme (chapter) 5. Medical imaging in pneumophthiziology.	
<ul style="list-style-type: none">to know the value of different imaging methods in evaluation of pulmonary tuberculosis,demonstrate abilities to indicate optimal imaging investigations based on suspected pathology and degree of emergency,demonstrate ability to analyze the results,to apply elements of differential imaging diagnosis,to integrate the gained knowledge	1. Elemental radiological changes in primary pulmonary tuberculosis. The imaging diagnostic algorithm for pulmonary tuberculosis.
	2. Imaging semiology of disseminated pulmonary tuberculosis (standard radiography, tomosynthesis, computed tomography).
	3. Imaging semiology of infiltrative pulmonary tuberculosis (standard radiography, tomosynthesis, computed tomography).
	4. Imaging semiology of nodular pulmonary tuberculosis (standard radiography, tomosynthesis, computed tomography).
	5. Imaging semiology of fibro-cavitary pulmonary tuberculosis (standard radiography, tomosynthesis, computed tomography).
	6. Imaging semiology of tuberculous tracheobronchial adenopathy (standard radiography, tomosynthesis, computed tomography).
	7. Imaging semiology in tuberculous pleurisy. Differential diagnosis.
	8. Imaging semiology in bronchial tuberculosis.
	9. Imaging semiology in complications of pulmonary tuberculosis. Interpretation of pathological opacities in pulmonary tuberculosis.
Theme (chapter) 6. Medical imaging in ophthalmology.	
<ul style="list-style-type: none">to know imaging methods of investigation used in ophthalmology,to know the imaging anatomy of the orbit and the eyeballdemonstrate abilities to indicate optimal imaging investigations based on suspected pathology	1. Principles of radiological investigations in ophthalmology. The methods used, the technique of making. Advantages disadvantages. Indications, contraindications. The Focht method. The Komberg-Baltin method. Investigation methods with metal probe.
	2. Imaging anatomy of the orbit and the eyeball.
	3. Computer tomography in ophthalmology. Advantages, disadvantages.
	4. MRI in ophthalmology. Advantages, disadvantages. Indications, contrindications.



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Objectives	Content units
<ul style="list-style-type: none">and degree of emergency,• demonstrate ability to analyze the results,• to apply elements of differential imaging diagnosis,• to integrate the gained knowledge in other clinical disciplines	5. Algorithm of imaging diagnosis of intra-orbital foreign bodies.
	6. Algorithm of imaging diagnosis in the trauma of the orbit and the eyeball.
	7. Algorithm of imaging diagnosis in the masses of the orbit and the eyeball.
	8. Algorithm of imaging diagnosis in the pathology of the optic nerve.
Theme (chapter) 7. Medical imaging in neurology.	
<ul style="list-style-type: none">• to know the value of different imaging methods of investigation used in neurology,• demonstrate abilities to indicate optimal imaging investigations based on suspected pathology and degree of emergency,• demonstrate ability to analyze the results,• to apply elements of differential imaging diagnosis,• to integrate the gained knowledge in other clinical disciplines	1. Computerized tomography of the skull. Indications, pathological signs. Cerebral angiography. Performing imaging techniques in neuroimaging. Comparative analysis of CT and IMR in neuroimaging.
	2. Nuclear medicine methods used in pathology of the nervous system.
	3. Algorithm of imaging diagnosis in ischemic stroke.
	4. Algorithm of imaging diagnosis in hemorrhagic stroke.
	5. Pathology of the spinal cord. Differential imaging diagnosis.
	6. Algorithm of imaging diagnosis of intraaxial and extraaxial neoplasms.
	7. Differential imaging diagnosis in intervertebral disc herniation.
	8. Computed tomography in cerebral trauma.
Theme (chapter) 8. Imaging in traumatology and orthopedics.	
<ul style="list-style-type: none">• to know the value of different imaging methods in the evaluation of patients in traumatology and orthopedics,• demonstrate abilities to indicate optimal imaging investigations based on suspected pathology and degree of emergency,• demonstrate ability to analyze the results,• to apply elements of differential imaging diagnosis,• to integrate the gained knowledge in other clinical disciplines	1. Methodology of imaging examination in osteo-articular trauma (standard radiography, CT, MRI, ultrasonography). Differential diagnostic algorithm.
	2. Radioimaging diagnosis of congenital hip dislocation.
	3. Radioimaging diagnosis of bone tumors.
	4. Radioimaging diagnosis in osteoarticular tuberculosis.
	5. Radioimaging diagnosis in avascular necrosis of the femoral head.
Theme (chapter) 9. Medical imaging in endocrinology.	
<ul style="list-style-type: none">• to know the value of different imaging methods of investigation used in endocrinology,• demonstrate abilities to indicate optimal imaging investigations based on suspected pathology and degree of emergency,• demonstrate ability to analyze the results,• to apply elements of differential imaging diagnosis,• to integrate the gained knowledge in other clinical disciplines	1. Radiological methods in the diagnosis of endocrine system pathology (standard radiography, computed tomography, ultrasonography, nuclear medicine, MRI). Indications. Advantages, disadvantages, limitations.
	2. Algorithm of imaging diagnosis in thyroid gland pathology.
	3. Algorithm of imaging diagnosis in pathology of the adrenal glands.
	4. Algorithm of imaging diagnosis in pituitary pathology.
Theme (chapter) 10. Medical imaging in rheumatology.	



