МИНИСТЕРСТВО НАУКИ И ВЫСШЕГО ОБРАЗОВАНИЯ РОССИЙСКОЙ ФЕДЕРАЦИИ
Федеральное государственное автономное образовательное учреждение высшего образования
Дальневосточный федеральный университет
(ДВФУ)

ШКОЛА БИОМЕДИЦИНЫ

«СОГЛАСОВАНО»	«УТВЕРЖДАЮ»
Руководитель ОП	Директор Департамента пищевых наук и технологий
_____ Каленик Т.К.	_____ Ю.В. Приходько
(подпись) (Ф.И.О. рук. ОП)	(подпись) (Ф.И.О.)
«12» июля 2018 г.	«12» июля 2018 г.

УЧЕБНО-МЕТОДИЧЕСКИЙ КОМПЛЕКС ДИСЦИПЛИНЫ

«Genetic modification of bacteria, plants and animals / Генетическая модификация бактерий, растений и животных»
Направление подготовки **19.04.01 «Биотехнология»**
Образовательная программа «Агропищевая биотехнология»
Форма подготовки очная

Школа биомедицины
Департамент пищевых наук и технологий
Курс _1_, семестр _2_
Лекции –_9_ час.
Практические занятия –_27_ час.
Лабораторные работы –_-_ час.
Самостоятельная работа – _72_ час.
Всего часов –_108_ час.
Всего часов аудиторной нагрузки – __36__ час.
Контрольные работы – ____ / не предусмотрены
Зачет – _2_ семестр
Экзамен – __ семестр

Учебно-методический комплекс составлен в соответствии с требованиями образовательного стандарта, самостоятельно устанавливаемого ДВФУ, утвержденного приказом ректора от 07.07.2015 № 12-13-1282.
УМКД обсужден на заседании Департамента пищевых наук и технологий Школы биомедицины ДВФУ протокол № 1 от «11» июля 2018 г.
Директор Департамента пищевых наук и технологий Ю.В. Приходько
Составитель: Ким Е.М.

ANNOTATION

of the educational complex of discipline

«Genetic modification of bacteria, plants and animals / Генетическая модификация бактерий, растений и животных»

Direction of preparation: 19.04.01 Biotechnology

Educational program: "Agri-Food Biotechnology"

The educational-methodical complex of the discipline «Genetic modification of bacteria, plants and animals / Генетическая модификация бактерий, растений и животных» was developed for the first-year students in the direction of 19.04.01 Biotechnology "master program" Agri-food biotechnology "in accordance with the requirements of the educational standard, independently established by FEFU, approved by order of the rector dated 07.07.2015 No. 12-13-1282 in this direction.

The discipline "Biotechnology of genetically modified raw materials and food / Biotechnology of genetically modified raw materials and food" is included in the variable part of the curriculum.

The total complexity of mastering the discipline is 108 hours. The curriculum includes lecture classes (9 hours), practical classes (27 hours), independent work of the student (54 hours). Discipline is implemented on the 1st course in the 2nd semester.

The content of the discipline covers the following range of issues:

- main directions of genetic modification of crops, microorganisms and animals, which are raw materials for food biotechnology;
- technology for creating genetically modified raw materials for food production;
- features of biotechnology of food products from genetically modified raw materials;
- regulatory and technical documentation in the field of handling genetically modified food raw materials.

The discipline "Biotechnology of genetically modified raw materials and food / Logically modification of bacteria, plants and animals" is logically and

meaningfully connected with such courses as "Modern trends in the development of biotechnology", "Safety and biosafety of agricultural raw materials and food products".

The discipline is aimed at the formation of professional competencies.

Educational complex includes:

- the work program of the discipline;
- educational and methodological support of students' independent work (Appendix 1);
- appraisal fund (appendix 2).

Директор Департамента
пищевых наук и технологий _____Ю.В. Приходько

МИНИСТЕРСТВО НАУКИ И ВЫСШЕГО ОБРАЗОВАНИЯ РОССИЙСКОЙ ФЕДЕРАЦИИ
Федеральное государственное автономное образовательное учреждение
высшего образования
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ШКОЛА БИОМЕДИЦИНЫ

«СОГЛАСОВАНО»	«УТВЕРЖДАЮ»
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«12» июля 2018 г.	«12» июля 2018 г.

РАБОЧАЯ ПРОГРАММА УЧЕБНОЙ ДИСЦИПЛИНЫ

Biotechnology of genetically modified raw materials and food

Направление подготовки 19.04.01 Биотехнология
магистерская программа «Агропищевая биотехнология»
Форма подготовки очная

курс ____1___ семестр ___2_____
лекции _9__ час.
практические занятия___27____час.
лабораторные работы___-____час.
в том числе с использованием МАО лек. __4___/пр.__8___/лаб._____ час.
в том числе в электронной форме лек._____/пр._____/лаб._____ час.
всего часов аудиторной нагрузки____36____ час.
в том числе с использованием МАО 12 час.
в том числе в электронной форме _____ час.
самостоятельная работа ___72_____ час.
в том числе на подготовку к экзамену _____ час.
курсовая работа / курсовой проект _____ семестр
зачет _____2_____ семестр
экзамен_____семестр

Рабочая программа составлена в соответствии с требованиями образовательного стандарта, самостоятельно устанавливаемого ДВФУ, утвержденного приказом ректора от 07.07.2015
№ 12-13-1282

Рабочая программа обсуждена на заседании Департамента пищевых наук и технологий Школы биомедицины ДВФУ протокол № 1 от «11» июля 2018 г.
Директор Департамента Ю.В. Приходько
Составитель (ли): к.т.н., доцент Ким Е.М.

Оборотная сторона титульного листа РПУД

I. Рабочая программа пересмотрена на заседании Департамента:

Протокол от «_____» _____ 20___ г. № _____

Директор Департамента _____ _____
(подпись) (И.О. Фамилия)

II. Рабочая программа пересмотрена на заседании Департамента:

Протокол от «_____» _____ 20___ г. № _____

Директор Департамента _____ _____
(подпись) (И.О. Фамилия)

ABSTRACT

Bachelor's/Specialist's/Master's degree in *19.04.01 Biotechnology*

Study profile/ Specialization/ Master's Program "Title" "*Agri-food biotechnology"*

Course title: «Genetic modification of bacteria, plants and animals / Генетическая модификация бактерий, растений и животных»

Variable part of Block 1 (Б1.В.02.02)**,** 3**credits**

At the beginning of the course a student should be able to:

- the ability to carry out the process in accordance with the regulations and use technical means to measure the main parameters of biotechnological processes, the properties of raw materials and products;

- the ability to carry out standard and certification testing of raw materials, finished products and technological processes;

- the ability to develop the main stages of the biotechnological process.

Learning outcomes: general professional competences (GPC)

SPC 11 – ability to provide technical discipline, sanitary and hygienic mode of operation of the enterprise, maintenance of processing equipment in proper technical condition;

SPC 14 – ability to use typical and develop new methods of engineering calculations of technological parameters and equipment of biotechnological productions;

SPC 17 – readiness for pilot development of technology and scaling-up;

SPC 18 – ability to develop and scientific substantiate schemes for optimal integrated certification of biotechnological products;

SPC 19 – ability to analyze the indicators of the technological process for compliance with the original scientific developments.

Course description: principles and methods for creating genetically modified raw materials; biotechnological features of processing GM raw materials in food production.

