

**NATIONAL UNIVERSITY OF LIFE AND ENVIRONMENTAL SCIENCES OF
UKRAINE**

Department of Molecular Biology, Microbiology and Biosafety

"APPROVED"

Dean Plant Protection, Biotechnology and Ecology

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«____» _____ 2020

Reviewed and approved

on meeting of department _____

Protocol № ____ of " ____ " ____ 2020

Head of Department

Starodub M. F.

WORKER EDUCATIONAL PROGRAM

"Biotechnology in agriculture"

Specialty _____ 162 "Biotechnologies and bioengineering" _____

Faculty _____ Plant protection, Biotechnology and Ecology _____

Developers: d. a. s., prof. Lisovyy M.M., c. b. s., a. p., doc. Lobova O.V. _____

1. Characterization of discipline "BIOTECHNOLOGY IN AGRICULTURE"

Field of knowledge, specialty, qualification level		
Educational qualification	"Master"	
Field	16«Chemistry and bioengenergy»	
Specialty	162 "Biotechnologies and bioengenergy"	
Characteristics of discipline		
Kind	compulsory	
Total amount of hours	98	
Amount of credits, corresponding to ECTS	3	
Modules	3	
Type of control:	test	
Structure of discipline for full-time and part-time students		
	Internal students	External students
Year of training	1	
Semester	1	
Lectures	15	
Practical, seminars		
Laboratory work		
Self-instruction under direction	83	
Individual tasks		
Amount of hours on a week for internal student auditory self-instruction	2	

1.1. The task of the discipline

Purpose: the study of discipline allows us to consider the use of biotechnology applied comprehensively, taking into account the urgent needs of agricultural production and new promising developments ahrobiotekhnolohiyi.

Objective: formation of students' system of theoretical and practical knowledge to ensure the implementation, production and exploitation of applied biotechnology in agriculture in a real production environment farm and regional bio-laboratories and modern methodological approaches to the development and improvement of appropriate biotechnology and engineering solutions.

As a result of the discipline the student should know:

- Classification and basic characteristics of biotechnological agents used for the implementation of existing and emerging applications of biotechnology in agriculture;
- Technological regimes and technical equipment for the main applications of biotechnological processes in agricultural production;
- For biological products and biotechnological characteristics that allowed for use in biological crop production;
- Design methodology and calculation of basic biotechnology and structural indicators processes applied biotechnology and cultivation and fermentation devices (microbiological reactors) for their implementation;
- Agri-environmental problems, the main requirements of biological safety when using the applications of biotechnology in agriculture;
- Technical specifications biotechnological processes methane fermentation, vermykompostuvannya, production of protein feed additives, regional production entomological and microbiological plant protection agents, etc;
- Methods and means of research aimed at further improving the application of biotechnological processes in agriculture.

After studying the discipline program the student should be able to:

- Plan, organize and operate the production of biologically active fertilizers and biological products;
- Identify and evaluate biotechnology and physical and chemical properties of raw materials, end products and biotechnological agents;
- Develop technological projects using applied biotechnologies concerning the conditions of particular agricultural enterprises;
- Identify problems biotechnological industries and to ensure their removal together with specialists of compatible industries (electricity, experts on the TRC and A, mechanics, plumbers, etc.);
- Formulate objectives for the development of new applications and improve existing biotechnology for their implementation according to the needs of the industry on the basis of commercial effect;

- Conduct scientific, theoretical and experimental research to further improve the application of biotech processes in agriculture.

2. The program of the course

- Full term full-time (part-time) form of study;
- Short term agenda (correspondence) learning.

