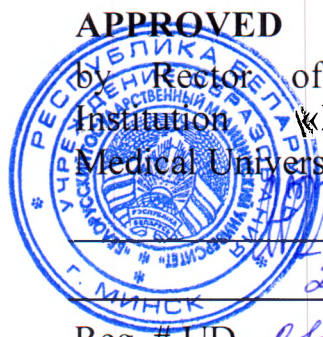


**MINISTRY OF HEALTH OF THE REPUBLIC OF BELARUS**  
Educational Institution  
**BELARUSIAN STATE MEDICAL UNIVERSITY**

**APPROVED**

by Rector of the Educational  
Institution «Belarusian State  
Medical University»

S.P.Rubnikovich



*24.06.2023*

Reg. # UD- *01-25/2324* /edu.

**Контрольный  
экземпляр**

**RADIODIAGNOSIS AND RADIOTHERAPY**

**Curriculum of the educational institution  
in the academic discipline for the specialty**

**1-79 01 01 «General Medicine»**

Curriculum is based on the educational program «Radiodiagnosis and Radiotherapy», approved 27.06.2023, registration # УД-01-25/2324/уч.; on the educational plan in the specialty 7-07-0911-01 «General Medicine», approved 17.05.2023, registration # 7-07-0911-01/2324/mf.

**COMPILERS:**

A.I. Aleshkevich, Head of the Department of Radiation Diagnostics and Radiation Therapy of the Educational Institution «Belarusian State Medical University», Ph.D, Associate Professor;

T.F. Tikhomirova, Associate Professor of the Department of Radiation Diagnostics and Radiation Therapy of the Educational Institution «Belarusian State Medical University», Ph.D, Associate Professor;

G.A. Alesina, Senior Lecturer of the Department of Radiation Diagnostics and Radiation Therapy of the Educational Institution «Belarusian State Medical University»

**RECOMMENDED FOR APPROVAL:**

by the Department of Radiation Diagnostics and Radiation Therapy of the educational institution «Belarusian State Medical University»  
(protocol # 23 of 12.05.2023);

by the Scientific and Methodological Council of the educational institution «Belarusian State Medical University»  
(protocol # 6 of 27.06.2023)

## EXPLANATORY NOTE

«Radiodiagnosis and Radiotherapy» is an academic discipline of the module «Therapy Module 1», which contains systematized scientific knowledge about the methods of radiodiagnosis and radiotherapy used in medicine.

The purpose of the discipline «Radiodiagnosis and Radiotherapy» is the formation of specialized competencies for examining patients using radiation diagnostic methods, identifying the main radiation symptoms and syndromes of human diseases with the complex use of radiation imaging and radiation therapy techniques.

The objectives of the discipline «Radiodiagnosis and Radiotherapy» are to form students' scientific knowledge about the diagnostic capabilities of radiodiagnosis methods; basic concepts of radiation diagnostics, radiation symptoms and syndromes, about the algorithm for using radiation studies in identifying pathological processes in internal organs, bones and joints; about the basic principles and methods of radiation therapy of malignant neoplasms and non-tumor diseases; skills and abilities required for:

determination of the method of radiation diagnostics, projection and area of study;

interpretation of the results of radiodiagnosis methods;

formulation of the conclusion on the results of radiation methods of research.

The knowledge, skills and abilities gained in the study of the discipline «Radiodiagnosis and Radiotherapy» are necessary for the successful study of the following disciplines: «Internal Diseases», «Surgical Diseases», «Traumatology and Orthopedics», «Neurology and Neurosurgery», «Disaster Medicine», «Phthisiopulmonology», «Endocrinology» and etc.

Studying the educational discipline «Radiodiagnosis and Radiotherapy» should ensure the formation of students' specialized competence:

SC. Examine patients' condition applying radiation diagnostic methods, identify the main radiation symptoms and syndromes of human diseases applying the combined radiation imaging techniques and radiotherapy.

As a result of studying the discipline «Radiodiagnosis and Radiotherapy», the student should

**know:**

types and properties of ionizing radiation;

principles of protection against exposure to ionizing radiation;

physical and technical foundations of radiation diagnostics and radiation therapy;

diagnostic capabilities of radiation imaging methods;

symptoms and syndromes of pathological processes of internal organs, bones and joints, detected using various methods of radiation diagnostics;

**be able to:**

plan and conduct communication;

analyze normative legal acts regulating legal relations related to the provision

of medical care;

determine indications and contraindications for radiological research methods;  
determine the method of radiation diagnostics, projection and area of study;  
interpret the results of various methods of radiation diagnostics;

**master:**

the skills of registration of the protocol of research;  
the skills of formulating a conclusion based on the data obtained as a result of radiological research methods.

