

Federal State Autonomous Educational Institution of Higher Education  
«Peoples' Friendship University of Russia»

*Medical Institute*

Recommended MCSD

**SYLLABUS**  
(STUDY GUIDE)

**Subject**

**Diagnostic Radiology**

**Recommended for the direction of training (specialty)**

**31.05.01 General Medicine**

**Program (profile, specialization)**

**General Medicine**

Section I. The main part.

### 1. COURSE PROGRAM: Diagnostic Radiology

In the "Federal State Standard of Higher Professional Education", the main emphasis in the preparation of students is made on the competence-based approach, when the basis of the educational process, along with the acquisition of knowledge and skills, is the acquisition of professional and general cultural competencies by students. A specialist in the field of training 05/31/01 "General Medicine" prepares for the following types of professional activities: prevention, diagnostics, therapy, rehabilitation, psychological and pedagogical, organizational and management, research work.

Diagnostic Radiology is a mandatory course, divided into 6 sections (or general modules), including 6 topics. In the 6th semester, the following items are studied: mastering radiological methods. Survey of diagnostic methods: laboratory, radiological, ultrasound, endoscopic, radioisotope, magnetic resonance diagnostic methods.

The program is based on the following classroom workload: 12 practical lessons for 6 hours in the 6th semester.

Control of students' knowledge level provides for: a) current control over the materials of the studied topics; b) final control in the form of an exam or test at the end of the 6th semester.

Information Course: III Semester: 6  
Department: Oncology and Diagnostic Radiology

The teaching materials were reviewed and approved at a meeting of the department on 08/28/2020. (Minutes No. 1)

#### 1. Goals and objectives of the discipline:

Purpose: Providing training of specialists in the program of medical disciplines. Section of Diagnostic Radiology.

Objectives: To provide theoretical and practical training for doctors in the specialty of general medicine in modern radiological diagnostics.

#### 2. Place of discipline in the structure of EP VO:

Discipline \_\_\_\_\_ Diagnostic Radiology \_\_\_\_\_ refers to the basic part of block \_\_\_\_\_1\_\_\_\_\_ (block 1, block 2) of the curriculum.

Table 1 shows the previous and subsequent disciplines aimed at the formation of discipline competencies in accordance with the competence matrix of EP HE (Educational Program of Higher Education).

Table No. 1

Previous and subsequent disciplines aimed at building competencies

	Code and name of competence	Previous disciplines	Subsequent disciplines (groups of disciplines)
General cultural competences			
	GK-1, GK-5, GK-6, GK-7. GC-8,	Philosophy	Therapy, surgery, oncology
Professional competencies (type of professional activity)			
	PC-1,PC-2, PC-5, PC-6, PC-7.	therapeutic disciplines	Therapy, surgery, oncology

### 1.3 REQUIREMENTS FOR THE RESULTS OF LEARNING THE DISCIPLINE:

As a result of mastering the program of the discipline, the student should have formed general cultural, general professional and professional competencies.

A student who has mastered the discipline program must have the following general cultural competencies (GC):

the ability for abstract thinking, analysis, synthesis (GC - 1); the ability to use the fundamentals of philosophical knowledge to

the formation of an ideological position (GC - 2);

the ability to analyze the main stages and patterns of the historical development of society for the formation of a civic position (GC - 3);

the ability to act in non-standard situations, to bear social and ethical responsibility for the decisions made (GC - 4);

readiness for self-development, self-realization, self-education, use of creative potential (GC - 5);

the ability to use methods and means of physical culture to ensure full-fledged social and professional activity (GC - 6);

the willingness to use first aid techniques, methods of protection in emergency situations (GC - 7);

willingness to work in a team, tolerantly perceive social, ethnic, confessional and cultural differences (GC - 8).

A student who has mastered the discipline program must have the following general professional competencies (GPC):

readiness to solve standard tasks of professional activity using information, bibliographic resources, biomedical terminology, information and communication technologies and taking into account the basic requirements of information security (GPC - 1);

readiness for communication in oral and written forms in Russian and foreign languages for solving problems of professional activity (GPC - 2);

the ability to use the foundations of economic and legal knowledge in professional activities (GPC - 3);

ability and willingness to implement ethical and deontological principles in professional activity (GPC - 4);

the ability and willingness to analyze the results of their own activities to prevent professional mistakes (GIC - 5);

readiness to maintain medical records (GPC - 6); readiness to use basic physical and chemical, mathematical and other natural science concepts and methods in solving professional problems (GIC - 7);

readiness for medical use of drugs and other substances and their combinations in solving professional problems (GPC - 8);

the ability to assess morphofunctional, physiological conditions and pathological processes in the human body to solve professional problems (GPC - 9);

readiness to ensure the organization of patient care and the provision of primary pre-medical

health care (GPC - 10);

the readiness to use medical devices provided for by the procedures for the medical care (GPC - 11).

