

## SUBJECT/COURSE SYLLABUS

1.	Course name in Polish and English <b>Animal Cell Culture Techniques</b> Hodowle komórek i tkanek zwierzęcych
2.	Scientific discipline <b>Medical sciences</b> <b>Biotechnology</b>
3.	Language of instruction <b>English</b>
4.	Unit conducting the course <b>Faculty of Biotechnology</b>
5.	Type of course <b>elective</b> - choice limited to Animal Cell Culture Techniques and Plant Cell Culture Techniques
6.	Field of study <b>Biotechnology</b>
7.	Level of study <b>first-cycle</b>
8.	Year of study <b>2nd</b>
9.	Semester <b>summer</b>
10.	Course form and number of hours <b>Lecture: 15 h</b> <b>Laboratory: 30 h</b>
11.	Prerequisites in terms of knowledge, skills, and social competencies for the course: <ul style="list-style-type: none"> <li>• basic knowledge about <b>biology and biochemistry</b> in the first years of bachelor studies, and <b>basic skills in laboratory work</b>.</li> </ul>
12.	Learning objectives for the course: <p><b>LECTURE:</b> Acquiring knowledge about work with animal cell and tissue cultures.</p> <p><b>LABORATORY:</b> Students will gain knowledge of culturing animal cells. They will learn how to culture animal cells derived from normal tissues and cancer cell lines. General knowledge of fluorescence/confocal microscopy, including its applications, will be passed to the Students. Students will also gain an understanding of quantitative methods used in the study of animal cells, including the assessment of cell viability and cell cycle distribution under drug treatment.</p>

13.	<p>Curriculum content:</p> <p><b>LECTURE:</b></p> <p>Attending the lecture will allow the students to get familiar with specificity of working in the laboratory where animal cells are cultured. During the lectures, the following topics are mentioned and discussed:</p> <ul style="list-style-type: none"> <li>• safety of work with animal cell and tissue cultures, and genetically modified microorganisms;</li> <li>• organization of animal cell culture laboratory;</li> <li>• preservation of sterile conditions during work with animal cells;</li> <li>• cells' authentication;</li> <li>• composition and types of the most commonly used media in animal cell cultures;</li> <li>• sources of cells and tissues;</li> <li>• characterization of primary cell cultures and cell lines;</li> <li>• examples of modern applications employing animal cell cultures in research aiming to solve scientific problems raised in biology, pharmacology, biotechnology, and medicine.</li> </ul> <p><b>LABORATORY:</b></p> <p>Active participation in laboratory classes will allow students to become familiar with the specifics of working in a laboratory where animal cells are cultured. During the practical course, students will learn to culture primary cells and cancer cell lines, examine cell viability, count cells, and subculture them. Students will also gain skills in preparing slides with fixed and stained cells and in analyzing cell morphology and the distribution of selected actin cytoskeleton proteins within a cell using an inverted light microscope and a confocal microscope, respectively. Some quantitative analyses, such as estimating cell viability and cell cycle distribution in the tested cells, are also done.</p>		
14.	<table border="1"> <tr> <td data-bbox="312 1279 1023 2022"> <p>Description of learning outcomes</p> <p><b>Student:</b></p> <ul style="list-style-type: none"> <li>• has knowledge of the basic techniques and research tools used for/in animal cell cultures;</li> <li>• knows how to combine theoretical knowledge of mammalian cell cultures with its practical application in research;</li> <li>• is familiar with and implements the basic principles of health and safety and ergonomics procedures in the laboratory, knows and follows procedures of work with genetically modified microorganisms;</li> <li>• applies basic physicochemical and biochemical techniques necessary for studying biological processes (including processes taking place in cultured cells);</li> <li>• has skills in culturing cells of higher organisms;</li> </ul> </td><td data-bbox="1023 1279 1396 2022"> <p>Symbols for relevant directional learning outcomes:</p> <p><b>K1_W08</b></p> <p><b>K1_W09</b></p> <p><b>K1_W10, K1_K05</b></p> <p><b>K1_U01</b></p> <p><b>K1_U02</b></p> </td></tr> </table>	<p>Description of learning outcomes</p> <p><b>Student:</b></p> <ul style="list-style-type: none"> <li>• has knowledge of the basic techniques and research tools used for/in animal cell cultures;</li> <li>• knows how to combine theoretical knowledge of mammalian cell cultures with its practical application in research;</li> <li>• is familiar with and implements the basic principles of health and safety and ergonomics procedures in the laboratory, knows and follows procedures of work with genetically modified microorganisms;</li> <li>• applies basic physicochemical and biochemical techniques necessary for studying biological processes (including processes taking place in cultured cells);</li> <li>• has skills in culturing cells of higher organisms;</li> </ul>	<p>Symbols for relevant directional learning outcomes:</p> <p><b>K1_W08</b></p> <p><b>K1_W09</b></p> <p><b>K1_W10, K1_K05</b></p> <p><b>K1_U01</b></p> <p><b>K1_U02</b></p>
<p>Description of learning outcomes</p> <p><b>Student:</b></p> <ul style="list-style-type: none"> <li>• has knowledge of the basic techniques and research tools used for/in animal cell cultures;</li> <li>• knows how to combine theoretical knowledge of mammalian cell cultures with its practical application in research;</li> <li>• is familiar with and implements the basic principles of health and safety and ergonomics procedures in the laboratory, knows and follows procedures of work with genetically modified microorganisms;</li> <li>• applies basic physicochemical and biochemical techniques necessary for studying biological processes (including processes taking place in cultured cells);</li> <li>• has skills in culturing cells of higher organisms;</li> </ul>	<p>Symbols for relevant directional learning outcomes:</p> <p><b>K1_W08</b></p> <p><b>K1_W09</b></p> <p><b>K1_W10, K1_K05</b></p> <p><b>K1_U01</b></p> <p><b>K1_U02</b></p>		

