



MINISTRY OF EDUCATION AND SCIENCE OF THE RUSSIAN FEDERATION  
Federal state autonomous educational institution  
of higher education  
**«Far Eastern Federal University»**  
(FEFU)

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**INSTITUTE OF LIFE SCIENCES AND BIOMEDICINE (SCHOOL)**

AGREED

Head of OP

Kalenik T.K.  
(signature) (full name)  
«28» September 2021 г.

APPROVE

Head of VSP

Kalenik T.K.  
(signature) (full name)  
«28» September 2021 г.

**WORKING PROGRAM OF THE DISCIPLINE**

Biotechnology for the production of functional foods  
Direction of training 19.04.01 «Biotechnology»  
(«Agri-Food Biotechnology»)  
Form of training full-time

course 2 semester 4  
lectures 9 hours.  
practical classes 27 h.  
laboratory work 0 hours.  
including using  
total classroom hours 36 hours.  
independent work 72 h.  
including preparation for the exam 00 hours (if the exam is provided).  
control works (quantity) are not provided  
term paper / term project are not provided  
credit 4 semester  
exam not included

The program of the state final certification was compiled in accordance with the requirements of the Federal State Educational Standard in the field of study 19.04.01 Biotechnology, approved by order of the Ministry of Science and Higher Education of the Russian Federation dated August 10, 2021 No. 737.

The program at the meeting of the Academic Council of the Institute of Life Sciences and Biomedicine (School) December 21, 2021  
Director of the Department of Food Science and Technology Kalenik T.K.  
Compiled by: Dobrynina E.V.

**Reverse side of the title page of the RPMU**

**I. The work program was revised at the meeting of the department:**

Protocol dated « \_\_\_\_\_ » \_\_\_\_\_ 20\_\_ № \_\_\_\_\_

Director \_\_\_\_\_

(signature)(full name)

**II. The work program was revised at the meeting of the department:**

Protocol dated « \_\_\_\_\_ » \_\_\_\_\_ 20\_\_ № \_\_\_\_\_

Director \_\_\_\_\_

(signature)(full name)

**III. The work program was revised at the meeting of the department:**

Protocol dated « \_\_\_\_\_ » \_\_\_\_\_ 20\_\_ № \_\_\_\_\_

Director \_\_\_\_\_

(signature)(full name)

**IV. The work program was revised at the meeting of the department:**

Protocol dated « \_\_\_\_\_ » \_\_\_\_\_ 20\_\_ № \_\_\_\_\_

Director \_\_\_\_\_

(signature)(full name)

## **ABSTRACT**

**Master's degree in 19.04.01 «Biotechnology»**

**Master's Program «Agri-Food Biotechnology»**

**Course title: «Biotechnology for the production of functional foods»**

**Variable part of Block, 3 credits**

**Instructor: Ph.D. Yuferova A.A.**

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

- the ability to use modern methods and technologies (including information) in professional activities;
- hold the basic methods and techniques of experimental research in the professional field; ability to carry out standard and certification tests of raw materials, finished products and production processes;
- possession of experimental design, processing and presentation of the results;
- the ability to participate in the development of technological projects in the group of authors;
- the ability to develop and implement normative documents on standardization, certification of food products.

**Learning outcomes:**

SPC-11 ability to provide technological discipline, sanitary and hygienic mode of operation of the enterprise, the content of technological equipment in proper technical condition;

SPC-14 ability to use standard and develop new methods of engineering calculations of technological parameters and equipment of biotechnological production;

SPC-17 readiness to conduct pilot technology development and process scaling;

SPC-18 ability to develop and scientifically substantiate optimal integrated certification schemes for biotechnological products;

SPC-19 ability to analyze the performance of the process for compliance with the initial scientific developments.

**Course description:** The content of the discipline covers a range of issues related to theoretical and practical aspects of the production of functional food products based on knowledge of the composition and properties of raw materials of different origin; the essence of technological methods and methods of its processing; changes in physical, chemical, rheological, microbiological indicators in the process flow.

**Main course literature:**

1. Functional food: a textbook for universities / [R. A. Zainullin, R.V. Kunakova, H.K.Gadeleva and others]. Moscow: KnoRus, 2012. - 303 p. (3 copies.)

[Http://lib.dvfu.ru:8080/lib/item?id=chamo:667028&theme=FEFU](http://lib.dvfu.ru:8080/lib/item?id=chamo:667028&theme=FEFU)

2. Functional foods. Introduction to technology: a textbook for high schools / A. F. Doronin, L. G. Ipatova, A. A. Kochetkova [and others]; by ed. A. A. Kochetkova. Moscow: DeLee Print, 2009. (3 copies) - 286 p.

<http://lib.dvfu.ru:8080/lib/item?id=chamo:359010&theme=FEFU>

3. Vitamins and vitamin-like substances: a tutorial / Yu. A. Tyrstin, A. A. Krolevets, A. S. Chizhik. Moscow: DeLi Plus, 2013. - 202 p. (2 copies)

<http://lib.dvfu.ru:8080/lib/item?id=chamo:732093&theme=FEFU>

**Form of final knowledge control:** credit.

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

**The purpose** of mastering the discipline "Biotechnology for the production of functional foods / Biotechnology for the production of functional foods" is to deepen and expand the fundamental and professional knowledge of the master needed for production, technological and research activities in the field of creating Biotechnology for the production of functional foods.

