Ministry of Science and Higher Education of the Russian Federation
Federal State Autonomous Institution of Higher Education
“National Research Nuclear University “MEPhI”

INSTITUTE OF ENGINEERING PHYSICS FOR BIOMEDICINE

APPROVED НТС ИФИБ

Protocol No. 3.1

dated 30.08.2024

ACADEMIC COURSE OUTLINE

ЭПИДЕМИОЛОГИЯ / EPIDEMIOLOGY

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

Semester	**Labour input, credits**	**Total course academic, hours**	**Lectures, hrs.**	**Practical sessions, hrs.**	**Laboratory sessions, hrs.**	**In the form of practical studies, hrs.**	**Independent studies, hrs.**	**Independent studies monitoring, hrs.**	**Course progress, Exam/Pass-fail exam/Term**
12	3	108	20	40	0		48	0	PFE
Total	3	108	20	40	0	40	48	0	

ABSTRACT

The program of the discipline is compiled based on the requirements for the results of mastering the specialist degree program. The graduate (General Practitioner) must be ready to solve problems of preventing the occurrence of diseases among the population by conducting preventive and anti-epidemic measures.

In the process of mastering the discipline, students acquire knowledge, abilities, and skills in preventive medicine, methods of epidemiological research, principles of conducting preventive and anti-epidemic measures, including in epidemic foci, and the formation of a healthy lifestyle.

1. ACADEMIC COURSE GOALS AND OBJECTIVES

Goal of studying the discipline

Formation of competencies for identifying the causes, conditions, and mechanisms of morbidity formation (infectious and non-infectious), for solving problems of preventing the occurrence of diseases among the population by conducting preventive and anti-epidemic measures, monitoring the effectiveness of prevention measures, forming a healthy lifestyle, and sanitary-hygienic education of the population.

Objectives:

- formation of an epidemiological approach to the study of human diseases;
- mastering methods of epidemiological research (evidence-based medicine);
- study of the regularities of the development of the epidemic process and the system of anti-epidemic measures;
- study of the principles of collection and medical-statistical analysis of information on health indicators of the population of various age and sex groups.
- mastering the basics of organizing and conducting anti-epidemic measures in emergency situations;
- formation of practical skills and abilities in the use of anti-epidemic means and the organization of anti-epidemic and preventive measures, the formation of a healthy lifestyle.

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

The discipline is implemented within the framework of the basic part of the educational program. It is based on knowledge, abilities, and skills obtained during the study of such disciplines as hygiene, internal diseases (faculty and hospital course), surgical diseases (faculty and hospital course), infectious diseases, dermatovenerology, and other clinical disciplines. Knowledge, abilities, and skills obtained as a result of mastering the discipline are necessary for subsequent professional activity.

3. DEVELOPED COMPETENCIES AND INTENDED LEARNING OUTCOMES

Universal and/or general professional competencies:

Competency code and title	**Code and title of competency-based rubrics**
ОПК-2 [1] – Capable of conducting	З-ОПК-2 [1] – Know: - regulatory foundations for conducting

and monitoring the effectiveness of measures for prevention, healthy lifestyle promotion, and sanitary-hygienic education of the population	preventive medical examinations and health check-ups; - rules for implementing sanitary and anti-epidemic measures; - forms and methods of health education work; - sanitary rules and regulations; - national immunization schedule; - main hazardous and harmful occupational factors. У-ОПК-2 [1] – Be able to: - determine medical indications for imposing restrictive measures (quarantine) and conduct anti-epidemic measures in case of an infection outbreak; - conduct preventive medical examinations and health check-ups in accordance with current regulatory legal acts and other documents; - monitor the effectiveness of measures for disease prevention, health promotion, and sanitary-hygienic education of the population; - develop and implement health promotion programs aimed at eliminating harmful effects of environmental factors on human health; - establish cause-effect relationships between changes in health status and exposure to environmental factors. В-ОПК-2 [1] – Possess skills in: - organizing and conducting preventive medical examinations and health check-ups for the adult population to prevent the occurrence and/or spread of diseases and identify risk factors; - preparation (formation) and sending to the territorial office of the Federal Service for Surveillance on Consumer Rights Protection and Human Wellbeing an emergency notification upon detection of an infectious or occupational disease; -educating patients and their relatives on methods of self-monitoring key physiological indicators.

