

INSTITUTE OF ENGINEERING PHYSICS FOR BIOMEDICINE

APPROVED ИТС ИФИБ

Protocol No. 3.1

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**ACADEMIC COURSE OUTLINE**

ЛУЧЕВАЯ ДИАГНОСТИКА / RADIODIAGNOSTICS

Educational program track (speciality) [1] 31.05.01 General Medicine

<b>Semester</b>	<b>Labour input, credits</b>	<b>Total course academic, hours</b>	<b>Lectures, hrs.</b>	<b>Practical sessions, hrs.</b>	<b>Laboratory sessions, hrs.</b>	<b>In the form of practical studies, hrs.</b>	<b>Independent studies, hrs.</b>	<b>Independent studies monitoring, hrs.</b>	<b>Course progress, Exam/Pass-fail exam/Term</b>
5	3	108	18	36	0		54	0	PFE
Total	3	108	18	36	0	36	54	0	

## **ABSTRACT**

The purpose of this course is to teach students how to use radiological methods in clinical practice to establish a diagnosis, recognize normal and abnormal conditions, and understand the diagnostic capabilities of each method before referring a patient for examination. For more severe conditions, they will also be able to independently interpret the results of radiological examinations, including digital fluoroscopy, computed tomography, ultrasound, magnetic resonance imaging, radionuclide studies, and others, and skillfully rely on the findings of specialists in the field of radiological diagnostics to substantiate a diagnosis and solve professional problems.

This course does not cover the treatment of diseases using radiation therapy, as it will be included in a separate course.

### **1. ACADEMIC COURSE GOALS AND OBJECTIVES**

Course purpose:

To develop professional knowledge, skills, and abilities in the application and interpretation of modern radiological diagnostic methods for the purpose of establishing a diagnosis.

Objectives:

- To familiarize students with the organization of radiological diagnostic departments in medical organizations;
- To study the regulations for radiological diagnostic examinations and the principles of protection from ionizing radiation;
- To study the principles of image acquisition using various types of radiation, magnetic fields, etc.
- To study the methods and principles of patient examination using radiological methods; the diagnostic capabilities of various radiological diagnostic methods;
- To study normal human radiological anatomy;
- To acquire the skills and abilities to recognize radiological symptoms and syndromes of the main pathological conditions of human organs and systems;
- Acquiring skills and mastering the ability to assess a patient's condition based on static and dynamic images of internal organs obtained using radiological diagnostics, as well as the ability to examine a patient and interpret the results of modern radiological diagnostic methods to establish a diagnosis;
- Developing students' fundamental clinical reasoning skills based on the analysis of radiographic images for future medical practice.

### **2. PLACE OF THE ACADEMIC COURSE IN THE MAIN HIGHER EDUCATION CURRICULUM**

The course is preceded by the study of the following disciplines: Medical and Biological Physics, Anatomy, Topographic Anatomy and Operative Surgery, Normal Physiology, Medical Informatics, Radiobiology, Biology, and Latin.

This course is studied in the third year. The following disciplines and practical training are a logical continuation of the course "Radiology/Radiodiagnostics": Radiopharmaceuticals, Radiology and Radiotherapy, and Internship in Diagnostics.

The knowledge, skills, and abilities acquired through mastering this course are essential for mastering all clinical disciplines included in the educational program.

### 3. DEVELOPED COMPETENCIES AND INTENDED LEARNING OUTCOMES

Universal and/or general professional competencies:

<b>Competency code and title</b>	<b>Code and title of competency-based rubrics</b>
OPIK-4 [1] – Capable of using medical devices stipulated by the medical care procedures, as well as conducting patient examination for diagnosis establishment.	<p>3-OPIK-4 [1] – Know: - modern diagnostic instrumental examination methods for patients, including functional, radiological, ultrasound, radionuclide diagnostics, and endoscopy; - diagnostic capabilities of instrumental examination methods; - medical devices stipulated by the procedure for providing medical care to the adult population in the "Therapy" specialty, and the equipment standard for a therapeutic room; - main medical devices stipulated by the procedures for providing medical care to the adult population in major surgical specialties, obstetrics, and gynecology; - indications for referring patients for instrumental examinations and functional diagnostics; - techniques for physical examination of patients using medical devices stipulated by procedures and considering medical care standards</p> <p>Y-OPIK-4 [1] – Be able to: - use medical devices stipulated by the medical care procedure; - determine the required volume and content of instrumental and functional diagnostics to establish a diagnosis; - interpret results of the most common functional and instrumental diagnostic methods</p> <p>B-OPIK-4 [1] – Possess skills in: - using basic medical devices (stethoscope, blood pressure monitor, sphygmomanometer, pulse oximeter, height-weight scale, measuring tape, neurological hammer, scalpel, forceps, and other devices); - operating electrocardiographs and devices for measuring external respiratory function; - interpreting results of the most common functional and instrumental diagnostic methods</p>

