

HIGHER EDUCATIONAL INSTITUTION OF UKOOPSPILKA
«POLTAV UNIVERSITY OF ECONOMICS AND TRADE»

Educational and Scientific Institute of International Education
Department of commodity science, biotechnology, expertise and customs

SYLLABUS

academic discipline

«Environmental biotechnology»

for the 2022-2023 academic year

Course and semester of study	4th year, 7th semester
Educational program/specialization	"Biotechnology"
Specialty	162 "Biotechnologies and bioengineering"
Branch of knowledge	16 "Chemical and Bioengineering"
Degree of higher education	bachelor

Name of the NPP that leads this discipline,
scientific degree and academic title,
position

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E-mail address	fokaliudmyla @ gmail . com
Schedule of educational classes	http://schedule.puet.edu.ua/
Consultations	intramural http://www.tpt.puet.edu.ua/stud.php online: by e-mail, Mon-Fri from 10:00 a.m. to 5:00 p.m
Distance course page	https://el.puet.edu.ua/

Description of the academic discipline

Goal study of an academic discipline	The formation of future specialists who have competence in the development of measures to protect the environment from pollution, technical solutions for solving environmental problems of the environment and its components - purification of wastewater, land, air, processing of solid, liquid, gaseous waste.
Duration	5 ECTS credits/150 hours (lectures 20 hours, practical classes 40 hours, independent work 90 hours)
Forms and methods of education	Lecture classes: verbal methods of learning (explanation, story, conversation); visual teaching methods (mind mapping , infographics); practical classes (written assignments, tests, creative works), field trips; independent work of students outside the schedule
System of current and final control	Current control: attending classes; protection of homework; discussion of lesson material; performance of educational tasks; reports with abstracts and their discussion; testing; current modular work Final control: exam
Basic knowledge	The prerequisites for the development of biotechnology as a science in its application to solving environmental problems are considered, and the prospects for its use in various branches of the national economy are outlined. Described: biochemical methods of wastewater treatment; biological treatment of wastewater in aeration tanks; microbiological methods of precipitation of metal ions from wastewater; biotechnological methods of wastewater treatment in anaerobic reactors; biochemical approaches in the field of oxidation of heavy metals; purification of metals by adsorption on microbial biomass; biological treatment of contaminated soils; biological transformation of waste; biochemical methods of air purification; basic types of installations for biological air purification.
Language of teaching	Ukrainian, English

List of competencies provided by this educational discipline, program learning outcomes

Program learning outcomes	Competencies that should master the acquirer
<ul style="list-style-type: none"> • be able to take into account social, ecological, ethical, economic aspects, requirements of labor protection, industrial sanitation and fire safety during the formation of technical solutions (PR22); • carry out work with biological agents in compliance with the rules and norms of biological safety, if necessary, detect and control dangerous biological agents (PR24). 	<ul style="list-style-type: none"> • have the skills to perform safe activities (ZK06); • have a desire to preserve the environment (ZK074); • have the ability to plan professional work in compliance with the rules and norms of labor protection and protection of the rights and health of employees; the ability to create appropriate conditions of safety, physical and psychological comfort, compliance with sanitary and hygienic norms and norms of industrial safety at the workplace (SK16); • have the ability to organize and conduct professional activities in compliance with the principles of bioethics, scientific ethics, modern conventions on life and environmental protection, to be aware of and bear personal responsibility for research results (SK17).

Thematic plan of the educational discipline

Topic name	Types of work	Tasks of independent work in terms of topics
Module 1. Biotechnologies in the environment		
Topic 1. Connection of biotechnology with production industries	Attending classes; discussion of lesson material; performance of educational tasks; tasks of independent work; testing	Carrying out tests for the topic
Topic 2. Bio objects - producers, their general characteristics	Attending classes; discussion of lesson material; performance of educational tasks; tasks of independent work; testing	Carrying out tests for the topic
Topic 3. Monitoring and bioindication	Attending classes; discussion of lesson material; performance of educational tasks; tasks of independent work; testing	Carrying out tests for the topic
Topic 4. Industrial use of biotechnology in environmental protection activities	Attending classes; discussion of lesson material; performance of educational tasks; tasks of independent work; testing	Carrying out tests for the topic
Topic 5. Biotechnologies in the agro-industrial complex	Attending classes; discussion of lesson material; performance of educational tasks; tasks of independent work; testing	Carrying out tests for the topic
Topic 6. Biotechnological transformation of industrial waste	Attending classes; discussion of lesson material; performance of educational tasks; tasks of independent work; testing	Carrying out tests for the topic
Topic 7. Biotechnology of environmental protection from harmful xenobiotics	Attending classes; discussion of lesson material; performance of educational tasks; tasks of independent work; testing	Carrying out tests for the topic
Topic 8. Mechanisms of self-protection of the human body against the influence of toxicants of biogenic origin	Attending classes; discussion of lesson material; performance of educational tasks; tasks of independent work; testing	Carrying out tests for the topic