Main course literature:

1. Kalenik T.K., Fedyanina L.N.. Tanashkina T.V. Tovarovedeniye i ekspertiza pishchevoy produktsii. poluchennoy iz geneticheski modifitsirovannykh istochnikov: kachestvo i bezopasnost: uchebnoye posobiye dlya vuzov [Merchandising and expertise of food products obtained from genetically modified sources: quality and safety: a textbook]. – Rostov-na-Donu: Izdatelskiy tsentr «MarT»; Feniks. 2010. – 223 p. (rus) – Access: http://lib.dvfu.ru:8080/lib/item?id=chamo:357125&theme=FEFU

2. Neverova O.A., Gorelikova G.A., Poznyakovskiy V.M. Pishchevaya biotekhnologiya produktov iz syria rastitelnogo proiskhozhdeniya: uchebnik [Food biotechnology products from raw materials of plant origin: a textbook]. – Saratov: Izd-vo «Vuzovskoye obrazovaniye». 2014. – 415 p. (rus) – Access: http://www.iprbookshop.ru/4160.html

Form of final control: *pass-fail exam.*

Annotation to the work program of the discipline

«Genetic modification of bacteria, plants and animals / Генетическая модификация бактерий, растений и животных»

The discipline «Genetic modification of bacteria, plants and animals / Генетическая модификация бактерий, растений и животных» is intended for students studying in the direction of preparation 19.04.01 "Biotechnology", master's program "Agri-food biotechnology". Discipline is included in the variable part of the disciplines of Block 1, has the number B1.V.02.03.

The total complexity of mastering the discipline is 3 credits, 108 hours. The curriculum includes lecture classes (9 hours), practical classes (27 hours), independent work (72 hours). Discipline is implemented in the 1st year in the 2nd semester. The form of control by discipline is a set-off.

This course is associated with other disciplines of the OPOP: “Scientific Support for Biotechnology”, “Modern Trends in the Development of Biotechnology”, “Safety and Biosafety of Agri-Food Raw Materials and Food Products”.

The purpose of the discipline is to acquire knowledge about the features of biotechnology of genetically modified raw materials and food products.

Objectives of the discipline:

• acquaintance with the main directions of genetic modification of crops, microorganisms and animals, which are raw materials for food biotechnology;

• consideration of principles and methods for creating genetically modified raw materials for food production;

• knowledge of the biotechnology of food products from genetically modified raw materials;

• ability to work with normative and technical documentation in the field of handling genetically modified food raw materials.

For successful study of the discipline «Genetic modification of bacteria, plants and animals / Генетическая модификация бактерий, растений и животных» the following preliminary competencies should be formed in students:

• the ability to carry out the technological process in accordance with the regulations and use technical means to measure the basic parameters of biotechnological processes, the properties of raw materials and products;

• the ability to conduct standard and certification tests of raw materials, finished products and processes;

• the ability to develop the main stages of the biotechnological process.

As a result of studying this discipline, the following professional competencies (elements of competencies) are formed in students.

Code and wording of competency	**Competency Stages**	
PK 11: the ability to provide technological discipline, sanitary and hygienic operation of the enterprise, the maintenance of technological equipment in proper technical condition	Knows	regulatory and technical and sanitary documents on the organization of the technological process and ensuring the sanitary-hygienic regime of a biotechnological enterprise for the processing of genetically modified food raw materials.
	Is able	to organize the technological process in accordance with the requirements of regulatory, technical and sanitary documentation in the field of handling genetically modified raw materials and food products.
	Owns	the skills of organizing and enforcing technological discipline and a sanitary-hygienic regime at a biotechnological enterprise for the processing of genetically modified raw materials.
PK 14: the ability to use standard and develop new methods of engineering calculations of technological parameters and equipment of biotechnological industries	Knows	standard methods of engineering calculations in biotechnological industries for the production of food products.
	Is able	to develop and produce engineering calculations in the organization of biotechnological industries for the production of genetically modified foods.
	Owns	methods of standard and experimental calculations in biotechnological industries for the processing of genetically modified food raw materials.
PK 17: readiness for pilot development of technology and scaling processes	Knows	principles and methods of organizing and conducting tests with the introduction of new technologies in biotechnological food production.
	Is able	organize pilot development of technologies and process scaling when introducing new biotechnological food production at the enterprise.
	Owns	skills of pilot industrial development of new technologies for the production of food products from genetically modified raw materials.
PK 18: the ability to develop and scientifically substantiate schemes for the optimal integrated certification of biotechnological products	Knows	principles and methods of organizing the optimal integrated certification of biotechnological products.
	Is able	substantiate and develop schemes for the optimal integrated certification of food products obtained from biotechnological processing of genetically modified raw materials.
	Owns	the skills of substantiating and compiling the optimal integrated certification of food products obtained during biotechnological processing of genetically modified raw materials.
PK 19: the ability to analyze process indicators for compliance with initial scientific developments	Knows	regulations and methods for assessing the performance of the process in the processing of genetically modified raw materials and food production.
	Is able	to evaluate and analyze process indicators at food enterprises.
	Owns	methods for establishing compliance of the values of

		technological process indicators indicated in scientific developments with actual data.

To form the above competencies within the framework of the discipline «Genetic modification of bacteria, plants and animals / Генетическая модификация бактерий, растений и животных», the following methods of active / interactive training are used: lecture-press conference, compilation of intelligence cards, work in small groups, seminar-press conference.

I. STRUCTURE AND CONTENT OF THE THEORETICAL PART OF THE COURSE

Section I. Principles and methods for creating genetically modified raw materials (5 hours)

Topic 1. Introduction to the discipline. Basic terms and concepts in the field of genetically modified raw materials and food products (2 hours), using the method of active learning lecture-press conference

Genetically modified organism (GMO), genetic engineering, genetically modified sources, genetically modified food sources. Types of intended use of GMOs.

The main purpose of the lecture and press conference at the beginning of the course is to identify the range of interests and needs of students, their degree of preparedness for work, their attitude to the subject. The need to formulate a question and correctly ask it initiates mental activity, and the expectation of an answer to your question concentrates the student's attention.

Topic 2. Fundamentals of genetic engineering activity (1 hour).

Genome structure pro- and eukaryotes. Features of the structure of the genes of pro- and eukaryotes. Transcription of the operon of prokaryotes. Regulation of the transcription of a bacterial operon. Stages of transcription of the eukaryotic gene. Regulatory elements of the eukaryotic gene.

Topic 3. Creation of genetically modified plants, animals, microorganisms (2 hours), using the active teaching method

General scheme for creating GM plants. Methods for obtaining target genes. The choice of vector for the introduction of the target gene. Methods of transforming plant cells. Getting a culture of regenerants. Testing transformed plants and isolating transgenic plants. Methods for the production of GM microorganisms and animals.

Section II. Biotechnological features of the processing of GM raw materials in food production (4 hours)

Topic 1. Features of various types of GM raw materials (2 hours.)

The main types of GM raw materials. GM plants with improved agronomic properties (resistant to herbicides, pests and diseases, etc.). GM plants for obtaining food products with improved properties (nutritional, technological, organoleptic, etc.).

Topic 2. Biotechnological features of the processing of GM raw materials (2 hours.)

Features of the chemical composition of GM raw materials for food production. Biotechnological techniques in the processing of GM raw materials.

II. STRUCTURE AND CONTENT OF THE PRACTICAL PART OF THE COURSE

Practical lessons
(27 hours, including in the form of interactive training - 8 hours)

Lesson 1. Normative legal regulation of genetic engineering activity in the Russian Federation (2 hours)

1. Consideration and analysis of certain provisions "On state regulation in the field of genetic engineering activity" dated 05.07.1996 N 86-ФЗ.
2. Consideration and analysis of certain provisions of Government Decisions relating to the regulation of genetic engineering activity in the Russian Federation..

