



MINISTRY OF SCIENCE AND HIGHER EDUCATION OF RUSSIAN FEDERATION  
Federal State Autonomous Educational Institution of Higher Education  
**Far Eastern Federal University**  
(FEFU)  
SCHOOL OF BIOMEDICINE

AGREED  
Head of OP

(Signed) (Full name)



CLAIM  
Director of the Department of Medical Biology and  
Biotechnology

(Signed) (Acting Name)  
December 30, 2021

**WORK PROGRAM OF THE DISCIPLINE**

Environmental and biological safety  
Direction of training 06.04.01 Biology  
Educational program in the profile "Molecular and Cell Biology (in English)"  
Form of training: full-time

Course 1 semester 2  
Lectures – 6 hours.  
Practical classes – 18 hours.  
The total hours of classroom load are 36 hours.  
Independent work – 36 hours.  
Credit 2 semester

The work program is drawn up in accordance with the requirements of the Federal State Educational Standard in the direction of training 06.04.01 Biology, approved by the order of the Ministry of Education and Science of Russia dated 11.08.2020 No. 934

The work program was discussed at the meeting of the Department of Medical Biology and Biotechnology Protocol dated December 30, 2021 No. 5

Director of the Department of Medical Biology and Biotechnology, Ph.D.  
V.V. Kumeiko

Vladivostok  
2021

Reverse side of the RPD cover page

1. The work program was revised at the meeting of the Department / department / department (implementing the discipline) and approved at the meeting of the Department / department / department (issuing structural unit), the protocol from " \_\_\_\_\_ № \_\_\_\_\_

2. The work program was revised at the meeting of the Department / department / department (implementing the discipline) and approved at the meeting of the Department / department / department (issuing structural unit), the protocol from " \_\_\_\_\_ № \_\_\_\_\_

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## Abstract of the work program of the discipline "Environmental and Biological Safety"

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

The purpose of mastering the discipline "Environmental and Biological Safety" is to form scientific ideas among students about the essence of the biological transmission of pathogens of infectious diseases by blood-sucking arthropods in the interests of ensuring biological safety.

#### Tasks:

1. To form students' scientific understanding of the types and mechanisms of transmission and functioning of biological threats.
2. To form students' ideas about infections, invasions, epidemics and pandemics.
3. To form students' skills of anti-epidemic measures in the interests of ensuring biological safety.

The results of training in the discipline (module) should be correlated with the indicators of competence achievement established in the OBOR.

The work program of the discipline "Environmental and Biological Safety" is compiled for students in the educational program of the magistracy 06.04.01 Biology "Molecular and Cellular Biology (together with the NSCMB FEB RAS)" in accordance with the requirements of the Federal State Educational Standard in the direction of training 06.04.01 Biology, approved by the order of the Ministry of Education and Science of Russia dated 11.08.2020 No. 934.

The discipline "Environmental and Biological Safety" is compiled for students in the educational program of the magistracy 06.04.01 Biology, included in the basic part of the mandatory disciplines of the educational program of the master's program "Molecular and Cell Biology (together with the NSCMB FEB RAS)".

The total labor intensity of mastering the discipline is 2 credit units (72 hours). The curriculum provides for lectures (18 hours), practical classes (18 hours), independent work (36 hours). The discipline is implemented in the 1st year in the 2nd semester. Evaluation of learning outcomes: credit.

For the successful development of this academic discipline, a confident possession of general biological ideas from the field of the history of science, general biology, zoology, parasitology, ecology, microbiology is required, which should be formed by undergraduates in the previous period of undergraduate studies. Students will need knowledge of the basic concepts that should be formed within the framework of previously studied disciplines: "Biology", "Ecology", "Microbiology".

A feature of this discipline is a deep immersion of students in the study of environmental and biological safety.

The totality of the planned learning outcomes in the discipline (module) should ensure the formation of all the competencies established by the OBOR in the graduate.

As a result of studying this discipline, students form the following competencies (elements of competencies):

Universal competencies of graduates and indicators of their achievement:

<b>Name of the category (group) of universal competencies</b>	<b>Code and name of the universal competence of the graduate</b>	<b>Code and name of the indicator of achievement of universal competence</b>
Systems and Critical Thinking	UK-1 is able to carry out critical analysis of problem situations on the basis of a systematic approach, to develop an action strategy	UK-1.1 Analyzes the problem situation using a systematic approach and modern natural science knowledge, using reliable data and reliable sources of information UK-1.2 Develops and substantively argues possible strategies for solving a problem situation on the basis of systemic and interdisciplinary approaches, taking into account the parameters of the level of health of the population UK-1.3 Develops a scenario for the implementation of the optimal strategy for solving a problem situation, taking into account the necessary resources, achievable results, possible risks and consequences.

General professional competencies of graduates and indicators of their achievement:

<b>Name of the category (group) of universal competencies</b>	<b>Code and name of the universal competence of the graduate</b>	<b>Code and name of the indicator of achievement of universal competence</b>
	OPK-4 Is able to participate in the environmental assessment of territories and water areas, as well as technological production using biological methods for assessing environmental and biological safety	OPK-4.1 Uses theoretical foundations, methods and regulatory documentation in the field of environmental expertise, features of survey and assessment of the ecological state of territories and water areas, methods of testing the effectiveness and biosafety of products of technological production OPK-4.2 Applies professional knowledge and skills to develop and