Professional competencies in compliance with the goals and professional knowledge areas:

<b>Professional activity goal</b>	<b>Professional activity knowledge area</b>	<b>Professional competency code and title; Based on the professional standard, experience analysis</b>	<b>Code and title of competency-based rubrics</b>
medical			
Diagnostics of diseases and pathological conditions of the patients.	Individuals (patients); the population; the set of means and technologies aimed at creating conditions for	IPIK-3.2 [1] - Capable of conducting patient examinations to establish a diagnosis	3-IPIK-3.2[1] - Know: - clinical diagnosis establishment algorithm; - patient history-taking and physical examination

	<p>preserving and strengthening the health of the adult population</p>	<p><i>The base:</i> Professional standard: 02.009</p>	<p>methodology; - laboratory and instrumental research methods for health assessment to establish a diagnosis; - semiotics of diseases of different organs and systems; - structure, principles of the current International Statistical Classification of Diseases and Related Health Problems (hereinafter - ICD).; Y-ΠK-3.2[1] - Be able to: - conduct patient history-taking and physical examination; - interpret history, physical examination data, laboratory and instrumental results to recognize a condition or establish the presence/absence of a disease, establish a diagnosis; - distinguish and recognize in each specific case tissue damage, the reaction to it, and the form of adaptability; - develop a patient examination plan, justify the necessity and scope of laboratory and instrumental examination; - identify main pathological conditions, symptoms and syndromes, nosological forms in the patient according to the current ICD.; B-ΠK-3.2[1] - Possess skills in: - patient history-taking and physical examination; Formulating a preliminary diagnosis; - developing a patient examination plan; Interpreting laboratory and instrumental results; - establishing a diagnosis considering the current ICD</p>
<p>Providing primary</p>	<p>Individuals (patients);</p>	<p>ΠK-3.3 [1] - Able to</p>	<p>3-ΠK-3.3[1] - Know: -</p>

<p>medical care in outpatient settings and day hospital settings.</p>	<p>the population; the set of means and technologies aimed at creating conditions for preserving and strengthening the health of the adult population</p>	<p>provide primary medical care in an outpatient setting</p> <p><i>The base:</i> Professional standard: 02.009</p>	<p>general issues of organizing medical care for the population and organizing medical care for the adult population in outpatient settings, including at home; - features of medical care using telemedicine technologies; - Clinical picture, differential diagnosis, features of the course of the disease, complications and outcomes of internal diseases; - diagnostic criteria for the most common diseases of internal organs and systems; - indications for referring patients for specialist consultations according to clinical guidelines and considering relevant medical care standards; - indications for referring patients for specialized medical care in inpatient settings and day hospitals according to clinical guidelines and considering relevant medical care standards; - features of managing and treating elderly patients in outpatient settings. ; У-ПК-3.3[1] - Be able to: - perform differential diagnosis of internal diseases; - monitor the course of physiological pregnancy; - justify the need for referring patients to specialist consultations; - recognize the main and concomitant diseases; - assess disease or condition severity - the degree of organ and/or system damage or functional impairment due to the disease/condition or its</p>
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			<p>complications; - determine management, examination and treatment tactics for patients with specific diseases (nosological units) depending on disease severity and condition, according to clinical guidelines and considering relevant medical care standards.;</p> <p>B-IIK-3.3[1] - Possess skills in: - conducting differential diagnosis with other diseases/conditions, including emergencies; - interpreting data obtained from patient consultations with specialists; - prescribing additional tests to clarify the diagnosis; - formulating a clinical diagnosis; - prescribing treatment according to clinical guidelines and considering relevant medical care standards.</p>
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#### 4. PEDAGOGIC POTENTIAL OF THE COURSE