**Objectives** of the discipline are:

- expanding knowledge about the scientific foundations and processes of production of functional products, about the principles of creating new recipes for functional products; about the main characteristics of the composition and properties of Biotechnology for the production of functional foods products, about modern methods of controlling technological operations, the quality of raw materials, semi-finished products, and finished products;

- consolidation of skills on the principles of constructing process flow diagrams, requirements for the quality of raw materials and products, conducting material calculations and choosing rational conditions for carrying out technological operations.

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

<b>Code and wording of competency</b>	<b>Competency Stages</b>	
SPC-11 ability to provide technological discipline, sanitary and hygienic mode of operation of the enterprise, the content of technological equipment in proper technical condition	Knows	technological discipline, sanitary and hygienic mode of operation of the enterprise, maintenance of technological equipment in proper technical condition
	Is able	ensure technological discipline, sanitary and hygienic mode of operation of the enterprise, maintenance of technological equipment in proper technical condition
	Owns	skills to ensure technological discipline, sanitary and hygienic mode of operation of the enterprise, maintenance of technological equipment in proper technical condition
SPC-14 ability to use standard and develop new methods of	Knows	typical and new methods of engineering calculations of technological parameters and equipment of biotechnological productions

engineering calculations of technological parameters and equipment for biotechnological production	Is able	use standard and develop new methods for engineering calculations of technological parameters and equipment for biotechnological production
	Owens	skills in using standard and developing new methods for engineering calculations of technological parameters and equipment for biotechnological production
SPC-17 readiness to conduct pilot technology development and process scaling	Knows	pilot testing of technology and scaling of processes
	Is able	carry out pilot testing of technology and scaling of processes
	Owens	skills in conducting pilot testing of technology and scaling up processes
SPC-18 ability to develop and scientifically substantiate optimal integrated certification schemes for biotechnological products	Knows	схемы оптимальной комплексной аттестации биотехнологических продуктов
	Is able	вырабатывать и научно обосновывать схемы оптимальной комплексной аттестации биотехнологических продуктов
	Owens	навыками выработки и научного обоснования схем оптимальной комплексной аттестации биотехнологических продуктов
SPC-19 ability to analyze the performance of the process for compliance with the initial scientific developments	Knows	schemes for optimal comprehensive certification of biotechnological products
	Is able	develop and scientifically substantiate schemes for optimal integrated certification of biotechnological products
	Owens	skills in developing and scientific substantiation of schemes for optimal integrated certification of biotechnological products

To form the above competencies in the framework of the discipline «Biotechnology for the production of functional foods», the following methods of active / interactive training are used: lecture-discussion, round table.

2. The complexity of the discipline and types of training sessions in the discipline

The total labor intensity of the discipline is 3 credit units (108 academic hours).

The types of training sessions and work of the student in the discipline can be:

Designation	Types of training sessions and work of the student
Lec	Lectures
Lab	Labs
Pe	Practical exercises
Oc	Online course
SR	Independent work of the student during the period of theoretical training
Control	Independent work of the student and contact work of the student with the teacher during the period of intermediate certification

Discipline structure:

The form of education is full-time.

№	Section namedisciplines	Semester	The number of hours by type of training sessions and work of the student					Control	Forms of intermediate certification, current monitoring of progress
			Lec	Lab	Pe	Oc	SR		
1	Topic 1. Food classification	4	1		3		72		Seminar, credit
2	Topic 2. Lecture-discussion (MAO): Principles of creating Biotechnology for the production of functional foodss	4	2		6				Seminar, credit
3	Topic 3. Ingredients used in the production of Biotechnology for the production of functional foods	4	2		6				Seminar, credit
4	Topic 4. Biotechnology of functional dairy and meat products	4	2		6				Seminar, credit
5	Topic 5. Production of functional drinks and food concentrates	4	2		6				Seminar, credit
	Total:		9		27		72		

### **3.STRUCTURE AND CONTENT OF THE THEORETICAL PART OF THE COURSE**

#### **Topic 1. Food classification**

The role of functional products in the implementation of the state policy of the Russian Federation in the field of healthy nutrition of the population.

Consumer Products. Functional nutrition products. Medical and preventive nutrition products.

## **Topic 2. Lecture-discussion (MAO): Principles of creating Biotechnology for the production of functional foods**

During the lecture-discussion, the teacher gives individual examples in the form of situations or briefly formulated problems, respectively, students analyze and discuss specific situations and material. The teacher, when presenting the lecture material, uses the students' answers to their questions and organizes a free exchange of views in the intervals between logical sections.

Questions of the lecture: basic principles for the development of Biotechnology for the production of functional foods products; selection criteria for fortified products; biomedical evaluation of fortified products; basic technological methods for introducing functional ingredients into food products.

## **Topic 3. Ingredients used in the production of Biotechnology for the production of functional foods**

Classification of functional ingredients. Requirements for raw materials and food components used in the production of Biotechnology for the production of functional foodss.

## **Topic 4. Biotechnology of functional dairy and meat products**

Characteristics of probiotic microorganisms and their physiological effect on the human body. The principles of selection of strains of microorganisms with desired properties to obtain bacterial starter cultures for the purpose of biotransformation of nutrients of dairy and meat raw materials in the production of Biotechnology for the production of functional foodss. The use of probiotic microorganisms in the biotechnology of dairy and meat products. Characterization of prebiotics and their use in biotechnology of dairy and meat products.