		<p>propose innovative tools and methods of environmental expertise</p> <p>OPK-4.3 Participates in the environmental assessment of technological production using biological methods for assessing environmental and biological safety</p> <p>Applies the experience of planning environmental impact assessment based on the analysis of available evidence</p> <p>OPK-4.4 Applies the experience of planning environmental impact assessment based on the analysis of available evidence</p>
	<p>OPK-5 Is able to participate in the creation and implementation of new technologies in the field of professional activity and control of their environmental safety using living objects</p>	<p>OPK-5.1 Applies theoretical foundations and practical experience in the use of various biological objects in the field of professional activity, bio- and environmental safety</p> <p>OPK-5.2 Applies criteria for assessing biosafety effectiveness</p> <p>OPK-5.3 Participates in the creation and implementation of new technologies in the field of professional activity and control of their environmental safety using living objects</p> <p>OPK-5.4 Applies the experience of working with promising for biotechnological processes living objects, in accordance with the profile type of activity</p>

Code and name of the competency achievement indicator	Name of the assessment indicator (the result of training in the discipline)
UK-1.1 Analyzes the problem situation using a systematic approach and modern natural science knowledge, using reliable data and reliable sources of information	<p><b>Knows</b> the basic ways to search for scientific information</p> <p><b>Able to</b> analyze a problem situation using a systematic approach and modern natural science knowledge</p> <p>Proficient in the methods of a systematic approach to solving professional problems</p>
UK-1.2 Develops and substantively argues possible strategies for solving a problem situation on the basis of systemic and interdisciplinary approaches, taking into account the parameters of the level of health of the population	<p><b>Knows</b> the basic criteria for the level of health of the population</p> <p><b>Able to</b> assess possible risks and threats to public safety</p> <p>Owns various methods of solving a problem situation on the basis of systematic and interdisciplinary approaches, taking into account the parameters of the level of health of the population</p>
UK-1.3	<p><b>Knows</b> the basic strategies for solving problem situations</p> <p><b>Able to</b> assess possible risks and consequences</p>

<p>Develops a scenario for the implementation of the optimal strategy for solving the problem situation, taking into account the necessary resources, achievable results, possible risks and consequences</p>	<p>Owns various methods of solving a problem situation, taking into account the necessary resources, achievable results, possible risks and consequences</p>
<p>OPK-4.1 Uses theoretical foundations, methods and regulatory documentation in the field of environmental expertise, features of survey and assessment of the ecological state of territories and water areas, methods of testing the effectiveness and biosafety of products of technological production</p>	<p><b>Knows</b> regulatory documents, in the field of environmental expertise  <b>Able to</b> develop evidence-based recommendations to protect the population from biological threats  <b>Has</b> the skills to conduct an environmental impact assessment</p>
<p>OPK-4.2 Applies professional knowledge and skills to develop and propose innovative tools and methods of environmental expertise</p>	<p><b>Knows</b> the simplest standard laboratory methods for detecting biological threats  <b>Able to</b> use professional knowledge and skills to develop and offer innovative tools and methods of environmental expertise  Owns modern methods of environmental expertise</p>
<p>OPK-4.3 Participates in the environmental assessment of technological production using biological methods for assessing environmental and biological safety  Applies the experience of planning environmental impact assessment based on the analysis of available evidence</p>	<p><b>Knows</b> the regulatory and legal documentation in the field of environmental safety of technological production  <b>Able to</b> analyze available evidence  <b>Has</b> the skills of planning and conducting environmental expertise</p>
<p>OPK-4.4 Applies the experience of planning environmental impact assessment based on the analysis of available evidence</p>	<p><b>He knows</b> the main types of biological threats, their metabolism, mechanism of action, interaction with the microbiota, mechanism of action on the macroorganism.  <b>Able</b> to identify the main natural and anthropogenic contaminants of biological origin, which are of epidemic importance  Owns methods of studying metabolism, the mechanism of action of biological agents of epidemic importance</p>
<p>OPK-5.1 Applies theoretical foundations and practical experience in the use of various biological objects in the field of professional activity, bio- and environmental safety</p>	<p><b>Knows</b> the main Russian and international legislative acts in the field of biosafety  <b>Able</b> to apply the norms of Russian and international law in the field of biosafety  <b>Has</b> the skills to conduct an environmental impact assessment</p>
<p>OPK-5.2 Applies criteria for assessing biosafety effectiveness</p>	<p><b>Knows</b> the basic methodological recommendations for the protection of the environment from the effects of contaminants of biological origin  <b>Able to</b> develop programs for the prevention of biological threats</p>

	Proficient in the implementation and control of biosafety and health protection programs
OPK-5.3 Participates in the creation and implementation of new technologies in the field of professional activity and control of their environmental safety using living objects	<b>Knows</b> the structure and biochemical mechanisms of functioning of living systems <b>Able to</b> work with laboratory animals Owns the methods of implementation and control of environmental safety programs using living objects.
OPK-5.4 Applies the experience of working with promising for biotechnological processes living objects, in accordance with the profile type of activity	<b>Knows</b> the main promising living objects for biotechnological processes <b>Able to</b> use living objects in biotechnological processes Owns the methods of work in accordance with the core type of activity

II. Labor intensity of discipline and types of training sessions in the discipline  
The total labor intensity of the discipline is 2 z.u. (72 academic hours, (1 credit unit corresponds to 36 academic hours).

Types of training sessions and work of the student in the discipline are:

Designation	Types of training sessions and work of the student
Lek	Lecture
Ave	Practical exercises
Pr electr.	
WED:	Independent work of the student during the period of theoretical training
including control	Independent work of the student and contact work of the student with the teacher during the period of intermediate certification
	And other types of work

Structure of the discipline:

The form of training is full-time.

