



Organization of scientific and innovative activities

Work program of the discipline (Syllabus)

Реквізити навчальної дисципліни

Level of higher education	<i>Third (educational and scientific)</i>
Branch of knowledge	<i>16 "Chemical and Bioengineering"</i>
Specialty	<i>162 - Biotechnology and bioengineering</i>
Educational program	<i>Biotechnology</i>
Discipline status	<i>Normative</i>
Form of study	<i>part-time</i>
Year of preparation, semester	<i>2nd year, spring semester</i>
The scope of discipline	<i>4 ECTS</i>
Semester control / control measures	<i>Credit</i>
Lessons schedule	<i>Lectures: 6 hour / 2 hour / week according to the schedule</i>
Language of instruction	<i>English</i>
Information about course leader / teachers	<i>Lecturer: Doctor of Biology Sciences, prof. Galkin Olexandr Yurievich alexfbt@gmail.com; (Telegram)</i> <i>Practice: Doctor of Biology Sciences, prof. Galkin Olexandr Yurievich</i>
Course placement	<i>Google classroom. course code lfrmeio</i>

Curriculum of the discipline

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

The relevance of the discipline "Organization of research and innovation" is to teach graduate students to present their scientific achievements in Ukrainian and foreign languages for discussion by the scientific community, conferences, articles, monographs, as well as submission of research projects for grants and their implementation. Course topics will develop the graduate student's ability to solve complex problems in the field of biotechnology and bioengineering, present their own research, and critically evaluate the results obtained, leading to the development of new and improvement of existing biotechnologies. This discipline should acquaint the student with the basics of presenting scientific results in Ukrainian and foreign languages in the scientific literature, preparation of innovative projects, implementation of the results in production and creation of presentations at conferences of various levels, promote the formation of scientific worldview.

The purpose of the discipline is to form students' abilities:

- to abstract thinking, analysis and synthesis,
- to perform original research and obtain new scientific results in biotechnology and bioengineering and related interdisciplinary areas, and their publication in leading scientific journals,
- to organize scientific researches of students,
- orally and in writing to present and discuss the results of scientific research and innovative developments in Ukrainian and English,
- assess the risks of the introduction of modern biotechnology for the environment.

The main tasks of the discipline –

Creation of a scientific product and its presentation to the scientific and professional community in Ukrainian and English. According to the requirements of the curriculum, students after mastering the credit module must demonstrate the following learning outcomes:

Knowledge:

- modern methods of conducting research, organization and practical publication of scientific results in scientific journals and conferences;
- mechanisms for introducing scientific results into production;;
- project writing technologies for obtaining grants for research and implementation of innovative technologies;
- requirements for scientific publications and presentations;

Skills:

- to develop and implement scientific and innovative projects that provide an opportunity to rethink the existing and create a new biotechnological process on problematic topics in compliance with the norms of academic ethics and taking into account social, economic, environmental and legal aspects;
- presentation and discussion of scientific results in Ukrainian and English; ability to conduct a dialogue, to defend one's own opinion;
- qualified to reflect the results of research in scientific publications;
- to professionally prepare a scientific article.

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

- Based on the knowledge gained by students in the study of disciplines of intellectual property, the creation of startup projects, integration and differentiation of modern scientific knowledge in biotechnology; problematic issues of ecobiotechnology and bioenergy, modern achievements of bioengineering and bioinformatics and knowledge of a foreign language not lower than A2 and information technology at the user level.
- The knowledge received on the basis of this course, students use when writing articles, monographs, projects, preparation of speeches at conferences, introduction into production of the scientific achievements received in work.

2. The content of the discipline

Section 1. Research and innovation activities of higher education

Topic 1.1. The relationship between science and innovation.

Definition of the concepts "innovation activity", "innovation process", scientific - innovation activity ". Innovation process systems. Technology transfer to the market of goods and services. Technologies of introduction of scientific results into production.

Topic 1.2. Program of development of scientific and innovative activity of the university.

The role of higher education in ensuring the innovative development of the country's economy.

Regulatory framework of innovation activities of the University and its structure.

Section 2. Presentation of research results

Topic 1. Presentation of scientific results.