**Total number** of hours for the study of the discipline is 138 academic hours. Classroom hours according to the types of studies: lectures – 20 hours (including 7 hours of supervised self-study), laboratory studies - 66 hours, student independent work (self-study) – 52 hours.

Intermediate assessment is carried out according to the syllabus of the specialty in the form of a differentiated credit (6 semester).

The form of education is full-time.

### ALLOCATION OF ACADEMIC TIME ACCORDING TO SEMESTERS OF STUDY

Cipher, name specialty	semester	Number of academic hours						Form of intermediate assessment
		Total	in-class	including			out-of-class self-studies	
				lectures (including supervised independent work)	supervised student independent work	practical classes		
1-79 01 01 «General Medicine»	5	68	45	12	4	33	23	differentiated credit
	6	70	41	8	3	33	29	

## THEMATIC PLAN

Section (topic) name	Number of class hours	
	lectures	practical classes
<b>1. Radiation Therapy</b>	<b>4</b>	<b>9</b>
1.1. Physical and biological bases of radiation diagnostics and radiation therapy	2	3
1.2. Principles and methods of radiation therapy	2	6
<b>2. Radiation Diagnostics</b>	<b>16</b>	<b>57</b>
2.1. Fundamentals and principles of radionuclide diagnostics	2	3
2.2. Radionuclide diagnostics in clinical medicine. Radionuclide study of the liver and kidneys	-	9
2.3. Physical and technical fundamentals and clinical application of ultrasound diagnostics	2	6
2.4. Physical and technical fundamentals and clinical application of computed tomography and magnetic resonance imaging	2	6
2.5. Methods of radiation diagnostics: classification and main characteristics. X-ray methods of research	2	6
2.6. Radiation methods for the study of the musculoskeletal system. X-ray semiotics of traumatic injuries of bones and joints	2	3
2.7. X-ray semiotics of pathological processes of bones and joints. X-ray signs of inflammatory diseases, benign and malignant neoplasms of bones and joints	2	6
2.8. Radiation methods for examining the of the thoracic cavity organs. X-ray anatomy of the thoracic cavity organs. X-ray semiotics of pathological processes of the thoracic cavity organs	2	9
2.9. Radiation methods for studying the digestive system. X-ray anatomy of the gastrointestinal tract. X-ray semiotics of the gastrointestinal tract diseases	2	9
<b>Total hours</b>	<b>20</b>	<b>66</b>

## CONTENT OF EDUCATIONAL MATERIAL

### 1. RADIATION THERAPY

#### 1.1. Physical and biological bases of radiation diagnostics and radiation therapy

Introduction to the discipline «Radiodiagnosis and radiotherapy». A short history of radiology. The place of radiation diagnostics and radiation therapy in the complex of medical knowledge and its connection with other sciences. Law of radioactive decay. Types of decays. Radiation and sources used in medicine, their

nature and properties. Fundamentals and principles of dosimetry. The concept of doses. Units of dose, dose rate and radioactivity. Tasks of the dosimetric service. Principles of protection against the harmful biological effects of ionizing radiation.

### **1.2. Principles and methods of radiation therapy**

Determination of indications, absolute and relative contraindications for radiation therapy. Principles of radiation therapy of malignant tumor and non-tumor processes. Classification of methods of radiation therapy. Rationale for the choice of method and devices used. The principle of choosing the type of treatment and the definition of therapeutic methods of exposure (complexes). Choice of radiation exposure parameters: mode and method of irradiation, total absorbed dose, irradiation rhythm. Complications of radiation therapy: radiation reactions and radiation damage.

Drawing up a plan for radiation therapy of malignant tumors.

## **2. RADIATION DIAGNOSTICS**

### **2.1. Fundamentals and principles of radionuclide diagnostics**

Definition of a radiopharmaceutical product (RP or labeled compound). Requirements for radiopharmaceuticals and their sources. Classification of methods of radionuclide diagnostics. Indications and contraindications for the study. Structure and equipment of the department of radionuclide diagnostics, organization of work in it. High-tech methods of radionuclide diagnostics: single-photon emission computed tomography (SPECT), positron emission tomography (PET).