№	Name of the section Discipline	Se me ster	Number of hours by types of training sessions and work of the student						Intermediate attestation forms
			Lek	Lab	Ave	OK	WED	Control	
1.	Module 1. Fundamentals of Russian and international legislation in the field of biosafety		9		9				

2.	Module 2. Methods for identifying, assessing and preventing biological threats		9		94				
	Total:	2	18	-	18	-	36	-	Credit

## THE STRUCTURE AND CONTENT OF THE THEORETICAL PART OF THE COURSE

### LECTURES 18 HOURS

#### **Module 1. Fundamentals of Russian and international legislation in the field of biosafety**

##### **Topic 1. Modern concept of state policy in the field of biosafety of the population of the Russian Federation (4 hours)**

Characteristics of the state in the field of biosafety of the population. Goals, objectives and stages of implementation of state policy. Basic principles of state policy in the field of biosafety. Main directions of state policy in the field of biosafety.

##### **Topic 2. Fundamentals of Russian and International Biosafety Legislation (5 hours)**

Basic concepts in the field of biosafety. Legal regulation of relations in the field of biosafety.

#### **Module 2. Methods for identifying, assessing and preventing biological threats**

##### **Topic 1. Types of biological threats (3 hours)**

Basic concepts, terms and definitions.

##### **Topic 2. Organization of laboratory control (3 hours)**

Types of laboratories, goals and objectives of laboratory control. Technological and biological control: Functions of the production laboratory.

##### **Topic 3. Environmental impact assessment (3 hours)**

The concept and types of environmental expertise. Standard methods of environmental impact assessment. Departmental and state control, public control, regulatory legal acts.



## **IV. STRUCTURE AND CONTENT OF THE PRACTICAL PART OF THE COURSE AND INDEPENDENT WORK**

### **PRACTICAL TRAINING 18 HOURS**

#### **Session 1. (3 hours)**

Modern concept of state policy in the field of biosafety of the population of the Russian Federation

#### **Session 2. (3 hours)**

Assessment of the risks of epidemics and pandemics.

#### **Session 3. (3hours)**

Natural and anthropogenic biological threats, their metabolism, mechanism of action, interaction with the microbiota, mechanism of action on the macroorganism

#### **Session 4. (3 hours)**

Laboratory methods for the analysis of the detection of biological agents that pose a threat to public health

#### **Session 5. (3 hours)**

Development of a program to ensure the biosecurity of the population

#### **Topic 6. (3 hours)**

Application of Russian and international law in the field of biosecurity

### **INDEPENDENT WORK**

The purpose of the independent work of the student is to work meaningfully and independently first with educational material, then with scientific information, to lay the foundations of self-organization and self-education in order to instill the ability to further continuously improve their professional qualifications.

The process of organizing the independent work of the student includes the following stages:

- preparatory (setting goals, drawing up a program, preparing methodological support, preparing equipment);
- basic (implementation of the program, the use of methods of information retrieval, assimilation, processing, application, transfer of knowledge, fixation of results, self-organization of the work process);
- final (assessment of the significance and analysis of the results, their systematization, assessment of the effectiveness of the program and methods of work, conclusions on the directions of labor optimization).

In the process of independent work, the student acquires the skills of self-organization, self-control, self-government, self-reflection and becomes an active independent subject of educational activity. Independent work of students should have an important impact on the formation of the personality of the future specialist, it is planned by the student independently. Each student independently determines the mode of his work and the measure of work spent on mastering the educational

content in each discipline. He performs extracurricular work according to a personal individual plan, depending on his preparation, time and other conditions.

## **V. EDUCATIONAL AND METHODOLOGICAL SUPPORT OF INDEPENDENT WORK OF STUDENTS**

As the material on the subject of the discipline is mastered, it is planned to perform independent work of students on the collection and processing of literary material to expand the field of knowledge in the discipline under study, which allows you to deepen and consolidate specific practical knowledge gained in classroom classes. To study and fully master the program material on the discipline, educational, reference and other literature recommended by this program, as well as specialized periodicals, are used.

When independently preparing for classes, students take notes on the material, independently study the issues on the topics covered, using the educational literature from the proposed list, periodicals, scientific and methodological information, databases of information networks.

Independent work consists of such types of work as the study of material on textbooks, reference books, videos and presentations, as well as other reliable sources of information; preparation for the test. To consolidate the material, it is enough, flipping through the notes or reading it, mentally restore the material. If necessary, refer to the recommended educational and reference literature, write down incomprehensible moments in the questions to understand them in the upcoming lesson.

Preparation for practical exercises. This type of independent work consists of several stages:

1) Repetition of the studied material. For this purpose, lecture notes, recommended basic and additional literature are used;

2) Deepening knowledge on the proposed topics. It is necessary to differentiate the available material in lectures, textbooks in accordance with the points of the plan of the practical lesson. Separately write out unclear questions, terms. It is better to do this in the margins of the lecture notes or textbook. Clarification should be carried out with the help of reference literature (dictionaries, encyclopedic publications, etc.);

3) Drawing up a detailed plan for the speech, or conducting calculations, solving problems, exercises, etc. In preparation for practical exercises, students take notes on the material, prepare answers to the above questions on the topics of practical exercises. In addition to the practical material, students independently study questions on the proposed topics, using educational literature from the

proposed list, periodicals, scientific and methodological information, databases of information networks (Internet, etc.).

Requirements for the presentation and design of the results of independent work

There are no special requirements for the provision and design of the results of this independent work.

Control over the implementation of the plan of independent work of students is carried out by the teacher in practical classes by interviewing and by including in the final tasks specified in the lesson from the plan of independent work.

