

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

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

SYLLABUS
academic discipline
«Biotechnology of cell and tissue cultures»
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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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 students' scientific worldview regarding the concept of cell culture, the main methods of cultivating cells outside the body: organ cultures, cell cultures, bacterial cultures; prerequisites for the emergence of the cell culture method, the main advantages and disadvantages of using the cell culture method
Duration	5 ECTS credits/150 hours (lectures 20 hours, practical classes 40 hours, independent work 90 hours)
Forms and methods of education	Forms: lecture-visualization, practical training, independent work outside the schedule, consultation. Methods: lectures (explanatory and illustrative, problem presentation, discussion); practical (partial research, discussion); independent work (research, self-monitoring method).
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	Study of methods of obtaining and maintaining in vitro callus, suspension cultures, haploid cells, isolated protoplasts; study of physiological and biochemical processes in plant cells in culture, as well as biotechnologies based on cultured plant cells
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 determine and analyze the main physicochemical properties of organic compounds that are part of biological agents (proteins, nucleic acids, carbohydrates, lipids) (PR06); • be able to apply knowledge of the composition and structure of cells of various biological agents to determine optimal cultivation conditions and the potential of using the studied cells in biotechnology (PR07); • to be able to isolate from natural substrates and identify microorganisms of different systematic groups. Determine the morphological-cultural and physiological-biochemical properties of various biological agents (PR08); • to be able to conduct experimental studies in order to determine the influence of physical, chemical and biological factors of the external environment on the vital activity of cells of living organisms (PR10). 	<ul style="list-style-type: none"> • the ability to use thorough knowledge of chemistry and biology to the extent necessary to achieve other results of the educational program (SK02); • the ability to work with biological agents used in biotechnological processes (microorganisms, fungi, plants, animals; viruses; their individual components) (SK04); • the ability to carry out experimental research on the improvement of biological agents. The ability to cause changes in the structure of the hereditary apparatus and the functional activity of biological agents (SK05).

Thematic plan of the educational discipline

Topic name	Types of work	Tasks of independent work in terms of topics
Module 1. Biotechnology of cell and tissue cultures in plant and animal husbandry		
Topic 1. Subject and methods of biotechnology	Attending classes; discussion of lesson material; performance of educational tasks; tasks of independent work; testing	Prepare reports on the topics: «Obtaining and cultivating protoplasts», «Main stages of obtaining protoplasts, nutrient media and methods of cultivation», «Fusion of protoplasts and parasexual hybridization of higher plants»
Theme 2. Cultivation of plant cells and tissues	Attending classes; discussion of lesson material; performance of educational tasks; tasks of independent work; testing	Prepare reports on the following topics: «Cell technologies in the creation of genetic diversity», «Induction and implementation of the in vitro development program from cell to plant», «Stability and variability of plant cell genomes in vitro»
Topic 3. Method of culture of isolated cells and tissues	Attending classes; discussion of lesson material; performance of educational tasks; tasks of independent work; testing	Prepare reports on the topics: «Connector method, connection using DNA ligase, use of linkers and adapters», «Methods of enriching the reaction mixture with ligation products»
Topic 4. Culture of callus tissue and cell suspensions	Attending classes; discussion of lesson material; performance of educational tasks; tasks of independent work; testing	Prepare reports on the following topics: «History of the emergence of genetic engineering», «Main stages of genetic engineering research»
Topic 5. Morphogenesis and regeneration of plants in cell and tissue culture	Attending classes; discussion of lesson material; performance of educational tasks; tasks of independent work; testing	Prepare reports on the following topics: «Mechanism of action of phytohormones», «Influence of phytohormones on the genetic apparatus of plants», «Biosynthesis, transport and inactivation of phytohormones», «Phytohormones in the ontogenesis of plants», «Phytohormonal regulation of vegetative growth processes»
Topic 6. Cellular selection of plants	Attending classes; discussion of lesson material; performance of educational tasks; tasks of independent work; testing	Prepare reports on the following topics: «Use of natural selection, its advantages and disadvantages», «Artificial selection without the use of mutagens», «Regulation of metabolism in a microbial cell: regulation of enzyme activity, amino acid control of metabolism and

		functions of guanosine tetraphosphate», «Energy state of the cell and regulation of metabolism», «Regulation of transport of substances through membranes»
Topic 7. Transgenic plants	Attending classes; discussion of lesson material; performance of educational tasks; tasks of independent work; testing	Prepare reports on the following topics: «Principles of choosing methods for introducing foreign genetic material into the recipient cell», «Identification of clones containing recombinant molecules», «Basic methods for determining the location of the cloned gene», «Nucleic acid hybridization», «Northern, Southern methods - blotting and Western blotting», «Protein engineering, bioinformatics, proteomics as promising areas of genetic engineering»
Topic 8. Biotechnology of animal reproduction	Attending classes; discussion of lesson material; performance of educational tasks; tasks of independent work; testing	Prepare reports on the following topics: «Creation of haploid and homozygous dihaploid lines by in vitro methods, preservation of the gene pool in vitro», «Clonal micropropagation and cell recovery», «Somaclonal variability and cell selection», «Creation of artificial associations of cultured cells»

Information sources

1. Barry G., Kishore G., Padgett S. et al. Inhibitors of amino acid biosynthesis: Strategies for imparting glyphosate tolerance to crop plants / B. K. Singh et al. (eds). Biosynthesis and Molecular Regulation of Amino Acids in Plants. Amer. Soc. Plant Physiol., Rockville, MD. — 1992. — P. 139–145.
2. Beyond promises: Top 10 Facts about Biotech / GM Crops in 2022 [Electronic resource]. – Access mode: <http://www.isaaa.org> .
3. Food and Agriculture Organization of the United Nations [Electronic resource]. - Access mode: <http://www.fao.org>.
4. James C. Global Status of Commercialized Biotech/GM Crops: 2020. / ISAAA Brief No. 46. [Electronic resource]. – Access mode: <http://www.isaaa.org/resources/publications/briefs/46/default.asp>
5. Karl-Hermann Neumann. Plant Cell and Tissue Culture – A Tool in Biotechnology // Springer Cham, Springer Nature Switzerland AG 2020. - 570 p.
6. Neal Stewart C/ Plant biotechnology and genetics: principles, techniques, and applications. Published by John Wiley & Sons, Inc., Hoboken, New Jersey, 2019. - 416 p.
7. Plain Facts about GMOs. Hungarian white paper // Editors: E. Balazs, D. Dudits, L. Sagi. - Szeged, 2021. - 136 p.
8. Vasil I. K. A history of plant biotechnology: from the Cell Theory of Schleiden and Schwann to biotech crops // Plant Cell Rep. — 2008. — V. 27. — P. 1423–1440.

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 and 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): work in a practical session (12 points), passing the final test for the topics (16 points); tasks of independent work (12 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