## **Topic 5. Production of functional drinks and food concentrates**

Classification of functional drinks. Technological aspects of the production of functional drinks.



Instant porridge. Curly Corn Products. Semi-finished products of flour products.

#### **4. STRUCTURE AND CONTENT OF THE PRACTICAL PART OF THE COURSE**

##### **Practical classes**

**Lesson 1. «Technology of products enriched with pectin and dietary fiber. Determination of the influence of technological parameters on the quality of finished products»**

1. Familiarization with the properties of biopolymers of plant materials, the influence of technological processing on their content and form in the finished product.

2. The role of hydrocarbon biopolymers in human nutrition, their content in fruit raw materials and products of its processing, the influence of production technology on the change in the properties of pectin substances.

**Lesson 2. «Technology of products enriched with b-carotene. The influence of heat treatment on the content of b-carotenes in the finished product»**

1. Familiarization with the properties of carotenoids of plant materials, the influence of technological processing on their content in the finished product.

2. The role of carotenoids in the metabolism, their content in raw materials of plant origin and products of its processing, the influence of production technology on the mass fraction of carotene.

3. Determination of the mass fraction of carotene in the processed products of plant materials and the spectrum of carotenoids in non-polar solvents.

**Lesson 3. «Technology of products enriched with L - ascorbic acid. Determination of the mass fraction of biologically active substances in the manufacturing process of the product»**

1. Familiarization with the properties of phenolic compounds and L-ascorbic

acid of fruit and berry raw materials, the influence of technological processing on their content in the finished product.

2. The role of phenolic compounds and L-ascorbic acid in the metabolism, their content in fruit raw materials and products of its processing, the influence of production technology on the mass fraction of phenolic compounds and L-ascorbic acid.

3. Determination of the mass fraction of phenolic compounds and L-ascorbic acid in the processed products of plant materials.

**Lesson 4. «Technology of products with betaine. Determination of pigment content in beetroot juice. The influence of technological parameters on the color change of beet juice»**

1. Familiarization with the properties of betaine, the influence of technological processing on their content in the processed products of table beets.

2. The role of betaine in metabolism, the mass fraction of betaine in beets and products of its processing, the influence of production technology on the mass fraction of betaine.

3. Determination of the mass fraction of betaine in processed beetroot products and color change of the product.

**Lesson 5. Round table (MAO) on the topic: «Technology of products enriched with minerals. Determination of the mass fraction of minerals in dairy products»**

Points for discussion:

1. Familiarization with the role of minerals in human nutrition.

2. The role of calcium, magnesium, iron in metabolism, the possibility of producing products with a high content of minerals

3. Determination of the mass fraction of calcium, magnesium, iron in food products.

To participate in the discussion of the topic of the round table, students should be familiar with the basics of the biotechnology being discussed, the essence of the process, the concepts of enrichment of products, functional

ingredients; requirements for raw materials and food components.

The round table is aimed at consolidating the knowledge gained by students, as well as the ability to conduct a discussion.

During the round table, students draw up technological schemes.

### **Lesson 6. Round table (MAO) on the topic: «Technology of dairy products enriched with fruit and berry additives»**

Points for discussion:

1. Familiarization with the role of dairy products enriched with fruit and berry supplements in human nutrition.

2. The technology of production of dairy products enriched with fruit and berry additives.

3. Determination of the mass fraction of the main quality indicators of dairy products enriched with fruit and berry additives.

To participate in the discussion of the topic of the round table, students should be acquainted with the basics of the technology of fortified dairy products, the concepts of fortification of products, functional ingredients; requirements for raw materials and food components.

The round table is aimed at consolidating the knowledge gained by students, as well as the ability to conduct a discussion.

During the round table, students draw up process flow diagrams.

## **5. TRAINING AND METHODOLOGICAL SUPPORT OF STUDENTS'S INDEPENDENT WORK**

Educational and methodological support for the independent work of students in the discipline "Biotechnology for the production of functional foods / Biotechnology for the production of functional foods" 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.

## 6. CONTROL OF ACHIEVING COURSE OBJECTIVES

№	Supervised sections / topics of discipline	Codes and stages of formation of competencies		Evaluation Tools	
				current control	intermediate certification
1	Topic 1. Food classification	SPC-11 SPC-14 SPC 17 SPC-18 SPC-19	Knows how to organize and conduct the technological process within the framework of the technology for the production of biotechnological products adopted in the organization	UO-1 - interview, UO-2 - colloquium, PR-4 - abstract	Exam Questions 1-44 Pr-1 - final test
2	Topic 2. Lecture-discussion (MAO): Principles of creating Biotechnology for the production of functional foods		Able to apply methods of organizing and conducting a technological process within the framework of the technology for the production of biotechnological products adopted in the organization		
3	Topic 3. Ingredients used in the production of Biotechnology for the production of functional foods		Owens methods of organizing and conducting the technological process within the framework of the technology for the production of biotechnological products adopted in the organization		
4	Topic 4. Biotechnology of functional dairy and meat products	SPC-11 SPC-14 SPC 17 SPC-18 SPC-19	Knows how to develop proposals for optimizing biotechnological processes and managing the release of biotechnological products		
5	Topic 5. Production of functional drinks and food		Able to apply methods for developing proposals for optimizing biotechnological processes and managing the release of biotechnological products		

	concentrates		Owens how to develop proposals for optimizing biotechnological processes and managing the release of biotechnological products		
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Typical control tasks, methodological materials that determine the procedures for assessing knowledge, skills and (or) experience, as well as the criteria and indicators necessary for assessing knowledge, skills, and characterizing the stages of formation of competencies in the process of developing an educational program are presented in the Appendix 2.