Information sources

1. Biochemical Engineering. Інформація із сайту UtahState University. – Access mode: http://ocw.usu.edu/Biological_and_Irrigation_Engineering/Biochemical_Engineering/BIE_5810__thermodynamics.pdf-view.html.
2. Bioleaching phosphorus from fluorapatites with acidophilic bacteria / Priha O., Sarlin T., Blomberg P., Wendling

- L., Mäkinen J., Arnold M., Kinnunen P. // Hydrometallurgy. – 2022. – №150. – C. 269–275.
3. Evans, G.M. (2001) Biowaste and Biological Waste Treatment, James and James, London
 4. Gavrilesco M, Teodosiu C, Gavrilesco D, Lupu L (2008) Strategies and practices for sustainable use of water in industrial papermaking processes. Engineering in Life Sciences 8, 99-124
 5. Hagger JA, Jones MB, Leonard DRP, Owen R, Galloway TS (2006) Biomarkers and integrated environmental risk assessment: Are there more questions than answers? Integrated Environmental Assessment and Management 2, 312-329
 6. Hernández-Luna CE, Gutiérrez-Soto G, Salcedo-Martínez SM (2007) Screening for decolorizing basidiomycetes in Mexico. World Journal of Microbiology and Biotechnology 24, 465-473
 7. Lakó J, Hancsók J, Yuzhakova T, Marton G, Utasi A, Rédey Á (2008) Biomass – a source of chemicals and energy for sustainable development. Environmental Engineering and Management Journal 7, 499-509
 8. Nelson, D.L. and Cox, M.M. (2000) Lehninger Principles of Biochemistry, 3rd edition, Worth, New York.
 9. Penciu OM, Gavrilesco M (2004) Biodegradation - Innovative technology for treating gaseous fluxes containing VOCs. Environmental Engineering and Management Journal 3, 737-754
 10. Tao H. Presentation on mechanism sandapplications of chalcopyrite an pyrite bioleachingin biohydrometallurgy – apresentation / TaoH., Dongwei L. // Bio-technology Reports. – 2021. – №4. – P.107–119.
 11. The shift of microbial communities and their roles in sulfur and iron cycling in a copper ore bioleaching system / Niu J. et all. // Scientific Reports. – 2019. – №6. – P. 34–44.
 12. Zouboulis AI, Loukidon MX, Matis KA (2004) Biosorption of toxic metals from aqueous solution by a bacteria strain isolated from metal-polluted soil. Process Biochemistry 39, 909-916

Educational discipline software

- Microsoft Office suite of software products.

Policy of study of academic discipline and assessment

- **Policy regarding deadlines, rescheduling of tasks, ongoing control; admission to the final control**, all tasks provided for by the program must be completed within the set deadline; assignments that are submitted late without good reason are evaluated at a lower grade (75% of the possible maximum number of points for the type of activity). Modules can be rearranged with the permission of the leading teacher if there are good reasons (for example, sick leave).
- **The procedure for admitting students to the credit -examination session:**
http://puet.edu.ua/sites/default/files/poryadok_dopusku_studentiv_do_zalikovo-ekzamenacinyoyi_sesiyi.pdf . Early submission of the final examination - according to DPSY M-9-8.1-211-54-19 "Procedure for granting permission to a student for early submission of credit and examination session"
http://puet.edu.ua/sites/default/files/poryadok_nadannya_dozvolu_na_dostrokovu_ekz_sesiyu.pdf .
- **Policy on academic integrity:** according to the "Regulations on prevention of cases of academic plagiarism" http://puet.edu.ua/sites/default/files/polozhennya_pro_zapobigannya_vypadkiv_akademichnogo_plagiatu.pdf , it is not permissible to violate academic integrity while working on the course material.
- **Attendance policy:** attending classes is a mandatory component, but for objective reasons (war in Ukraine, illness, employment, internship) training can take place online (Moodle).
- **Policy of recognition and enrollment of learning results obtained through informal and/or informal education**
http://puet.edu.ua/sites/default/files/polozhennya_pro_zarahuvannya_rezultativ_neformalnoyi_osvity_0.pdf .
- **Graphic presentation of information on the policy of recognition and enrollment of learning outcomes obtained through non-formal and/or informal education:** <http://www.puet.edu.ua/uk/neformalna-osvita> .

Assessment

The final grade for the study of the academic discipline is calculated through the current assessment

Types of work	Maximum number of points
Module 1 (topics 1-8): attending lectures (10 points), working in a practical session (20 points), passing the final test for the topics (20 points); tasks of independent work (10 points); current module work (20 points)	60
Final control (exam)	40
Together	100

For participation in research work and other activities, additional points are awarded to winners. For additional types of educational work, a student of higher education can receive no more than 30 points. Additional points are added to the total final grade for studying the academic discipline, but the total final grade cannot exceed 100 points.

The scale of evaluation of students of higher education according to the results of the study of the academic discipline

The sum of points for all types of educational activities	Evaluation according to the ECTS scale	Evaluation on a national scale
90-100	A	Perfectly
82-89	B	Very good
74-81	C	Fine
64-73	D	Satisfactorily
60-63	E	Satisfy enough
35-59	FX	Unsatisfactory with the possibility of reassembly
0-34	F	Unsatisfactory with mandatory repeated study of the academic discipline