The structure of the article, abstracts, patent applications. Preparation of illustrative material for articles and presentations in Ukrainian and foreign languages. Approaches for writing a project to receive a grant for funding.

4. Training materials and resources

Suggested Reading

Basic

1. Agbo, E. C. (2012). *Innovations in biotechnology*. Rijeka, Croatia: InTech.
https://books.google.com.ua/books?hl=uk&lr=&id=gdCcDwAAQBAJ&oi=fnd&pg=PR11&dq=innovations+in+biotechnology&ots=aF1FxZjajl&sig=9N02LMgIYzdZ2CigOEXX9-Ro3vg&redir_esc=y#v=onepage&q=innovations%20in%20biotechnology&f=false
2. Linacre, Nicholas & Gaskell, Joanne & Rosegrant, Mark & Falck-Zepeda, Jose & Quemada, Hector & Halsey, Mark & Birner, Regina. (2005). Analysis for biotechnology innovations using Strategic Environmental Assessment (SEA):. International Food Policy Research Institute (IFPRI), EPTD discussion papers.
<https://play.google.com/books/reader?id=YoxvHS1hcuUC&hl=uk&printsec=frontcover&pg=GBS.PR1.w.1.0.0>
3. Steiber, A. (2012). *Organizational innovations: A conceptualization of how they are created, diffused and sustained* (PhD-thesis). Dept. of Technology Management and Economics, Chalmers University of Technology, Gothenburg.
<https://core.ac.uk/download/pdf/70594049.pdf>
4. Anneli Stenberg What does Innovation mean - a term without a clear definition
<http://www.diva-portal.org/smash/get/diva2:1064843/FULLTEXT01.pdf>
5. Gary P. Pisano You Need an Innovation Strategy. It's the only way to make sound trade-off decisions and choose the right practices.
<https://hbr.org/2015/06/you-need-an-innovation-strategy>

Additional

1. Day R.A. and Gastel B. How to write and publish a scientific paper. – [s.l.]: Greenwood, 2006. – p. 360.
2. Hartley J. Academic writing and publishing: a practical handbook. – [s.l.]: Routledge, 2008. – p. 208.
https://www.researchgate.net/publication/281763722_Academic_Writing_and_Publishing_A_Practical_Handbook
3. Renko, Maija & Brännback, Malin & Carsrud, Alan. (2009). Sources, Development and Uses of Innovation in Modern Biotechnology. International Journal of Technoentrepreneurship. 1.
https://www.researchgate.net/publication/228264386_Sources_Development_and_Uses_of_Innovation_in_Modern_Biotechnology
4. 1504/IJTE.2008.022863. https://www.researchgate.net/publication/228264386_Sources_Development_and_Uses_of_Innovation_in_Modern_Biotechnology
5. Biotechnology and Innovation Systems, The Role of Public Policy , Bo Göransson and Carl Magnus Pålsson *Research Policy Institute, Lund University, Sweden* 2011
<https://www.idrc.ca/sites/default/files/openbooks/538-0/index.html>
11. Steven Weldon & David Laycock (2009) Public opinion and biotechnological innovation, Policy and Society, 28:4, 315-325, DOI: [10.1016/j.polsoc.2009.09.005https://www.researchgate.net/publication/248601984_Public_opinion_and_biotechnological_innovation](https://www.researchgate.net/publication/248601984_Public_opinion_and_biotechnological_innovation)

Information resources

Lectures

1. <https://dntb.gov.ua/wp-content/uploads/2019/05/%D0%9D%D0%B0%D1%83%D0%BA%D0%B0-%D1%8F%D0%BA-%D1%96%D0%BD%D0%BE%D0%B2%D0%B0%D1%86%D1%96%D0%B9%D0%BD%D0%B0-%D0%B4%D1%96%D1%8F%D0%BB%D1%8C%D0%BD%D1%96%D1%81%D1%82%D1%8C.pdf>