## **7. LIST OF TRAINING LITERATURE AND INFORMATION AND METHODOLOGICAL SUPPORT OF DISCIPLINE**

### **Main literature**

*(electronic and print editions)*

1. Biotechnology for the production of functional foods: a textbook for universities / [R. A. Zaynullin, R.V. Kunakova, H.K. Gadeleva and others]. Moscow: KnoRus, 2012 .-- 303 p. (3 copies)

<http://lib.dvfu.ru:8080/lib/item?id=chamo:667028&theme=FEFU>

2. Biotechnology for the production of functional foodss. Introduction to technology: a textbook for high schools / A. F. Doronin, L. G. Ipatova, A. A. Kochetkova [et al.]; under the editorship of A.A. Kochetkova. Moscow: DeLi Print, 2009 .-- 286 p. (3 copies)

<http://lib.dvfu.ru:8080/lib/item?id=chamo{59590&theme=FEFU>

3. Vitamins and vitamin-like substances: a training manual / Yu. A. Tyrsin, A. A. Krolevets, A. S. Chizhik. Moscow: DeLi Plus, 2013 .-- 202 p. (2 copies)

<http://lib.dvfu.ru:8080/lib/item?id=chamo:732093&theme=FEFU>

### **Additional literature**

*(print and electronic publications)*

1. Neverova O. A., Food biotechnology of products from raw materials of plant origin: Textbook. / O.A. Neverova, G.A. Gorelikova, A. Yu. Prosekov, V.M.

Poznyakovsky - M.: SIC INFRA-M, 2014 .-- 318 p.  
<http://lib.dvfu.ru:8080/lib/item?id=IPRbooks:IPRbooks-4160&theme=FEFU>

2. Technology for the production of Biotechnology for the production of functional foods [Electronic resource]: teaching aid / Venetsian AS, Mishina O. - Volgograd: Volgograd GAU, 2014. - 80 p. - Access Mode: <http://znanium.com/catalog/product/615070>

3. Zinoviev M.E. Technology of functional nutrition products [Electronic resource]: study guide / Zinovieva M.E., Schneider K.L. - Electron. textual data. — Kazan: Kazan National Research Technological University, 2016. — 175 c. — Access mode: <http://www.iprbookshop.ru/79571>

4. Quality management of Biotechnology for the production of functional foods ingredients [Electronic resource]: monograph / L.G. Eliseeva [et al.] .— Electron. textual data. - M.: Paleotype, 2013.— 210 c .— Access mode: <http://www.iprbookshop.ru/48705.html>

5. Biotechnology of combined foods based on dairy and microbiological raw materials: method. directions to the lab. works for students special. 240902 "Food biotechnology" of all forms of education / comp. N.V. Xitun, E.S. Fishchenko. Biotechnology of dairy production, Vladivostok: Publishing House of the Pacific Economic University, 2009. - 96 p. (8 copies).  
<http://lib.dvfu.ru:8080/lib/item?id=chamo:357087&theme=FEFU>

6. Basic principles of processing raw materials of plant, animal, microbiological origin and fish: method. directions for students special. 240902 "Food biotechnology" of all forms of education / comp. E.V. Makarova, Vladivostok: Publishing House of the Pacific Economic University, 2009. - 80 p. (10 copies) <http://lib.dvfu.ru:8080/lib/item?id=chamo:356130&theme=FEFU>

7. Drozdova T.M. Physiology of nutrition (text): textbook / T.A. Krasnova, P.E. Vloshchinsky, V.M. Poznyakovsky. - M .: De Lee plus, 2011 .-- 352 p. (10 copies).  
[https://lib.dvfu.ru:8443/lib/item?id=chamo:666788&aid=TAMN3%2B0YoyTYRiO4N1jSLVI33bBH0IT1ZL8rayoDn3w%3D%3BbujE0HvUx8s0Wn4DJUA1MA%](https://lib.dvfu.ru:8443/lib/item?id=chamo:666788&aid=TAMN3%2B0YoyTYRiO4N1jSLVI33bBH0IT1ZL8rayoDn3w%3D%3BbujE0HvUx8s0Wn4DJUA1MA%2B)

[3D%3D%3BhHJLDwitYc3eBE7sxgCETbocS0dMGxkO%2B9Wlcdm/yk2fJ3XuaPu9vSNe78sNOwAifvQwUSE6Rj21UYO3BG9B1tAJgvofIMMcpUfJ5OCvnG4%3D](http://www.iprbookshop.ru/61260.html)

8. Seregin S.A. Biologically active additives in the production of products from animal raw materials [Electronic resource]: study guide / Seregin S.A. - The electron. textual data. - Kemerovo: Kemerovo Technological Institute of Food Industry, 2014. - 104 p. - Access mode: <http://www.iprbookshop.ru/61260.html>

### **Regulations**

1. GOST R 54059-2010 Biotechnology for the production of functional foods products. Biotechnology for the production of functional foods ingredients. Classification and general requirements.