Pedagogic tracks/objectives	Pedagogic goals (code)
Professional education	Establishing conditions for: formation of responsibility for professional choice, professional development and professional decisions (B18)
Professional education	Establishing conditions for: formation of motivation to improve the quality of medical care to the population and the desire to follow the rules and norms of interaction between the doctor, colleagues and the patient, contributing to the creation of the most favorable environment for the patient's recovery (B34)

#### 5. ACADEMIC COURSE STRUCTURE AND CONTENT

Academic course sections, their scope, terms of study and assessment:

No.	Academic course section name	Weeks	Lectures/ Practical (seminars)/ Laboratory sessions, hrs.	Compulsory current assessment (form*, week)	Maximum grade per section**	Section assessment (form*, week)	Competency-based rubrics
	<i>5 Semester</i>						
1	The First Section	1-8	9/18/0	T-8 (25)	25	T-8	3-ОПК-4, У-ОПК-4, В-ОПК-4, 3-ПК-3.2, У-ПК-3.2, В-ПК-3.2, 3-ПК-3.3, У-ПК-3.3, В-ПК-3.3
2	The Second Section	9-16	9/18/0	T-15 (25)	25	T-15	3-ОПК-4, У-ОПК-4, В-ОПК-4, 3-ПК-3.2, У-ПК-3.2, В-ПК-3.2, 3-ПК-3.3, У-ПК-3.3, В-ПК-3.3
	<i>Totals for 5 Semester</i>		18/36/0		50		
	<b>Assessment events for 5 Semester</b>				50	PFE	3-ОПК-4, У-ОПК-4, В-ОПК-4, 3-ПК-3.2, У-ПК-3.2, В-ПК-3.2, 3-ПК-3.3, У-ПК-3.3, В-ПК-3.3

\* – abbreviated name of assessment

\*\* – 100 maximum points per semester including a pass/fail exam and (or) an exam

Abbreviated current assessment forms and section assessment

Abbreviation	Full name
T	Testing
PFE	Pass/fail examination

## SYLLABUS

Weeks	Topics / Content	Lect., hrs.	Pr./sem., hrs.	Lab., hrs.
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	<i>5 Semester</i>	18	36	0
<b>1-8</b>	<b>The First Section</b>	9	18	0
1 - 4	<b>Introduction to Radiology. General and Specialized Methods in Radiology.</b> History of the Discovery of X-rays. Biography of V.K. Roentgen. Development of Radiology in Russia, Austria, and Germany. Properties of X-rays. Principles and Methods of Protection from Ionizing Radiation. Structure of the X-ray Department. General Methods of Radiology (fluorography, radiography, fluoroscopy). Classification of Radiocontrast Agents. Routes of Administration. Principle of Computed Tomography. Types of Computed Tomography. Principle of Magnetic Resonance Imaging. Ultrasound. Radionuclide Diagnostic Method.	All		
		5	9	0
		Online		
		0	0	0
5 - 8	<b>Methods of radiological examination of the musculoskeletal system. Radiological diagnostics of bone and joint diseases.</b> X-ray, ultrasound, and radionuclide methods for examining the musculoskeletal system. Classification and diagnosis of fractures, bone and joint diseases. Radiographic analysis.	All		
		4	9	0
		Online		
		0	0	0
<b>9-16</b>	<b>The Second Section</b>	9	18	0
9 - 12	<b>Radiological examination of the digestive system.</b> X-ray examination methods, ultrasound diagnostics, and radionuclide imaging of the digestive system. Radiographic anatomy of the esophagus, stomach, and intestines. Radiographic syndromes associated with digestive diseases. Radiographic diagnostics of diseases of the esophagus, stomach, and intestines. Radiographic diagnostics of parenchymal diseases of the digestive system. Radiographic signs of liver and pancreatic diseases, including their main syndromes.	All		
		4	9	0
		Online		
		0	0	0
13 - 16	<b>Radiological examination of the respiratory system. Radiological signs and syndromes of pulmonary pathology. Cardiovascular examination methods.</b> Radiological examination of the respiratory system. Radiological signs and syndromes of pulmonary pathology. Cardiovascular examination methods. Radiological semiotics of cardiac and vascular diseases. Radiological signs of respiratory diseases, main syndromes. Radiological semiotics of lung, pleural, and mediastinal diseases. Radiological syndromes in lung and mediastinal diseases. Ultrasound syndromes in lung diseases. Radiological syndromes in cardiac and vascular diseases. Ultrasound syndromes in cardiac diseases.	All		
		5	9	0
		Online		
		0	0	0