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Objectives	Content units
<ul style="list-style-type: none">• to know the value of different imaging methods of investigation used in rheumatology,• demonstrate abilities to indicate optimal imaging investigations based on suspected pathology and degree of emergency,• demonstrate ability to analyze the results,• to apply elements of differential imaging diagnosis,• to integrate the gained knowledge in other clinical disciplines	1. Principles of radiological investigations in rheumatology. Methods used, technique of performance. Advantages disadvantages. Indications, contraindications.
	2. Imaging semiology in rheumatoid arthritis. Differential diagnosis.
	3. Imaging semiology in gout. Differential diagnosis.
	4. Imaging semiology in osteoarthritis. Differential diagnosis.
	5. Imaging semiology in systemic lupus erythematosus. Differential diagnosis.

VIII. PROFESSIONAL (SPECIFIC (SC)) AND TRANSVERSAL (TC) COMPETENCES AND STUDY OUTCOMES

✓ Professional (specific) (SC) competences

- **PC1.** Responsible execution of professional tasks with the application of the values and norms of professional ethics, as well as the provisions of the legislation in force.
- **PC2.** Adequate knowledge of the sciences about the structure of the body, physiological functions and behavior of the human body in various physiological and pathological conditions, as well as the relationships between health, physical and social environment.
- **PC3.** Resolving clinical situations by developing a plan for diagnosis, treatment and rehabilitation in various pathological situations and selecting appropriate therapeutic procedures for them, including providing emergency medical care.
- **PC5.** Interdisciplinary integration of the doctor's activity in a team with efficient use of all resources.

✓ Transversal competences (TC)

- **TC1.** Autonomy and responsibility in the activity.

✓ Study outcomes

Upon completion of the study, the student will be able to:

- to know clinical criteria on the basis of which diagnostic procedures will be indicated,
- to understand the importance of using imaging methods in chronic disease monitoring and acute phase detection,
- to understand ways to combine imaging methods to get the right diagnosis,
- to understand the value and limits of different imaging methods in relation to patient accusations and suspected pathology,
- to formulate optimal indications of planned and emergent imaging investigations;
- to apply elements of differential imaging diagnosis.

IX. STUDENT'S SELF-TRAINING



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Nr.	Expected product	Implementation strategies	Assessment criteria	Implementation terms
1.	Problem report	Oral communication, Power Point Presentation,	Knowing and mastering the theme, The completeness of the elucidation of the question raised for the referral, Ability to highlight the essence of the theme, The representativeness of the images used to illustrate the theme, Answer questions, Compliance with the prescribed regulation	For practical lesson
2.	Homework	Written work in the workbook depending on the question or problem formulated.	The correctness of solving the problem	To be ready for practical lesson
3.	Working with information sources	Read the lecture and the material in the manual to the theme carefully. To get acquainted with the list of additional information sources on the topic. Select the source of additional information for that theme. Wording of generalizations and conclusions related to the theme of the lesson.	The ability to extract the essential, Interpretative ability, The volume of work	During the semester

X. METHODOLOGICAL SUGGESTIONS FOR TEACHING-LEARNING-ASSESSMENT

- ***Teaching and learning methods used:***
- Course
 - introductive
 - current
 - synthesis
 - theoretical and practical
 - debates
- Practical lessons
 - synthesis
 - repetitive
 - debates
- Traditional methods
 - case study



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- role playing
- interactive
- tests

- **Applied teaching strategies / technologies (specific to the discipline)**

Analysis of radiographs, computed tomographs, magnetic resonance tomography, ultrasound and nuclear medicine investigation results.

- **Methods of assessment (including the method of final mark calculation)**

Current: each student's knowledge will be evaluated at each practical lesson in one or several ways: oral, test, control work, image interpretation, clinical case resolution. 20% of the mark is assigned to the individual work of the student.

Final: semester VII - exam. The students, who have the average annual mark under the grade "5" or have not recovered absences from practical lessons by the end of the semester, are not admitted to the exam. The exam consists of testing by the Test Editor in the specialized room for this type of evaluation. The final grade for the exam consists of 0.5 of the average annual score and 0.5 of the one obtained by the test.

Method of mark rounding at different assessment stages

Intermediate marks scale (annual average, marks from the examination stages)	National Assessment System	ECTS Equivalent
1,00-3,00	2	F
3,01-4,99	4	FX
5,00	5	E
5,01-5,50	5,5	
5,51-6,0	6	
6,01-6,50	6,5	D
6,51-7,00	7	
7,01-7,50	7,5	C
7,51-8,00	8	
8,01-8,50	8,5	B
8,51-8,00	9	
9,01-9,50	9,5	A
9,51-10,0	10	

The average annual mark and the marks of all stages of final examination (computer assisted, test, oral) - are expressed in numbers according to the mark scale (according to the



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table), and the final mark obtained is expressed in number with two decimals, which is transferred to student's record-book.

Absence on examination without good reason is recorded as "absent" and is equivalent to 0 (zero). The student has the right to have two re-examinations.

XI. RECOMMENDED LITERATURE:

A. Compulsory:

1. Materials of the Course of Medical Imaging, Department of Radiology and Medical Imaging.
2. Malîga O., Rotaru N., Obadă A. Medical imaging in tables and algorithms. Guidelines. Chisinau, 2015.
3. Holger Petterson. A Global Text Book of Radiology. Sweden, 2010.

B. Additional (available in electronic form at the chair):

1. David Sutton. Textbook of radiology and imaging, 7th edition.