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

Professional activity goal	**Professional activity knowledge area**	**Professional competency code and title; Based on the professional standard, experience analysis**	**Code and title of competency-based rubrics**
organizational and managerial			
Collection of medical data, medical and statistical analysis of information on the population health indicators for various age and sex groups.	Individuals (patients); the population; the set of means and technologies aimed at creating conditions for preserving and strengthening the health of the adult population	ПК-3.4 [1] - Able to analyze population health indicators *The base:* Professional standard: 02.022	З-ПК-3.4[1] - Know: - factors shaping human health; - main medical-statistical indicators characterizing population health, methods for their calculation; - methodologies for collecting medical-statistical information.; У-ПК-3.4[1] - Be able to: - analyze statistical indicators of morbidity

			with temporary disability, disability, mortality.; В-ПК-3.4[1] - Possess skills in: - analyzing official statistical reporting, including federal and industry statistical observation forms.

4. PEDAGOGIC POTENTIAL OF THE COURSE

Pedagogic tracks/objectives	Pedagogic goals (code)
Intellectual education	Establishing conditions for: formation of culture of intellectual work (В11)
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 (В34)

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
	12 Semester						
1	The First Section	1-8	10/20/0	Т-8 (25)	25	Т-8	З-ОПК-2, У-ОПК-2, В-ОПК-2, З-ПК-3.4, У-ПК-3.4, В-ПК-3.4
2	The Second Section	9-15	10/20/0	Т-14 (25)	25	Т-14	З-ОПК-2, У-ОПК-2, В-ОПК-2, З-ПК-3.4, У-ПК-3.4, В-ПК-3.4
	Totals for 12 Semester		20/40/0		50		
	Assessment events for				50	PFE	З-ОПК-2,

	12 Semester						У-ОПК-2, В-ОПК-2, З-ПК-3.4, У-ПК-3.4, В-ПК-3.4

* – 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.**
	12 Semester	20	40	0
1-8	**The First Section**	10	20	0
1 - 2	**Introduction to modern epidemiology** Modern epidemiology refers to rapidly developing disciplines, although its origins as a science go back to deep antiquity. In recent years, ideas about its structure and content have undergone significant changes. Globalization and integration processes in science have determined a qualitatively new level of the development of epidemiology and the expansion of the boundaries of its subject matter.	All 2 Online 0	5 0	0 0
3 - 4	**Sanitary protection of the territory from the importation of infectious diseases** Sanitary protection of the country's territory represents a system of nationwide measures aimed at preventing the importation into the country's territory from other countries of quarantine and other particularly dangerous infectious diseases, the localization and elimination of foci of these diseases in case of their occurrence on the territory of the Russian Federation, including in endemic natural foci, as well as preventing the import and spread of goods potentially dangerous to public health.	All 2 Online 0	5 0	0 0
5	**Measures for control and prevention of infectious diseases** Measures for control and prevention of infectious diseases The world of pathogens is dynamic and constantly evolving with the aim of maintaining the existence of a given organism as a biological species, as a result of which resistance to antimicrobial and disinfecting agents appears.	All 2 Online 0	3 0	0 0
6	**Immunoprophylaxis** Immunoprophylaxis of infectious diseases is an important component of health protection and ensuring the sanitary and epidemiological well-being of the population, and in some cases, the only effective measure for the prevention, reduction,	All 2 Online 0	3 0	0 0

