NATIONAL UNIVERSITY OF LIFE AND ENVIRONMENTAL SCIENCES OF UKRAINE

Department of physiology, biochemistry of plants and bioenergetics

"APPROVED"
Dean of Faculty of Plant protection,
Biotechnology and Ecology
Kolomiets Y.V.
23 " May 2024

" **APPROVED**"
on the meeting of physiology, biochemistry of plants
and bioenergetics department
Protocol № 10 from «22» May 2024
Head of Department
Prylutska S.V.

"**REVIEWED**"
Guarantor EO 162 Biotechnology and bioenergetic
Kvasko O.Y.
Guarantor EO

PROGRAM OF THE COURSE

INTRODUCTION TO THE PROFESSION

Branch of knowledge 16 "Chemical and bioengineering"
Specialty 162 "Biotechnology and Bioengineering"
Educational program "Biotechnologies and bioengineering"
Faculty of Plant Protection, Biotechnology and Ecology
Developers: Head of Department, Dr. of Sci., Prof. Prylutska S.V.

Kyiv – 2024

1. **Description of the course**

«INTRODUCTION TO THE PROFESSION»

Branch of knowledge, training direction, specialty, education level		
Educational degree	Bachelor	
Specialization	162 «Biotechnology and bioenergetic»	
Educational program	«Biotechnology and bioenergetic»	
Characteristics of the course		
Type	Compulsory	
Total number of hours	120	
Number of credits ECTS	4	
Number of content modules	2	
Form of control	Exam	
Indicators of the academic discipline for full-time and part-time forms of higher education		
	full-time education	correspondence form of training
Course (year of study)	2	2
Semester	3	4
Lecture classes	30 hours	4 hours
Practical, seminar classes	15 hours	6 hours
Laboratory classes	-	-
Self-study	75 hours	110 hours
Individual assignments	-	-
Number of weekly hours for full-time higher education	3 hours	

1. Purpose, tasks, competencies and program results of the educational discipline

The purpose of the discipline "Introduction to the profession" is the formation of theoretical foundations and principles aimed at determining the main biotechnological directions of using the properties of microorganisms, cells, tissues and plant organs to meet human needs. An important feature of this course is its focus on the practical use of the results of fundamental sciences in various fields of human economic activity.

The task of the discipline "Introduction to the profession" consists in: summarizing the basic concepts, biological and chemical foundations and technological principles of biotechnological productions with the involvement of theoretical and practical knowledge of basic sciences; assimilation of directions and tasks of modern biotechnology, awareness of the connection of biotechnology with other biological and agricultural sciences.

Competence acquisition:

integral competence (IC): - the ability to solve complex specialized tasks and practical problems characterized by complexity and uncertainty in biotechnology and bioengineering, or in the learning process involving the application of theories and methods of biotechnology and bioengineering.

general competencies (CG):

CG5 The ability to learn and master modern knowledge;

CG6 The ability to preserve and multiply moral, cultural, scientific values and achievements of society based on an understanding of the history and patterns of development of the subject area, its place in the general system of knowledge about nature and society and in the development of society, technology and technologies, to use various types and forms of motor activity for active recreation and leading a healthy lifestyle.

special (specialist) competences (SC):

SC3 The ability to analyze regulatory documentation necessary to ensure engineering activities in the field of biotechnology;

SC4 The ability to work with biological agents used in biotechnological processes (microorganisms, fungi, plants, animals, viruses, their individual components);

SC5 The ability to carry out experimental research on the improvement of biological agents, including causing changes in the structure of the hereditary apparatus and the functional activity of biological agents;

SC6 The ability to analyze raw materials, materials, semi-products, target products of biotechnological production

Program learning outcomes (LP):

LP12 using microbiological, chemical, physical, physico-chemical and biochemical methods, be able to carry out chemical control (determining the concentration of solutions of disinfectants, titration agents, concentration of nutrient medium components, etc.), technological control (concentrations of carbon sources and nitrogen in the culture liquid during the process; concentration of the target product); microbiological control (determination of microbiological purity of nutrient

media after sterilization, microbiological purity of biological agent, etc.), microbiological purity and sterility of biotechnological products for various purposes;

LP13 to be able to carry out technical and economic substantiation of the production of biotechnological products for various purposes (determining the need for the target product and calculating the production capacity);

LP14 to be able to justify the choice of a biological agent, the composition of the nutrient medium and the method of cultivation, the necessary auxiliary works and the main stages of the technological process;

LP15 based on knowledge of the regularities of mechanical, hydromechanical, heat and mass exchange processes and the main design features, be able to choose the appropriate equipment in the process of designing the production of biotechnological products of various purposes to ensure their maximum efficiency;

LP16 based on the knowledge gained during practice at enterprises and institutions, to be able to perform product calculation and calculation of technological equipment.