Abbreviated names of online options:

<b>Abbreviation</b>	<b>Full name</b>
EC	E-course
FtM	Full-text material
FtL	Full-text lectures
VM	Video materials
AM	Audio materials
Prs	Presentations

T	Tests
ERM	E-reference materials
IS	Interactive site

## PRACTICAL SESSIONS TOPICS

Weeks	Topics / Content
	<i>5 Semester</i>
1	<b>Introduction to Radiological Diagnostics</b> History of the development of medical radiology, general issues of X-ray diagnostics.
2	<b>X-ray anatomy of human organs and systems</b> Skeletal development in X-ray imaging.
3	<b>Radiographic Diagnostics</b> Fundamentals and Clinical Application
4	<b>Computed Tomography</b> Fundamentals and Clinical Application
5	<b>Ultrasound</b> Fundamentals and Clinical Application
6	<b>Radionuclide Diagnostics</b> Fundamentals and Clinical Application
7 - 8	<b>Methods of Examining the Musculoskeletal System</b> Radiological Semiotics of Musculoskeletal Diseases: Fractures, Bone and Joint Pathologies, Tumors
9 - 10	<b>Methods of Radiological Examination of the Digestive System</b> Fundamentals and Clinical Application
10 - 11	<b>Radiological Diagnostics of Diseases of the Esophagus, Stomach, and Intestines</b> Fundamentals and Clinical Application
11 - 12	<b>Radiological Diagnostics of Diseases of the Parenchymal Organs of the Digestive System</b> Fundamentals and Clinical Application
12 - 13	<b>Methods of Radiological Examination of the Respiratory Organs</b> Radiological Symptoms and Syndromes of Pulmonary Pathology
13 - 14	<b>Radiological Semiotics of Diseases of the Lungs, Pleura, and Mediastinum</b> Diagnostic Methods
14 - 15	<b>Radiological Examination Methods of the Heart and Vascular System</b> Radiological Semiotics of Diseases of the Heart and Vascular System

## 6. EDUCATIONAL TECHNOLOGIES

In addition to the traditional clinical practical training method, the following is provided:

1. Classes are conducted with computer-based learning programs, with clinical case analysis.
2. To organize independent work, preparation of papers, reports, and presentations for group presentations and student conferences is suggested; preparation for practical training, work with additional literature, and preparation of papers are also included.
3. Work in a student research group.

## 7. ASSESSMENT TOOLKIT

The assessment toolkit ensures verification of the intended learning outcomes achievement (competency-based rubrics) using current, midterm and interim assessment of the course.

The link between developed competencies and their assessment is presented in the following table:

Competency	Achievement rubrics	Assessment activity (Syl 1)
ОПК-4	3-ОПК-4	PFE, T-8, T-15, T-8, T-15
	У-ОПК-4	PFE, T-8, T-15, T-8
	В-ОПК-4	PFE, T-8, T-15, T-15
ПК-3.2	3-ПК-3.2	PFE, T-8, T-15
	У-ПК-3.2	PFE, T-8, T-15
	В-ПК-3.2	PFE, T-8, T-15
ПК-3.3	3-ПК-3.3	PFE, T-8, T-15
	У-ПК-3.3	PFE, T-8, T-15
	В-ПК-3.3	PFE, T-8, T-15

### Educational achievement rubrics scales

The scale of each assessment activity varies from 0 to the maximum established point, inclusive. The final assessment of the course is performed on a 100-point scale and represents the sum of the points earned by the student in the section assessments, framework of current and interim assessment.

Sections and interim assessments are considered passed when the student achieves a minimum score equal to 60% of the maximum. The final grade is assigned only upon passing all sections and the interim assessment.