## VI. MONITORING THE ACHIEVEMENT OF COURSE OBJECTIVES

No p/n	Supervised modules/ sections / topics of the discipline	Codes and stages of competence formation		Valuation tools - name	
				current control	intermediate attestation
1	Module 1. Fundamentals of Russian and international legislation in the field of biosafety	UK-1.1 UK-1.2 UK-1.3 OPK-4.1 OPK-4.2 OPK-4.3 OPK-4.4 OPK-5.1 OPK-5.2 OPK-5.3 OPK-5.4	Knows, can, owns	UO-3, PR-1, PR-4	Credit
2	Module 2. Methods for identifying, assessing and preventing biological threats	UK-1.1 UK-1.2 UK-1.3 OPK-4.1 OPK-4.2 OPK-4.3 OPK-4.4 OPK-5.1 OPK-5.2 OPK-5.3 OPK-5.4	Knows, can, owns	UO-3, PR-1, PR-4	Credit

## VII. LIST OF REFERENCES AND INFORMATION AND METHODOLOGICAL SUPPORT OF THE DISCIPLINE

### MAIN LITERATURE

1. Kalygin, V. G. Safety of life. Industrial and environmental safety, safety in technogenic emergency situations. Kurs lektsii / V. G. Kalygin, V. A. Bondar, R. Y.

Deseyan - Moscow : KolosS, 2013. - 520 p. (Textbooks and teaching aids for students of higher educational institutions) - ISBN 5-9532-0221-0. - Text : electronic // EBS "Student Consultant" : [site]. - URL : <https://www.studentlibrary.ru/book/ISBN5953202210.html> (date of access: 2023.02.15).

2. Gazizova, O. V. Ecological safety : uchebnoe posobie / O. V. Gazizova, A. R. Galeeva, A. V. Safina. - Kazan : KNRTU, 2019. - 116 p. - ISBN 978-5-7882-2708-5. - Text : electronic // EBS "Student Consultant" : [site]. - URL : <https://www.studentlibrary.ru/book/ISBN9785788227085.html> (date of access: 2023-02-15).

3. Pochekaeva, E. I. Safety of the environment and health of the population : uchebnoe posobie / E. I. Pochekaeva, T. V. Popova. - Rostov n/A : Phoenix, 2013. - 443 p. (Higher education) - ISBN 978-5-222-20051-3. - Text : electronic // EBS "Student Consultant" : [site]. - URL : <https://www.studentlibrary.ru/book/ISBN9785222200513.html> (date of access: 2023-02-15).

4. Narkevich, I. A. Safety of life, medicine of catastrophes : T. 1 : textbook : v 2 t. / pod red. I. A. Narkevicha - Moscow : GEOTAR-Media, 2019. - 768 p. - ISBN 978-5-9704-4596-9. - Text : electronic // EBS "Student Consultant" : [site]. - URL : <https://www.studentlibrary.ru/book/ISBN9785970445969.html> (date of access: 2023-02-15).

#### **FURTHER READING**

1. Dmitrieva, I. A. Ecological safety as a part of international relations : uchebnoe posobie / Dmitrieva I. A. - Rostov n/D : Izd-vo SFU, 2018. - 73 p. - ISBN 978-5-9275-2697-0. - Text : electronic // EBS "Student Consultant" : [site]. - URL : <https://www.studentlibrary.ru/book/ISBN9785927526970.html> (date of access: 2023.02.15).

2. Tetior, A. N. Ecological infrastructure / Tetior A. N. - Moscow : KolosS, 2005. - 272 p. (Textbooks and teaching aids for students of higher educational institutions) - ISBN 5-9532-0312-8. - Text : electronic // EBS "Student Consultant" : [site]. - URL : <https://www.studentlibrary.ru/book/ISBN5953203128.html> (date of access: 2023.02.15).

#### **EXTERNAL LINKS**

1. <https://www.rospotrebnadzor.ru/>
2. <https://foodsafety.ru/>
3. <https://www.who.int/ru>

### **VIII.METHODICAL INSTRUCTIONS FOR MASTERING THE DISCIPLINE**

**Planning and organization of the time allotted for the study of the discipline.** You should start mastering the discipline immediately at the very beginning of the academic semester. It is recommended to study the structure and basic provisions of the Work Program of the discipline. Please note that in addition to classroom work (practical classes), independent work is planned, the results of which affect the final assessment based on the results of mastering the academic discipline. All tasks (classroom and independent) must be performed and submitted for evaluation in accordance with the schedule.

In the process of studying the materials of the training course, the following forms of work are offered: lectures, laboratory work, practical classes, tasks (topics) for independent work.

Especially significant for the professional training of students is *the independent work* on the course. In the course of this work, students select the necessary material on the issue under study and analyze it. Students need to familiarize themselves with and complete the basic tasks, without which it is impossible to fully understand the discipline.

Mastering the course contributes to the development of skills in informed and self-assessment of facts and concepts. Therefore, in all forms of knowledge control, especially when passing the test and the exam, attention is paid to the completeness of the development of competencies, to the ability to practically apply knowledge and draw conclusions.

**Work with literature.** It is recommended to use various opportunities for working with literature: the funds of the FEFU scientific library and electronic libraries (<http://www.dvfu.ru/library/>), as well as other scientific and library systems available for use.

Students who have completed all the tasks (practical, independent), provided for by the curriculum of the discipline, who have attended at least 75% of classroom classes are allowed to pass the test and the exam.

### III. MATERNAL-TECHNICAL SUPPORT OF DISCIPLINA

Mastering the discipline "Environmental and Biological Safety" involves the use of the following logistics: A multimedia classroom equipped with broadband Internet access. Computer class. All computers are connected to the FEFU corporate computer network and are in a single domain.

To perform independent work, students in fefu residential buildings are provided with Wi-Fi.