Lesson 2. Normative legal regulation of the activities for the circulation of GM raw materials and food products in the Russian Federation (4 hours)

1. Consideration and analysis of certain provisions "On state regulation in the field of genetic engineering activity" dated 05.07.1996 N 86-ФЗ.
2. Consideration and analysis of certain provisions of Government Decisions relating to the regulation of activities for the circulation of GM raw materials and food products in the Russian Federation.
3. Consideration and analysis of certain provisions of the Decisions of the Chief State Sanitary Inspector in the field of regulation of activities on the circulation of GM raw materials and food products in the Russian Federation.

Lesson 3. Regulatory regulation of the activities for the handling of GM raw materials and food products in the countries of the European Union, USA, Canada (4 hours), using the active learning method - seminar-press conference

1. Definition of the list and consideration of certain provisions of regulatory documents on the regulation of activities in the field of the handling of GM raw materials and food products in the EU countries.

2. Definition of the list and consideration of certain provisions of regulatory documents on the regulation of activities in the field of the circulation of GM raw materials and food products in the USA.

3. Definition of the list and consideration of certain provisions of regulatory documents on the regulation of activities in the field of the circulation of GM raw materials and food products in Canada.

The essence of the seminar-press conference method is that the teacher instructs several students to prepare reports on each item of the seminar plan on the topic of the next seminar. After a brief introduction, the leader of the seminar gives his choice of the floor for a presentation to one of the students who are preparing. The report lasts 10-12 minutes. Then each student asks the speaker one question. Questions and answers to them form the central part of the seminar.

Lesson 4. Regulatory regulation of the activities for the handling of GM raw materials and food in China, India, Brazil, Argentina (4 hours), using the active learning method - seminar-press conference

1. Definition of the list and consideration of certain provisions of regulatory documents on the regulation of activities in the field of the circulation of GM raw materials and food products in China.

2. Definition of the list and consideration of certain provisions of regulatory documents on the regulation of activities in the field of handling GM raw materials and food products in India.

3. Definition of the list and consideration of certain provisions of regulatory documents on the regulation of activities in the field of handling GM raw materials and food products in Brazil.

4. Definition of the list and consideration of certain provisions of regulatory documents on the regulation of activities in the field of the circulation of GM raw materials and food products in Argentina.

The essence of the seminar-press conference method is that the teacher instructs several students to prepare reports on each item of the seminar plan on the topic of the next seminar. After a brief introduction, the leader of the seminar gives his choice of the floor for a presentation to one of the students who are preparing. The report lasts 10-12 minutes. Then each student asks the speaker one question. Questions and answers to them form the central part of the seminar.

Lesson 5. State registration of genetically modified organisms in the Russian Federation (4 hours)

1. Consideration and analysis of the procedure for state registration of genetically modified organisms intended for release into the environment, as well

as products obtained using or containing such organisms, including these products imported into the Russian Federation.

2. Charting the distribution of types of products in the following segments: soybeans, soybeans, soybean meal; corn, corn; sugar beets, rice; potatoes; protein-vitamin-mineral concentrates (BVMK), whole milk substitutes and other types of animal feed; food and biologically active food additives for humans; technological aids, enzyme preparations, etc. (according to the website https://gmo.rosminzdrav.ru/).

3. Compilation of a distribution chart by type of intended use: production of feed and feed additives, breeding and (or) cultivation, etc. (according to the site https://gmo.rosminzdrav.ru/).

4. Establishment of the ratio between domestic and foreign products presented on the Russian market (according to the site https://gmo.rosminzdrav.ru/).

Lesson 6. Examination of GMO products. Safety assessment of GM foods. (4 hours)

1. Definition of safety criteria for GM raw materials and food products.

2. Medical genetic assessment of the safety of GM raw materials and food products: the procedure, safety indicators, institutions involved in the examination.

3. Biomedical assessment: procedure, safety indicators, institutions conducting the examination.

4. Technological assessment: procedure, safety indicators, institutions involved in the examination.

Lesson 7. Methods of identification of GMOs (4 hours), including using active learning methods - the method of compiling intelligence cards and the method of working in small groups (2 hours)

1. Consideration of the principles, the essence of the method and the procedure for PCR for the identification of GMI (based on regulatory documents - GOST and MUK identification methods)

2. Consideration of the principles, essence of the chemical method and the procedure for its identification for GMI (based on regulatory documents - GOST and MUK by identification methods).

3. Consideration of the principles, essence of the immunological method and the procedure for its identification for GMI (based on regulatory documents - GOST and MUK by identification methods).

The essence of the method of compiling intelligence cards is to structure and graphically display materials on a given topic. Work in small groups in compiling intelligence cards develops students' initiative and communication skills.

Lesson 8. Test lesson (1 hour)

1. The final test.
2. The interview.

III. TRAINING AND METHODOLOGICAL SUPPORT OF STUDENTS'S INDEPENDENT WORK

Educational and methodological support for the independent work of students in the discipline «Genetic modification of bacteria, plants and animals / Генетическая модификация бактерий, растений и животных» is presented in Appendix 1 and includes:

- a schedule of independent work on the discipline, including approximate norms of time to complete each task;
- characteristics of tasks for independent work of students and guidelines for their implementation;
- requirements for the presentation and presentation of the results of independent work;

criteria for evaluating the performance of independent work.

IV. CONTROL OF ACHIEVING COURSE OBJECTIVES

№	Supervised sections / topics of discipline	Codes and stages of formation of competencies		Evaluation Tools	
				current control	intermediate certification
1	Section I Principles and methods for creating genetically modified raw materials	PK-18	knows the principles and methods of organizing the optimal integrated certification of biotechnological products.	UO-1 - interview, UO-3 - report, message, PR-2 - test work, PR-7 – compendium	Credit Questions 1-5
			Able to justify and develop schemes for the optimal integrated certification of food products obtained from biotechnological processing of genetically modified raw materials.		
			has the skills to justify and compile the optimal integrated certification of food products obtained		

			from biotechnological processing of genetically modified raw materials.		
2	Section II Biotechnological features of the processing of GM raw materials in food production	PK-11 PK-14 PK-17 PK-19	knows the typical methods of engineering calculations in biotechnological industries for the production of food products; regulations and methods for assessing the performance of the process in the processing of genetically modified raw materials and food production principles and methods of organizing and conducting tests with the introduction of new technologies in biotechnological food production; regulatory and technical and sanitary documents on the organization of the technological process and ensuring the sanitary-hygienic regime of a biotechnological enterprise for the processing of genetically modified food raw materials.	UO-1 - interview, UO-3 - report, message, PR-1 – test	Credit Questions 6-14
			Able to organize the technological process in accordance with the requirements of regulatory, technical and sanitary documentation in the field of circulation of genetically modified raw materials and food products; to		

			develop and produce engineering calculations in the organization of biotechnological industries for the production of genetically modified food; substantiate and develop schemes for the optimal integrated certification of food products obtained from biotechnological processing of genetically modified raw materials.		
			is skilled in organizing and enforcing technological discipline and a sanitary-hygienic regime at a biotechnological enterprise for the processing of genetically modified raw materials; methods of standard and experimental calculations in biotechnological industries for the processing of genetically modified food raw materials; skills of pilot industrial development of new technologies for the production of food products from genetically modified raw materials; methods for establishing compliance of the values of technological process indicators indicated in scientific		

			developments with actual data.		

Typical control tasks, methodological materials that determine the procedures for assessing knowledge, skills and (or) experience, as well as criteria and indicators necessary for assessing knowledge, skills, and characterizing the stages of formation of competencies in the process of mastering an educational program are presented in the Appendix 2.

