COURSE DESCRIPTION CARD

BIALYSTOK UNIVERSITY OF TECHNOLOGY								**Faculty of Civil Engineering and Environmental Sciences**	
Field of study								**Level and form of study**	Full-time Bachelor Degree
A group of modules /specialty								**Education profile**	Academic profile
Course name	Plant and Human cell culture							**Course code**	IS-FCEE-00259-1S
								Course type	
Course form(s)	**L**	**C**	**LC**	**P**	**SW**	**FW**	**S**	**Semester**	**summer**
and number of hours	30		45					**ECTS credits**	**5**
The programme is valid from	2026/2027								
Introductory courses									
Course objectives	To familiarise students with the basic techniques for isolating, propagating, culturing, banking, and storing cells, as well as for planning experiments using in vitro cultures of plant and animal cells. It also aims to outline the potential applications of in vitro culture in biotechnology laboratories.								
Framework programme content	Advanced methods for establishing plant and animal tissue and cell cultures. Types and conditions for conducting in vitro cultures. Characteristics of the components of culture media used in in vitro cultures, and principles for preparing substrates for tissue cultures. Growth regulators added to culture media to enable the control of morphogenetic processes in in vitro cultures. Types of cell and tissue cultures. Applications of various tissue culture methods in basic and applied biotechnology research. Micropropagation of crop plants, cultures of plant cells and organs in liquid media, and the production of somatic embryos as examples of plant tissue cultures used in plant biotechnology. Storage of biological material, including cryopreservation.								
Other information about the course	the course is related to the scientific activity conducted at the University								

Calculation:	**Student workload related to:**	**Total number of hours**	**including contact**	**including practical**
	participation in lectures	15	15	
	participation in other forms of activities	30	30	30
	individual substantive support of the learning process, participation in exams/assessments organized outside the scheduled classes	2,5	2,5	1,7
	completion of professional training	0	0	0
	preparation for the exam	5		
	preparation for the credit	72,5		72,5
	Total number of hours:	**125**	**48**	**104**
	Total number of ECTS credits:	**5**	**1,9**	**4,2**

Expected discipline learning outcomes	Knowledge	Skills	Social competence
	BT1_W01 BT1_W06	BT1_U03	BT1_K01 BT1_K02

Objectives and framework content prepared by	dr hab. inż. Elżbieta Wołejko; dr hab. Agata Jabłońska-Trypuć	Date: 20.02.2026

Implementation in the academic year **enter academic year**

Programme content		**Lecture**
	1	Biological progress in in vitro plant cultures. (2 hours)
	2	Research history. Applications of plant tissue cultures. (2 hours)
	3	Plant Regeneration and Propagation. (2 hours)
	4	Explants and organogenesis. (2 hours)
	5	Callus production in vivo and in vitro; callus cell morphology and physiology; callus tissue genome; in vitro callus tissue production and passage. (3 hours)
	6	Cell suspensions and Root cultures. (2 hours)
	7	Freeing Plants from Pathogens. (2 hours)
	8	Human and animal cell and tissue cultures. Cell culture laboratory. (2h)
	9	Contamination of human and animal cell cultures. (2h)
	10	Human and animal cell cultures - basics of management. (2h)
	11	Obtaining cell lines. (2h)
	12	Application of human and animal cell cultures in vitro. (2h)
	13	Immunocytochemistry. (2h)
	14	Stem cells. (3h)
	15	
		Laboratory classes
	1	Health and safety regulations for the laboratory. Media used in in vitro plant culture. Preparing media for plant culture. (3 hour)
	2	Seed sterilisation and establishment of in vitro plant cell cultures. (3 hours)
	3	Sterilization and establishment of in vitro plant tissue cultures. (3 hours)
	4	Micropropagation from shoot fragments of young seedlings. (3 hours)
	5	The effect of plant hormones on the process of organogenesis. (3 hours)
	6	Passaging and acclimatising regenerants. (3 hours)
	7	Plasma encapsulation of explants. Colloquium I. (3 hours)
	8	Principles of working in the cell culture laboratory. Preparing the workspace. Changing the culture medium for adherent cultures. (3h)
	9	Passaging of adherent and suspension-growing cells. Part I. (3h)
	10	Passaging of adherent and suspension-growing cells. Part II. (3h)
	11	Cell counting and seeding principles for experiments. (3h)
	12	Freezing and Thawing Cells. Part I. (3h)
	13	Freezing and Thawing Cells. Creating Cell Banks. Part II. (3h)
	14	Introduction to in vitro cytotoxicity analyses. (3h)
	15	In vitro cytotoxicity analyses. Colloquium II. (3h)
Teaching methods (on-site classes)	L	problem based lecture with multimedia presentation
	LC	experiment