### **2.2. Radionuclide diagnostics in clinical medicine. Radionuclide study of the liver and kidneys**

Radionuclide diagnostics in clinical medicine. Methods of radionuclide diagnostics in cardiology, pulmonology, endocrinology and oncology. Indications and diagnostic possibilities of application.

Methods of radionuclide diagnostics for assessing the functional and morphological state of the liver and kidneys. Indications for the study. Indicators of the functional and morphological state in normal and pathological conditions.

Analysis of the results of radionuclide diagnostics of the liver, kidneys, thyroid gland, skeleton, cardiovascular system.

### **2.3. Physical and technical fundamentals and clinical application of ultrasound diagnostics**

Physical fundamentals of ultrasound. Frequency of ultrasonic vibrations, period and wavelength. Characteristics of ultrasonic waves, their properties (penetrating power, reflection, absorption, scattering). Definition of indications for ultrasound examination. Possibilities of ultrasonic methods in the study of morphology and function of organs. The role of the ultrasound method in the study of children and pregnant women. Formation of an ultrasound image. Piezo effect. Resolution of ultrasonic sensors, their types. The general scheme of the echo-pulse ultrasonic device and devices for dopplerography. The main terms used in the ultrasound examination: echo-negative formation, echo-positive formation, acoustic shadow.

Algorithm for describing the ultrasound image.

#### **2.4. Physical and technical fundamentals and clinical application of computed tomography and magnetic resonance imaging**

Physical and technical fundamentals of computed tomography (CT). Definition of indications and contraindications for CT. Dose loads and radiation protection in CT. Computed tomographic semiotics of pathological changes in the brain and spinal cord, lungs and mediastinum, parenchymal organs.

Physico-technical foundations of magnetic resonance imaging (MRI). Determination of indications and contraindications for magnetic resonance MRI. Magnetic resonance imaging semiotics of pathological changes in the organs of the brain and spinal cord, chest organs, liver, kidneys, soft tissues.

Analysis of the results obtained during computed and magnetic resonance imaging in patients with diseases of the brain and spinal cord, lungs and mediastinum, parenchymal organs.

#### **2.5. Methods of radiation diagnostics: classification and main characteristics. X-ray methods of research**

The role and importance of radiation diagnostics in solving professional problems and its place in the system of medical education and training of doctors. Classification and main characteristics of methods of radiation diagnostics. X-ray machine. X-ray equipment. X-ray properties used for diagnostic purposes. The principle of radiography. Characterization of the X-ray image.

Definition and analysis of basic and special methods of X-ray examination.

#### **2.6. Radiation methods for studying the musculoskeletal system. X-ray semiotics of traumatic injuries of bones and joints**

Methods of X-ray examination of bones and joints. Radiation anatomy of the musculoskeletal system by norm. Projections of the study of bones and joints. Classification of fractures and dislocations of bones. X-ray semiotics of traumatic injuries of bones and joints. Features of injuries in childhood and old age. Healing of bone fractures in the radiological image. X-ray diagnostics of complications of healing of traumatic injuries of bones and joints.

Analysis of the results of the study and the method of describing x-ray images in traumatic injuries of bones and joints.

#### **2.7. X-ray semiotics of pathological processes of bones and joints. X-ray signs of inflammatory diseases, benign and malignant neoplasms of bones and joints**

X-ray semiotics of pathological processes of bones and joints: changes in bone shape, bone size, bone structure, x-ray joint space. X-ray symptoms of inflammatory diseases of the skeleton (osteomyelitis, tuberculosis of bones and joints). X-ray signs of benign and primary malignant bone tumors. X-ray signs of secondary malignant bone lesions.

Analysis of the results of the study and a method for describing x-ray images in inflammatory diseases of bones and joints (osteomyelitis, tuberculosis of bones and joints), benign and malignant tumors of bones and joints.

**2.8. Radiation methods for examining the thoracic cavity organs. X-ray anatomy of the thoracic cavity organs. X-ray semiotics of pathological processes of the thoracic cavity organs**

Anatomy of the organs of the chest cavity. Methods of radiation research. Interpretation of the most important radiological syndromes of lung diseases: extensive and limited darkening (enlightenment) of the lung field, focal, round and annular shadow, pulmonary dissemination, pathological changes in the root and lung pattern, impaired bronchial patency. Radiation diagnostics in traumatic injuries and emergency conditions of the organs of the chest cavity. Foreign bodies of the bronchi.

