

SUBJECT/COURSE SYLLABUS

1.	Course name in Polish and English Plant Cell Culture Techniques Hodowle komórek i tkanek roślinnych
2.	Scientific discipline Medical sciences Biotechnology
3.	Language of instruction English
4.	Unit conducting the course Faculty of Biotechnology
5.	Type of course elective - choice limited to Animal Cell Culture Techniques and Plant Cell Culture Techniques
6.	Field of study Biotechnology
7.	Level of study first-cycle
8.	Year of study 2nd
9.	Semester summer
10.	Course form and number of hours Lecture: 15 h Laboratory: 30 h
11.	Prerequisites in terms of knowledge, skills and social competences for the course: <ul style="list-style-type: none"> • basic knowledge of biochemistry, botany and plant physiology; • basic skills in laboratory work and biochemical calculations.
12.	Learning objectives for the course: LECTURE classes are designed to familiarize students with the different types of plant tissue cultures, the requirements for their growth, and practical applications of plant tissue cultures in basic science, plant breeding, biotechnology and pharmaceutical industry. LABORATORY classes are designed to familiarize students with methods of plant breeding in sterile <i>in vitro</i> cultures, including transgenic plants in tissue cultures as well as with practical aspects of the use of plant tissue cultures.

13.	<p>Curriculum content:</p> <p>LECTURE:</p> <ul style="list-style-type: none"> types of tissue cultures, tissue cultures derived from various organs and cell types (stem culture, callus culture, root culture, anther culture, suspension culture); equipment used for plant cell cultures, cell-culture set-up and maintenance; nutritional requirements of tissue cultures, used media and supplements including the use of plant hormones in tissue cultures; plant variability in tissue cultures, including genetic and epigenetic changes; the use of tissue cultures in the production of metabolites, and pharmaceutical proteins including the creation of transgenic plants and root hair culture; use of tissue cultures in plant propagation and plant breeding; storage of cultures including cryopreservation and artificial seed technology; quality testing of tissue cultures, microbial contamination. <p>LABORATORY:</p> <ul style="list-style-type: none"> preparation of culture media (MS for shoot cultures, CIM, RIM). Discussion of the composition of standard culture media and the role of individual components; sterilization of plant material (seeds, green tissue). Discussing the mechanisms of action of the active agents used; solving endogenous infections; addition of various antimicrobial and antifungal compounds to culture media. Evaluation of the purity of the sterilized plant material; determination of the phytotoxicity of the active agent, expressed in % of germinated seeds; establishment of various types of cultures: cultures of shoots, hypocotyls, epicotyls, callus cultures, root culture, suspension cultures; familiarization with methods of plant transformation; conducting tissue cultures to isolate bioactive compounds (tissue cultures of transgenic plants); evaluation of quality, amount of secondary metabolites in various types of explants (TLC, UPLC). 		
14.	<table border="1"> <tr> <td data-bbox="312 1458 1023 2018"> <p>Description of learning outcomes</p> <p>Student:</p> <ul style="list-style-type: none"> has knowledge of the basic techniques and research tools used for/in plant cell cultures (e.g. nutritional requirements of tissue cultures, preparation of media, basic principles of work with tissue cultures); knows how to combine theoretical knowledge of plant cell cultures with its practical application in research, agriculture and medicine; is familiar with and implements the basic principles of health and safety and ergonomics procedures in the laboratory, knows and follows </td><td data-bbox="1023 1458 1402 2018"> <p>Symbols for relevant directional learning outcomes:</p> <p>K1_W08</p> <p>K1_W09</p> <p>K1_W10, K1_K05</p> </td></tr> </table>	<p>Description of learning outcomes</p> <p>Student:</p> <ul style="list-style-type: none"> has knowledge of the basic techniques and research tools used for/in plant cell cultures (e.g. nutritional requirements of tissue cultures, preparation of media, basic principles of work with tissue cultures); knows how to combine theoretical knowledge of plant cell cultures with its practical application in research, agriculture and medicine; is familiar with and implements the basic principles of health and safety and ergonomics procedures in the laboratory, knows and follows 	<p>Symbols for relevant directional learning outcomes:</p> <p>K1_W08</p> <p>K1_W09</p> <p>K1_W10, K1_K05</p>
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	<p>procedures of work with genetically modified organisms;</p> <ul style="list-style-type: none"> • applies basic physicochemical and biochemical techniques necessary for studying biological processes (including processes taking place in cultured cells); • has skills in breeding and genetic modification of plant cells; • synthesizes information from multiple scientific sources, uses professional scientific language and terminology specific to the course topics; • performs standard plant cell biology experiments safely using proper laboratory equipment and techniques; • analyzes experimental data and describes the results accurately and objectively; • collaborates effectively within a team while planning and organizing work, as well as addressing a scientific problem; • understands the need for updating knowledge and skills in the field of plant biotechnology. 	<p>K1_U01</p> <p>K1_U02</p> <p>K1_U03, K1_U04, K1_U09</p> <p>K1_U05</p> <p>K1_U05, K1_U06</p> <p>K1_U13, K1_K03</p> <p>K1_K01</p>
15.	<p>Mandatory literature:</p> <ul style="list-style-type: none"> • laboratory manual provided by the teachers. <p>Recommended literature:</p> <ul style="list-style-type: none"> • M. K. Razdan; Introduction to plant tissue culture, Oxford and IBH Publishers; • R. H. Smith; Plant Tissue culture, Techniques and Experiments, Academic Press; • E. F. George, M. Halle; Plant Propagation by Tissue Culture, Springer; • R.E. Trigano, D. J. Grey; Plant Tissue Culture, Development and Biotechnology, CRC Press; • other sources provided/indicated by the teachers. 	
16.	<p>Methods of verification of the assumed learning outcomes:</p> <p>LABORATORY:</p> <ul style="list-style-type: none"> • students will be assessed on their ability to safely and competently execute laboratory procedures and manage their time efficiently during all scheduled lab sessions. Active participation and attendance are mandatory. • preparation of an individual report /individual or group oral presentation of obtained results • final written test. <p>LECTURE:</p> <ul style="list-style-type: none"> • final written test 	

17.	Conditions and form of credit for individual components of the course: LABORATORY: <ul style="list-style-type: none"> • mandatory presence and active participation in the classes; • positive test result. LECTURE: <ul style="list-style-type: none"> • positive test result. 	
18.	Student workload expressed in teaching hours and ECTS credits	number of hours allocated for the course of a given type of classes
	classes (according to the study plan) with the instructor: <ul style="list-style-type: none"> • laboratory (including introduction lecture) • lecture 	30 h 15 h
	student's own work (including participation in group work) e.g.: <ul style="list-style-type: none"> • preparation for the classes • reading the manual and literature indicated • preparation of the report / presentation of obtained results • preparation for the final tests 	50 h
	Total number of class hours:	95 h
	Number of ECTS credits: <ul style="list-style-type: none"> • laboratory • lecture 	2 ECTS 2 ECTS