1. https://www.irf.ua/wp-content/uploads/2019/12/baseline-research_report_publishing-dec-2019.pdf
2. <https://zakon.rada.gov.ua/laws/show/2697-19#Text>
science as an innovative activity:
4. <https://dntb.gov.ua/wp-content/uploads/2019/05/%D0%9D%D0%B0%D1%83%D0%BA%D0%B0-%D1%8F%D0%BA-%D1%96%D0%BD%D0%BD%D0%BE%D0%B2%D0%B0%D1%86%D1%96%D0%B9%D0%BD%D0%B0-%D0%B4%D1%96%D1%8F%D0%BB%D1%8C%D0%BD%D1%96%D1%81%D1%82%D1%8C.pdf>
5. https://www.irf.ua/wp-content/uploads/2019/12/baseline-research_report_publishing-dec-2019.pdf
6. <https://zakon.rada.gov.ua/laws/show/2697-19#Text>
7. <https://kpi.ua/science>
8. <https://uteka.ua/ua/publication/budget-13-byudzheth-byudzhethnyj-process-planirovanie-primenenie-kekr-54-granty-kak-istochnik-dopolnitelnogo-finansirovaniya>
9. <http://iii.ua/uk/grantovi-mozhливosti>
10. <http://ena.lp.edu.ua/bitstream/ntb/24609/1/39-254-263.pdf>

Educational content

5. Methods of mastering the discipline (educational component)

Lectures

Strategies of active and collective learning are applied, which are determined by the following methods and technologies: methods of problem-based learning (problem-based presentation, part-search (heuristic conversation); information and communication technologies for lectures, use of audio, video support of educational classes, development and application on the basis of computer and multimedia means of creative tasks, etc.).

No.	The title of the lecture topic and a list of key issues
1	<p>Lecture 1. Systems of innovation process</p> <p>Systems of innovation process: scientific - production of new knowledge, scientific-innovative - transformation of new knowledge into scientific innovations, innovative - transfer of technologies to the market of goods and services.</p> <p>Suggested readings [1,2]</p>
3	<p>Lecture 2. Introduction of scientific results into production</p> <p>Transfer of scientific knowledge to the market of intellectual property rights. Technology of introduction of scientific results into production.</p> <p>Suggested readings: [1-5]</p>
4	
5	
6	
7	
8	<p>Lecture 3. Projects for scientific development and implementation in production</p> <p>Preparing a project to receive a grant for funding. The main headings and their content. Formulation of the problem. Presentation of the calendar plan and financing.</p> <p>Suggested readings: [6,7]</p>
9	

Practical training

The main tasks of the series of practical classes in the discipline "Organization of scientific and innovative activities" is the formation of students' ability to present scientific results at different levels of scientific literature, creating projects for grants, implementing new innovative developments in production.

Strategies of active and collective learning are applied, which are determined by the following methods and technologies: personality-oriented (developing) technologies based on active forms and methods of learning (discussion, express conference, educational debates, application of creative tasks based on computer and multimedia means).

No.	Name of the topic of the lesson
1	Transformation of scientific knowledge into innovative technologies Suggested readings: [1,2]
2	Prospects and shortcomings of technology, impact on the environment Consideration of technologies offered by graduate students on the basis of their own scientific results. Identification of positive directions and shortcomings, impact on the environment and human health. Suggested readings: [1-5]
3	The program of development of innovative activity of KPI named after Igor Sikorsky Analysis of the programs of development of innovative activity of KPI named after Igor Sikorsky. <i>Suggested readings:</i> kpi.ua > 2019-science
4	Obtaining a grant for funding Project structure. Selection and presentation of innovative ideas that are the basis for future development. Tasks to be achieved. Compilation of project stages and evaluation of results obtained depending on the direction of work (educational, scientific, fundamental, applied, implementation, etc.) Calculation of project financing. Consideration of projects. Critical evaluation of the prospects of the project and the results obtained. Suggested readings: [1,2,6,7]
5	Transfer of scientific knowledge to the market of production. Introduction of innovative technologies into production. Problems that arise at the stage of implementation in production. Production regulations. Production design stage. Selection of equipment. Risk assessment of the introduction of modern biotechnology for the environment and human health. Suggested readings: [1,2]
6	Technology presentation. Issues that need to be covered for the interest of manufacturers. Graphic presentation of material for better perception by interested manufacturers. Calculation of the cost of the received production on the offered technology. Suggested readings: [1,2]
7	Analysis of the presented own results in the form of a scientific article. Review of the article, writing an annotation, identifying controversial issues, presenting a graphic image, calculating the error, captions to the drawings, relevance, review of literature sources, conclusions. Suggested readings: [1,2]