V. LIST OF TRAINING LITERATURE AND INFORMATION AND METHODOLOGICAL SUPPORT OF DISCIPLINE

Main literature

(electronic and print editions)

1. Kalenik, T.K. Commodity research and examination of food products obtained from genetically modified sources: quality and safety: a textbook for universities / T.K. Kalenik, L.N. Fedyanina, T.V. Tanashkina. - Rostov-on-Don: Publishing Center "Mart"; Phoenix, 2010 .-- 223 p. http://lib.dvfu.ru:8080/lib/item?id=chamo{5757125&theme=FEFU

2. Food biotechnology of products from raw materials of plant origin: a textbook / O.A. Neverova, G.A. Gorelikova, V.M. Poznyakovsky. - Saratov: Publishing House "University Education", 2014. - 415 p. http://www.iprbookshop.ru/4160.html

Additional literature

(print and electronic publications)

1. 1. Ermishin, A.P. Genetically modified organisms and biosafety [Electronic resource]: monograph / A.P. - Minsk: Belarusian Science, 2013 .-- 172 p. http://www.iprbookshop.ru/29440.html
2. 2. Food biotechnology: a textbook for high schools [In 4 kn.] Book. 1. The basics of food biotechnology / I.A. Rogov, L.V. Antipova, G.P. Shuvaev. - M .: KolosS, 2004 .-- 440 p. http://lib.dvfu.ru:8080/lib/item?id=chamo[42243&theme=FEFU
3. 3. Food biotechnology of products from raw materials of plant origin: a textbook / O.A. Neverova, G.A. Gorelikova, V.M. Poznyakovsky. - Saratov: Publishing House "University Education", 2014. - 415 p. http://www.iprbookshop.ru/4160.html
4. 4. Principles and methods of biochemistry and molecular biology [Electronic resource] / editors K. Wilson and J. Walker; trans. from English - 2nd ed. (email). - M .: BINOM. Laboratory of Knowledge, 2013 .-- 848 p. http://znanium.com/bookread2.php?book=501136

5. 5. Schmid, R. Visual biotechnology and genetic engineering [Electronic resource] / R. Schmid; trans. with him. - 2nd ed. (email). - The electron. text data (1 pdf file: 327 s.). - M.: BINOM. Knowledge Lab, 2015. http://znanium.com/bookread2.php?book=541279

Regulatory Materials

1. The Federal Law "On Amending Certain Legislative Acts of the Russian Federation regarding Improving State Regulation in the Field of Genetic Engineering" dated 03.07.2016 N 358-ФЗ (latest revision) http://www.consultant.ru/document/cons_doc_LAW_200732 /.

2. Decree of the Government of the Russian Federation of September 23, 2013 N 839 (as amended on January 29, 2019) "On state registration of genetically modified organisms intended for release into the environment, as well as products obtained using such organisms or containing such organisms , including the specified products imported into the territory of the Russian Federation "http://www.consultant.ru/document/cons_doc_LAW_152217/.

3. The Federal Law "On State Regulation in the Field of Genetic Engineering" dated 05.07.1996 N 86-ФЗ (as amended on 03.07.2016) http://www.consultant.ru/document/cons_doc_LAW_10944/.

4. Resolution of the Chief State Sanitary Doctor of the Russian Federation of November 30, 2007 N 80 "On supervision of the circulation of food products containing GMOs" http://www.consultant.ru/document/cons_doc_LAW_75474/.

5. Decree of the Chief State Sanitary Doctor of the Russian Federation of 08.12.2006 N 32 "On the supervision of food products containing GMOs" (Registered in the Ministry of Justice of the Russian Federation on 16.02.2007 N 8958) http://www.consultant.ru/document/cons_doc_LAW_66242/.

6. Decree of the Government of the Russian Federation of 08.12.2017 N 1491 "On approval of the Rules for the implementation by the Federal Service for Veterinary and Phytosanitary Supervision of monitoring of the effects of genetically modified organisms and products obtained using or containing such organisms on humans and the environment, and control over the release of such organisms into the environment "http://www.consultant.ru/document/cons_doc_LAW_285052/.

7. Decree of the Chief State Sanitary Doctor of the Russian Federation of 08.11.2000 N 14 "On the Procedure for the Sanitary and Epidemiological Expertise of Foods Derived from Genetically Modified Sources" (together with the "Regulation on the Procedure for the Sanitary and Epidemiological Expertise of Foods Received from

Genetically Modified sources ") http://www.consultant.ru/document/cons_doc_LAW_107479/.

8. Decree of the Government of the Russian Federation of March 13, 2017 N 281 "On the procedure for the Federal Service for Supervision of Consumer Rights Protection and Human Well-being to monitor the effects on humans and the environment of genetically modified organisms and products obtained using such organisms or containing such organisms, and control over the release of such organisms into the environment.http: //www.consultant.ru/document/cons_doc_LAW_214066/.

9. Federal Law "On State Regulation in the Field of Genetic Engineering" dated 05.07.1996 N 86-ФЗ http://www.consultant.ru/document/cons_doc_LAW_10944/.

The list of resources of the information and telecommunication network "Internet"

1. http://elibrary.ru Scientific Electronic Library eLIBRARY.RU
2. The electronic library system "Doe" http://e.lanbook.com/
3. The electronic library system "IPRBOOK" http://www.iprbookshop.ru
4. Scopushttp database: //www.scopus.com/home.url
5. Web of Science Database http://apps.webofknowledge.com/
6. Database of full-texting academic journals in China http://oversea.cnki.net/
7. The electronic library of dissertations of the Russian State Library http://diss.rsl.ru/
8. EBSCO Electronic Databases http://search.ebscohost.com/

List of information technology and software

In the process of training in the discipline «Genetic modification of bacteria, plants and animals / Генетическая модификация бактерий, растений и животных» , the following software is used installed on the personal computers of the School of Biomedicine: office suite Microsoft Office 2010 professional plus, version 14.0.6029.1000; educational software package 7-Zip, version 9.20.00.0; training complex of programs Abbyy FineReader 11, version 11.0.460; training package of programs Adobe Acrobat XI Pro, version 11.0.00; browser for working in the environment of WWW Coogle Chrome, version 42.0.2311.90; Teaching software package CoreDraw Graphics Suite X3, version 13.0.0.739.

PowerPoint is used to prepare presentations for lecture and practical classes. When preparing intelligence cards, special programs MindManager, MindMap, etc.

VI. METHODOLOGICAL INSTRUCTIONS FOR THE DEVELOPMENT OF THE DISCIPLINE

In accordance with the curriculum for the discipline "Biotechnology of genetically modified raw materials and food / Lecture, practical classes, as well as independent work of the student.

At lectures, the student is provided with basic information on the course, the basic concepts are revealed, the main provisions of theories, hypotheses are stated. The most important task of the lecture course is the formation of the skills to highlight problems, formulate and test hypotheses, and assess the current state of science. Lectures lay the foundations of scientific knowledge among students, are a method and means of forming scientific thinking. The lecture material is necessary for students to further work on the development of the discipline program.

In practical classes, self-preparation of students on the topic of classes, which is announced to teachers in advance, is of great importance. Also, at the beginning of the semester, students are provided with a plan and a calendar schedule for practical classes.

In preparation for the practical lesson, it is necessary to build on the theoretical knowledge gained in the lecture, which should be expanded, deepened and illustrated using additional sources of information. In this case, important attention should be paid to the structuring and systematization of the material presented. In case of preparation of the message, it is necessary to provide it with a presentation.