Name of equipped premises and premises for independent work	List of main equipment
Reading rooms of the FEFU	HP All-in-One 400 All-in-One 19,5 (1600x900), Core i3-

<p>Scientific Library with open access to the fund (building A - level 10)</p>	<p>4150T, 4GB DDR3-1600 (1x4GB), 1TB HDD 7200 SATA, DVD+/-RW, GigEth, Wi-Fi, WT, usb kbd/mse, Win7Pro (64-bit)+Win8.1Pro(64-bit), 1-1-1 Wty Internet access speed 500 Mbps.</p> <p>Workplaces for people with disabilities are equipped with Braille displays and printers; equipped with: portable devices for reading flat-printed texts, scanning and reading machines video magnifier with the ability to regulate color spectra; magnifying electronic magnifiers and ultrasonic markers</p>
<p>Auditorium for independent work of students Vladivostok, Russky, Ajax, 10, Building 25.1, Oud. M621 Area 44.5 m<sup>2</sup></p>	<p>Monoblock Lenovo C360G-i34164G500UDK 19.5" Intel Core i3-4160T 4GB DDR3-1600 SODIMM (1x4GB)500GB Windows Seven Enterprise - 17 pieces; Wired LAN - Cisco 800 series; wireless LANs for students are provided with a system based on access points 802.11a / b / g / n 2x2 MIMO (2SS).</p>
<p>Auditorium for lectures  Vladivostok, Russky Island, Ajax village, FEFU campus, korp. M, aud. M 422, area 158,6 m<sup>2</sup></p>	<p>Multimedia audience: Monoblock Lenovo C360G-i34164G500UDK; Projection screen Projecta Elpro Electrol, 300x173 cm; Multimedia projector, Mitsubishi FD630U, 4000 ANSI Lumen, 1920x1080; Mortise interface with TLS TAM 201 Stan automatic cable retraction system; Avervision CP355AF Visualizer; Microphone cordless radio system UHF band Sennheiser EW 122 G3 consisting of a wireless microphone and receiver; LifeSizeExpress 220- Codeconly- Non-AES video conferencing codec; Network video camera Multipix MP-HD718; Two 47" LCD panels, Full HD, LG M4716CCBA; Subsystem of audio switching and sound amplification; centralized uninterrupted power supply</p>
<p>Classroom for practical exercises  Vladivostok, Russkiy p. Ajax, 10, Korpus L, aud. L 403, area 30.6 m<sup>2</sup></p>	<p>Computer Lab: 15 workstations with access to the FEFU local network and the Internet; HP LogoOpe 400 All-in-One 19.5 (1600x900), Core i3-4150T, 4GB DDR3-1600 (1x4GB), 1TB HDD 7200 SATA, DVD+/-RW, GigEth, Wi-Fi, WT, usb kbd/mse, Win7Pro (64-bit)+Win8.1Pro(64-bit), 1-1-1 Wty.</p>
<p>Vladivostok, Russky Island, Ajax, FEFU campus, Building L, aud. L 432</p>	<p>Center for Biological Safety of FEFU SBM: microbiological safety boxes BMB-II Laminar-S in the performance of BMB-II-"Laminar-S"-1.2, a device for polymerase chain reaction in real time Rotor-Gene Q, 6 plex, automatic luminescent multichannel analyzer ALA-1/4 (4-channel), high-speed mini-centrifuge Microspin, medical suctioner OM-1, Microcentrifuge / Shaker TETA-2, solid-state thermostat Thermo 24/15, four-channel thermostat programmable for PCR analysis "Tertsik", automatic pipettes.</p>

In order to provide special conditions for the education of disabled people and persons with disabilities at FEFU, all buildings are equipped with ramps, elevators, lifts, specialized places equipped with toilets, signs of information and navigation support.

## EVALUATION FUND

### FOS Passport

Name of the category (group) of universal competencies	Code and name of the universal competence of the graduate	Code and name of the indicator of achievement of universal competence
Systems and Critical Thinking	UK-1 is able to carry out critical analysis of problem situations on the basis of a systematic approach, to develop an action strategy	<p>UK-1.1 Analyzes the problem situation using a systematic approach and modern natural science knowledge, using reliable data and reliable sources of information</p> <p>UK-1.2 Develops and substantively argues possible strategies for solving a problem situation on the basis of systemic and interdisciplinary approaches, taking into account the parameters of the level of health of the population</p> <p>UK-1.3 Develops a scenario for the implementation of the optimal strategy for solving a problem situation, taking into account the necessary resources, achievable results, possible risks and consequences.</p>

General professional competencies of graduates and indicators of their achievement:

Name of the category (group) of universal competencies	Code and name of the universal competence of the graduate	Code and name of the indicator of achievement of universal competence
	OPK-4 Is able to participate in the environmental assessment of territories and water areas, as well as technological production using biological methods for assessing environmental and biological safety	<p>OPK-4.1 Uses theoretical foundations, methods and regulatory documentation in the field of environmental expertise, features of survey and assessment of the ecological state of territories and water areas, methods of testing the effectiveness and biosafety of products of technological production</p> <p>OPK-4.2 Applies professional knowledge and skills to develop and propose innovative tools and methods of environmental expertise</p> <p>OPK-4.3 Participates in the environmental assessment of technological production using biological methods for assessing environmental and biological safety</p>

		<p>Applies the experience of planning environmental impact assessment based on the analysis of available evidence</p> <p>OPK-4.4 Applies the experience of planning environmental impact assessment based on the analysis of available evidence</p>
	<p>OPK-5 Is able to participate in the creation and implementation of new technologies in the field of professional activity and control of their environmental safety using living objects</p>	<p>OPK-5.1 Applies theoretical foundations and practical experience in the use of various biological objects in the field of professional activity, bio- and environmental safety</p> <p>OPK-5.2 Applies criteria for assessing biosafety effectiveness</p> <p>OPK-5.3 Participates in the creation and implementation of new technologies in the field of professional activity and control of their environmental safety using living objects</p> <p>OPK-5.4 Applies the experience of working with promising for biotechnological processes living objects, in accordance with the profile type of activity</p>

