



## INNOVATIVE FINISHED FORMS OF BIOPREPARATIONS

### Work program of the discipline (Syllabus)

#### Details of the discipline

Level of higher education	<i>Third (educational and scientific)</i>
Branch of knowledge	16 "Chemical and Bioengineering"
Specialty	162 - Biotechnology and bioengineering
Educational program	Biotechnology
Discipline status	Selective
Form of study	part-time form of education
Year of preparation, semester	2nd year, 2 semester
The scope of discipline	150 hour/5 cr. ECTS, Lectures 6 hour; practical classes 2 hour according to the schedule
Semester control / control measures	Exam/MCW
Lessons schedule	<a href="http://rozklad.kpi.ua/">http://rozklad.kpi.ua/</a>
Language of instruction	Ukrainian, English
Information about the course leader / teachers	Lectures and practicals are conducted by: Dr. Eng. Sciences, Assoc. Prof., Head of the Department Todosiichuk Tetiana Serhiivna, <i>email: tts.pbt@gmail.com</i>
Course placement	<a href="http://prombiotech.kpi.ua/en/student/english-doctor-philosophy/english-innovative-finished-forms-of-biopreparations/">http://prombiotech.kpi.ua/en/student/english-doctor-philosophy/english-innovative-finished-forms-of-biopreparations/</a> Sikorsky platform: <a href="https://do.ipk.kpi.ua/course/">https://do.ipk.kpi.ua/course/</a> , Electronic Campus

#### Curriculum of the discipline

##### 1. Description of the discipline, its purpose, subject of study and learning outcomes

The action and effectiveness of biologically active substances in most cases is due to the finished form of the drug, which is provided to him during production. This applies to biological products for different applications: in pharmacy, the finished form is becoming critical, but in agriculture, it will depend on the effect of the drug.

The knowledge and experience gained during the study of the discipline can be used to solve complex problems and problems in specialized areas of professional activity or training, which involves creating new innovative and improving already used ready-made forms of biologics or biosynthesis processes and finishing stages to obtain target products in effective and stable finished forms.

The course will provide an opportunity:

- to analyze, create and use promising finished forms based on cells and biomolecules in various fields and research practice;
- to develop finished forms of biological products for various industries, medicine, agriculture, etc.

**The purpose** of the discipline is to form approaches to the development of innovative finished forms of biological products, solving problems in the creation of finished dosage forms and drugs for agriculture based on biotechnological substances.

**The subject** of the discipline are the main types of modern and promising finished forms of biomolecules and cells in accordance with the purpose of drugs, methods of design and production of innovative finished forms of biological products, principles of their application, features of finished forms of biological products in accordance with areas of application.

The discipline contributes to the formation of postgraduate students in the following competencies:

- ability to abstract thinking, analysis, synthesis in the development of finished forms of drugs and agrobio products;
- ability to generate new ideas, conduct research at the appropriate level; perform original research in the field of biological product development;
- ability to critically comprehend and adapt newly created ready-made forms of biological products;
- ability to critically evaluate the obtained results and recommend alternative solutions in biopharmacy and agrotechnologies;
- ability to develop new and improve existing ready-made forms of biological products.

After mastering the discipline, graduate students must demonstrate the following learning outcomes:

**Knowledge:**

- basic methods and principles of designing biological products for different areas of practical application;
- principles of choosing an effective finished form of biological product and optimization of existing forms;
- features of production and finishing stages of biotechnologies for obtaining modern and promising finished forms of biological products

**Skills:**

- choose the finished form of the biological product in accordance with the type of biological object and the tasks of its further use;
- to analyze the effectiveness of the finished form and the activity of biomolecules in the composition of such structures and drugs;
- to determine the feasibility of creating a certain finished form of the biomolecule and the prospects for the use of the created drugs.

## **2. Prerequisites and postrequisites of the discipline (place in the structural and logical scheme of education according to the relevant educational program)**

The study of the discipline is based on postgraduate knowledge of the basics of pharmaceutical production, problematic issues of modern biotechnology and microbial technologies, design of biotechnological and pharmaceutical industries, regulatory support of biotechnological industries, as well as integration and differentiation of modern scientific knowledge in biotechnology, organization. To use foreign sources of information in the discipline, graduate students must speak a foreign language for research.

The knowledge and skills acquired after studying the discipline can be further used by graduate students in preparing a dissertation, processing and analysis of problematic issues in various fields of biotechnology and bioengineering.