2. GOST R 52349-2005 Food Products. Biotechnology for the production of functional foods products. Terms and Definitions.

3. GOST R 56543-2015 Functional drinks. General specifications.

4. GOST R 56145-2014 Biotechnology for the production of functional foods products. Methods of microbiological analysis.

5. GOST R 55577-2013 Specialized and Biotechnology for the production of functional foods products. Information on hallmarks and effectiveness.

## **8. METHODOLOGICAL INSTRUCTIONS FOR THE DEVELOPMENT OF THE DISCIPLINE**

The theoretical part of the discipline "Biotechnology for the production of functional foods" is revealed in the lecture classes, as a lecture is the main form of training, where the teacher gives the basic concepts of the discipline.

The sequence of presentation of the material at the lecture classes is aimed at forming an indicative basis for students for the subsequent assimilation of the material during independent work.

In practical classes during discussions at seminars and in discussing essays, students learn to analyze and predict the development of biotechnology of

Biotechnology for the production of functional foods products in various applications as a science, and reveal its scientific and social problems.

Practical classes of the course are held in all sections of the curriculum. Practical work is aimed at developing students' independent research work skills. During practical classes, the student performs a set of tasks that allows you to consolidate lecture material on the topic under study, to obtain basic skills in various fields of discipline. Active consolidation of theoretical knowledge is facilitated by the discussion of the problematic aspects of the discipline in the form of a seminar and practical exercises. At the same time, the skills of independent research activity are developed in the process of working with scientific literature, periodicals, the formation of the ability to defend one's point of view reasonably, listen to others, answer questions, and lead discussions.

When writing essays, it is recommended that you independently find the literature for it. The abstract reveals the content of the investigated problem. Work on the essay helps to deepen understanding of individual issues of the course, to form and defend your point of view, to acquire and improve independent creative work skills, to conduct active cognitive work.

The main types of independent work of undergraduates is work with literary sources and methodological recommendations for studying the technology of Biotechnology for the production of functional foods products, Internet resources for more in-depth familiarization with certain problems of the technology of functional products. The results of the work are drawn up in the form of abstracts or reports with subsequent discussion. Topics of essays correspond to the main sections of the course.

To conduct ongoing monitoring and intermediate certification, several oral interviews and test-control works are carried out.

## **9. MATERIAL AND TECHNICAL SUPPORT OF DISCIPLINE**



Logistical support for the implementation of the discipline includes classrooms for lectures and practical classes, equipped with multimedia equipment, and corresponding to sanitary and fire safety standards.

Name of equipped premises	List of main equipment
<p>Laboratory of General Food Biotechnology Vladivostok, about. Russian p. Ajax 10, Building 25.1, aud. M 311. The classroom for lectures, practical and laboratory classes, group and individual consultations, ongoing monitoring and interim certification.</p>	<p>Training furniture for 25 workplaces, teacher's place (table, chair). Analytical and technological equipment (M311): Milk centrifuge with heating IJIM 1-12; Liquid thermostat LOIP Lt-208a, volume 8l, 120x150 / 200mm; Analyzer of milk quality Lactan 1-4 mod. 230; PH-millivoltmeter with tripod pH-150MI; VSP 1.5-2-3T scales; Refrigerator "Ocean-RFD-325B"; Drying cabinet, stainless steel chamber. steel, 58l; electric stove 111CH 101-226589; PE-6110 magnetic stirrer with heating; VNZh-0,3-KhS3 viscometer (d-1.41) glass capillary; Tripod PE-2710 lab. for burettes.</p> <p>Multimedia equipment: 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.</p>
<p>Independent work</p>	
<p>Computer class Vladivostok, about. Russian p. Ajax 10, Building 25.1, aud. M621. The classroom for lectures, practical exercises, group and individual consultations, ongoing monitoring and interim certification.</p>	<p>Training furniture for 17 workplaces, teacher's place (table, chair). 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).</p>
<p>Reading rooms of the FEFU Scientific Library with open access to the fund (building A - level 10)</p>	<p>Reading room equipment of the FEFU Scientific Library: HP All-in-One 400 All-in-One Monoblock 400 All-in-One 19.5 (1600x900), Core i3-4150T, 4GB DDR3-1600 (1x4GB), 1TB HDD 7200 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</p>

## 10. VALUATION FUNDS

Code and wording of competency	Competency Stages	
SPC-11 ability to provide technological discipline, sanitary and hygienic mode of operation of the enterprise, the content of technological equipment in proper technical condition	Knows	technological discipline, sanitary and hygienic mode of operation of the enterprise, maintenance of technological equipment in proper technical condition
	Is able	ensure technological discipline, sanitary and hygienic mode of operation of the enterprise, maintenance of technological equipment in proper technical condition
	Owens	skills to ensure technological discipline, sanitary and hygienic mode of operation of the enterprise, maintenance of technological equipment in proper technical condition
SPC-14 ability to use standard and develop new methods of engineering calculations of technological parameters and equipment of biotechnological production	Knows	typical and new methods of engineering calculations of technological parameters and equipment of biotechnological productions
	Is able	use standard and develop new methods for engineering calculations of technological parameters and equipment for biotechnological production
	Owens	skills in using standard and developing new methods for engineering calculations of technological parameters and equipment for biotechnological production
SPC-17 readiness to conduct pilot technology development and process scaling	Knows	pilot testing of technology and scaling of processes
	Is able	carry out pilot testing of technology and scaling of processes
	Owens	skills in conducting pilot testing of technology and scaling up processes
SPC-18 ability to develop and scientifically substantiate optimal integrated certification schemes for biotechnological products	Knows	схемы оптимальной комплексной аттестации биотехнологических продуктов
	Is able	вырабатывать и научно обосновывать схемы оптимальной комплексной аттестации биотехнологических продуктов
	Owens	навыками выработки и научного обоснования схем оптимальной комплексной аттестации биотехнологических продуктов
SPC-19 ability to analyze the performance of the process for compliance with the initial scientific developments	Knows	schemes for optimal comprehensive certification of biotechnological products
	Is able	develop and scientifically substantiate schemes for optimal integrated certification of biotechnological products
	Owens	skills in developing and scientific substantiation of schemes for optimal integrated certification of biotechnological products