A student who has mastered the discipline program must have professional competencies (PC) corresponding to the type (types) of professional activity to which the specialty program is focused:

medical activity:

the ability and readiness to implement a set of measures aimed at maintaining and strengthening health and including the formation of a healthy lifestyle, preventing the occurrence and (or) spread of diseases, their early diagnosis, identification of the causes and conditions of their occurrence and development, as well as those aimed at eliminating the harmful effects of environmental factors on human health (PC - 1);

the ability and readiness to carry out preventive medical examinations, medical examination in cases of diseases and dispensary observation (PC - 2);

the ability and readiness to carry out anti-epidemic measures, organize the protection of the population in the areas of especially dangerous infections, in the event of a worsening radiation situation, natural disasters and other emergencies (PC - 3);

ability and willingness to apply social-hygienic methods for collecting and medical - statistical analysis of information on indicators of public health (PC - 4);

the readiness to collect and analyze the patient's complaints, data from his anamnesis, examination results, laboratory, instrumental, pathological-anatomical and other studies in order to recognize the condition or establish the presence or absence of a disease (PC - 5);

the ability to determine the patient's main pathological conditions, symptoms, disease syndromes, nosological forms in accordance with the International Statistical Classification of Diseases and Problems Related to Health, X revision (PC - 6);

the willingness to conduct an examination of temporary disability, participation in medical and social examination, ascertaining the biological death of a person (PC - 7);

the ability to determine the tactics of managing patients with various nosological forms (PC - 8);

readiness to manage and treat patients with various nosological forms on an outpatient basis and in a day hospital setting (PC - 9);

the readiness to provide medical care in case of sudden acute diseases, conditions, exacerbation of chronic diseases that are not accompanied by a threat to the patient's life and do not require emergency medical care (PC - 10);

readiness to participate in the provision of emergency medical care in conditions requiring urgent medical intervention (PC - 11);

readiness to conduct physiological pregnancy; delivery (PC - 12);

readiness to participate in the provision of medical assistance in emergency situations, including participation in medical evacuation (PC - 13);

the readiness to determine the need for the use of natural healing factors, drug, non-drug therapy and other

methods for patients in need of medical rehabilitation and spa treatment (PC - 14);

the readiness to teach patients and their relatives the basic hygienic measures of a health-improving nature, the skills of self-control of the main physiological indicators that contribute to the preservation and strengthening of health, the prevention of diseases (PC - 15);

readiness for educational activities to eliminate risk factors and develop healthy lifestyle skills (PC - 16).

Organizational and management activities:

the ability to apply the basic principles of organization and management in the field of public health protection, in medical organizations and their structural units (PC - 17);

the willingness to participate in assessing the quality of medical care using the main medical and statistical indicators (PC - 18);

the ability to organize medical assistance in emergency situations, including medical evacuation (PC - 19).

Research activities:

the readiness for analysis and public presentation of medical information based on evidence-based medicine (PC - 20);

the ability to participate in scientific research (PC - 21);

willingness to participate in the implementation of new methods and techniques aimed at protecting the health of citizens (PC - 22).

As a result of studying the discipline, the student must know: Types of radiation, their physical nature, methods based on various types of radiation.

Properties of various types of radiation, the possibilities of radiation research methods in the assessment of various organs, systems, tissues.

To know the schematic structure of the X-ray apparatus, the principles of obtaining X-rays, to have an idea of bremsstrahlung and characteristic radiation.

By the example of the properties of X-ray radiation, to understand the principles of obtaining an image in radiation diagnostics.

To know what a X-ray projection is, an examination position. Know the construction of an X-ray image, the patterns of assigning the necessary projections and positions, and their characteristics.

Diagnostic capabilities of various techniques. How to evaluate the X-ray image of the lungs for syndromes reflecting the morphological structures of the lungs.

#### Learning content

When analyzing the X-ray image of the lungs, to determine the size of the pulmonary field according to the symptoms: Position of the diaphragm, the state of the intercostal spaces, the position of the mediastinal organs.

To evaluate the state of the lung parenchyma, considered in the images by the syndrome of "transparency" in the form of its increase, manifested by X-ray high intensity and a decrease, manifested by X-ray attenuation (shadow). To characterize the shadow or transparency according to the symptoms adopted in Radiology: the number, shape, size, localization, contours, structure, intensity, mobility and to adapt them relative to the lungs.

To assess the state of the circulatory system of the lungs, revealed by the "pulmonary (vascular) pattern" syndrome. Determine the strengthening (enrichment), weakening (depletion) deformation of the pulmonary pattern.

To assess the state of the lymphatic system of the lungs, detected by the syndrome of "lymph nodes" and represented by the paratracheal, bifurcation and bronchopulmonary groups.

To assess the state of the bronchial system of the lungs, represented on X-ray images by the syndrome of "bronchial patency". Know the symptom complex that characterizes the degree of bronchial obstruction: hypoventilation, valvular emphysema, atelectasis; to be able to use the symptom complex when assessing an X-ray image of the lungs.

To reflect the X-ray examination revealed in the protocol and formulate a conclusion reflecting the disease, its spread and localization.

Diagnostic capabilities of various techniques.

How to evaluate X-ray examination of the heart and large vessels in the normal person.

Principles of X-ray imaging of pathology.

Diagnostic capabilities of various techniques used for examination of various organs of the digestive system. Principles of diagnostics of the pathology of the digestive tube in the X-ray images.

Diagnostic capabilities of each of the techniques used to assess various components of the musculoskeletal system. Signs of norm and pathology in the X-ray image.

Students are informed about various types of radiation and their characteristics (X-rays, gamma rays, beta radiation, bremsstrahlung, protons and electrons in radiation therapy).