Algorithm for analysis of radiographs of the lungs. Drawing up a protocol for examining the chest organs in normal and pathological conditions.

**2.9. Radiation methods for studying the digestive system. X-ray anatomy of the gastrointestinal tract. X-ray semiotics of the gastrointestinal tract diseases**

X-ray anatomy of the gastrointestinal tract. Methods of X-ray examination of the esophagus, stomach, duodenum, small and large intestines. Method of double and triple contrasting. pharmacological tests. Interpretation of the main radiological syndromes and symptoms of pathological changes in the esophagus, stomach, duodenum, small and large intestines. Urgent X-ray diagnostics of foreign bodies. X-ray diagnostics of pathological changes in the esophagus, stomach, small and large intestines of emergency conditions of the abdominal cavity.

Determination of radiation studies methods of the gastrointestinal tract. Algorithm for protocol registration for the study of the abdominal organs.



## EDUCATIONAL AND METHODOLOGICAL CARD

Section number, topic	Section name, topic	Number of classroom hours			Student's independent work	Forms of knowledge control
		Lectures (including GIW)	GIW	practical		
<b>5th semester</b>						
<b>1. Radiation Therapy</b>		<b>4</b>	<b>1,5</b>	<b>9</b>	<b>7</b>	
1.1 Physical and biological bases of radiation diagnostics and radiation therapy		2	1	3	2	Oral examinations; control questioning
1.2 Principles and methods of radiotherapy		2	0,5	-	1	
Principles of radiation therapy. Indications, contraindications of radiation therapy				3	2	Control questioning, conference reports
Radiation therapy methods. Complications of radiation therapy				3	2	Interviews, situational tasks, computer tests; conference reports
<b>2. Radiation Diagnostics</b>		<b>16</b>	<b>5,5</b>	<b>57</b>	<b>45</b>	
2.1 Fundamentals and principles of radionuclide diagnostics		2	0,5	3	2	Control questioning; computer tests
2.2 Radionuclide diagnostics in clinical medicine		-	-	3	2	Control questioning; conference reports
Radionuclide study of the liver		-	-	3	1	Control questioning; situational tasks
Radionuclide study of the kidneys		-	-	3	1	Control questioning; situational tasks
2.3 Physical and technical fundamentals and clinical application of ultrasound diagnostics		2	0,5	-	1	

	Physical and technical fundamentals of ultrasound diagnostics	-	-	3	2	Control questioning; reports	conference
	Possibilities of ultrasound techniques in studying the morphology and function of organs. Application of ultrasound in medicine	-	-	3	1	Oral quiz, control questioning, situational tasks, computer tests	
2.4	Physical and technical fundamentals and clinical application of computed tomography and magnetic resonance imaging	2	0,5	-	1		
	Physical and technical foundations and clinical application of computed tomography	-	-	3	2	Situational tasks, conference reports, written classroom practical exercises	
	Physical and technical foundations and clinical application of magnetic resonance imaging	-	-	3	1	Oral quiz, control questioning, situational tasks, computer tests	
2.5	Methods of radiation diagnostics: classification and main characteristics. X-ray methods of research	2	1	-	1		
<b>6th semester</b>							
2.5	Radiation diagnostic methods. Application in medicine. Structure of the X-ray department. X-ray equipment. X-ray research methods	-	-	3	2	Oral quiz, control questioning, computer tests	
2.6	Radiation methods for studying the osteoarticular system. X-ray semiotics of traumatic injuries of bones and joints	2	0,5	3	3	Control questioning, situational tasks	
2.7	X-ray semiotics of pathological processes of bones and joints. X-ray signs of inflammatory diseases, benign and malignant neoplasms of bones and joints	2	0,5	-	1		
	X-ray semiotics of pathological processes of bones and joints	-	-	3	2	Control questioning, practical exercises, written situational tasks	
	X-ray signs of inflammatory diseases, benign and malignant neoplasms of bones and joints	-	-	3	3	Control questioning; situational tasks; computer tests	
2.8	Radiation methods for examining of the thoracic cavity organs. X-ray anatomy of the thoracic cavity organs. X-ray semiotics of the thoracic cavity organs	2	1	-	1		