### I. Evaluation tools for intermediate certification

Interim certification includes the student's answer to the questions for the classification and passing the final test.

### **Student grading criteria**

Points (rating)	Credit score / exam (standard)	Requirements for formed competencies
100-85	"Set off" / "excellent"	The student is rated as "excellent" if he has deeply and firmly grasped the program material, sets out it comprehensively, consistently, clearly and logically in order, knows how to closely relate theory to practice, freely copes with tasks, questions and other types of application of knowledge, and does not have difficulty response when modifying tasks, uses monographic material in the answer literature, correctly substantiates the decision, has versatile skills and techniques for performing practical tasks.
84-75	"Set off" / "good"	The student is rated "good" if he knows the material well, correctly and essentially sets out it, avoiding significant inaccuracies in answering the question, correctly applies theoretical principles when solving practical questions and tasks, and possesses the necessary skills and techniques for their implementation
74-61	"Set off" / "satisfactory"	A student is rated "satisfactory" if he has knowledge of only the basic material, but has not learned its details, admits inaccuracies, insufficiently correct wording, violations of the logical sequence in the presentation of program material, has difficulty in performing practical work.
60-0	"Not set off" / "unsatisfactory"	Evaluation of "unsatisfactory" is given to a student who does not know a significant part of the program material, makes significant mistakes, hesitates, with great difficulty performs practical work. As a rule, grades are given to students who cannot continue their studies without additional classes in the relevant discipline.

Students' independent work consists of preparing for practical classes, working on recommended literature, writing reports on the topic of a seminar, preparing presentations.

The teacher offers each student individual and differentiated tasks. Some of them can be carried out in a group (for example, several students can do the preparation of a report and presentation on the same topic, sharing their responsibilities - one prepares the scientific and theoretical part, and the second carries out an analysis of the practice).

### **Tasks for self-fulfillment**

1. Literature should be analyzed on a given topic of the round table. According to the developed material, the topic of the round table should be prepared and presented for discussion.

2. Writing an essay on a topic proposed by the teacher or independently selected by the student and agreed with the teacher.

3. Preparation of presentations using multimedia equipment.

### **Methodological instructions for the abstract**

#### **The goals and objectives of the abstract**

The abstract (from lat. Referto - report, report) is a summary of the problems of a practical or theoretical nature with the formulation of certain conclusions on the subject. A student-selected problem is studied and analyzed based on one or more sources. In contrast to the course project, which is a comprehensive study of the problem, the abstract is aimed at analyzing one or more scientific papers.

*The objectives* of writing an abstract are:

development of students' skills in finding relevant problems of modern legislation;

- development of skills to summarize the material with highlighting only the most significant points necessary to reveal the essence of the problem;

- development of skills to analyze the material studied and formulate their own conclusions on the selected issue in writing, in a scientific, competent language.

*The tasks* of writing an abstract are:

- teach the student to convey the opinions of the authors as faithfully as possible, on the basis of which the student writes his essay;

- teach the student to correctly state their position on the problem analyzed in the abstract;

- prepare the student for further participation in scientific - practical conferences, seminars and competitions;

- help the student to determine the topic of interest to him, the further disclosure of which is possible when writing a term paper or diploma;

- to clarify for themselves and state the reasons for their consent (disagreement) with the opinion of one or another author on this issue.

### **The basic requirements for the content of the essay, course project**

The student should use only those materials (scientific articles, monographs, manuals) that are directly related to their chosen topic. Remote reasoning not related to the problem being analyzed is not allowed. The content of the abstract should be specific, only one problem should be investigated (several are allowed, only if they are interconnected). The student must strictly adhere to the logic of presentation (start with the definition and analysis of concepts, go to the problem statement, analyze the ways to solve it and draw the appropriate conclusions). The abstract should end with a conclusion on the topic.

*The structure* of the abstract consists of:

1. The title page;
2. Introduction, where the student formulates the problem to be analyzed and investigated;
3. The main text, which consistently reveals the selected topic. Unlike term paper, the main text of the essay involves a division into 2-3 paragraphs without highlighting the chapters. If necessary, the text of the abstract can be supplemented by illustrations, tables, graphs, but they should not "overload" the text;
4. Conclusions, where the student formulates conclusions made on the basis of the main text.
5. The list of used literature. This list refers to those sources that the student refers to in preparing the essay, as well as others that were studied by him during the preparation of the essay.