The methods of radiation therapy (radical, palliative radiation therapy, external, interstitial, intracavitary, contact, intravenous, single-field and multi-field, small-fractional and large-fractional) and pathological processes in which they are used are considered. Complications of radiation therapy and methods of their prevention and treatment.

To be able to:

1. determine the indications for radiological examination.
2. correctly prescribe the necessary technique of radiological examination.
3. determine the area of study, the method used by the image.
4. assess the radiographs
  - lungs with image analysis for syndromes;
  - to assess the size of the pulmonary fields, the position of the diaphragm, the position of the mediastinal organs, the state of the intercostal spaces;
  - to assess the condition of the lung parenchyma, represented by the syndrome
    - a) in the form of shadow
    - b) in the form of transparencyand to describe them according to the symptoms accepted in Radiology: (number, norm, size, localization, contours, structure, intensity, structure, mobility), adapting to the lung.
  - to assess the state of the vasculature of the lung, manifested by the pulmonary pattern syndrome, to identify possible changes in the form of its strengthening, weakening, deformation.
  - to assess the state of the lymphatic system of the lung, represented by regional lymph nodes (paratracheal, tracheobronchial, bifurcation, bronchopulmonary group).
  - to assess the state of the bronchial tree of the lungs, represented by the syndrome of bronchial patency, taking into account the picture produced by hypoventilation, valvular emphysema, atelectasis.
5. Read the presented radiographs of a standard examination of the heart, including 3 projections, one of which is with a contrasted esophagus.
6. Read the radiographs of the digestive tube, assessing the morphological symptoms, in the phase of mucosal relief, in the phase of tight filling, with double contrast, assessing the functional symptoms revealed by CT, ultrasound, MRI, radionuclide radiological methods in the examination of other digestive organs (liver, pancreas, salivary glands).
7. Read radiographs of the osseous-articular system with an assessment of the condition of bones, joints, periosteum of soft tissues surrounding bones and joints. Evaluate the symptoms detected during the study of the osseous-articular system using special methods (CT, MRI, isotope techniques, fistulography, arthrography, tomography).

To master the following skills:

To evaluate the condition of the lung parenchyma, seen in the pictures by the syndromes of translucency and shadow. To characterize the shadow or transparency according to the symptoms adopted in Radiology: the number, shape, size, localization, contours, structure, intensity, mobility and adapt them relative to the lungs.

To assess the state of the circulatory system of the lungs, revealed by the "pulmonary (vascular) pattern" syndrome. Determine the strengthening (enrichment), weakening (depletion) deformation of the pulmonary pattern.

To assess the state of the lymphatic system of the lungs, detected by the syndrome "lymph nodes" and represented by the paratracheal, bifurcation, bronchopulmonary group.

To assess the state of the bronchial system of the lungs, represented on X-ray images by the syndrome "bronchial patency". Know the symptom complex that characterizes the degree of violation of bronchial obstruction: hypoventilation, valvular emphysema, atelectasis; be able to use the symptom complex when reading an X-ray image of the lungs.

To reflect the X-ray examination revealed in the protocol and formulate a conclusion reflecting the disease, its prevalence and localization.

When analyzing the X-ray image of the heart, determine the state of the pulmonary pattern in order to identify signs of pulmonary hypertension. To assess the state of transparency of the pulmonary fields to determine the hemosiderosis of the lungs.

By studying the X-ray image of the heart itself, to reveal changes in hemodynamics, leading through a change in the heart chambers to an increase or decrease in the X-ray arcs, which, in turn, determines the shape, position, and size of the heart.

Acquired heart defects, in particular mitral, aortic and combined, which serve as an example of the principles of analysis. To reflect the identified changes in the examination protocols.

When analyzing the X-ray image, to determine the phase of the study. In the relief phase, to assess the normal state of the mucous membrane of each section of the digestive tube. To reveal the signs of different parts of the healthy digestive canal in the tight filling phase. To assess the functional symptoms (secretion, peristalsis, tonus, evacuation) of the digestive tube.

Studying the picture of peptic ulcer disease in the X-ray image, identify morphological symptoms: a symptom of a niche, an inflammatory shaft, convergence of folds, scar deformity of the organ. Describe them according to the signs accepted in radiology, adapt them in relation to morphological symptoms. To see the functional characteristics of peptic ulcer disease. Evaluating the morphological signs of cancer of the digestive canal, identify the symptoms of filling defect, wall rigidity, atypical relief in the images, see the weakening of functions in the form of suprastenotic expansion, aperistaltic zone, and delayed evacuation. To determine the signs of perforation of the hollow organ of the digestive tube, signs of obstruction in various organs of the digestive canal. To describe the identified changes in the study protocol.

When analyzing an X-ray image, to assess the condition of the soft tissues surrounding the bones and joints. It is necessary to:

- evaluate the joints detected in the images,
- assess the condition of the periosteum,
- evaluate the image of the bones according to the principles of Radiology.

Evaluating soft tissues, to reveal areas of transparency that occur with subcutaneous emphysema and gas gangrene, shadows formed by the deposition of calcium in old hematomas, ruptures, soft tissue damage, dead parasites, atherosclerotic arteries.