8	Modular control work
9	Credit

6. Independent work of a graduate student

The postgraduate student's independent work in the discipline includes preparation for classroom classes (6 hours), control (4 hours), preparation for the test (6 hours) and independent preparation of material on certain topics, the list of which is given below based on own research (104 hours).

No.	Names of topics and questions submitted for self-study and references to educational literature	Number of hours of independent work
1	<i>The concept of research and innovation</i> Definition. The relationship between science and innovation. The difference between the concepts of "innovation process", "innovation", "research and innovation". Suggested readings: [1]	9
2	<i>Program of development of scientific and innovative activity of the university</i> Main priorities and key activities. Regulatory framework of innovative activities of the University. Formation of modern innovation infrastructure of the University. Suggested readings: [3]	9
3	<i>Innovative development of economy</i> The role of higher education in ensuring the innovative development of the country's economy. Structural elements of the research and production complex. Expected results of the Program of development of scientific and innovative activity. Suggested readings [1-5]	9
4	<i>Presentation of the results of work to the scientific community</i> The structure of the article, the main headings, analysis of literature sources, problem statement, discussion of the results. Specifics of writing monographs. additional readings: [1]	9
5	<i>Presentation of the results of work to the scientific community</i> Preparation of abstracts. Key points presented in the report. Preparation and presentation of illustrative material for the report. additional readings: [1]	9
6	<i>Preparation of materials for obtaining a patent</i> Preparation of an application for an invention. Analysis of analogues, presentation of the claims, presentation of the material of the invention. additional readings: [1]	9
7	Prepare proposals for the possibility of transforming their own scientific results into biotechnology	6

	<i>Suggested readings: additional literature and information sources from the list</i>	
8	To prepare a vision of the program of development of innovative activity of Igor Sikorsky KPI. <i>Suggested readings: additional literature and information sources from the list</i>	10
9	Prepare a project for a grant <i>Suggested readings: additional literature and information sources from the list</i>	14
10	Prepare proposals for the introduction of technology based on your innovations into production <i>Suggested readings: additional literature and information sources from the list</i>	10
11	Preparation of a presentation to interest manufacturers in your proposals <i>Suggested readings: additional literature and information sources from the list</i>	10

Policy and control

7. Course policy (educational component)

Deadline and Recompilation Policy: Entries that fail to meet deadlines without good reason are rated lower. Rearrangement of topics (modules) occurs for good reasons.

The policy and principles of academic integrity are defined in Section 3 of the Code of Honor of the National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute". Details: <https://kpi.ua/code>. The use of additional sources of information when assessing knowledge is prohibited (including mobile devices). Mobile devices may only be used during online testing and calculations.

Norms of ethical behavior: Norms of ethical behavior of students and employees are defined in Section 2 of the Code of Honor of the National Technical University of Ukraine "Kyiv Polytechnic Institute named after Igor Sikorsky". Details: <https://kpi.ua/code>.

Attendance policy: Attendance at lectures, practical classes, as well as absence from them, is not evaluated. However, students are encouraged to attend classes because they teach theoretical material and develop the skills needed to develop the competencies defined by the educational and scientific program of Biotechnology. The assessment system is focused on obtaining points for student activity, as well as performing tasks that are able to develop practical skills and abilities. For objective reasons (for example, illness, employment, international internship, etc.) training can take place online in consultation with the course leader.

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

Current control: survey on the topic of practical training (10 points), CW (30 points), preparation of proposals submitted to the ELP(60 points). The total amount of points for the semester work is 100 points.