Names of modules and themes	Amounts of hours											
	Internal						External					
	Common amount	including					Common amount	including				
		Lect.	P.	Labor.	Self-work	Self-work under direction		Lect.	P.	Labor	Self-work	Self-work under direction
1	2	3	4	5	6	7	8	9	10	11	12	13
Module 1. Formation of virology as a science and structural property of viruses												
Theme 1. Introduction. Subject main objectives of the subject "Applications of biotechnology in agriculture"		2				10						
Theme 2. Biotechnology recycling and waste bioconversion APC		2				10						
Total for module 1.		4				20						
Module 2. Spread of viruses and its influence on plants												
Theme 3 Biotechnological production processes entomological and microbiological preparations for plant protection. Biological plant		2				13						

protection.												
Theme 4. Biotechnological processes for production of biologically active fertilizers and biological products for the restoration and rehabilitation of soil productivity		2				10						
Theme 5. Biotechnological processes forage and fodder additives		2				10						
Total for module 2.		6				33						
Module 3. Spread viruses in nature												
Theme 6. Biotechnology and structural characteristics of domestic and foreign bioengineering systems based on complex integrated vzayemovvyazan omu use ahrobiotehnohiiy		2				13						
Theme 7. Methodological bases of research, evaluation and drafting of complex use of biotechnological processes concerning the conditions of specific agricultural or agricultural		2				8						

landscapes												
Theme 8. Methodology of scientific, theoretical and experimental research on the development and implementation of applications ahrobiotekhnolohiy		1				9						
Total for module 3.		5				30						
Common amount of hours		15				83						

3. THEMES OF SEMINAR

№	Theme	Amount of hours
1	It does not foreseen by plan	

4. THEMES OF HANDS-ON LEARNING

№	Theme	Amount of hours
1	It does not foreseen by plan	

5. SUBJECT OF LABORATORY WORKS

№	Theme	Amount of hours
1	Determination of secondary raw materials and the calculation of the possible biogas output on livestock farms and complexes	1
2	Biotechnological processes and devices for the production of microbiological preparations for plant protection. Methods for determining key indicators of process and quality of the mikrobiopreparatu	2
3	Identification of possible vermicompost production volumes and calculating the basic technological parameters vermyhospodarstva in a particular agricultural enterprise	2

4	Bioenergy assessment biotechnological processes	1
	Total amount	6

6. Test question test kits to determine the level of learning students.

Question 1.

50	Applied Biotechnology in agriculture call:
A	Red
B	Blue
C	White
D	Green

Question 2.

50	The agrarian economy of any legal organizational form, which operates in a way which is compatible with natural living systems and cycles, creates and develops viable and sustainable ahroekosystemu, as evidenced license
A	Steady
B	Biological (ecological, organic)
C	energy saving
D	Biotechnology

Question 3.

50	Complex systems that include biological and technical subsystems that operate together to achieve a common purpose, are called:
A	Biotechnical System (BTS)
B	Systems man - machine (SLM)
C	Life support systems
D	bioenergy systems

Question 4.

50	Mesophilic anaerobic methane fermentation process of organic materials is at:
A	30-40 °C
B	50-60 °C
C	15-20 °C
D	70-80 °C

Question 5.

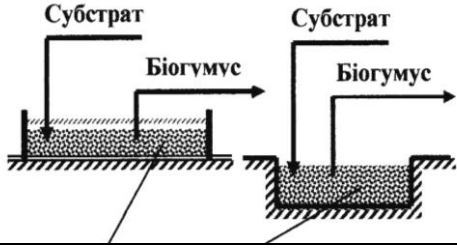
50	Mesophilic anaerobic methane fermentation process of organic materials is at:
A	30-40 °C
B	50-60 °C

C	15-20 °C
D	70-80 °C

Question 5.

50	The temperature in the production mikrobiopreparatu fungicidal action based on <i>Bacillus subtilis</i> shall be:
A	19,5±1 °C
B	30±1 °C
C	37±1 °C
D	29,5±1 °C

Question 6.

50	What type of equipment vermykompostuvannya shown in the diagram? 
A	Ridges
B	The stock, trenches
C	Containers, pallets
D	Solid-phase reactors (cultivators)

Question 7.

50	Joint methane fermentation of various biomasses call:
A	Cogeneration
B	Kofermentatsiya
C	trigeneration
D	Selective fermentation

Question 8.

50	Which of these drugs has rodentodny effect (similar to mouse used against rodents)?
A	Boverin
B	Bakto-rodent-syd
C	Tryhodermin
D	Haupsyn

Question 9.