Assessing the condition of the joints, determine the shape, size, congruence of the X-ray joint space, the contours of the endplates.

Evaluating the periosteum, identify its normal state or the type of excessive reaction (linear, onion-peel, visor, spiculose periostitis)

Evaluating the actual bone, to determine the number, shape, size, position, contours, structure of the X-ray shadows and their possible changes.

Using the example of traumatic lesions of the osteoarticular system, to identify signs of dislocation in the form of a loss of the conformity of the articular ends; to identify combinations of fracture symptoms: displacement of fragments of various types, fracture lines, loss of the

integrity of the compact layer, deformation of the bone and bone structure, deformation of the compact layer, formation of callus.

Using the example of chronic osteomyelitis and tuberculosis, learn how to identify signs of non-specific and specific inflammation.

Using the example of chondroma, osteosarcoma, to learn how to identify the symptoms of benign and malignant tumors of the osseous-articular system.

To describe the identified symptoms of norm or pathology in the X-ray protocol.

## 2.1 Scope of discipline and types of educational work

The total workload of the discipline is   2   credit units.

### The scope of the discipline and types of educational work

Type of educational work	Hours, total	Semesters			
		6			
<b>Classroom lessons (total)</b>	72	72			
Including:	-	-	-	-	-
Lectures					
Practical lessons (PL)	57	57			
Semonars (S)					
Laboratory works (LR)					
<b>Independent work (total)</b>	15	15			
Including:	-	-	-	-	-
Course project (work)					
Calculation and graphic works					
Survey					
<i>Other kinds of independent works</i>					
<i>Work in Diagnostic Department</i>	13	13			
Type of intermediate certification (test, exam)	2	2			
Total labor input	hours	72	72		
credit units		2	2		

## 2.2 Contents of discipline sections

№	Name of discipline section	Contents of the section
1.	Physical and technical foundations of radiation diagnostics	Types of radiation, their physical nature, methods based on various types of radiation. Properties of various types of radiation, the possibility of radiation research methods in the assessment of various organs, systems, tissues.



		<p>Know the schematic structure of the X-ray apparatus, the principles of obtaining X-ray radiation, have an idea of bremsstrahlung and characteristic radiation.</p> <p>Using the example of the properties of X-ray radiation to understand the principles of image acquisition in radiation diagnostics.</p>
2.	Radiology of the lungs	<p>Diagnostic capabilities of various techniques. How to evaluate the X-ray image of the lungs for syndromes reflecting the morphological structures of the lungs.</p> <p>Learning content</p> <p>When analyzing the X-ray image of the lungs, determine the size of the pulmonary field according to the symptoms: Position of the diaphragm, the state of the intercostal spaces, the position of the mediastinal organs.</p> <p>Evaluate the state of the lung parenchyma, considered in the images by the syndrome of "transparency" in the form of its increase, manifested by X-ray enlightenment and a decrease, manifested by X-ray obscuration (shadow). To characterize the shadow or enlightenment according to the symptoms adopted in radiology: the number, shape, size, localization, contours, structure, intensity, mobility and adapt them relative to the lungs.</p>
3..	Radiology of heart and vessels	<p>When analyzing the X-ray image of the heart, determine the state of the pulmonary pattern in order to identify signs of pulmonary hypertension. To assess the state of transparency of the pulmonary fields to determine the hemosiderosis of the lungs.</p> <p>By studying the X-ray image of the heart itself, to reveal changes in hemodynamics, leading through a change in the heart chambers to an increase or decrease in the X-ray arcs, which, in turn, determines the shape, position, and size of the heart.</p> <p>Acquired heart defects, in particular mitral and aortic, both pure and combined and combined, serve as an illustration of the principles of analysis. To reflect the identified changes in the examination protocols.</p>
4.	Gastro-intestinal radiology	<p>When analyzing the X-ray image, determine the phase of the study. In the relief phase, assess the normal state of the mucous membrane of each section of the digestive tube. To identify the signs of different parts of the healthy alimentary canal in the tight filling phase. Assess the functional symptoms (secretion, peristalsis, tone, evacuation) of the digestive tube.</p>
5.	Muscular-skeletal radiology	<p>Diagnostic capabilities of each of the techniques used to assess various components of the musculoskeletal system. Signs of recognition of norm and pathology in the x-ray image.</p> <p>When analyzing an X-ray image, assess the condition of the soft tissues surrounding the bones and joints.</p>

		<ul style="list-style-type: none"> <li>- to evaluate the joints detected in the images,</li> <li>- assess the condition of the periosteum,</li> <li>- evaluate the image of the bones according to the symptoms accepted in radiology</li> </ul>
6.	Basics of Radiotherapy	<p>Students learn about various types of radiation and their characteristics (X-rays, gamma radiation, beta radiation, inhibitory cure, protons and electrons in radiation therapy.</p> <p>The methods of radiation therapy (radical, palliative radiation therapy, external, interstitial, intracavitary, contact, intravenous, single-field and multi-field, small-fractional and large-fractional) and pathological processes in which they are used are considered. Complications of radiation therapy and methods of their prevention and treatment.</p>
7.	Test Credit	