## **3. The content of the discipline**

Topic 1. Innovative ready-made forms of biologicals for medicine and pharmacy.

Topic 2. Innovative ready-made forms of biological products for agriculture.

## **4. Training materials and resources**

### ***Basic teaching resources***

(<http://prombiotech.kpi.ua/en/student/english-doctor-philosophy/english-innovative-finished-forms-of-biopreparations/>)

1. Bacterial and Bacteriophage Genetics Fifth Edition Edward A. Birge. School of Life Sciences Arizona State University Tempe, AZ 85287-4501 USA. -2006.

2. Principles of Molecular Virology. Fourth edition/ Alan J. Cann., 2005.

3. DsRNA genetic elements: Concepts and Applications in Agriculture, Forestry, and Medicine/ Ed. by Stellos M. Tavantzis, crc Press. 2001. ISBN 0-8493-2205-7

4.Exploring the Cell. The American Society for Cell Biology. 2005.

5.Introduction to the Bioinformatics. Arthur M. Lesk, Oxford University Press Inc., New York. – 2002.

#### **Additional teaching resources**

6.Fundamental Bioengineering. John Villadsen (Editor), Sang Yup Lee (Series Editor), Jens Nielsen (Series Editor), Gregory Stephanopoulos (Series Editor). ISBN: 978-3-527-33674-6 February 2016 Wiley-Blackwell 574 Pages

7.Techniques in Genetic Engineering. Isil Aksan Kurnaz. 2015. ISBN 9780367658816. 346 Pages

8. Molecular Biology of the Cell, 6th edition. Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, and Peter Walter. New York: Garland Science; 2021. ISBN-10: 0-8153-3218-1ISBN-10: 0-8153-4072-9

9.Trends and Challenges in Neuroengineering: Toward “Intelligent” Neuroprostheses through Brain-“Brain Inspired Systems” Communication. Frontiers in Neuroscience. 2016. P. 438 DOI=10.3389/fnins.2016.00438

10.Precision medicine integrating whole-genome sequencing, comprehensive metabolomics, and advanced imaging. Ying-Chen Claire Hou, Hung-Chun Yu, Rick Martin,Proceedings of the National Academy of Sciences Feb 2020, 117 (6) 3053-3062; DOI: 10.1073/pnas.1909378117

#### **Another teaching resources**

<https://agrinos.com.ua>

<https://bio-norma.agro-business.com.ua/>

<https://www.bio-norma.com/>

### **Educational content**

#### **5. Methods of mastering the discipline (educational component)**

The discipline covers 6 hours of lectures and 2 hours of practical classes, as well as the implementation of modular tests, lasting 2 hours. Practical classes are held in order to consolidate the theoretical provisions of the discipline and the acquisition by graduate students of skills and experience in operating modern concepts of finished forms in pharmacy and agriculture.

Teaching methods: explanatory-illustrated (multimedia lectures with elements of discussion communication with applicants), reproductive, research, part-search (independent search work, work with literature). The following teaching methods are used: • verbal – story, explanation, conversation, instruction, lecture, discussion; • visual – demonstration of videos, visual equipment, illustrations; • practical methods - practical work; • inductive methods – generalization of search and research results.

<b>lessons</b>	<b>Topics and classes</b>
Lecture 1	Interactive and multifunctional wound dressings. Polymeric carrier materials, active pharmaceutical ingredients, inclusion technologies. Teaching resources: 4, 5, 9
Practical 1	Aerosol dosage forms with nanoparticles. Sprays and features of biological products in their composition. Teaching resources: 1, 6
Lecture 2	Microencapsulated biologicals for crop production and bioremediation of agricultural lands. Teaching resources: 3, 8
Lecture 3	Immobilized biologicals for veterinary medicine. Teaching resources: 4, 7
	Modular control work

## 6. Independent work of a student / graduate student

142 hours are allotted for independent work at this course. Types of independent work:

- preparation for lectures (20 hours)
- preparation for practical classes (26 hours)
- preparation for module control (4 hours, acquaintance with materials of presentations of lectures, additional literature during teaching time of a course);
- preparation for the exam (30 hours).