Teaching methods (online classes)	L	problem based lecture with multimedia presentation
Forms of crediting	L	The knowledge acquired by students during lectures is assessed using a closed or open test.
	LC	Based on the reports and colloquium
Conditions of crediting	L	A closed or open-ended session test will consist of 20-30 questions. Each question will be marked out of 1 or 2. Marks will be awarded according to the following scheme: 51%-60% of total marks - 3; 61%-70% of total marks - 3,5; 71%-80% of total marks - 4; 81%-90% of the total number of points - 4,5; 91%-100% of the total number of points - 5. The condition for passing is achieving all learning outcomes.
	LC	Within the scope of laboratory exercises, the student performs 14 practical exercises, working alone or in groups of 2-3 persons. Laboratory exercises are passed on the basis of two colloquia and reports. For the colloquium (a closed or open-ended session test) the student may obtain a maximum of 20 points, for the report student receives a '1' point. The final mark is the product of all the points obtained. - The student receives a failing grade if less than 50% of the total points are obtained. - The student receives a '3' if 51-60% of the points are achieved. - the student receives a '3.5' if achieves 61-70% of the points - the student receives a '4' if achieves 71-80% of the points - the student obtains a '4.5' if achieves 81-90% of the points - the student receives a '5' if achieves 91-100% of the points. The condition for passing is achieving all learning outcomes.

Outcome symbols	**Expected learning outcomes**	**Expected learning outcomes defined for the field of study**		
		Knowlegde	Skills	Social competence
	Knowledge: the student knows and understands			
E1	has knowledge about the basic types of plant and human cultures in vitro and can explain the process of genetic transformation	BT1_W01		
E2	An in-depth understanding of key aspects of in vitro culture essential for the preparation and maintenance of plant and animal cell cultures of biotechnological significance, as well as methods for utilising them in biotechnological processes.	BT1_W06		
	Skills: the student can			
E3	knows and able to perform simple research tasks in sterile conditions (preparation of nutrient solution, disinfection of plant material, cutting out explants, culture passage, acclimatization) individually and in a team.		BT1_U03	
	Social competence: the student is ready to			
E4, E5	the student critically evaluates theoretical knowledge, experimental data, and scientific information related to cell cultures, demonstrating the capacity to interpret findings, assess their reliability, and integrate new information with existing knowledge.			BT1_K01 BT1_K02

Outcome symbols	**Methods of verification of learning outcomes**	**Course form subject to verification**
E1	*Written Test*	L
E2	*Written Test*	L
E3	*Written Test, reports and colloquium*	L,LC
E4	*reports and colloquium*	LC
E5	*reports and colloquium*	LC

Basic references	1	*Malepszy S., red., 2011, Biotechnologia roślin, PWN.,Warszawa.*
	2	*Freshney R.I., Culture of Animal Cells, Wiley-Liss, 2005*
	3	*Davis J.M. Basic cell culture. Oxford University Press. 2001.*
Supplementary references	1	*Halford N. (ed.), 2006, Plant Biotechnology. Wiley.*
Course coordinator	*dr hab. inż. Elżbieta Wołejko; dr hab. Agata Jabłońska-Trypuć*	**Date: 20.02.2026**