	pathological processes								
	Radiation methods for examining of the thoracic cavity organs. X-ray anatomy of the thoracic cavity organs	-	-	3	2			Control questioning	
	X-ray semiotics of the thoracic cavity organs pathological processes	-	-	3	2			Situational tasks, written classroom practical exercises	
	Radiation diagnostics for traumatic injuries and the chest organs emergency conditions	-	-	3	2			Situational tasks; computer tests	
2.9	Radiation methods for studying of the digestive system organs. X-ray anatomy of the gastrointestinal tract. X-ray semiotics of the gastrointestinal tract diseases.	2	1	-	1				
	Radiation methods for studying the esophagus and stomach. X-ray anatomy of the esophagus and stomach. X-ray semiotics of the esophagus and stomach diseases	-	-	3	2			Control questioning; situational tasks	
	Radiation methods for studying the small and large intestines. X-ray anatomy of the small and large intestine. X-ray semiotics of the small and large intestine diseases	-	-	3	2			Control questioning; situational tasks; computer tests	
	Final lesson on sections «Radiation therapy», «Radiation diagnostics»	-	-	3	4			Differentiated credit	
		<b>20</b>	<b>7</b>	<b>66</b>	<b>52</b>				

8. Interpretation of the ultrasound examination results in patients with the thyroid gland diseases.
9. Interpretation of ultrasound results in patients with gallbladder diseases.
10. Interpretation of the x-ray examination results for traumatic injuries of bones and joints and drawing up a research protocol.
11. Interpretation of the x-ray examination results for inflammatory diseases of bones and joints (osteomyelitis - acute, chronic; tuberculosis).
12. Interpretation of the x-ray examination results for benign and primary malignant neoplasms of bones and joints.
13. Interpretation of the x-ray examination results for emergency conditions of the abdominal cavity and drawing up a research protocol.
14. Interpretation of the x-ray examination results for gastric ulcer.
15. Interpretation of the x-ray examination results for benign and malignant neoplasms of the stomach.
16. Interpretation of the x-ray examination results for benign and malignant neoplasms of the large intestine.
17. Interpretation of the CT examination results of patients with traumatic brain injuries (epidural and subdural hematomas of the brain).
18. Interpretation of the radionuclide methods results radionuclide methods for studying the liver.
19. Interpretation of the radionuclide methods results of for studying the kidneys.

### **LIST OF EQUIPMENT USED**

1. Negatoscopes.
2. Computers.
3. Tablets.
4. Sets of X-ray images.
5. Sets of scanograms and scintigrams.
6. Sets of illustrations with the gamma chronography results of the liver and kidneys.
7. Sets of illustrations of ultrasound examinations.
8. Sets of illustrations of the computer and magnetic resonance imaging results.

### **LIST OF LECTURES**

#### **5th semester**

1. Physical and biological bases of radiation diagnostics and radiation therapy.
2. Principles and methods of radiation therapy.
3. Fundamentals and principles of radionuclide diagnostics.
4. Physical and technical fundamentals and clinical application of ultrasound diagnostics.
5. Physical and technical fundamentals and clinical application of computed tomography and magnetic resonance imaging.
6. Radiation diagnostic methods. X-ray research methods.

## INFORMATION AND INSTRUCTIONAL UNIT

### LITERATURE

#### **Basic (relevant):**

1. Diagnostic radiology : textbook/ G. E. Trufanov, R. M. Akiev, K. N. Alekseev [et al.]; ed. G. E. Trufanov. – Moscow : GEOTAR-Media, 2021. – 444 p.
2. Овчинников, В. А. Лучевая диагностика и лучевая терапия = Radiology and radiotherapy : textbook: учебное пособие для студентов факультета иностранных учащихся с английским языком обучения / В. А. Овчинников – Минск : Новое знание, 2020. – 504 с.

#### **Additional:**

3. Ермолицкий, Н. М. Лучевая диагностика и лучевая терапия = Radiology : учеб. пособие для иностр. студентов. В 2 ч. Ч. 1. Основы лучевой диагностики / Н. М. Ермолицкий. – Гомель : ГомГМУ, 2022. – 164 с.
4. Ермолицкий, Н. М. Лучевая диагностика и лучевая терапия = Radiology : учеб. пособие для иностр. студентов. В 2 ч. Ч. 2. Основы лучевой диагностики / Н. М. Ермолицкий. – Гомель : ГомГМУ, 2022 – 155 с.