Topics that are submitted for self-study (62 hours):

Dosage forms of targeted delivery: dendrimers, liposomes, nanocapsules, nanosomes. Biologically active compounds in the forms of directed delivery. Teaching resources: 5, 10
Principles of development of means of delivery and choice of a target for action of biologicals. Teaching resources: 3, 6
Dosage forms obtained by 3D printing. Teaching resources: 6, 8
Gaseous biologicals for agrotechnologies. Teaching resources: 3, 8
Suspension biologicals for crop production with functional auxiliary substances (stabilizers, prolongators, activators). Teaching resources: 5, 8

## Policy and control

### 7. Course policy (educational component)

- **rules for attending classes:** free attendance of lectures and mandatory attendance at practical classes. In the absence of practical classes, the graduate student must provide confirmation of good reasons, otherwise he will not receive points for answers to practical;
- **rules of conduct in class:** activity, turning off the phone;
- **rules for assigning incentive and penalty points:** the graduate student can receive incentive points for the preparation of information on the issues provided, penalty points are not accrued;
- **policy of deadlines and rearrangements:** in case of absence when writing a modular test, the graduate student provides confirmation of valid reasons for absence, after which he is assigned additional time to write it;
- **policy on academic integrity:** graduate students must follow the rules of academic integrity – as stated on the website of NTUU I. Sikorsky KPI., see <https://kpi.ua/academic-integrity>, <https://kpi.ua/files/honorcode.pdf>.

### 8. Types of control and rating system for evaluation of learning outcomes (RSELO)

**Current control:** modular control work on the issues provided in paragraph 9.

**Calendar control:** conducted twice a semester as a monitoring of the current state of compliance with the requirements of the syllabus. A positive attestation is awarded to a student who has received at least 50% of the points possible at the time of the calendar controls at the university.

**Semester control:** Exam. The list of questions for the exam is given in paragraph 9.

**Conditions of admission to semester control:** semester rating is more than 27 points

The semester rating consists of points for the module test (45 points) and the answer to the situational question in the Practical lesson (10 points): 45 + 10 = 55 points

Answer to the situational question on the topic of the lecture:

- full answer to the question – 10 points;
- incomplete answer to the question – 5-7 points;
- partial answer to the question – 2-3 points;
- only some elements of the answer to the question – 1 point;
- unsatisfactory answer to the question – 0 points.

Modular test consists of three questions, each of which is evaluated in 15 points:

- complete answer to control questions – 15 points;
- incomplete answer to control questions – 11-14 points;
- partial answer to control questions – 7-10 points;
- only some elements of the answer to the question – 5-14 points;
- unsatisfactory answer to control questions – up to 5 points.

The written exam consists of 3 questions, each of which is graded at 15 points:

- full answer to the question - 15 points;
- incomplete answer to the question - 11-14 points;
- partial answer to the question - 6-10 points;
- some elements of the answer to the question with errors - 1-5 points;
- unsatisfactory answer to the question - 0 points.

The overall rating of the discipline is as follows: semester score (55) and exam scores (45) = 100 points

Table of correspondence of rating points to grades on the university scale:

<i>Scores</i>	<i>Rating</i>
100-95	<i>Excellent</i>
94-85	<i>Very good</i>
84-75	<i>Good</i>
74-65	<i>Satisfactorily</i>
64-60	<i>Enough</i>
Less than 60	<i>Unsatisfactory</i>
Less than 40	<i>Not allowed</i>

## 9. Additional information on the discipline (educational component)

- **List of questions for modular control work (examples):**  
Finished forms of liposomal drugs.  
Finished forms of nanosomal preparations.  
Finished dosage forms of nanocapsules.  
Principles of delivery of active drugs into the human body.  
Problems of creating medical implants and suture material.  
Materials for immobilization of bioactive substances.  
Interactive wound dressings.  
Functional excipients in innovative liqueur forms.  
Prospects for the production of pharmaceuticals by 3D printing.
- **List of questions for the exam (examples):**  
Microencapsulated biologicals for crop production  
Microencapsulated biological products of bioremediation of agricultural lands.  
Immobilized biologicals for veterinary medicine.  
Gaseous biologicals for agrotechnologies.  
Suspension biologicals for crop production.  
Functional excipients in agricultural commodity forms.

Biologically active compounds in the forms of directed delivery.  
Principles of development of means of delivery.  
Principles of target selection for the action of biological products.

The working program of the discipline (syllabus) is made: Head Department of Industrial Biotechnology,  
Doctor of Eng. Sc., Assoc. Prof. Tosiichuk TS

Approved by the Department of Industrial Biotechnology (Protocol№ 3 of 15.10.2020)

Approved by the Methodical Commission of the Faculty of Biotechnology and Biotechnology (Protocol №  
2 of 23.10.2020)