### 2.3. Discipline sections

№ п/п	Name of discipline section	Lecture	Practical work.	Laboratory work	Из н т и х в И Ф и н т е р а к т и в н о й ф о р м е	Independent work	Total hours
1.	Physical and technical foundations of radiation diagnostics		5			1	6
2.	Radiology of the lungs		13		1	1	14
3.	Radiology of heart and vessels		12			2	14
4.	Gastro-intestinal radiology		11		1	1	12
5.	Muscular-skeletal radiology		11		1	1	12
6.	Basics of Radiotherapy		5		1	1	6
7.	Test Credit					8	8
	Total:		57		4	15	72

### 2.4 Description of the interactive lessons

№ п/п	№ of the discipline section	Topic of the interactive lesson	Type of lesson	Total labor intensity, hours
1.	2	Spiral CT	Practical work	1
2.	4	MRI in diagnostics	Practical work	1
3.	5	Densitometry	Practical work	1

4.	6	Radiology in planning of radiotherapy	Practical work	1
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### 2.5 Practical works (seminars)

№/№	№ of the discipline section	Topic of the practical works (seminars)	Total labor intensity, hours
	1.	Physical-technical basis of Radiology	6
	2.	Radiology of the lungs	14
	3.	Radiology of the heart and vessels	14
	4.	Gastro-intestinal radiology	12
	5.	Muscular-skeletal radiology	12
	8.	Basics of Radiotherapy	6
	7	Test Credit	8
		Total	72

### 3. List of main and additional literature:

#### a) the main literature:

1. Medical radiology. A textbook for university students, Moscow, Medicine, 2004.
2. Radiation diagnostics. Study guide, Moscow, GOETAR-MEDIA, 2009. Ilyasova et al.
3. Radiation diagnostics. Textbook. Edited by G.U. Trufanov Moscow. GOETAR-MEDIA. 2018.-208 p. ISBN 978-5-9704-4419-1 /

#### b) additional literature

1. X-ray studies of the cardiovascular system. Moscow, RUDN. 1990 (tutorial)
  2. Emergency radiology (Manual) Moscow, Medicine, 2009
- c) software video, audio cassettes with lectures

### 4. Material and technical support of the discipline:

X-ray rooms: lung X-ray, gastrointestinal X-ray, bone X-ray, angiography.

Radioisotope diagnostics: bone scintigraphy, hepatobiliscintigraphy, radioisotope scanning of the kidneys and thyroid gland, radioisotope scanning of the lungs and brain.

Endoscopic laboratory: fibrograstroduodenoscopy, bronchoscopy, colonoscopy, cystoscopy, laparoscopy, choledochoscopy.

Spiral computed tomography.

Magnetic resonance imaging

Ultrasound diagnostics laboratory: ultrasound tomography of soft tissues, abdominal cavity, retroperitoneal space, kidneys and urinary bladder.

Pathomorphology laboratory: Cytology, histology. Electron microscopy.

Mammological laboratory.

Computer complex for teaching students and conducting test control.

Radiation therapy laboratory: X-ray therapy, gamma therapy, particle accelerator radiation, intracavitary therapy laboratory.

Two laboratories for practical training

Lecture hall.

Slides, videos, posters, tables, drawings.

## 5. Tutorials

1. Medical radiology. A textbook for university students, Moscow, Medicine, 2004.

2. Radiation diagnostics. Study guide, Moscow, GOETAR-MEDIA, 2009. Ilyasova et al.

3. Radiation diagnostics. Textbook. Edited by G.U. Trufanov Moscow. GOETAR-MEDIA. 2018.-208 p. ISBN 978-5-9704-4419-1 /

1. X-ray studies of the cardiovascular system. Moscow, RUDN. 1990 (tutorial)

2. Emergency radiology (Manual) Moscow, Medicine, 2009

3. Radiation therapy (radiotherapy): Textbook Edited by GE Trufanov Moscow. ISBN 978-5-9704-442-7

GOETAR-Media. 2018-208 p.

4. Methods of X-ray examination of the digestive tract (Study guide) Moscow., RUDN, 2020.

5. Basic principles of radiation diagnosis of malignant neoplasms of the lungs using multiplanar reconstructions during post-processing processing of images of multislice computed tomography (Study guide) Moscow., RUDN, 2020. Karmazanovsky G.G. , Kolganova I.P. Computed tomography and X-ray diagnostics. Moscow. Vidal, 2014, 208 pp.

6. Differential diagnosis of respiratory diseases. Rozenshtaukh L.S., Winner M.G. Moscow, Medicine 2012, 351C

7 Vlasov P.V. X-ray diagnostics of diseases of the digestive system. // M .: VIDAR. - 2008.

8. Vlasov P.V., Kotlyarov P.M., Zhuk Yu.N. X-ray diagnostics in urology. // M .: VIDAR. - 2010.

9. Vlasov P.V. Radiation diagnosis of diseases of the chest cavity. // M .: Vidar. - 2006.

10. Herring W. - Learning radiology/ Elsevier 2015, 352 p.

6. Information support of the discipline databases, reference and search systems:  
–□RUDN Electronic Library System.

- PFUR educational portal <http://web-local.rudn.ru>.
- Universal library ONLINE <http://biblioclub.ru>.
- Library of electronic journals BENTHAMOPEN <http://www.benthamscience.com/open/a-z.htm>.
- Library of electronic journals Elsevier <http://www.elsevier.com/about/open-access/open-archives>.
- Medical online library MedLib <http://med-lib.ru/>.
- Scientific Electronic Library <http://elibrary.ru/>.
- U.S. National Library of Medicine National Institutes of Health: <http://www.ncbi.nlm.nih.gov/pubmed/>.

a) software\_

Presentations of lectures and laboratory classes in all sections of the discipline

Test tasks for learning and knowledge control

Section II. Control of student's knowledge and competencies.