2. Program and structure of the academic discipline

- a full-time full-time (correspondence) form of higher education

Names of content modules and topics	Number of hours												
	full-time education							full-time education					
	weeks	total	included					total	included				
			lec	prac	lab.	ind.	in. w.		lec	prac	lab.	ind.	in. w.
Content module 1. Areas of application of biotechnology													
Topic 1. Biotechnology as a branch of science.	1	8	2	1			5		1				6
Topic 2. Prospects of industrial biotechnology.	2	8	2	1			5						7
Topic 3. Current state of ecological biotechnology.	3	8	2	1			5						6
Topic 4. Development of alternative bioenergy.	4	8	2	1			5						7
Topic 5. Eco-biotechnological approaches to environmental protection.	5	8	2	1			5						6
Topic 6. Prospects of agricultural biotechnology.	6	8	2	1			5						7
Topic 7. Basic principles of biosafety and bioethics in biotechnology.	7	8	2	1			5						6
Topic 8. Current state of biomedical technologies.	8	8	2	1			5						7
Topic 9. Perspectives of food biotechnology.	9	8	2	1			5						6
Topic 10. Food and biological supplements	10	4	2	1			5						7
Topic 11. Basic principles of nanobiotechnologies.	11	8	2	1			5						7
Total hours:	88		22	11			55	73	1				72
Content module 2. Biotechnological methods													
Topic 1. Methodological approaches of practical use of knowledge and skills in modern biotechnological industries.	12	8	2	1			5		1				7

Topic 2. Modern methods used in biotechnology.	13	8	2	1			5						7
Topic 3. Biotechnology of cultivation of isolated cells and tissues.	14	8	2	1			5						7
Topic 4. Culture of isolated protoplasts as the basis of cell engineering.	15	8	2	1			5						7
Total hours:	32		8	4			20						28
The total number of hours:	**120**		**30**	**15**			**75**	**102**	**2**				**100**

3. Topics of laboratory (practical, seminar) classes

№	Topic title	Number of hours
1.	Fundamentals of molecular biology and its importance in biotechnology.	3
2.	Transgenic organisms.	2
3.	Hybridoma technology.	2
4.	Microorganisms as classic objects of cell biotechnology.	2
5.	Animal cells as producers of biologically active substances.	2
6.	Plant cells as objects of biotechnology.	2
7.	Mushrooms as objects of biotechnology.	2
Total hours		15

4. Topics of independent work

№	Topic title	Number of hours
1	World classification of biotechnologies	10
2	Normative and legal basis for the application of biotechnology in Ukraine and the world	10
3	Biotechnology of oil and oil products processing	10
4	Biotechnology of wastewater treatment	10
5	Waste disposal biotechnology	10
6	Biotechnological methods of plant protection	10
7	Biotechnology of growing energy crops	10
8	The labor market in Ukraine. The need for specialist biotechnologists	5

5. Means of diagnosis of learning results

- exam;
- module tests;
- preparation and defense of presentations;
- oral and written survey;
- abstracts.

6. Teaching methods:

- verbal method (lecture, seminar, discussion, interview);
- visual method (illustration method, demonstration method);
- work with educational and methodical literature (summarizing, summarizing, annotating, reviewing, writing an essay);
- video method (remote, multimedia);
- independent work (task performance);
- individual research work of students of higher education.

7. Evaluation methods:

-exam;
- modular testing;
- oral and written survey;
- presentations and speeches at scientific events;
- abstracts.

8. Distribution of points received by students of higher education. The assessment of the knowledge of a higher education student takes place on a 100-point scale and is translated into national assessments according to the table. 1 of the current "Regulations on examinations and assessments at NULES of Ukraine"

Student rating, points	**National grade based on exam results**	
	Exams	**Credits**
90-100	Excellent	Passed
74-89	Good	
60-73	Satisfactory	
0-59	Unsatisfactory	Not passed

In order to determine the rating of a student (listener) in the discipline $\mathbf{R_{dis}}$ (up to 100 points), the rating from the exam $\mathbf{R_{ex}}$(up to 30 points) is added to the rating of a student's academic work $\mathbf{R_{aw}}$ (up to 70 points): $\mathbf{R_{dis} = R_{aw} + R_{ex}}$

9. Educational and methodological support

- electronic educational course of the educational discipline https://elearn.nubip.edu.ua/course/view.php?id=3693
- abstracts of lectures and their presentations (in electronic form);

- textbooks, manuals, workshops;
- methodical materials on the study of the academic discipline for students of higher education full-time and part-time forms of higher education;
- the program of educational practice of the academic discipline.

10. Recommended sources of information

1. Біотехнологія: Підручник / В.Г. Герасименко, М.О. Герасименко, М.І. Цвіліховський та ін.; Під ред. В.Г. Герасименка. - К.: Фірма «ІНКОС», 2006. - 647 с.
2. Промислові біотехнології. Курс лекцій. Курта С.А. Прикарпатський національний університет імені Василя Стефаника. - Івано-Франківськ, 2018. - 197с.
3. Екологічна біотехнологія: Конспект лекцій з дисципліни для студ. спец. 6.070800 “Екологія та охорона навколишнього середовища” напряму 0708 „Екологія” ден. форми навч. / Уклад. Н.О.Бублієнко. – К.: НУХТ, 2005. – ... с. 46.
4. Сільськогосподарська біотехнологія : курс лекцій з дисципліни для здобувачів вищої освіти ступеня «бакалавр» спеціальності 162 «Біотехнологія та біоінженерія» денної форми навчання / О. Ю. Сметана. – Миколаїв : МНАУ, 2017. – 132 с.