	and elimination of infectious diseases.			
7 - 8	**Epidemiology of healthcare-associated infections (HAI)** The widespread prevalence of infections associated with the provision of medical care (HAI), in medical organizations of various profiles, significant damage to population health, the economy, and the demographic situation in various countries of the continent determine the relevance of their prevention at the present stage.	All		
		2	4	0
		Online		
		0	0	0
9-15	**The Second Section**	10	20	0
9 - 10	**Epidemiology and prevention of zoonoses, sapronoses, airborne infections** Epidemiology and prevention of zoonoses, sapronoses, airborne infections Zoonoses are infectious diseases where the reservoir of the pathogen is animals. This is a large group of infectious diseases, numbering more than 190 nosological forms and including, among others, such particularly dangerous infections as plague, anthrax, hemorrhagic fevers, including hemorrhagic fever with renal syndrome (HFRS).	All		
		6	10	0
		Online		
		0	0	0
11 - 12	**Epidemiology and prevention of bacterial and viral intestinal infections** Intestinal infections are a group of diseases united by a common mechanism of transmission and localization of the pathogen in the organism. Thus, water and food routes of infection take place. In some cases, a contact route of infection is possible.	All		
		0	0	0
		Online		
		0	0	0
13	**Epidemiology, prevention, diagnostics of helminthiases** Helminthiases are the most widespread and massive parasitic diseases of humans. The majority of them are characterized by a long course and a wide range of clinical manifestations – from asymptomatic to severe forms.	All		
		0	0	0
		Online		
		0	0	0
14 - 15	**Epidemiology and prevention of infections transmitted predominantly sexually and through blood** Epidemiology and prevention of infections transmitted predominantly sexually and through blood Venereal diseases include a group of infectious diseases transmitted predominantly sexually – these are syphilis, gonorrhea, chancroid, lymphogranuloma venereum. Furthermore, according to the decision of the World Health Organization (WHO), infections transmitted sexually can include trichomoniasis, pubic lice, genital herpes, chlamydiosis, human papillomavirus infection, bacterial vaginosis, urogenital candidiasis, and some rare infections. Currently, 18 infectious diseases transmitted sexually are known. In recent years, the world has received large epidemic spread of a life-threatening viral disease caused by the human immunodeficiency virus (HIV). Transmission of infection from a sick person to a healthy one also occurs predominantly sexually.	All		
		4	10	0
		Online		
		0	0	0

Abbreviated names of online options:

Abbreviation	**Full name**

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**
	12 Semester
1 - 4	**Epidemiological approach to the study of infectious and non-infectious diseases. International Health Regulations** Epidemiological approach to the study of infectious and non-infectious diseases. International Health Regulations Currently, epidemiology is regarded as a fundamental medical science belonging to the field of preventive medicine. Two main directions of this science – epidemiology of infectious diseases and epidemiology of non-infectious diseases – are identical in their essence. They have a common object of study – the population level of pathology organization (incidence, morbidity), a single scientific method of cognition – epidemiological, and a common goal – disease prevention. Constant changes in the environment and human living conditions require continuous development of prevention methods.
5 - 8	**Measures for control and prevention of infectious diseases. Immunoprophylaxis. Sections of disinfectology (disinfection, sterilization)** Measures for control and prevention of infectious diseases. Immunoprophylaxis. Sections of disinfectology (disinfection, sterilization) Urbanization has led to an increase in the incidence of infectious diseases (tuberculosis, sexually transmitted infections, HIV infections). Special attention is paid not only to human environmental conditions but also to persons with immunodeficient states. All these factors led to the necessity of using molecular-genetic research methods in practice. In the Russian Federation, immunoprophylaxis of infectious diseases is regulated by the Federal Law "On Immunoprophylaxis of Infectious Diseases," approved on 17.09.98. The Federal Law establishes the legal foundations of state policy in the field of immunoprophylaxis of infectious diseases, providing for a combination of rights, duties, and responsibilities of the individual and the state. Disinfection includes measures aimed at breaking the connections between the links of the epidemic process and is used for both preventive and anti-epidemic purposes in the fight against infectious diseases.
9 - 11	**Epidemiology and prevention of zoonoses, sapronoses, airborne infections, bacterial and viral intestinal infections. Epidemiology, prevention, diagnostics of helminthiases.** In the Russian Federation, the epizootic situation remains tense: up to 30 thousand cases of HFRS [Hemorrhagic Fever with Renal Syndrome], tick-borne encephalitis, tick-borne borreliosis, tularemia, and salmonellosis are registered annually in the country. All intestinal infections are united by the fecal-oral mechanism of pathogen transmission; the habitat of these microorganisms is the intestine. In the process of evolution, these relatives to each other and to E. coli pathogens developed the ability to leave the intestine and survive outside it for a long time — in food, soil, water contaminated with infected feces, then penetrate through the mouth with this food or water to the next host. Due to the high, in comparison with microorganisms, level of organization of helminthiasis pathogens, their interaction with the host organism (human) is much more complex and diverse. The existence of a complexly