The student's independent work is an integral element of the discipline program. This part of the planned educational work is carried out on assignment and with the methodological guidance of the teacher, but without his direct participation. Independent work is aimed at mastering the system of scientific and professional knowledge, the formation of skills, gaining experience in independent creative activity. Tasks for independent work of students and its educational and methodological support are presented in Appendix 1.

Only students who do not have debts under the current control, i.e. they successfully completed individual tasks, passed test papers and test tasks. To prepare for the test, students are offered questions that cover and systematize both theoretical and practical material of the course.

Students should master theoretical knowledge regularly, systematically, sequentially from lesson to lesson, carefully prepare for practical exercises, perform individual tasks, tests, etc. in the allotted time. Only in this case, one can expect a high level of assimilation of the material, the formation of the necessary competencies and, how consequence, the successful completion of the standings.

VII. MATERIAL AND TECHNICAL SUPPORT OF DISCIPLINE

Lecture and practical classes are held in the classroom equipped with multimedia equipment. For independent work of students, reading rooms of the FEFU scientific library and computer classes of the School of Biomedicine with free access are used.

Training lab Vladivostok, Russian Island, 10 Ajax, Building 25.1, aud. M311, area 96.6 m2	Monoblock Lenovo C360G-i34164G500UDK; Screen with electric 236 * 147 cm Trim Screen Line; DLP projector, 3000 ANSI Lm, WXGA 1280x800, 2000: 1 EW330U Mitsubishi; Subsystem of specialized hardware mounts CORSA-2007 Tuarex; Video Switching Subsystem: DVI DXP 44 DVI Pro Extron matrix switcher; Extender DVI over twisted pair DVI 201 Tx / Rx; Subsystem of audio switching and sound reinforcement; ceiling mount speaker SI 3CT LP Extron; Sennheiser EW 122 G3 UHF Microphone Lavalier Radio System with a wireless microphone and receiver; DMP 44 LC Extron digital audio processor; Extron IPL T S4 Network Management Controller; Wireless LANs for students are provided with a system based on 802.11a / b / g / n 2x2 MIMO (2SS) access points
Training lab Vladivostok, Russian Island, 10 Ajax, Building 25.1, aud. M312, area 96.6 m2	Monoblock Lenovo C360G-i34164G500UDK; Screen with electric 236 * 147 cm Trim Screen Line; DLP projector, 3000 ANSI Lm, WXGA 1280x800, 2000: 1 EW330U Mitsubishi; Subsystem of specialized hardware mounts CORSA-2007 Tuarex; Video Switching Subsystem: DVI DXP 44 DVI Pro Extron matrix switcher; Extender DVI over twisted pair DVI 201 Tx / Rx; Subsystem of audio switching and sound reinforcement; ceiling mount speaker SI 3CT LP Extron; Sennheiser EW 122 G3 UHF Microphone Lavalier Radio System with a wireless microphone and receiver; DMP 44 LC Extron digital audio processor; Extron IPL T S4 Network Management Controller; Wireless LANs for students are provided with a system based on 802.11a / b / g / n 2x2 MIMO (2SS) access points
Reading rooms of the FEFU Scientific Library with open access to the fund	All-in-One HP All-in-One 400 All-in-One Monoblock 19.5 (1600x900), Core i3-4150T, 4GB DDR3-1600 (1x4GB), 1TB HDD 7200

Vladivostok, Russian island, 10 Ajax, building A - level 10	SATA, DVD +/- RW, GigEth, Wi-Fi, BT, usb kbd / mse, Win7Pro (64-bit) + Win8.1Pro (64-bit), 1-1-1 Wty Internet access speed of 500 Mbps. 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 with a video enlarger with the ability to control color spectra; magnifying electronic magnifiers and ultrasonic markers
Computer class Vladivostok, Russian Island, 10 Ajax, Building 25.1, aud. M621, area 44.5 m2	Monoblock Lenovo C360G-i34164G500UDK 19.5 "Intel Core i3-4160T 4GB DDR3-1600 SODIMM (1x4GB) 500GB Windows Seven Enterprise - 17 pcs; Wired LAN - Cisco 800 series; Wireless LAN for students with a system based on 802.11a / b access points / g / n 2x2 MIMO (2SS)

Приложение 1

МИНИСТЕРСТВО НАУКИ И ВЫСШЕГО ОБРАЗОВАНИЯ РОССИЙСКОЙ ФЕДЕРАЦИИ
Федеральное государственное автономное образовательное учреждение
высшего образования
«Дальневосточный федеральный университет»
(ДВФУ)

ШКОЛА БИОМЕДИЦИНЫ

УЧЕБНО-МЕТОДИЧЕСКОЕ ОБЕСПЕЧЕНИЕ САМОСТОЯТЕЛЬНОЙ РАБОТЫ ОБУЧАЮЩИХСЯ

по дисциплине «Genetic modification of bacteria, plants and animals / Генетическая модификация бактерий, растений и животных»

Направление подготовки 19.04.01 Биотехнология

магистерская программа «Агропищевая биотехнология»

Форма подготовки очная

Владивосток
2019

Schedule of independent work on the discipline

The schedule of the implementation of the SIW in the discipline «Genetic modification of bacteria, plants and animals / Генетическая модификация бактерий, растений и животных» is presented in the table.

№	Date / Deadline	Type of independent work	Estimated time to complete	Form of control
1	2-17 weeks	practical training	40 h	UO-1 - interview
2	2-16 weeks	preparation of messages and presentations on given topics	12 h	UO-3 - report, message
3	8-9 weeks	studying theoretical topics planned for self-development (GM market of raw materials and products in Russia and the world) and preparing reporting materials	12 h	UO-1 - interview PR-7 - compendium, preparation of graphic material
4	18th week	Test preparation	8 h	PR-1 - test UO-1 - interview

Recommendations for independent work of students

Student's independent work (SIW) in the discipline "Biotechnology of genetically modified raw materials and food / Biotechnology of genetically modified raw materials and food" includes the following activities:

- study of educational material (lecture notes, educational and scientific literature, normative and normative-technical documentation);
- the study of the topics of the theoretical course, planned for independent development (Status and prospects of the market of genetically modified raw materials and food products; Genetically modified raw materials and food products of the 3rd generation);
- preparation and implementation of reporting materials on topics planned for self-development;
- preparation for practical exercises;
- Preparation of messages and presentations on given topics;

- preparation and implementation of reporting materials on the topics of practical training;

- preparation for testing, offset.

For independent work, it is recommended to devote an average of 3 hours a week.

Guidelines for the implementation of the SIW

The development of educational material using lecture notes, educational and scientific literature, normative and regulatory technical documentation, sanitary legislation documentation, etc. should be carried out regularly, sequentially throughout the semester. This will allow you to successfully master the following topics.

When studying the topics of the theoretical course, planned for self-mastery, it is necessary to independently study the relevant sections of textbooks and manuals on the discipline, Internet sources and other materials.

As reporting materials on the topic “State and Prospects of the Market of Genetically Modified Raw Materials and Foodstuffs”, it is necessary to prepare analytical graphic materials in the form of diagrams, tables, graphs, schemes, etc., in which to reflect structured information by country, year, type of raw material and product. It is also necessary to attach a list of sources of information. Present all materials in one file. This type of SIW can be rated as high as 10 points. The content of materials and the ability to navigate in the presented data are taken into account.