### METHODOLOGICAL RECOMMENDATIONS FOR THE ORGANIZATION AND PERFORMANCE OF STUDENT INDEPENDENT WORK IN THE ACADEMIC DISCIPLINE

The time allotted for independent work can be used by students to:

- preparation for lectures, practical exercises;
- preparation for the test in the academic discipline;
- study of topics (questions) submitted for independent study;
- solution of practical problems;
- performance of research and creative tasks;
- preparation of thematic reports, abstracts, presentations;
- implementation of practical tasks;
- note-taking of educational literature;
- compiling a review of scientific literature on a given topic;
- design of information and demonstration materials (stands, posters, graphics, tables, newspapers, etc.);
- compiling a thematic selection of literary sources, Internet sources.

### METHODOLOGICAL RECOMMENDATIONS FOR THE ORGANIZATION AND PERFORMANCE OF SUPERVISED STUDENT INDEPENDENT WORK IN THE ACADEMIC DISCIPLINE

#### **Main forms of supervised student independent work:**

- preparation and presentation of abstracts;
- presentation of reports;
- studying topics and problems that have not been discussed at the lectures;
- participation in active forms of education;
- computer testing.

**Control of supervised student independent work is carried out in the form of:**  
 test paper;  
 final class, colloquium in the form of an oral interview, written work, testing;  
 discussion of abstracts;  
 checking up abstracts, written reports, accounts, prescriptions;  
 individual interview;  
 checking up notes of original sources, monographs and articles.

#### **LIST OF AVAILABLE DIAGNOSTIC TOOLS**

The following forms are used for competences assessment:

##### **Oral form:**

interviews;  
 quiz;  
 conference reports  
 situational tasks.

##### **Written form:**

control questioning;  
 written classroom practical exercises.

##### **Oral-written form:**

differentiated credit.

##### **Technical form:**

computer tests.

#### **LIST OF AVAILABLE TEACHING METHODS**

Traditional method (lecture, practicals);

Active (interactive) methods:

- Problem-Based Learning (PBL);
- Team-Based Learning (TBL);
- Case-Based Learning (CBL);
- Research-Based Learning (RBL).

#### **LIST OF PRACTICAL SKILLS**

1. Interpretation of the x-ray examination results of the chest organs in limited shadow syndrome.
2. Interpretation of the x-ray examination results of the chest organs in case of round shadow syndrome.
3. Interpretation of the x-ray examination results of the chest organs in case of ring-shaped shadow syndrome.
4. Interpretation of the x-ray examination results of the chest organs in case of extensive (total, subtotal) shadow syndrome.
5. Interpretation of the x-ray examination results of the chest organs in of the extensive pulmonary dissemination syndrome.
6. Interpretation of the x-ray examination results of the chest organs in case of total (subtotal) radiolucent syndrome.
7. Interpretation of X-ray results in emergency conditions of the chest organs.

8. Interpretation of the ultrasound examination results in patients with the thyroid gland diseases.
9. Interpretation of ultrasound results in patients with gallbladder diseases.
10. Interpretation of the x-ray examination results for traumatic injuries of bones and joints and drawing up a research protocol.
11. Interpretation of the x-ray examination results for inflammatory diseases of bones and joints (osteomyelitis - acute, chronic; tuberculosis).
12. Interpretation of the x-ray examination results for benign and primary malignant neoplasms of bones and joints.
13. Interpretation of the x-ray examination results for emergency conditions of the abdominal cavity and drawing up a research protocol.
14. Interpretation of the x-ray examination results for gastric ulcer.
15. Interpretation of the x-ray examination results for benign and malignant neoplasms of the stomach.
16. Interpretation of the x-ray examination results for benign and malignant neoplasms of the large intestine.
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18. Interpretation of the radionuclide methods results radionuclide methods for studying the liver.
19. Interpretation of the radionuclide methods results of for studying the kidneys.

### **LIST OF EQUIPMENT USED**

1. Negatoscopes.
2. Computers.
3. Tablets.
4. Sets of X-ray images.
5. Sets of scanograms and scintigrams.
6. Sets of illustrations with the gamma chronography results of the liver and kidneys.
7. Sets of illustrations of ultrasound examinations.
8. Sets of illustrations of the computer and magnetic resonance imaging results.