50	The photo shows: 
A	Rocking chair Suspended microbiological KPM
B	Kit for minivyrobnystv mikrobiopreparativ BAC
C	Equipment for unified mass breeding entomoakaryfahiv ORE
D	Rocking chair Suspended microbiological KPM

Question 10.

50	What is the storage temperature entomological drug Trichogramma?
A	+3 ±1 ° C
B	– 4 ±1 ° C
C	+ 5 ±1 ° C
D	– 5 ±1 ° C

8. FORMS OF CONTROLS

Rating of student from mastering of discipline is determined for 100 a ball scale. It consists of rating from educational work, at the evaluation of which 70 marks target, and rating from attestation (to examination) are 30 marks. Every semantic module is also estimated for 100 a ball scale.

On the rating of educational work by decision of the department can influence rating of additional work to □ 20 points and ranking penalty (with negative sign) □ to 5 points.

Rating of student from educational work of R_{EW} is determined after a formula

$$0,7 \cdot (R^{(1)}_M + R^{(2)}_M + R^{(3)}_M)$$

$$R_{HP} = \text{-----} + R_{DP} - R_{ШТР},$$

3

where R^1_M , R^2_M , R^3_M - rating estimation of 1th 2th and 3th modules on a 100 ball scale. R_{AW} , R_{PW} - accordingly rating from additional work and rating of penalty area.

Students, who have received 60 or more points from educational work, cannot take the examination, and obtain test scores "Automatically". In this case the rating of student from discipline (R_{DIS}) is equal to his rating of educational work.

$$R_{DIS} = R_{EW}$$

If a student wants to improve his ranking and improve the assessment of discipline, he must pass an exam. A exam is passed by students who has scored less than 60 points. For admission to exam a student must score at least 60 points from each module and in general - not less than 42 points from educational work.

Rating of student from attestation (R_{AT}) is determined on a 100-point scale.

Rating of student from discipline (R_{DIS}) is calculated by the formula.

$$R_{DIS} = R_{EW} + 0,3 \times R_{AT}$$

10. Distribution Points that receive students. Evaluation of the student is in accordance with the provisions of "On the examinations and tests NUSEU in Ukraine" dated 02/20/2015. The protocol number 6 from the table. 1

national assessment	Assessment YEKTS	Визначення оцінки ЄКТС	Рейтинг студента, бали
Excellent	A	Excellent - excellent performance with few errors	90 – 100
Good	B	VERY GOOD - above average with some mistakes	82 – 89
	C	GOOD - generally correct work with a number of blunders	74 – 81
Satisfactorily	D	Satisfactory - not bad but many drawbacks	64 – 73
	E	ENOUGH - performance meets the minimum criteria	60 – 63
Unsatisfactorily	FX	Unsatisfactory - must work before get credit (positive evaluation)	35 – 59
	F	Poor - thorough and elaborate	01 – 34

To determine the ranking of the student (listener) from mastering the discipline $R_{дис}$ (100 points) received rating from certification (30 points) added to the ranking student (listener) for Academic $R_{НР}$ (70 points): $R_{дис} = R_{НР} + R_{AT}$.

12. Suggested Reading

General

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2. Вивчення біотехнологічних процесів та апаратів для виробництва мікробіологічних препаратів і оцінки їх якості. Методичні