As reporting materials on the topic “Genetically Modified Raw Materials and Food Products of the 3rd Generation”, it is necessary to prepare a brief summary, which should reflect the following issues: the main directions in the development of GM raw materials and food products; biotechnological features of the creation of new types of GM food raw materials; leading companies, research centers, laboratories for the creation of GM raw materials of the 3rd generation; new methods for detecting GM raw materials and food products. When passing the abstract, the teacher offers the student to answer several control questions to make sure that he has mastered this topic. This type of SIW can be rated as high as 10 points. The content of the abstract, the completeness and the correctness of the answers to the questions during the interview are taken into account.

One of the types of SIW in the discipline is the preparation of messages and multimedia presentations on given topics.

Report topics

1. Legal regulation of the activities of the circulation of GM raw materials and food products in the Russian Federation.

2. Legal regulation of the activities of the circulation of GM raw materials and food products in the EU countries.

3. The regulatory framework for the handling of GM raw materials and food products in the United States.

4. Legal regulation of the activities of the circulation of GM raw materials and food products in Canada.

5. Legal regulation of the activities of the circulation of GM raw materials and food products in China.

6. Legal regulation of the activities of the circulation of GM raw materials and food in India.

7. Regulatory framework for the handling of GM raw materials and food products in Argentina.

8. Legal regulation of the activities of the circulation of GM raw materials and food products in Brazil.

When preparing communications, it is necessary to highlight the following issues: the volume of the country's regulatory framework; the most important regulatory documents that determine the treatment of GM raw materials and food products in the country; state registration of GM organisms; examination of GM raw materials and products; the methods of identification of GM raw materials and food products used in the country.

When preparing messages, you must adhere to the following recommendations. The duration of the speech should be no more than 15 minutes. The content should cover all issues necessary for consideration. Only those terms and concepts should be used, the meaning of which is known to the speaker and, if necessary, he can give explanations to the audience. The speaker should know well the material on the topic of his speech, quickly and freely navigate it. The content of the presentation should be followed. It is not permissible to read or repeat the text of the slides by heart. Speaker's speech should be clear, intelligible, moderate pace. After the presentation, the speaker should be able to essentially answer the questions of the audience.

In preparing the presentation should be guided by the following recommendations. The first slide should reflect information about the name of the topic (message) and the author of the presentation. Each slide should have a title, the information on it should correspond to the content of the report. The slide should have a minimum amount of text, information should be presented in the

form of tables, diagrams, graphs, figures, diagrams, etc. For all presentation slides, the same layout should be used. The font for the title is at least 24 pt., For the main text - at least 18 pt. For color design - no more than 3 colors on one slide. All slides must be numbered.

Messages and presentations are evaluated on a 10-point scale. Correspondence of the content to the subject of the message, completeness and structure of the submitted material, presentation of the material, contact with the audience, answers to questions are taken into account.

Приложение 2

МИНИСТЕРСТВО НАУКИ И ВЫСШЕГО ОБРАЗОВАНИЯ РОССИЙСКОЙ ФЕДЕРАЦИИ
Федеральное государственное автономное образовательное учреждение
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«Дальневосточный федеральный университет»
(ДВФУ)

ШКОЛА БИОМЕДИЦИНЫ

ФОНД ОЦЕНОЧНЫХ СРЕДСТВ

по дисциплине «Genetic modification of bacteria, plants and animals / Генетическая модификация бактерий, растений и животных»

Направление подготовки 19.04.01 Биотехнология

магистерская программа «Агропищевая биотехнология»

Форма подготовки очная

Владивосток
2019

FOS PASSPORT

Code and wording of competency	Competency Stages	
PK 11: the ability to provide technological discipline, sanitary and hygienic operation of the enterprise, the maintenance of technological equipment in proper technical condition	Knows	regulatory and technical and sanitary documents on the organization of the technological process and ensuring the sanitary-hygienic regime of a biotechnological enterprise for the processing of genetically modified food raw materials.
	Is able	to organize the technological process in accordance with the requirements of regulatory, technical and sanitary documentation in the field of handling genetically modified raw materials and food products.
	Owns	the skills of organizing and enforcing technological discipline and a sanitary-hygienic regime at a biotechnological enterprise for the processing of genetically modified raw materials.
PK 14: the ability to use standard and develop new methods of engineering calculations of technological parameters and equipment of biotechnological industries	Knows	standard methods of engineering calculations in biotechnological industries for the production of food products.
	Is able	to develop and produce engineering calculations in the organization of biotechnological industries for the production of genetically modified foods.
	Owns	methods of standard and experimental calculations in biotechnological industries for the processing of genetically modified food raw materials.
PK 17: readiness for pilot development of technology and scaling processes	Knows	principles and methods of organizing and conducting tests with the introduction of new technologies in biotechnological food production.
	Is able	organize pilot development of technologies and process scaling when introducing new biotechnological food production at the enterprise.
	Owns	skills of pilot industrial development of new technologies for the production of food products from genetically modified raw materials.
PK 18: the ability to develop and scientifically substantiate schemes for the optimal integrated certification of biotechnological products	Knows	principles and methods of organizing the optimal integrated certification of biotechnological products.
	Is able	substantiate and develop schemes for the optimal integrated certification of food products obtained from biotechnological processing of genetically modified raw materials.
	Owns	the skills of substantiating and compiling the optimal integrated certification of food products obtained during biotechnological processing of genetically modified raw materials.
PK 19: the ability to analyze process indicators for compliance with initial scientific developments	Knows	regulations and methods for assessing the performance of the process in the processing of genetically modified raw materials and food production.
	Is able	to evaluate and analyze process indicators at food enterprises.
	Owns	methods for establishing compliance of the values of

		technological process indicators indicated in scientific developments with actual data.

№	Supervised sections / topics of discipline	Codes and stages of formation of competencies		Evaluation Tools	
				current control	intermediate certification
1	Section I Principles and methods for creating genetically modified raw materials	PK-18	knows the principles and methods of organizing the optimal integrated certification of biotechnological products.	UO-1 - interview, UO-3 - report, message, PR-2 - test work, PR-7 – compendium	Credit Questions 1-5
			Able to justify and develop schemes for the optimal integrated certification of food products obtained from biotechnological processing of genetically modified raw materials.		
			has the skills to justify and compile the optimal integrated certification of food products obtained from biotechnological processing of genetically modified raw materials.		
2	Section II Biotechnological features of the processing of GM raw materials in food production	PK-11 PK-14 PK-17 PK-19	knows the typical methods of engineering calculations in biotechnological industries for the production of food products; regulations and methods for assessing the performance of the process in the processing of genetically modified raw materials and food production principles and methods of organizing and	UO-1 - interview, UO-3 - report, message, PR-1 – test	Credit Questions 6-14

			conducting tests with the introduction of new technologies in biotechnological food production; regulatory and technical and sanitary documents on the organization of the technological process and ensuring the sanitary-hygienic regime of a biotechnological enterprise for the processing of genetically modified food raw materials.		
			Able to organize the technological process in accordance with the requirements of regulatory, technical and sanitary documentation in the field of circulation of genetically modified raw materials and food products; to develop and produce engineering calculations in the organization of biotechnological industries for the production of genetically modified food; substantiate and develop schemes for the optimal integrated certification of food products obtained from biotechnological processing of genetically modified raw materials.		
			is skilled in organizing and enforcing technological discipline and a sanitary-hygienic		

			regime at a biotechnological enterprise for the processing of genetically modified raw materials; methods of standard and experimental calculations in biotechnological industries for the processing of genetically modified food raw materials; skills of pilot industrial development of new technologies for the production of food products from genetically modified raw materials; methods for establishing compliance of the values of technological process indicators indicated in scientific developments with actual data.		