Code and name of the competency achievement indicator	Name of the assessment indicator (the result of training in the discipline)
UK-1.1 Analyzes the problem situation using a systematic approach and modern natural science knowledge, using reliable data and reliable sources of information	<p><b>Knows</b> the basic ways to search for scientific information</p> <p><b>Able to</b> analyze a problem situation using a systematic approach and modern natural science knowledge</p> <p>Proficient in the methods of a systematic approach to solving professional problems</p>
UK-1.2 Develops and substantively argues possible strategies for solving a problem situation on the basis of systemic and interdisciplinary approaches, taking into account the parameters of the level of health of the population	<p><b>Knows</b> the basic criteria for the level of health of the population</p> <p><b>Able to</b> assess possible risks and threats to public safety</p> <p>Owns various methods of solving a problem situation on the basis of systematic and interdisciplinary approaches, taking into account the parameters of the level of health of the population</p>
UK-1.3 Develops a scenario for the implementation of the optimal strategy for solving the problem situation, taking into account the necessary resources, achievable results, possible risks and consequences	<p><b>Knows</b> the basic strategies for solving problem situations</p> <p><b>Able to</b> assess possible risks and consequences</p> <p>Owns various methods of solving a problem situation, taking into account the necessary resources, achievable results, possible risks and consequences</p>



<p>OPK-4.1 Uses theoretical foundations, methods and regulatory documentation in the field of environmental expertise, features of survey and assessment of the ecological state of territories and water areas, methods of testing the effectiveness and biosafety of products of technological production</p>	<p><b>Knows</b> regulatory documents, in the field of environmental expertise  <b>Able to</b> develop evidence-based recommendations to protect the population from biological threats  <b>Has</b> the skills to conduct an environmental impact assessment</p>
<p>OPK-4.2 Applies professional knowledge and skills to develop and propose innovative tools and methods of environmental expertise</p>	<p><b>Knows</b> the simplest standard laboratory methods for detecting biological threats  <b>Able to</b> use professional knowledge and skills to develop and offer innovative tools and methods of environmental expertise  Owns modern methods of environmental expertise</p>
<p>OPK-4.3 Participates in the environmental assessment of technological production using biological methods for assessing environmental and biological safety  Applies the experience of planning environmental impact assessment based on the analysis of available evidence</p>	<p><b>Knows</b> the regulatory and legal documentation in the field of environmental safety of technological production  <b>Able to</b> analyze available evidence  <b>Has</b> the skills of planning and conducting environmental expertise</p>
<p>OPK-4.4 Applies the experience of planning environmental impact assessment based on the analysis of available evidence</p>	<p><b>He knows</b> the main types of biological threats, their metabolism, mechanism of action, interaction with the microbiota, mechanism of action on the macroorganism.  <b>Able</b> to identify the main natural and anthropogenic contaminants of biological origin, which are of epidemic importance  Owns methods of studying metabolism, the mechanism of action of biological agents of epidemic importance</p>
<p>OPK-5.1 Applies theoretical foundations and practical experience in the use of various biological objects in the field of professional activity, bio- and environmental safety</p>	<p><b>Knows</b> the main Russian and international legislative acts in the field of biosafety  <b>Able</b> to apply the norms of Russian and international law in the field of biosafety  <b>Has</b> the skills to conduct an environmental impact assessment</p>
<p>OPK-5.2 Applies criteria for assessing biosafety effectiveness</p>	<p><b>Knows</b> the basic methodological recommendations for the protection of the environment from the effects of contaminants of biological origin  <b>Able to</b> develop programs for the prevention of biological threats  Proficient in the implementation and control of biosafety and health protection programs</p>
<p>OPK-5.3 Participates in the creation and implementation of new technologies in the field of professional activity and control of</p>	<p><b>Knows</b> the structure and biochemical mechanisms of functioning of living systems  <b>Able to</b> work with laboratory animals  Owns the methods of implementation and control of environmental safety programs using living objects.</p>

their environmental safety using living objects	
OPK-5.4 Applies the experience of working with promising for biotechnological processes living objects, in accordance with the profile type of activity	<b>Knows</b> the main promising living objects for biotechnological processes <b>Able to</b> use living objects in biotechnological processes Owns the methods of work in accordance with the core type of activity

### MONITORING THE ACHIEVEMENT OF COURSE OBJECTIVES

No p/n	Supervised modules/ sections / topics of the discipline	Codes and stages of competence formation		Valuation tools - name	
				current control	intermediate attestation
1	Module 1. Fundamentals of Russian and international legislation in the field of biosafety	UK-1.1 UK-1.2 UK-1.3 OPK-4.1 OPK-4.2 OPK-4.3 OPK-4.4 OPK-5.1 OPK-5.2 OPK-5.3 OPK-5.4	Knows, can, owns	UO-3, PR-1, PR-4	Credit
2	Module 2. Methods for identifying, assessing and preventing biological threats	UK-1.1 UK-1.2 UK-1.3 OPK-4.1 OPK-4.2 OPK-4.3 OPK-4.4 OPK-5.1 OPK-5.2 OPK-5.3 OPK-5.4	Knows, can, owns	UO-3, PR-1, PR-4	Credit