### 1. DESCRIPTION OF THE SCORE RATING SYSTEM

To assess the educational activities of students at the department, a point-rating system and ECTS assessments are used.

The maximum number of points is 100.

The final grade takes into account both the points received during the semester and the credit.

The total number of points is calculated using the following formula:

$$i \quad \sum_{k=1}^n ik \quad ik \quad result \quad k=1$$

$$k=1 \quad ik$$

where  $result \ i$

$$D_{ik}$$

- $n$  - the total number of points in the  $i$ -th discipline of the curriculum;
- the number of points in the  $i$ -th discipline of the curriculum in the  $k$ -th semester;
- the number of credits in the  $i$ -th discipline in the  $k$ -th semester;
- the number of semesters in which the  $i$ -th discipline was studied.

### 6 SEMESTER.

12 lessons x 5 points = 60 points.

Final test or exam 40 points

TOTAL: 100 points.

A missed lesson or grade must be completed unsatisfactorily; during the practice, a student can receive 0.5 points.

The student's pre-examination rating is made up of the points received by the student at the end of the semester.

The final grade is determined by the total number of points obtained during the semester and on the exam. In the student's record book, a final grade is given, including points and a letter equivalent.

Correspondence table of the final score-rating assessment to the level of knowledge of students in the discipline

<i>Knowledge of the material</i>							
Mastering of the material (% sum of the scores)	95-100	86-94	69-85	61 - 68	51- 60	31 - 50	≤30
<i>Mark at the test</i>							
Rating mark	A	B	C	D	E	FX	F
Score mark	5+	5	4	3+	3	2+	2
Classical mark	Excellent		Good	Satisfactory		Failed	

Description of ECTS grades:

A ("Excellent") - the theoretical content of the course has been mastered completely, without gaps, the necessary practical skills for working with the mastered material have been formed, all the educational tasks provided for by the training program have been completed, the quality of their implementation was assessed by the number of points close to the maximum.

B ("Very good") - the theoretical content of the course is mastered completely, without gaps, the necessary practical skills of working with the mastered material are basically formed, all the educational tasks provided for by the curriculum have been completed, the quality of performance of most of them is assessed by the number of points close to the maximum .

C ("Good") - the theoretical content of the course has been fully mastered, without gaps, some practical skills of working with the acquired material are not sufficiently formed, all the educational tasks provided for by the training program have been completed, the quality of performance of none of them has not been assessed with a minimum number of 5 points, some types of tasks are carried out with mistakes.

D ("Satisfactory") - the theoretical content of the course has been partially mastered, but the gaps are not significant, the necessary practical skills to take care of the mastered material are mainly formed, most of the educational tasks provided for in the training program have been completed, some of the completed tasks may contain errors.

E ("Mediocre") - the theoretical content of the course is partially mastered, some practical skills are not formed, many of the educational tasks stipulated by the training program were not completed, or the quality of performance of some of them was assessed by the number of points close to the minimum.

FX ("Conditionally unsatisfactory") - the theoretical content of the course is partially mastered, the necessary practical skills have not been formed, most of the study assignments provided for by the training program have not been completed or the quality of their implementation is assessed by the number of points close to the minimum; with additional independent work on the course material, it is possible to improve the quality of completing educational tasks.

F ("Certainly unsatisfactory") - the theoretical content of the course has not been mastered, the necessary practical skills are not formed, all completed study tasks contain gross errors, additional independent work on the course material will not lead to any significant improvement in the quality of the study tasks.

3. Fund of assessment tools for intermediate certification of students in the discipline (module)  
 The current control of knowledge and the success of mastering the curriculum is carried out in the form of an oral survey or computer testing during practical training.  
 Midterm knowledge control is carried out at least once a semester. It is carried out by means of test control, supplemented, at the discretion of the teacher, with an oral interview. In the process of control, the student must show his knowledge of the passed sections of the discipline, skills and abilities. The attendance of practical classes is also monitored. Knowledge is assessed according to the pass / fail system; during testing, the "pass" grade is given if the correct answer is 70% or more questions.  
 A student who has fully completed the curriculum of the discipline is admitted to the final certification in the discipline. Final certification is carried out through oral interviews and testing: the student is offered a test containing 10 questions on the main topics of the discipline with multiple answers, the test is considered successful if 7 or more questions are correctly answered.