Шкала оценивания уровня сформированности компетенций

Code and wording of competency	**Competency Stages**		**Criteria**	**Indicators**
PK 11: the ability to provide technological discipline, sanitary and hygienic operation of the enterprise, the maintenance of technological	knows (threshold level)	regulatory and technical and sanitary documents on the organization of the technological process and ensuring the sanitary-hygienic regime of a biotechnological enterprise for the processing of genetically	knowledge of regulatory, technical and sanitary documents on the organization of the technological process and the provision of the sanitary-hygienic regime of a biotechnological enterprise for the processing of	the ability to select, navigate and monitor changes in technological regulations, regulatory and technical documents containing requirements for ensuring the regular operation of the enterprise for the production of

equipment in proper technical condition		modified food raw materials.	genetically modified food raw materials.	food products from GM raw materials.
	able (advanced)	to organize the technological process in accordance with the requirements of regulatory, technical and sanitary documentation in the field of handling genetically modified raw materials and food products.	the ability to organize the technological process in accordance with the requirements of regulatory, technical and sanitary documentation in the field of handling genetically modified raw materials and food products.	the ability to organize work to comply with the requirements of normative and technical documentation for maintaining the technological process, maintaining the sanitary-hygienic regime of the enterprise.
	owns (high)	the skills of organizing and enforcing technological discipline and a sanitary-hygienic regime at a biotechnological enterprise for the processing of genetically modified raw materials.	possession of skills in organizing and enforcing technological discipline and a sanitary-hygienic regime at a biotechnological enterprise for the processing of genetically modified raw materials.	the ability to support the work of the enterprise without disruption of the technological process and sanitary-hygienic regime
PK 14: the ability to use standard and develop new methods of engineering calculations of technological parameters and equipment of biotechnological industries	knows (threshold level)	standard methods of engineering calculations in biotechnological industries for the production of food products.	knowledge of standard methods of engineering calculations in biotechnological industries for the production of food products.	ability to understand the essence of engineering calculation methods in biotechnological industries for the production of food products.
	able (advanced)	to develop and produce engineering calculations in the organization of biotechnological industries for the production of genetically	the ability to develop and produce engineering calculations when organizing biotechnological industries for the production of	the ability to select the necessary standard methods, and, if necessary, to develop new engineering calculations of technological parameters in

		modified foods.	genetically modified foods.	biotechnological industries.
	owns (high)	methods of standard and experimental calculations in biotechnological industries for the processing of genetically modified food raw materials.	knowledge of the methods of standard and experimental calculations in biotechnological industries for the processing of genetically modified food raw materials.	the ability to make the necessary engineering calculations of technological parameters in biotechnological industries for the production of food products from GM raw materials.
PK 17: readiness for pilot development of technology and scaling processes	knows (threshold level)	principles and methods of organizing and conducting tests with the introduction of new technologies in biotechnological food production.	knowledge of the principles and methods of organizing and conducting tests with the introduction of new technologies in biotechnological food production.	the ability to determine the readiness of new technologies for pilot development of biotechnological industries.
	able (advanced)	organize pilot development of technologies and process scaling when introducing new biotechnological food production at the enterprise.	the ability to organize pilot industrial testing of technologies and the scaling of processes when introducing new biotechnological food production at the enterprise.	the ability to draw up regulations for pilot development of technology in biotechnological industries.
	owns (high)	skills of pilot industrial development of new technologies for the production of food products from genetically modified raw materials.	possession of the skills of pilot industrial development of new technologies for the production of food products from genetically modified raw materials.	the ability to carry out pilot industrial testing of technology in the production of food products from GM raw materials.
PK 18: the ability to develop and scientifically substantiate schemes for	knows (threshold level)	principles and methods of organizing the optimal integrated certification of biotechnological products.	knowledge of the principles and methods of organizing the optimal integrated certification of biotechnological products.	ability to understand the general principles and details of certification schemes for biotechnological food products.

the optimal integrated certification of biotechnological products	able (advanced)	substantiate and develop schemes for the optimal integrated certification of food products obtained from biotechnological processing of genetically modified raw materials.	the ability to justify and develop schemes for optimal integrated certification of food products obtained from biotechnological processing of genetically modified raw materials.	the ability to draw up optimal optimal certification schemes for biotechnological food products from GM raw materials.
	owns (high)	the skills of substantiating and compiling the optimal integrated certification of food products obtained during biotechnological processing of genetically modified raw materials.	Skills in substantiating and compiling the optimal integrated certification of food products obtained from biotechnological processing of genetically modified raw materials.	the ability to conduct optimal integrated certification of food products derived from GM raw materials.
PK 19: the ability to analyze process indicators for compliance with initial scientific developments	knows (threshold level)	regulations and methods for assessing the performance of the process in the processing of genetically modified raw materials and food production.	knowledge of the regulations and methods for assessing the performance of the process in the processing of genetically modified raw materials and food production.	the ability to formulate tasks for conducting a comparative analysis of technological process indicators and such indicators in scientific developments.
	able (advanced)	to evaluate and analyze process indicators at food enterprises.	the ability to evaluate and analyze process indicators in food enterprises.	the ability to evaluate the performance of the process and the performance of the initial scientific developments.
	owns (high)	methods for establishing compliance of the values of technological process indicators indicated in scientific developments	mastery of the methods of establishing the conformity of the values of technological process indicators indicated in scientific	the ability to make a conclusion about the compliance of the process indicators with the initial scientific developments in the field of biotechnology for

		with actual data.	developments with actual data.	the processing of GM food raw materials.

Guidelines that determine the procedures for assessing the results of mastering the discipline

Current certification of students. The current certification of students in the discipline "Biotechnology of genetically modified raw materials and food / Biotechnology of genetically modified raw materials and food" is carried out in accordance with local regulations of the FEFU and is mandatory.

The current certification in the discipline "Biotechnology of genetically modified raw materials and food / Biotechnology of genetically modified raw materials and food" is carried out in the form of control measures (giving a message on practical work, drawing up analytical tables and abstracts within the framework of the CDS) to assess the actual results of student learning and carried out by the lead teacher. The objects of evaluation are:

- academic discipline (activity in the classroom, the timely completion of various types of tasks, attendance of all types of classes in the certified discipline);
- the degree of assimilation of theoretical knowledge;
- the level of mastery of practical skills in all types of educational work;
- results of independent work.

The degree of assimilation of theoretical knowledge is evaluated when preparing abstracts on topics intended for independent study (the content of the abstract, the completeness of the presentation, answers to control questions when passing the abstract to the teacher are evaluated). The level of mastery of practical skills - while listening to messages on a given topic, the quality of presentations prepared by students. The results of independent work - in the preparation of analytical materials in the form of tables, diagrams, diagrams, figures, etc.

Interim certification of students. Interim certification of students in the discipline "Biotechnology of genetically modified raw materials and food / Biotechnology of genetically modified raw materials and food" is carried out in accordance with local regulations of FEFU and is mandatory. In accordance with the curriculum, the type of intermediate certification is offset. Students who have fully completed the academic tasks in the discipline are allowed to set off. The set-up procedure includes final testing and interviews. During the interview, to assess the degree of ownership of the material, the student is asked additional questions that clarify the answers to test tasks.