- рекомендації / В.С. Таргоня, М.М. Лісовий, І.І. Кошевський – К.: 2015. – с. 42.
3. Біотехнологічні процеси та апарати для виробництва мікробіологічних препаратів захисту рослин. Методи визначення основних показників процесу та якості отриманого мікробіопрепарату. Методичні вказівки / В.С. Таргоня, М.М. Лісовий, І.І. Кошевський – К.: 2015. – с. 51.
 4. Біопалива (технології, машини і обладнання) / В.О. Дубровін, М.О. Корчемний, І.П. Масло, О. Шептицький, А. Рожковський, З. Пасторек, А. Гжибек, П. Євич, Т. Амон, В.В. Криворучко – К.: ЦТІ"Енергетика і електрифікація", 2004. – 256 с.
 5. Альтернативна енергетика: [навч. посібник для студ. вищ. навч. закл.] / М.Д. Мельничук, В.О. Дубровін, В.Г. Мироненко, І.П. Григорюк, В.М. Поліщук, Г.А. Голуб, В.С. Таргоня, С.В. Драгнєв, І.В. Свистунова, С.М. Кухарець, – К: «Аграр Медія Груп», 2011. – 612 с.
 6. Посібник. Технології та обладнання для використання поновлюваних джерел енергії в сільськогосподарському виробництві / [за ред. В.І. Кравчука, В.О.Дубровіна. – Дослідницьке: УкрНДІПВТ ім. Л.Погорілого, 2010. – 184 с.
 7. Біоенергія в Україні – розвиток сільських територій та можливості для окремих громад / [Дубровін В.О., Мельничук М.Д., Мельник Ю.Ф. та ін.]; за ред. В.О.Дубровіна, Анни Гжибек, В.М. Любарського. – Каunas: Srausdino UAB "Taurapolis", 2009. – 120 с.
 8. Біотехнологія: підручн. / [В.Г. Герасименко, М.О. Герасименко, М.І. Цвіліховський та ін.]; за ред. В.Г. Герасименка. – К.: Інкос, 2006. – 647 с.
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 - 10.Бекер М.Е. Биотехнология / М.Е. Бекер, Г.К. Лиепинь, Е.П. Райпулис. – М.: Агропроиздат, 1990. – 334 с.
 - 11.Герасименко В.Г. Биотехнология: учеб. пособ. / В.Г. Герасименко. – К.: Вища школа, 1989. – 343 с.
 - 12.Герасименко В.Г. Біотехнологічний словник / В.Г. Герасименко. – К.: Высш. школа, 1991. – 167 с.

Additional:

1. Медведовський О.К., Іваненко П.І. Енергетичний аналіз інтенсивних технологій в сільськогосподарському виробництві. – К.: Урожай, 1998. – 205 с.
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3. Тараріко Ю.О. Енергетична оцінка систем землеробства і технологій вирощування сільськогосподарських культур. Методичні рекомендації. / Ю.О.Тараріко, О.Є.Несмашна, Л.Д.Глущенко. – К.:Нора – прінт, 2001. – 60 с.
4. План дій по біомасі для України (проект). – К.:НТЦ „Біомаса”, 2008. – 43 с.

5. Атлас енергетичного потенціалу відновлюваних джерел енергії, розроблений Інститутом електродинаміки НАН України за підтримки Державного комітету України з енергозбереження. – К.: Інститут електродинаміки НАН України, 2001.
6. Малащенко Ю.Р., Хайер Ю., Бергер У., Романовская В.А., Мучник Ф.В. Биология метанообразующих и метаноокисляющих микроорганизмов. - К.: Наукова думка, 1993. - 256с.
7. Використання біомаси на енергетичні потреби в сільському господарстві. Біогазові технології / [Таргоня В.С., Клименко В.П., Луценко М.М., Бабинець Т.Л.]; за ред. В.І. Кравчука. – Дослідницьке: УкрНДІПВТ ім. Л. Погорілого, 2009. – 72 с.
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9. Відтворення родючості ґрунтів у ґрунтозахисному землеробстві: наукова монографія; під ред. М.К. Шикули. – К.: ПФ “Оранта”, 1998. – 680 с.
10. Агроекологія: навч. посібник / М.М. Городній, М.К. Шикула, І.М. Гудков та ін. – К.: Вища школа, 1993. – 416 с.
11. Лер Р. Переработка и использование сельскохозяйственных отходов / Р. Лер. – М.: Колос, 1979. – 415 с.
12. Виестур У.Є. Системы ферментации / У.Э. Виестур, А.М. Кузнецов, В.В. Савенков. – Рига: Зинатне, 1986. – 174 с.
13. Баадер В. Биогаз: теория и практика / Баадер В., Доне Е., Бренндерфер М. ; пер. с нем. и предислов. М.И. Серебряного. – М.: Колос, 1982. – 148 с.