	<ul style="list-style-type: none"> <li>• synthesizes information from multiple scientific sources, uses professional scientific language and terminology specific to the course topics;</li> <li>• performs standard animal cell biology experiments safely using proper laboratory equipment and techniques;</li> <li>• analyzes experimental data and describes the results accurately and objectively;</li> <li>• collaborates effectively within a team while planning and organizing work, as well as addressing a scientific problem;</li> <li>• understands the need for updating knowledge and skills in the field of biotechnology.</li> </ul>	<b>K1_U03, K1_U04, K1_U09</b>  <b>K1_U05</b>  <b>K1_U05, K1_U06</b>  <b>K1_U13, K1_K03</b>  <b>K1_K01</b>
15.	<b>Mandatory literature:</b> <ul style="list-style-type: none"> <li>• <b>laboratory manual</b> provided by the teachers.</li> </ul> <b>Recommended literature:</b> <ul style="list-style-type: none"> <li>• R.I. Freshney, <b>Culture of Animal cells - a manual of basic techniques and specialized applications</b>, Willey-Blackwell;</li> <li>• other sources provided/indicated by the teachers.</li> </ul>	
16.	<p>Methods of verification of the assumed learning outcomes:</p> <b>LABORATORY:</b> <ul style="list-style-type: none"> <li>• Students will be assessed on their <b>ability to safely and competently execute laboratory procedures</b> and manage their time efficiently during all scheduled lab sessions. <b>Active participation and attendance are mandatory.</b></li> <li>• <b>Final written test.</b></li> </ul> <b>LECTURE:</b> <ul style="list-style-type: none"> <li>• <b>final written test</b> (the condition for taking the test is to obtain a positive grade in the laboratory classes).</li> </ul>	
17.	<p>Conditions and form of credit for individual components of the course:</p> <b>LABORATORY:</b> <ul style="list-style-type: none"> <li>• mandatory presence and active participation in the classes;</li> <li>• positive test result.</li> </ul> <b>LECTURE:</b> <ul style="list-style-type: none"> <li>• positive test result.</li> </ul>	
18.	Student workload expressed in teaching hours and ECTS credits	number of hours allocated for the course of a given type of classes
	<p>Classes (according to the study plan) with the instructor:</p> <ul style="list-style-type: none"> <li>• <b>laboratory</b> (including an introduction lecture)</li> <li>• <b>lecture</b></li> </ul>	<b>30 h</b> <b>15 h</b>

	Student's own work (including participation in group work), e.g.: <ul style="list-style-type: none"> <li>• <b>preparation for the classes</b></li> <li>• <b>reading the manual and literature indicated</b></li> <li>• <b>preparation for the final tests</b></li> </ul>	<b>50 h</b>
	Total number of class hours:	<b>95 h</b>
	Number of ECTS credits: <ul style="list-style-type: none"> <li>• <b>laboratory</b></li> <li>• <b>lecture</b></li> </ul>	<b>2 ECTS</b> <b>2 ECTS</b>