The final grade is assigned in accordance with the following scale:

Total score	Rating on a 4-point scale	Pass/fail examination	ECTS assessment
90-100	5 – « <i>excellent</i> »	« <i>pass</i> »	A
85-89	4 – « <i>good</i> »		B
75-84			C
70-74			D
65-69	3 – « <i>satisfactory</i> »		E
60-64		F	
below 60	2 – « <i>fail</i> »	« <i>fail</i> »	

An “excellent” grade indicates a deep and solid mastery of the program material by a student who presents their answers consistently, clearly, and logically, is able to closely link theory with practice, and uses materials from monographic literature in their answers.

A “good” grade corresponds to a student’s solid knowledge of the material, who presents their answers competently and to the point, without any significant inaccuracies.

A “satisfactory” grade corresponds to the basic level of mastery of the material by the student, in which the main material has been mastered, but its details have not been assimilated, the answers contain inaccuracies, insufficiently correct wording and logical inconsistencies.

A grade “pass” corresponds to at least a basic level of mastery of the program material, in which the student possesses the necessary knowledge, skills, and abilities, and is able to apply theoretical principles to solve typical practical problems.

A grade “fail” is given to a student who lacks a significant understanding of the curriculum material, makes significant errors in their answers, or fails all required assignments. These students are generally unable to continue their studies without additional classes.

## **8. ACADEMIC COURSE EDUCATIONAL, METHODOLOGICAL AND INFORMATIONAL SUPPORT**

### **CORE READING:**

1. ЭИ D53 Diagnostic radiology : учебник, Akiev R.M., Alekseev K.N., Trufanov G.E., Москва: ГЭОТАР-Медиа, 2021
2. ЭИ А 92 Атлас лучевой анатомии человека : Гриф Минобрнауки России. Рекомендовано ГОУ ВПО "Московская медицинская академия имени И.М. Сеченова" в качестве учебного пособия для студентов учреждений высшего профессионального образования, обучающихся по специальностям 060101.65 "Лечебное дело", 060201.65 "Стоматология", 060103.65 "Педиатрия" по дисциплинам "Анатомия человека" и "Лучевая диагностика и терапия"., , Москва: ГЭОТАР-Медиа, 2010

### **FURTHER READING:**

1. ЭИ Л 87 Лучевая диагностика и терапия. Общая лучевая диагностика : , , Москва: ГЭОТАР-Медиа, 2014
2. ЭИ Т 35 Лучевая диагностика и терапия. Частная лучевая диагностика : , Терновая С.К., Moscow: ГЭОТАР-Медиа, 2014

### **SOFTWARE:**

No special softwares is required

### **LMS AND ONLINE RESOURCES**

<https://online.mephi.ru/>

<http://library.mephi.ru/>

## **9. LOGISTICAL SUPPORT**

1. Интерактивная доска SMART SBM 685 (64-307)
2. Монитор Dell P2720D (64-307)
3. Мышь, клавиатура (64-307)

4. Видеокамера Microsoft LifeCam Cinema HD (64-307)

5. Персональный компьютер: Моноблок Lenovo V540-24IWL All-In-One 23,8" i3-8145U 8Gb 256GB\_SSD\_M.2 Intel (64-307)

6. Проектор SMART P109 (64-307)

7. Персональный компьютер: Процессор CPU Intel Core i7-8700 (3.2GHz/12MB/6 cores) Материнская плата Gig (64-307)

## **10. EDUCATIONAL AND METHODOLOGICAL RECOMMENDATIONS FOR STUDENTS**

### Lecture:

Writing lecture notes: briefly, schematically, and consistently capture the main points, conclusions, formulations, and generalizations; highlight important ideas, and underline keywords and terms. Check terms and concepts using encyclopedias, dictionaries, and reference books, writing down definitions in your notebook. Identify questions, terms, and material that poses difficulties, mark them, and try to find the answer in the recommended literature. If you are unable to understand the material independently, formulate a question and ask the instructor during a consultation or practical lesson.

### Independent Work:

Each student should prepare individually for the course topics by reading lecture notes and recommended literature. Independent work allows students to reflect in a calm environment, understand the information on the topic, and, if necessary, consult reference literature. Careful reading and reviewing helps you fully grasp the topic and structure your knowledge.