	organized, multicellular parasite in another multicellular organism (human) is possible only with the suppression of natural defense mechanisms. This conflict is always accompanied by allergization and immunosuppression, which reduces the organism's resistance and makes it more vulnerable to a multitude of pathogens.
12 - 15	**Epidemiology and prevention of infections with a transmissible mechanism of transmission. Epidemiology and prevention of external integument infections** Epidemiology and prevention of infections with a transmissible mechanism of transmission. Epidemiology and prevention of external integument infections Transmissible diseases are infectious diseases of humans, the pathogens of which are transmitted by blood-sucking insects. There are several billion insect individuals in the world, of which only about seventy thousand have been studied. Many of them are vectors of various microscopic pathogens of human and animal infectious diseases. "Uninvited guests" have adapted to parasitize in the blood-sucking apparatus of various host insects: viruses, bacteria, rickettsiae, plasmodia, etc. Some of these pathogens can lead to diseases with significant complications for health for the continuation of a full life and, even, to fatal outcomes.

6. EDUCATIONAL TECHNOLOGIES

In the process of teaching the discipline, methods based on modern achievements of science and information technologies in education are applied. They are aimed at improving the quality of specialist training by developing students' creative abilities and independence. For this purpose, both traditional teaching methods (lectures, clinical practical classes) and interactive forms of conducting seminars and clinical case reviews are used:

- training forms of conducting practical classes (situational task, case study, role play in the form of analyzing specific epidemiological situations, analysis of statistical reports on the state of population health);
- involvement of students in scientific preclinical and clinical research, preparation of presentation materials, reports, essays, or abstracts.

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-2	З-ОПК-2	PFE, T-8, T-14, T-8, T-14
	У-ОПК-2	PFE, T-8, T-14, T-8, T-14
	В-ОПК-2	PFE, T-8, T-14, T-8, T-14
ПК-3.4	З-ПК-3.4	PFE, T-8, T-14
	У-ПК-3.4	PFE, T-8, T-14
	В-ПК-3.4	PFE, T-8, T-14

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:

<table>
<tr><th>Total score</th><th>Rating on a 4-point scale</th><th>Pass/fail examination</th><th>ECTS assessment</th></tr>
<tr><td>90-100</td><td>5 – «excellent»</td><td rowspan="7">«pass»</td><td>A</td></tr>
<tr><td>85-89</td><td rowspan="3">4 – «good»</td><td>B</td></tr>
<tr><td>75-84</td><td>C</td></tr>
<tr><td>70-74</td><td rowspan="2">D</td></tr>
<tr><td>65-69</td><td rowspan="2">3 – «satisfactory»</td></tr>
<tr><td>60-64</td><td>E</td></tr>
<tr><td>below 60</td><td>2 – «fail»</td><td>«fail»</td><td>F</td></tr>
</table>

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 I-60 Infectious diseases: textbook : учебник, Yushchuk N.D., Vengerov Yu.Ya., Москва: ГЭОТАР-Медиа, 2020

2. ЭИ Э71 Эпидемиология : учебник, , Москва: ГЭОТАР-Медиа, 2023

3. ЭИ З-86 Эпидемиология чрезвычайных ситуаций : учебное пособие для вузов, Зорина И. Г., Санкт-Петербург: Лань, 2024

FURTHER READING:

1. ЭИ О-28 Общая эпидемиология с основами доказательной медицины: руководство к практическим занятиям : учебное пособие, , Москва: ГЭОТАР-Медиа, 2021