## Scale of assessment of the level of formation of competencies

Competence code and wording	Stages of competence formation		criteria	Indicators
UK-1.1 Analyzes the problem situation using a systematic approach and modern natural science knowledge, using reliable data and reliable sources of information	Knows	the main ways to search for scientific information	knowledge of methods of searching for scientific information	the ability to use scientific information competently
	Can	analyze the problem situation using a systematic approach and modern natural science knowledge	ability to analyze a problem situation	the ability to apply a systematic approach and modern natural science knowledge
	Owns	methods of a systematic approach in solving professional problems	Owns technologies for solving professional problems	ability to effectively solve the tasks
UK-1.2 Develops and substantively argues possible strategies for solving a problem situation on the basis of systemic and interdisciplinary approaches, taking into account the parameters of the level of health of the population	Knows	the main criteria for the level of health of the population	knowledge of the strategy for solving a problem situation based on systematic and interdisciplinary research approaches	the ability to take into account the parameters of public health when solving problems in the field of environmental safety
	Can	assess possible risks and threats to public safety	ability to characterize the ecological and biological situation	the ability to independently make a decision in case of non-standard situations
	Owns	various methods of solving the problem	possession of moral and ethical standards	the ability to analyze the current situations in the process of research, to

		situation on the basis of systematic and interdisciplinary approaches, taking into account the parameters of the level of health of the population	of biological research; ensuring the security of the research process	justify the choice of methods and technologies used in research; the ability to take ethical and social responsibility for the decisions made
UK-1.3 Develops a scenario for the implementation of the optimal strategy for solving the problem situation, taking into account the necessary resources, achievable results, possible risks and consequences	Knows	<b>Knows</b> the basic strategies for solving problem situations	knowledge of methods of analysis, processing and presentation of solving professional problems	the ability to independently solve the problem posed
	Can	assess possible risks and consequences	owns modern methods and technologies for solving scientific and research problems	the ability to independently set scientific tasks and perform them
	Owens	various methods of solving the problem situation, taking into account the necessary resources, achievable results, possible risks and consequences	Knows the methods of analysis of biological information	owns the methods of systematization and analysis of data
OPK-4.1 Uses theoretical foundations, methods and regulatory documentation in the field of	Knows	normative documents in the field of environmental expertise	It is necessary to design the work on the conduct of environmental expertise	is able to independently conduct an environmental impact assessment

environmental expertise, features of survey and assessment of the ecological state of territories and water areas, methods of testing the effectiveness and biosafety of products of technological production	Can	develop evidence-based recommendations to protect the public from biological threats	uses a minimum set of MTO to solve scientific problems	has the skills to work with technical equipment
	Owns	skills in conducting environmental expertise	uses modern methods of diagnosis of infectious diseases	is able to competently differentiate the causative agent of infection
OPK-4.2 Applies professional knowledge and skills to develop and propose innovative tools and methods of environmental expertise	Knows	the simplest standard laboratory methods for detecting biological threats	owns the basic requirements for the safety of the population	is able to independently identify negative factors of influence on humans
	Can	use professional knowledge and skills to develop and propose innovative tools and methods of environmental impact assessment	performs tasks to improve the health of the environment and the population	is able to perform certain tasks in the field of biosafety
	Owns	modern methods of environmental expertise	knows the methods of eliminating biological threats	is able to independently identify and develop a plan for eliminating a biological threat
OPK-4.3 Participates in the environmental assessment of technological production using biological methods for assessing	Knows	regulatory and legal documentation in the field of environmental safety of technological production	knows the technical documentation	has the skills to work with technical equipment

environmental and biological safety Applies the experience of planning environmental impact assessment based on the analysis of available evidence	Can	analyze the available evidence	knows how to solve technical problems	is able to competently prepare proposals for the modification of technical means to solve innovative problems in professional activities
	Owns	skills in planning and conducting environmental impact assessment	knows how to use technical means to solve innovative problems in the field of environmental expertise	uses technical means to solve innovative problems in the field of environmental expertise
OPK-4.4 Applies the experience of planning environmental impact assessment based on the analysis of available evidence	Knows	the main types of biological threat, their metabolism, mechanism of action, interaction with the microbiota, mechanism of action on the macroorganism.	knows the main types of biological threat in the field of biosafety	is able to use the evidence to decide for the country in the field of biosafety
	Can	to identify the main natural and anthropogenic contaminants of biological origin, which are of epidemic importance	knows natural and anthropogenic contaminants of biological origin that are of epidemic importance	is able to independently investigate cases of infectious and mass non-communicable diseases
	Owns	methods of studying metabolism, the mechanism of action of biological agents of epidemic importance	knows modern methods of identification of pathogens	is able to identify and identify the causative agent of the disease

OPK-5.1 Applies theoretical foundations and practical experience in the use of various biological objects in the field of professional activity, bio- and environmental safety	Knows	the main Russian and international legislative acts in the field of biosafety	knows the technical and scientific base in the field of biosafety	is able to apply the acquired knowledge in practice
	Can	apply the norms of Russian and international law in the field of biosafety	knows how to register cases of occupational diseases	is able to draw up an act or draw up a protocol of a case of an occupational disease
	Owns	skills in assessing the occurrence of biological threat risks	knows modern methods of identifying biological threats	is able to independently identify a biological threat
OPK-5.2 Applies criteria for assessing biosafety effectiveness	Knows	<b>Knows</b> the basic methodological recommendations for the protection of the environment from the effects of contaminants of biological origin	knows the regulatory and legal documentation in the field of biosafety	is able to apply the legislative framework in the field of biosafety in practice
	Can	carry out sanitary-technical and organizational measures to localize the outbreak and group morbidity of infectious diseases	develop programmes to prevent biological threats	is able to carry out organizational measures to localize the outbreak and group morbidity of infectious diseases
	Owns	algorithm of anti-epidemic protection of the population	methods of implementation and control of biosecurity and sanitary protection programs	is able to organize anti-epidemic protection of the population