System of rating (weight) points of classes and rating assessments by types of control for the year

No.	Type of control	Points	Amount	Sum
1	The answer to a practical lesson			
	- weight score r_k^*	10	1	10
	-quality of execution*	1-10		
2.	control work			
	- weight score r_k	30	1	30
	- -quality of execution **	0-30		

3.	Preparation of presentations and reports on topics	20	3	60
	- weight score r_k^{***}	20		
	- quality of execution	0-10		
4				100

*** - Answers to the practical lesson:**

Reasoned full answer – 10 points;
Some aspects are not disclosed – 8-9 points;
incomplete answer – 6-7 points;
unsatisfactory answer – 0-5 points.

**** - Quality of performance of modular control work:**

full disclosed answer – 28-30 points;
error in one task or incomplete answer in two tasks – 23- 27 points;
error in two tasks or incomplete answer in 4 tasks – 18-22 points;
work is not credited – 0-17 points.

***** - The quality of the presentation by topic:**

Reasonable offer – 20 points
Some aspects – 17-19 points are not taken into account
There are errors in the analysis and justification of the proposal – 12-16 points
The work is not credited – 0-11 points

Calculation of the rating scale (R)

The sum of weight points of control measures during the semester is:

$$R = 10 + 30 + 60 = 100 \text{ points};$$

Rating scale for the discipline is $R = 100$ points;

A necessary condition for obtaining automatic credit is the crediting of all proposals submitted for discussion of performance for a positive assessment of the modular test and an overall rating of more than 60 points. To increase the score, test work is carried out. Thus from the previous rating estimations for the offers which are prepared are credited.

Calendar control: conducted twice a semester as a monitoring of the current state of compliance with the requirements of the syllabus.

Boundary (scheduled certifications). The student must score points: 1 certification - "credited" - 20 points (40 - maximum), 2 certification - 40 points (80 - maximum).

The final assessment of the quality of knowledge in the discipline is determined by the traditional 6-level scale on the basis of individual current assessments on the following scale:

Rating	ESTS	Traditional assessment
$95 \leq R < 100$	A	Perfectly
$85 \leq R < 95$	B	Very good
$75 \leq R < 85$	C	Okay
$65 \leq R < 75$	D	Satisfactorily
$60 \leq R < 65$	E	Enough
$R < 60$	Fx	unsatisfactorily

Semester control: credit. The total amount of credit points - 40 points. Mandatory consideration of points for proposals submitted to the ELO. Conditions of admission to the semester control: semester rating not less than 50 points, writing the MCR and the proposal made on the ELO.

The test consists of 4 questions, 1 question is estimated at 10 points.
The complete answer to the question – (10) points
Minor mistakes were made – (8-9) points

Significant errors in the answer – (7-6) points

The answers are not correct – (0-5) points.

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

<i>Scores</i>	<i>Rating</i>
100-95	Perfectly
94-85	Very good
84-75	Okay
74-65	Satisfactorily
64-60	Enough
Less than 60	Unsatisfactorily

Test questions:

1. The concept of innovation, innovation in the educational process and research.
2. The relationship between research and innovation.
3. Criteria for the transformation of scientific results into biotechnology
4. Technology transfer to the goods market
5. Transfer of scientific knowledge to the market of intellectual property rights.
6. Technology of introduction of scientific results into production.
7. Innovative development of KPI. Igor Sikorsky
8. The role of higher education in ensuring the innovative development of the country's economy.
9. Rules for presenting scientific results at conferences.
10. Criteria for drafting grants
11. Criteria for coverage of the results of scientific work in the article
12. Base points of presentation of scientific work for innovation in production
13. Problems that arise at the stage of implementation in production.
14. Production regulations.
15. Production design stage. Selection of equipment.
16. Risk assessment of the introduction of modern biotechnology for the environment and human health.
17. Coverage of the results of scientific work in a presentation for the scientific community
18. Coverage of technology in the presentation to find investors
19. Selection and submission of innovative ideas that are the basis for future development when writing a project
20. The possible impact of biotechnology on the environment
21. Risks of introduction of technologies in production.

Work program of the discipline (syllabus):

Compiled by Dr. Tech. Sciences, Professor Nataliia Golub

Approved by the Department of Ecobiotechnology and Bioenergy (protocol № 12 of 12.06.20)

Approved by the Methodical Commission of the faculty (protocol № 10 from 26.06.20)