### **LIST OF LECTURES**

#### **5th semester**

1. Physical and biological bases of radiation diagnostics and radiation therapy.
2. Principles and methods of radiation therapy.
3. Fundamentals and principles of radionuclide diagnostics.
4. Physical and technical fundamentals and clinical application of ultrasound diagnostics.
5. Physical and technical fundamentals and clinical application of computed tomography and magnetic resonance imaging.
6. Radiation diagnostic methods. X-ray research methods.

**6th semester**

1. Radiation methods for studying the osteoarticular system. X-ray semiotics of traumatic injuries of bones and joints.
2. X-ray semiotics of pathological processes of bones and joints. X-ray signs of inflammatory diseases, benign and malignant neoplasms of bones and joints.
3. Radiation methods for examining the of the thoracic cavity organs. X-ray semiotics of pathological processes of the thoracic cavity organs.
4. Radiation methods for studying the digestive system. X-ray anatomy of the gastrointestinal tract. X-ray semiotics of the gastrointestinal tract diseases.

**LIST OF PRACTICAL STADIES****5th semester**

1. Physical and biological basis of radiation diagnostics and radiation therapy.
2. Principles of radiation therapy. Indications, contraindications.
3. Methods of radiation therapy. Complications of radiation therapy.
4. Fundamentals and principles of radionuclide diagnostics.
5. Radionuclide diagnostics in medicine.
6. Radionuclide study of the liver.
7. Radionuclide study of the kidneys.
8. Physical and technical fundamentals of ultrasound examination.
9. Possibilities of ultrasound techniques in studying the morphology and function of organs. Application of ultrasound in medicine.
10. Physical and technical fundamentals of computed tomography. Application in medicine.
11. Physical and technical principles of magnetic resonance imaging. Application in medicine.

**6th semester**

1. Radiation diagnostic methods. Application in medicine. Construction of the X-ray department. X-ray equipment.
2. X-ray research methods
3. Radiation methods for studying the osteoarticular system. X-ray semiotics of traumatic injuries of bones and joints.
4. X-ray semiotics of pathological processes of bones and joints.
5. X-ray signs of inflammatory diseases, benign and malignant neoplasms of bones and joints
6. Radiation methods for examining the organs of the chest cavity. X-ray anatomy of the chest organs.
7. X-ray semiotics of pathological processes of the thoracic cavity organs.
8. Radiation diagnostics for traumatic injuries and emergency conditions of the chest organs.
9. Radiation methods for studying the esophagus and stomach. X-ray anatomy of the esophagus and stomach. X-ray semiotics of diseases of the esophagus and stomach.
10. Radiation methods for studying the small and large intestines. X-ray anatomy of the small and large intestine. X-ray semiotics of diseases of the small and large intestine.
11. Final lesson on sections «Radiation therapy», «Radiation diagnostics».



**PROTOCOL OF THE CURRICULUM APPROVAL  
BY OTHER DEPARTMENTS**

Title of the discipline requiring approval	Department	Amendments to the curriculum in the academic discipline	Decision of the department, which designed the curriculum (date, protocol #)
Internal Diseases	1-st Department of Internal Diseases	No comments	Protocol # 23 of 12.05.2023
Neurology and Neurosurgery	Department of Nervous and Neurosurgical Diseases	No comments	Protocol # 23 of 12.05.2023
Phthisiopulmonology	Department of Phthisiopulmonology	No comments	Protocol # 23 of 12.05.2023

**COMPILERS/AUTHORS:**

Head of the department of radiation diagnosis and radiation therapy, educational institution “Belarusian State Medical University”, PhD, Associate Professor



signature

A.I. Aleshkevich


Associate Professor of the department of radiation diagnosis and radiation therapy, educational institution “Belarusian State Medical University”, PhD, Associate Professor



signature

T.F. Tikhomirova

Senior Lecturer of the department of radiation diagnosis and radiation therapy, educational institution “Belarusian State Medical University”



signature

G.A. Alesina

Curriculum content, composition and the accompanying documents comply with the established requirements.

Dean of the Medical Faculty for International Students of the educational institution «Belarusian State Medical University»

24.06.2023



O.S. Ishutin

Methodologist of the educational institution «Belarusian State Medical University»

24.06.2023



S.V. Zaturanova