The abstract is 10-15 pages of typewritten text, but in any case should not exceed 15 pages. Interval - 1.5, font size - 14, margins: left - 3 cm, right - 1.5 cm, upper and lower - 1.5 cm. Pages must be numbered. The indent from the beginning of the line is 1.25 cm.

### **The order of delivery of the abstract and its assessment**

Abstracts are written by students during the semester in the terms set by the teacher in a particular discipline, reported by the student and submitted for discussion. The printed version is given to the teacher, leading the discipline.

Based on the results of the check, the student is given a certain number of points, which is included in the total number of student points scored by him during the semester. When evaluating the abstract, the correspondence of the content to the chosen topic, the clarity of the work structure, the ability to work with scientific literature, the ability to pose a problem and analyze it, the ability to think logically, knowledge of professional terminology, and literacy are taken into account.

### **Recommended topics and list of abstracts**

1. Identification and molecular genetic characteristics of probiotic microorganisms. Molecular mechanisms of action of probiotics.
2. New probiotics, prebiotics, synbiotics and Biotechnology for the production of functional foodss.
3. Nutrition problems of healthy and sick people: trophology, therapeutic, functional and supportive nutrition, biologically active food supplements (BAA) in clinical and nutritional practice.
4. Safety assessment of probiotic preparations and food products.
5. The use of stanols for the production of functional products.
6. Using the light culture method to create Biotechnology for the production of functional foods products.
7. Biotechnology for the production of functional foodss with dietary fiber.
8. Dietary fiber: its role in human nutrition and use in the food industry.
9. Biotechnology for the production of functional foods products using additives of biological origin.
10. Biotechnology for the production of functional foodss used for diseases of the gastrointestinal tract, lipid metabolism disorders, diseases of the nervous system, and to maintain immunity.
11. The use of thermoplastic extrusion in the development of Biotechnology

for the production of functional foods products.

12. Modeling and forecasting recipes and technologies in food development.

13. Methodology for creating Biotechnology for the production of functional foodss.

14. The construction of Biotechnology for the production of functional foodss.

15. New technologies of Biotechnology for the production of functional foods products from various types of raw materials.

16. Biologically active additives: nutraceuticals, parapharmaceuticals, eubiotics and their main fields of application.

17. Technology of radioprotective and immunomodulating food products.

18. Pectin as a promising food supplement of the 21st century.

19. Functional ingredients and their use in the production of food products for meat, dairy, bakery, confectionery, pasta and canned goods, oils and fats, drinks, etc.

20. The use of biologically active additives in therapeutic and prophylactic food products.

21. Innovative technologies in the modeling of functional products.

22. Nutritional supplements in Biotechnology for the production of functional foodss.

23. A modular approach to creating vitamin premixes.

24. Biotechnology for the production of functional foodss in the prevention of accelerated aging. Characteristic, technology features.

### **Set-off questions**

1. Tasks and prospects for the development of functional nutrition products.

2. The stages of development and creation of a Biotechnology for the production of functional foods product.

3. The basic principles of enrichment of a product with nutrients during its production.

4. Biomedical requirements for Biotechnology for the production of functional foods products (harmlessness, organoleptic, general hygiene, technological).

5. Development of recommendations for the use of functional products.

6. Clinical testing of Biotechnology for the production of functional foodss.

7. Foods fortified with micronutrients: jelly.

8. Foods fortified with micronutrients: tea drinks.

9. Foods fortified with micronutrients: dairy desserts.

10. Concentrates of soft drinks enriched with dietary supplements.

11. The explosions and sbitnits enriched with dietary supplements.

12. Jams and jams enriched with dietary supplements.

13. Food concentrates of first and second courses of fast cooking, enriched with dietary supplements.

14. Milk sweets enriched with dietary supplements.

15. Production of fortified meat products.

16. Semi-finished products of flour products enriched with dietary supplements.

17. Flour confectionery enriched with trace elements and vitamins.

18. Bakery products with multifunctional vegetable additives.

19. Bakery products enriched with b-carotene.

20. Bakery products enriched with iodine.

21. Bakery products produced using chitosan.

22. Classification of functional soft drinks.

23. Drinks based on medicinal plants.

24. Soft drinks based on milk.

25. Beekeeping-based soft drinks

26. Functional properties and characteristics of melted edible fats.

27. Functional properties and characteristics of margarine products.

28. Functional properties and characteristics of mayonnaise, sauces, dressings, creams.



29. Assortment of functional dairy products.
30. Prebiotic dairy products.
31. Symbiotic dairy products.
32. Dairy products enriched with biologically active substances.
33. Requirements for raw materials and production technology of meat products of functional nutrition.
34. Assortment of meat products for functional nutrition.
35. Hydrobionts as a raw material for Biotechnology for the production of functional foods products.
36. Characterization of traditional and new fish food with functional properties.
37. Technology of functional sweets.
38. Technology functional caramel.
39. Technology of functional pastille, marmalade and whipped confectionery.
40. Technology of functional chocolate.
41. Products from aquatic organisms of balanced composition.
42. Products from aquatic organisms, enriched with dietary fiber and biologically active substances.
43. The use of pro- and prebiotics in the technology of products from aquatic organisms.
44. The use of pro- and prebiotics in the technology of meat products.

### **Final test**

#### Variant 1

Task 1. The importance of proteins in the human body is to perform the functions:

- a) contractile;
- b) antitoxic;

c) energy, transport, protective, plastic, catalytic, antitoxic;

g) catalytic.