To ensure lasting retention of the subject's content, it's advisable to study it in stages – topically and in strict sequence, as subsequent topics typically build on previous ones. Therefore, much of the independent work involves preparing for seminars, completing recommended problems, preparing for colloquiums, completing and defending individual homework assignments, and preparing for laboratory work. To successfully complete these tasks, each student has access to the teaching resources developed by the department.

Students should best plan the time for independent study required for this course throughout the semester, while also regularly reviewing the material covered. Lecture notes should be regularly supplemented with information from the literature presented in the course syllabus. For each independent study topic listed in the course syllabus, students should first read the recommended literature and, if necessary, compile a brief summary of the main concepts, terms, and information that must be memorized and are fundamental to this topic and to mastering subsequent sections of the course. To expand their knowledge of the course, it is recommended to use online resources.

When working independently, it is recommended to take notes on the material being studied (processed). Notes can be basic, containing only the main key points, but still sufficient to fully answer the question. Notes can be detailed. The length of the notes is determined by the student. When working with academic/scientific literature, students are encouraged to take notes as they read, using a simple or detailed outline, formulate summaries, and prepare summaries of what they read. Such notes can earn additional points for active participation.

When preparing for a practical lesson, it is necessary to first refer to lecture notes, textbook sections, and teaching aids to gain a general understanding of the topic's place and significance in the course being studied.

Then, work with additional literature and take notes on the recommended sources. While studying the recommended material, it is important to understand the structure of the topic being studied, identify key concepts, follow their logic, and thereby gain insight into the problem being studied. It is essential to keep notes of the material being studied in the form of summaries, which, along with visual memory, engages motor memory and allows for the accumulation of a personalized resource for rapid review of what has been read and the mobilization of accumulated knowledge.

#### Clinical Practical Classes:

A key stage of the practical class is students' independent work on mastering practical skills: in simulated conditions, at the patient's bedside, in the functional diagnostics room, etc. Depending on the specific topic of the class, the student independently (or under the supervision of the instructor) interviews the patient, conducts a clinical examination, observes instrumental diagnostics, and studies the results of additional tests, summarizes the data, presents it as fragments of the patient's medical history, and reports the results to the instructor. Each student's progress is assessed individually, based on the degree of development of their practical skills and their theoretical foundations.

Clinical case studies are conducted for the entire group or through students' participation in clinical case studies and periodic scientific and practical conferences at the medical organizations where their practical training takes place. During these case studies, the instructor evaluates each student's active participation and clinical reasoning skills.

Situational problems proposed by the instructor are solved, which develop clinical reasoning and force the student to apply knowledge acquired in various specialty subjects. The educational process makes extensive use of active and interactive learning methods (small group work, creative activities, computer-based learning programs, and conference sessions).

The instructor supervises students' independent work, including preparing papers, research projects, working with patients together with the instructor, interpreting additional research data, and completing medical documentation.

#### Test:

Familiarization with primary and secondary literature, including reference publications and foreign sources, a summary of key concepts, terms, and information required for memorization and fundamental to this topic. Writing annotations for literary sources read, etc.

Test: 10-15 (20-25) points. Each question: 1 (2) point.

TOPICS: The topics of a specific section are indicated.

Answer Requirements: A clear, detailed answer (2 points/question) or choosing the correct answer to a test task (1 point/question).

#### Abstract:

Reference research and bibliography, use of 3 to 5 scientific works, presentation of the authors' opinions and your own judgment on the chosen issue; presentation of the main aspects of the problem.

#### Exam/Credit Preparation:

When preparing for an exam (credit), please refer to lecture notes, recommended readings, etc.

#### Response Requirements and Assessment Criteria:

An "Excellent" grade of 45-50 points on the credit/exam is awarded for: a correct, complete, and logically constructed answer; the ability to use specialized terminology; and the ability to illustrate theoretical principles with practical material.

A "Good" grade of 35-44 points on the exam is awarded for: a correct, complete, and logically constructed answer with minor errors or inaccuracies; the ability to use specialized terminology, but incomplete conclusions or generalizations.

A "Satisfactory" grade of 30-34 points on the exam is awarded for: a schematic, incomplete answer; an inability to use specialized terminology or lack of knowledge of them; with one serious error;

A grade of "unsatisfactory" (<30 points) on the exam is given for: gross errors in answering all questions on the exam; inability to use specialized terminology; or inability to provide examples of the practical application of scientific knowledge.