**Table 2**

<b>№ module</b>	<b>Name of the module</b>	<b>Failed</b>	<b>Satisfactory</b>	<b>Good</b>	<b>Excellent</b>
1	<b>Physical and technical fundamentals of radiation diagnostics 6 hours (0.15 credit)</b>	0-3 scores	1,9-3,45 scores	2,72-4,19 scores	3,27-4,54 scores
2	<b>Radiation examination of the lungs 12 hours (0.35 credit) Incl. independent form</b>	0-6 scores	3,8-6,9 scores	5,42-8,38 scores	6,54-9,08 scores
3	<b>Radiation examination of the heart and blood vessels 14 hours (0.4 credits)</b>	0-6 scores	3,8-6,9 scores	5,42-8,38 scores	6,54-9,1 scores
4	<b>Radiation examination of the digestive system 14 hours (0.4 credits) Incl. independent form</b>	0-6 scores	3,8-6,9 scores	5,42-8,38 scores	6,54-9,08 scores
5	<b>Radiation examination of the osteoarticular system 12 hours (0.35 credit) Incl. independent form</b>	0-6 scores	3,8-6,9 scores	5,42-8,38 scores	6,54-9,1 scores
6	<b>Fundamentals of Radiation Therapy, 6 hours (0.175 Credits) Incl. independent form</b>	0-6 scores	3,8-6,9 scores	5,42-8,38 scores	6,54-9,08 scores
7	<b>Test, Credit 8 hours (0,25 credits)</b>	17 scores	30 scores	39 scores	50 scores
Total	72 hours 2 credits	0-50 scores	51-68 scores	69-85 scores	86-100 scores

4. Examples of questions on Radiology for passing oral control:

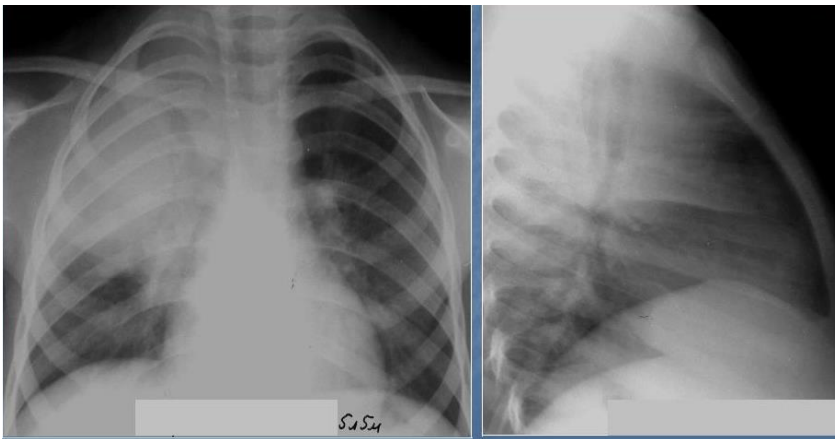
Set of questions N1

1. X-ray images formation in analogue and digital systems
2. Hip joint in radiological methods. Its sarcoma, diagnostics and differential diagnostics
3. Interpret this diagnostic image:



Set of questions N2

1. Principles of imaging in ultrasonography
2. X-ray anatomy of respiratory organs, signs of cancer of the lung
3. Interpret this diagnostic image:





Set of questions N6

1. Principles of PET-CT, radionuclides of it, the rope of PET-CT in oncology.
2. Knee joint in radiological methods. Its sarcoma, diagnostics and differential differential diagnostics
3. Interpret this diagnostic image:



5. Examples of test questions for assessing students' knowledge:

X-ray test questions

1. What are the main properties of X-rays?

- A) Penetration ability
- B) Ionizing property
- C) Photochemical property
- D) Magnetic property

2. What is X-ray tomography?

- A) Layer-by-layer study of an object in the form of a longitudinal section
- B) Layer-by-layer study of an object in the form of a cross-section
- C) Layer-by-layer study of an object in the form of a longitudinal section and a cross section

3. What is bronchography?

- A) The method of artificial contrasting of the bronchi
- B) Computer examination of bronchi
- C) Contrast study of bronchial vessels

4. What is angiography?

- A) Examination of the liver
- B) Study of vessels by contrasting method
- C) Study of the lymphatic system

5. What is magnetic resonance angiography of the brain?

- A) Visualization of cerebral vessels without the introduction of a contrast agent
- B) Layered study of the brain
- C) Study of the phase of blood flow in the brain

6. What is Doppler ultrasound?

- A) Study of the structure of organs
- B) Study of blood flow in arteries and veins
- C) Ultrasound examination of adipose tissue

7. What is contrast X-ray examination?

- A) The introduction of a contrast agent for the differentiation of various organs and tissues
- B) Layer-by-layer examination of organs

8. What is thermography?

- A) A method for diagnosing diseases by registering thermal radiation from various tissues of the human body
- B) Radiography with heating of the examined organ

9. What is electroradiography?

- A) Method of obtaining an X-ray image on paper
- B) Combination of electric and X-ray radiation

10. What method most accurately determines the transition of the process in cancer of the pancreas, bile ducts and large duodenal nipple to the arterial and venous trunks?

- a) angiography
- b) portography
- c) angiocholangiography

Approximate topics of control questions:

1. Types of rays used in diagnostics
2. X-ray tube device
3. Radiotherapy planning
4. Film and filmless radiography.
5. X-ray examination of the stomach.
6. CT scan in the lung diseases.
7. MRI in the diagnosis of pelvic pathology.
8. Contrast research methods in Radiology.
9. Radionuclide studies in thyroid cancer.
10. Combined radionuclide and CT studies.