Task 2. The country in which the concept of functional nutrition first appeared:

a) Russia;

b) Canada;

c) Japan;

d) China.

Task 3. The proportion of animal protein in the daily protein content is (in%):

a) 80;

b) 35;

c) 50;

d) 75

Task 4. To reduce visual acuity (especially at dusk), dry skin and mucous membranes of the eyes, damage to the cornea of the eye, growth retardation in children, leads to a vitamin deficiency:

a) C;

b) A;

c) PP;

d) B6

Task 5. Insufficiency of calcium in food, with a simultaneous lack of vitamin D leads to:

a) muscle weakness, heart rhythm disturbance;

b) rickets and softening of bones;

c) anemia, fatigue, pallor;

d) slowing the growth of children and adolescents, changing the skin.

Task 6. The pancreas secretes a hormone:

a) thyroglobulin;

b) adrenaline;

- c) insulin;
- d) parathyroid hormone.

Task 7. The enzyme pepsin is formed:

- a) in the stomach;
- b) in the large intestine;
- c) in the small intestine;
- g) in the oral cavity

Task 8. The activator of the enzymes of the gastric juice is:

- a) phosphoric acid;
- b) sodium carbonate;
- c) hydrochloric acid;
- g) sulfuric acid.

Task 9. The biological role of fats is that they:

- a) are a source of B vitamins;
- b) are a source of energy, phosphates, fatty acids and fat-soluble vitamins;
- c) are a source of vitamins C and PP;
- g) are sources of minerals.

Task 10. The substance necessary for the normal function of the mucous membranes of the respiratory tract is:

- a) glucose;
- b) vitamin D;
- c) vitamin A;
- g) vitamin C.

## OPTION 2

Task 1. Physiology of nutrition is:

- a) a science that studies the shape and structure of an organism in connection with its functions, development under the influence of the environment;
- b) a science that studies the effect of food on the human body; establishes a person's need for nutrients;

c) the science of the laws of the vital processes of a living organism, its organs, tissues and cells, their relationship with changing various conditions and conditions of the body;

d) a science that studies the knowledge of life at various levels of its organization.

Task 2. Additional exchange is:

a) the energy spent on the work of internal organs;

b) increased metabolism as a result of eating;

c) the amount of energy spent on the performance of a particular work;

g) the minimum level of metabolism, expressed in calories.

Task 3. The proportion of proteins of plant origin in the daily protein content is (in%):

a) 75;

b) 50;

c) 45;

d) 35.

Task 4. The need for children and adolescents in the water aged 7-17 years per 1 kg of body weight is (in ml):

a) 100;

b) 30;

c) 50;

d) 20.

Task 5. Diseases of the bones, rickets in children are observed with a lack of vitamin:

a) A;

b) D;

c) C;

d) B12.

Task 6. The enzyme lysozyme is formed:

a) in the stomach;

- b) in the oral cavity;
- c) in the small intestine "
- d) in the large intestine.

Task 7. Insufficiency in iron nutrition leads to the occurrence of:

- a) anemia, fatigue, pallor, decreased resistance to infectious diseases;
- b) slowing the growth of children and adolescents, changing the skin;
- c) rickets, softening of bones;
- d) muscle weakness, heart rhythm disturbance;

Task 8. The need for vitamin C increases significantly with:

- a) tuberculosis, gastrointestinal diseases, infectious diseases;
- b) diseases of the genitourinary system;
- c) diseases of the cardiovascular system;
- g) diseases of the respiratory system.

Task 9. Putrefactive processes in the intestine suppresses:

- a) bile;
- b) the digestive juice of the pancreas;
- c) gastric juice;
- g) lysozyme enzyme.

Task 10. The substances with a protective function against microorganisms include:

- a) volatile;
- b) retinol, tocopherol, etc .;
- c) vitamins A, P, E of group B;
- d) sterols, sterols.

## **II. Evaluation tools for ongoing certification**

### **Evaluation Criteria**

- 100-86 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 are given. 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

- 85-76 - points - the work is characterized by semantic integrity, coherence and sequence 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

- 75-61 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 are brought. No more than 2 errors were made in the meaning or content of the problem, the design of the work

- 60-50 points - if the work is a retransmitted or completely rewritten source text without any comments, 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.

### **Questions for colloquiums, interviews on the discipline**

#### **"Biotechnology for the production of functional foods"**

### **Section I. Biotechnology for the production of functional foodss**

#### **1. Food classification.**

2. The principles of creating Biotechnology for the production of functional foodss.
3. The ingredients used in the production of Biotechnology for the production of functional foodss.
4. Biotechnology of functional dairy and meat products.
5. Production of functional drinks and food concentrates.

### **Evaluation Criteria**

- 100-86 points are awarded to the student, if the student knows and is fluent in the material, expressed his opinion on the formulated problem, argued for it. For preparation, the student uses not only lecture material, but also additional domestic and foreign literature.

- 85-76 - points - the work is characterized by semantic integrity, coherence and sequence of presentation. There are no actual errors related to understanding the problem.

- 75-61 points - the student understands the basic foundations and theoretical justification of the topic. The main sources on this topic are brought.

- 60-50 points - if the answer is a retransmitted source text, without any comments, analysis. Three or more than three errors were made in the semantic content of the topic.