Evaluation tools for intermediate certification

Questions for preparation to the credit

1. The genome structure of pro- and eukaryotes. Features of the structure of the genes of pro- and eukaryotes.
2. The scheme for creating GMOs. Methods for obtaining target genes, constructing an expression cassette, introducing target genes into cells, obtaining GM regenerants, isolating transgenic organisms.
3. Types of intended use of GMOs.
4. GM plants with improved agronomic properties (resistant to herbicides, pests and diseases, etc.).
5. GM plants for obtaining food products with improved properties (nutritious, technological, organoleptic, etc.).
6. Features of the chemical composition of GM raw materials for food production.
7. Biotechnological techniques in the processing of GM raw materials.
8. The main legislative and regulatory technical documents governing genetic engineering activities in the Russian Federation and the world.
9. Regulatory documents governing the circulation of genetically modified food raw materials and food products in the Russian Federation and the world.
10. State registration of genetically modified organisms intended for release into the environment, as well as products obtained with the use of such organisms or containing such organisms, including products imported into the Russian Federation.
11. The consolidated register of genetically modified organisms and food products: the purpose of formation, structure, content.
12. Examination of GM products.
13. Criteria and safety assessment of GM products.
14. Methods of identification of GM raw materials and food products.

Discipline final test

To conduct the final test, 4 test variants were developed, each of which includes 10 test questions. Below, as an example, one of the options is presented..

Sample

VARIANT № 1

1. The use of this transformation method is possible for introducing genes only into the protoplasts of plants of those species from which viable plants can be regenerated:
a. agrobacterial (use of Ti plasmids)
b. ballistic
c. electroporation
d. the use of phytovirus-based vectors

2. Genetic engineering should be based on the following principles:
a. improving the efficiency of the mining and processing industries
b. safety of citizens (individuals) and the environment
c. mandatory confirmation of conformity of products containing the results of genetic engineering activities, indicating complete information about the methods of preparation and properties of this product
d. conservation and restoration of the environment, conservation of biological diversity

3. Target gene:
a. allows selection of transformed cells
b. the desired gene to be introduced into the recipient cell
c. allows you to evaluate the activity of the encoded enzyme

4. The cultivation of GM plants is prohibited in the following countries:
a. Japan, Russia, New Zealand
b. China, India, Vietnam
c. France, Germany, Czech Republic
d. Spain, Portugal, Slovakia

5. A service that monitors the impact on humans and the environment of genetically modified organisms used for the production of food products and genetically modified food products?
a. Federal Service for Supervision of Natural Resources
b. Federal Service for Supervision of Consumer Rights Protection and Human Well-Being
c. Federal Service for Health Supervision
d. Federal Service for Veterinary and Phytosanitary Surveillance

6. The nucleotide sequence in DNA recognized by RNA polymerase as a launching pad for the initiation of specific transcription:
a. Terminator
b. intron
c. exon
d. promoter

7. In the Russian Federation it is allowed:
a. grow GM plants

b. breed GM animals
c. import GM food raw materials
d. import seeds of GM plants

8. Medical genetic assessment includes:
a) study of chemical composition
b) toxicological studies in laboratory animals
c) regulatory sequence assessment
d) assessment of biological value and digestibility

9. A group of functionally linked DNA regions, which includes the promoter, target gene, and terminator:
a. vector
b. expression cassette
c. plasmid
d. operon

10. The creation of GM plants resistant to insect pests is based on the introduction of a gene:
a. antisense RNA or capsid protein
b. toxin B. thuringiensis
c. 5-enolpyruvyl chicomat-3-phosphate synthetase enzyme inhibitor
d. nitrilase enzyme

Criteria for assessing the performance of test tasks:

Credited- 7-10 points
Not credited - less than 7 points

Evaluation tools for ongoing certification

The following materials are used as tools for the current certification in the discipline «Genetic modification of bacteria, plants and animals / Генетическая модификация бактерий, растений и животных».

Summaries on topics intended for independent theoretical study. The content of the abstract, the depth and completeness of the presentation, the answers to control questions when passing the abstract to the teacher are evaluated.

Reports on a given topic, the quality of presentations prepared by students.

Evaluation criteria for oral presentations made in the form of presentations

Report Evaluation	Content Requirements
10-9 points	are awarded to the student if the student expressed his opinion on the formulated problem, argued for it, accurately determining its content and components. The data of domestic and foreign literature, statistical information, regulatory information. The student knows and possesses the skill of independent research work on the topic of research; methods and techniques of analysis of theoretical and / or practical aspects of the study area. There are no factual errors related to understanding the problem; graphically, the work is framed correctly
8-7 points	the work is characterized by semantic integrity, coherence and consistency of presentation; no more than 1 mistake was made in explaining the meaning or content of the problem. For argumentation, data from domestic and foreign authors are given. Demonstrated research skills. There are no actual errors related to understanding the problem. One or two errors in the design of the work
6-5 points	the student conducts a fairly independent analysis of the main stages and semantic components of the problem; understands the basic foundations and theoretical justification of the chosen topic. The main sources on this topic were brought. No more than 2 errors were made in the meaning or content of the problem, the design of the work
Less then 5 points	the work is a retransmitted or completely rewritten source text without any comments or analysis. The structure and theoretical component of the topic is not disclosed. Three or more than three errors were made in the semantic content of the disclosed problem and in the design of the work

Presentation Evaluation Criteria:

Rating	less than 5 points (unsatisfactory)	5-6 points (satisfactory)	7-8 points (good)	9-10 points (excellent)
Criteria	The content of the criteria			
Disclosure of the problem	The problem is not solved. Missing conclusions	The problem is not fully disclosed. Conclusions are not made and / or conclusions are not substantiated.	The problem is solved. The analysis of the problem without involving additional literature. Not all conclusions are made and / or justified.	The problem is fully disclosed. The analysis of the problem with the involvement of additional literature. The conclusions are justified.

Performance	The information provided is not logically related. No professional terms used	The information provided is not systematized and / or inconsistent. 1-2 professional terms used	The information provided is not systematic and consistent. More than 2 professional terms used.	The information presented is systematized, consistent and logically connected. Over 5 professional terms used
Design	Not used Power Point technology. More than 4 errors in the information provided	Powerpoint technologies Used partially. 3-4 errors in the information provided	Used Power Point technology. No more than 2 errors in the information provided	Widely used technology (Power Point, etc.). There are no errors in the information provided.
Answers on questions	No answers to questions.	Only answers to basic questions	Full and / or partially complete answers to questions	The answers to the questions are complete, with the appearance of examples and / or explanations

Intelligence Mapping Method

1. Topic: Methods for the identification of GMOs.

2. Concept: Consideration of the principles, nature and order of the basic methods for identifying GMI.

3. Expected results of the study students' development of creativity; the formation of communicative competence in the process of group activities for the compilation of intelligence cards; the formation of a general educational skill related to the perception, processing and exchange of information; acceleration of the learning process.

Criteria for evaluation:

- 100-86 points are awarded to the student if he takes an active part in drawing up the intellect of the map, shows deep knowledge on a given problem, actively expresses and defends his opinion, has high communicative abilities.

- 85-76 points are awarded to the student if he takes part in drawing up the intelligence of the map, but does not show deep knowledge on the given problem, expresses his opinion and tries to argue him.

- 75-61 points are awarded to the student if he does not accept or takes a passive part in compiling the intellect card. Shows weak knowledge on a given problem, is not able to express his opinion.

Seminar-press conference

The essence of the seminar-press conference is that the teacher instructs several students to prepare reports on each item of the seminar plan on the topic of the next seminar. After a brief introduction, the leader of the seminar gives his choice of the floor for a presentation to one of the students who are preparing. The report lasts 10-12 minutes. Then each student asks the speaker one question. Questions and answers to them form the central part of the seminar.

It is understood that in order to formulate the question, the student must have certain knowledge on the topic, and first study the relevant literature. The nature of the issues is largely determined by the depth of independent work. The speaker answers questions.

If the leader of the seminar considers the answer insufficient, he provides an opportunity to express his opinion on the issue to other students, and then supplements what has been said and makes the necessary adjustments.