6. Methodical instructions for students on mastering the discipline (module)

Students are required to attend classes, complete the teacher's assignments, read the recommended literature, etc. During the certification of a student, the quality of work in the classroom, the level of preparation for independent activity in the chosen field, the quality of the teacher's assignments, the ability to independently study the educational material are assessed.

In practical classes in the classroom, the relevant topics are analyzed using multimedia technology (computer, projector).

The main goal of the practical exercises is to study the methods of radiological diagnostics, their use in practical clinical medicine, as well as to master the practical skills of viewing and evaluating X-ray images. Therefore, attending practical classes and working at them with radiographs and presentation models is a duty of students. Missed classes should be worked out.

Independent work of students during extracurricular hours can take place both in the X-ray Department and in the classroom, where the results of modern diagnostic methods and radiographs in all sections of the diagnosis of diseases are presented.

1 Extracurricular independent work of a student includes:

- Studying the material on the textbook, tutorials and presentations.
- Independent study of anatomy and normal radiographs, as well as pathological processes on radiological images.
- Work in the information and educational environment with accessible databases on radiology.

The development of general professional competencies is facilitated by the participation of students in the work of the student society created at the Department of Radiation Diagnostics. The most important task of these public associations is the earliest possible inclusion of the student in the professional medical environment and involvement in scientific activities, the creation of conditions for business cooperation of students with competent professional specialists, as well as for the acquisition of target attitudes by students for a deep and comprehensive mastery of the profession of a general practitioner ...

#### Requirements for mastering topics and assignments for independent work

Independent work outside the classroom can take place both in the classrooms of the department and in the computer class, where students can study material from presentations prepared by the teachers of the department, as well as computer tests.

Extracurricular independent work includes:

study of material from a textbook, study guides on paper and electronic media; preparation of an abstract message on a selected topic; preparation of presentations on radiation diagnostics.

Subjects of abstracts and presentations on radiological diagnostics:

1. Radiation diagnostics of lung diseases.
2. Radiation diagnosis of diseases of the mammary glands.
3. Radiation diagnostics of stomach diseases.
4. Radiation diagnosis of diseases of the esophagus.
5. Radiation diagnostics of diseases of the colon.
6. Radiation diagnosis of skeletal diseases.
7. Radiation diagnosis of thyroid diseases.
8. Radiation diagnosis of heart disease.
9. Radiation diagnosis of soft tissue diseases.

During self-study and work, the student must learn:

1. Properties of various types of radiation, the possibility of radiation research methods in the assessment of various organs, systems, tissues.
2. The schematic structure of the X-ray apparatus, the principles of obtaining X-ray radiation, have an idea of the bremsstrahlung and characteristic radiation.
3. Using the example of the properties of X-ray radiation, to understand the principles of image acquisition in radiation diagnostics.
4. Students should know what are an examination projection and position, to know the principles of acquisition of an X-ray image, the patterns of assigning the necessary projections and positions, and their characteristics.
5. Diagnostic capabilities of various techniques. How to evaluate the X-ray image of the lungs for syndromes reflecting the morphological structures of the lungs.
6. When analyzing the X-ray image of the lungs, to determine the size of the pulmonary field according to the symptoms: Position of the diaphragm, the state of the intercostal spaces, the position of the mediastinal organs.
7. Evaluate the state of the lung parenchyma, considered in the images by the syndrome of "transparency" in the form of its increase, manifested by X-ray enlightenment and a decrease, manifested by X-ray darkening (shadow). To characterize the shadow or enlightenment according to the symptoms adopted in radiology: the number, shape, size, localization, contours, structure, intensity, mobility and adapt them relative to the lungs.

8. To assess the state of the circulatory system of the lungs, revealed by the syndrome "pulmonary (vascular) pattern". Determine the strengthening (enrichment), weakening (depletion) deformation of the pulmonary pattern.

9. To assess the state of the lymphatic system of the lungs, detected by the syndrome "lymph nodes" and represented by the paratracheal, bifurcation, bronchopulmonary group.

10. To assess the state of the bronchial system of the lungs, presented on X-ray images by the syndrome "bronchial patency". Know the symptom complex that characterizes the degree of violation of bronchial obstruction: hypoventilation, valvular emphysema, atelectasis; be able to use the symptom complex when reading an x-ray image of the lungs.

11. Reflect the X-ray examination revealed in the protocol and formulate a conclusion reflecting the disease, its prevalence and localization.

Diagnostic capabilities of various techniques. How to evaluate x-ray examination of the heart and large vessels in the norm. Principles of X-ray imaging of pathology.

12. Diagnostic capabilities of various techniques used for studies of various organs of the digestive system. Principles of diagnostics of the pathology of the digestive tube in the X-ray image.

13. Diagnostic capabilities of each of the techniques used to assess various components of the musculoskeletal system. Signs of recognition of norm and pathology in the X-ray image.

14. Students are informed about various types of radiation and their characteristics (X-rays, gamma radiation, beta radiation, bremsstrahlung, protons and electrons in radiation therapy).

15. Methods of radiation therapy (radical, palliative radiation therapy, external, interstitial, intracavitary, contact, intravenous, single-field and multi-field, small-fractional and large-fractional) and pathological processes in which they are used are considered. Complications of radiation therapy and methods of their prevention and treatment are discussed.

The program is compiled in accordance with the requirements of the FSES HE.

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