2. ЭИ С 50 Основы дезинфектологии : учебное пособие для вузов, Сметанин В. Н., Здольник Т. Д., Москва: Юрайт, 2024

3. ЭИ Ш 96 Экологическая эпидемиология : учебное пособие для вузов, Мукминов М. Н., Шуралев Э. А., Москва: Юрайт, 2024

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 (64-407)

2. Монитор Dell P2720D (64-407)

3. Мышь, клавиатура (64-407)

4. Персональный компьютер: Моноблок Lenovo V540-24IWL All-In-One 23,8" i3-8145U 8Gb 256GB_SSD_M.2 Intel (64-407)

10. EDUCATIONAL AND METHODOLOGICAL RECOMMENDATIONS FOR STUDENTS

Recommendations for preparing for seminars.

The plan of practical classes, their topics, recommended literature, the goal and objectives of studying the discipline are communicated by the teacher at the introductory classes or in the curriculum for this discipline. Practical classes help to assimilate the educational material more deeply, to acquire skills in creative work with scientific literature.

Before starting to study a topic, it is necessary to familiarize oneself with the main questions of the practical lesson plan and the list of recommended literature.

Starting preparation for a practical lesson, it is necessary, first of all, to turn to the lecture notes, sections of textbooks and study guides to obtain a general idea of the place and significance of the topic in the course being studied. Then work with additional literature, make notes on recommended sources. In the process of studying the recommended material, it is necessary to understand the

construction of the topic being studied, highlight the main provisions, trace their logic and thereby delve into the essence of the problem being studied. It is necessary to keep notes of the material being studied in the form of a synopsis, which, along with visual memory, involves motor memory and allows accumulating an individual fund of auxiliary materials for rapid repetition of what has been read, for mobilizing accumulated knowledge.

Main forms of recording: plan (simple and detailed), extracts, theses. In the process of preparation, it is important to compare sources, think over the material being studied and build an algorithm of actions, carefully think over your oral presentation.

Recommendations for preparing for control work.

Control work – 10 - 15 – 20 - 25 points. Each question – 1 (2) point.

TOPICS: are indicated in each specific section.

Requirement for the answer: a clear detailed answer (2 points/task) or a choice of the correct answer to a test task (1 point/task).

Recommendations for preparing for the credit/exam

Requirement for the answer and grading criteria:

Grade "excellent" (45–50 points on the credit/exam) is given for: a correct, complete, and logically constructed answer; the ability to operate with special terminology; the ability to illustrate theoretical provisions with practical material.

Grade "good" (35–44 points on the exam) is given for: a correct, complete, and logically constructed answer with minor errors or inaccuracies; the ability to operate with special terminology, but incomplete conclusions or generalizations are made.

Grade "satisfactory" (30–34 points on the exam) is given for: a schematic or incomplete answer; inability to operate with special terminology or ignorance of it; with one gross error;

Grade "unsatisfactory" (< 30 points on the exam) is given for: an answer to all ticket questions with gross errors; inability to operate with special terminology; inability to provide examples of the practical use of scientific knowledge.

Admission to the exam for the discipline is carried out with a score of more than 30.

During the semester, the student can score from 30 to 50 points.

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

11. EDUCATIONAL AND METHODOLOGICAL RECOMMENDATIONS FOR TEACHERS

In the process of organizing and conducting the educational process, the teacher must be able to plan and organize their time, which allows distributing the teaching load and is an important condition for the successful teaching of the discipline. The teacher must actively and directly participate in the educational process and conduct preparation for it. The necessity of constant preparation for lectures, seminars, and practical classes is conditioned by the need to reflect modern approaches, views, and data on topics and sections. While conducting preparation for the educational process, it is necessary to study modern methodological recommendations, results of scientific research, new technologies, etc.

The goal of the teacher's work should be the effective perception of the material by the listeners. In the process of teaching, the following types of educational work are implemented: lecture, seminar and practical lesson, independent work. When implementing various types of educational work, the teacher must use educational technologies (creation of interactive presentations, teaching

computer programs, technologies for the development of thinking (effective lecture, tables, group work, etc.).

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