OPK-5.3 Participates in the creation and implementation of new technologies in the field of professional activity and control of their environmental safety using living objects.	Knows	structure and biochemical mechanisms of functioning of living systems	mechanisms of functioning of living systems	To develop new technologies in the field of professional activity and control of their environmental safety using living objects.
	Can	work with laboratory animals	Principles and rules of experimental work with living objects	Independently conduct an experiment
	Owns	methods of implementation and control of environmental safety programs using living objects	Methods of control of environmental safety programs using living objects	Implement an environmental safety program using living objects
OPK-5.4 Applies the experience of working with promising for biotechnological processes living objects, in accordance with the profile type of activity	Knows	the main promising living objects for biotechnological processes	kinds of promising living objects for biotechnological processes	work with living objects
	Can	use of living objects in biotechnological processes	methods of using living objects in biotechnological processes	work with living objects
	Owns	methods of work in accordance with the core type of activity	basic methods of environmental and biological expertise	Independently conduct research to solve professional problems

**Methodological recommendations that determine the procedures for assessing the results of mastering the discipline**



Current and intermediate certification of students in the discipline "Environmental and Biological Safety" is carried out in accordance with local FEFU regulations and is mandatory.

According to the discipline under study, the following are used for current control and intermediate (semester) certification

### **Valuation tools:**

1. Oral questioning:  
report (GS-3),
2. Test (PR-1):
3. Abstract (PR-4)

**Oral questioning (report)** is the most common method of monitoring students' knowledge. During oral questioning, direct contact is established between the teacher and students, during which the teacher receives ample opportunities to assess the quantity and quality of students' assimilation of educational material. It is the most common and adequate form of monitoring students' knowledge, includes an interview (mainly in an exam and test), a colloquium, report.

### **Criteria for evaluating an oral response:**

"5 points" are given to the student if he gives the right answers to the questions under discussion, which are distinguished by the depth and completeness of the disclosure of the topic, is able to draw conclusions and generalizations, give reasoned answers that are logical and consistent.

"4 points" is given to the student if he gives the right answers to the questions under discussion, which differ in the depth and completeness of the disclosure of the topic, is able to draw conclusions and generalizations, but one or two errors in the answers are allowed.

"3 points" are given to the student if he gives answers to the discussed questions that do not fully disclose it, there is no logical construction of the answer, makes several mistakes.

"2 points" are given to the student if he gives answers to the questions under discussion, which show that he does not own the material of the topic, cannot give reasoned answers, serious errors are made in the content of the answer.

**The abstract** can serve as a form not only of verification, but also of increasing the knowledge of students. In the abstracts, all or individual topics, issues of the course under study can be discussed.

The evaluation criteria for abstracts at colloquia are the same as for oral answers.

**The test** is a written or computer form of control aimed at checking the possession of the terminological apparatus and specific (accurate) knowledge in the field of fundamental and applied disciplines.

Criteria for assessing the control work:

5 points are given to a student if he answered 100-90% of all questions.

4 points are given for the correct answer to 89-80% of all questions.

3 points are given for the correct answer to 79-65% of all questions.

2 points are given for the correct answer to 64-50% of all questions.

1 point is given for the correct answer on less than 50% of all questions.

### **Questions for credit**

1. The concept of environmental safety. Indicators of the state of national security of the Far East in the environmental sphere.

2. Threats to the environmental safety of the Far East. Environmental safety system.

3. Ecology as a science. The concept of ecology beyond science.

4. General patterns of action on organisms of adverse factors - factors of threshold and non-threshold action. Features of ionizing radiation as an environmental factor.

5. Characteristics of the population. Biocenosis and its most important characteristics. Concepts of ecosystem and biosphere.

6. The principle of bioaccumulation (aka biological accumulation or accumulation of pollutants in food chains).

7. Biological diversity. Biodiversity levels. The importance of biological diversity. Problems of reducing the quantitative composition and extinction of species.

8. Scientific principles of allocation of specially protected natural areas. Specially protected areas and objects of the Far East.

9. Atmosphere and its importance for environmental safety. Dangerous meteorological phenomena and their relevance for the territory of the Far East. Layering of the atmosphere and its ecological significance.

10. Dangerous planetary consequences of modern anthropogenic impact on the atmosphere. 11. The main factors of anthropogenic climate change.

12. Types of air pollution and changes in the state of the atmosphere. Areas of activity for the protection of the atmosphere and the regulation of the quality of the air basin.

13. Hydrosphere as a factor of environmental safety. Dangerous hydrological phenomena and their relevance for the territory of the Far East.

14. Water availability and water consumption in the world and in the Far East. Ways to reduce water consumption in the industrial and municipal spheres.

15. Lithosphere as a factor of environmental safety. Immediate lithospheric threats and their risks.

16. Environmental consequences and risks of exploitation of mineral deposits. Ways to reduce the environmental costs associated with the development of deposits.

17. Soil fertility and its types. The importance of preserving natural soil fertility.

18. Ecological differences between humans and animals.

19. Environmental policy and the main areas of its implementation. Environmental human rights and its components.

20. Concept of sustainable development. The National Strategy for Sustainable Social and Economic Development of the Far East and its most important strategic goals.

21. Methods of management of the ecological sphere of society. Management bodies in the field of nature management and nature protection of the Far East and their functions. Functions of the Ministry of Emergency Situations in the field of environmental safety.

22. Environmental safety in the activities of enterprises. Environmental expertise, environmental certification and environmental audit.

23. Principles and forms of interstate cooperation in the field of environmental safety.

24. Ecological notrmatives, their types. Environmental monitoring and its types.

25. Environmental consequences of fires in natural systems, as well as natural disasters.