Admission to the exam in a discipline is granted if the student's score exceeds 30.

A student can earn between 30 and 50 points per semester.

The minimum score for an exam answer is 30, the maximum is 50.

## **11. EDUCATIONAL AND METHODOLOGICAL RECOMMENDATIONS FOR TEACHERS**

Practical classes monitor students' understanding of lecture material, supervise patients, and assess their practical skills. Visual aids, surgical instruments, simulators, and device simulations, as well as demonstrations of interventional cardiology procedures in real-life settings, are used to demonstrate and practical skills. To assess clinical reasoning skills, students are offered situational problems, clinical cases, test assignments, case studies, and attendance at medical conferences, consultations, and scientific symposia. Active and interactive learning methods are widely used in the educational process (work in small groups, fostering creative thinking, using computer-based learning programs, and conducting conferences). The instructor supervises students' independent work, including preparing papers and research projects, working with patients in collaboration with the instructor, interpreting additional research data, and completing medical documentation. Working with academic literature is considered a form of academic work and is completed within the time allotted for its study. Each student has access to the institute's and department's electronic library collections.

Students' training helps them develop skills in interacting with patients, taking ethical and deontological principles into account. Independent work helps develop skills in working with patients, working with literature, analytical thinking, documentation skills, accuracy, and discipline. Students' initial knowledge level is determined by testing, and ongoing assessment of their mastery of the subject is determined by oral questioning during classes, clinical case studies, solving typical situational problems, and answering test questions. At the end of the course, students undergo a midterm and final assessment using a test, practical skills assessment, and solving situational problems.

Grading and criteria for tests, extended tests, homework, and the final test:

1) Test questions are graded according to the following scheme:

1 point for every 1 correct answer. Student did not start work – (-1) point

2) - Tests with detailed answers are graded according to the following system: complete answer – 2 points, incomplete answer – 1 point, no answer – 0 points, student did not start work – (-2) points.

3) - Homework must be completed by all students to be admitted to the final assessment. Late submissions will result in a deduction of (-1) point from the final score.

4) - Presentation report grading criteria. Recalculation from a 100-point to a 10 (5)-point system.

5) - Essay grading criteria. Maximum 10 points. Possibly upgraded to a 5-point system.

10 points are awarded if all abstract writing requirements are met: the problem is identified and its relevance justified, a brief analysis of the issue is provided and a logical position is presented, conclusions are formulated, the article is fully analyzed, the length is maintained, and formatting requirements are met.

9 points are awarded if the following abstract writing requirements are met: the problem is identified and its relevance justified, a brief analysis of the issue is provided and a logical position is presented, conclusions are formulated, the article is fully analyzed, but the length is not maintained and formatting requirements are not met.

8 points – the basic requirements for the abstract are met, but some shortcomings are present. Specifically, there are inaccuracies in the presentation of the material; there is a lack of logical consistency in the judgments; the abstract is not within the specified length; and there are omissions in the formatting.

7 points – the basic requirements for the abstract are met, but the following shortcomings are present: there are inaccuracies in the presentation of the material; there is a lack of logical consistency in the judgments; no conclusions are formulated; the abstract is not within the specified length; and there are omissions in the formatting.

6 points – there are significant deviations from the abstracting requirements; the topic is only partially covered; there are factual errors in the content of the abstract; conclusions and a personal perspective on the problem are missing.

5 points – there are significant deviations from the abstract requirements: the topic is only partially covered; there are factual errors in the presentation of the materials and methods; conclusions and a personal perspective on the problem are missing; the format is not maintained.

4 points – there are significant deviations from the abstract requirements: the relevance of the topic is not addressed; factual errors in the presentation of materials and methods are present; conclusions and personal perspective on the problem are missing; the format is not followed.

3 points – there is no analysis of the relevance of the research topic, approaches, and methods used, while the abstract formally complies with the length requirements.

2 points – the abstract topic is not addressed, revealing a significant misunderstanding of the problem. However, the abstract length and formal requirements are met.

1 point – the abstract topic is not addressed, revealing a significant misunderstanding of the problem.

0 points – the student did not submit an abstract.

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