

## COURSE UNIT DESCRIPTION - CELL TECHNOLOGIES

Course unit title	Code
<b>CELL TECHNOLOGIES</b>	

Lecturer(s)	Department(s)
<b>Coordinator:</b> Assoc. Prof. Virginija BUKELSKIENĖ	Institute of Biochemistry of Vilnius University, Mokslininkų 12, LT-08662 Vilnius
<b>Other(s):</b> dr. Daiva Baltriukienė	

Cycle	Level of the course unit	Type of the course unit
Full-time studies (2 <sup>nd</sup> stage)	1 out of 1	Compulsory

Mode of delivery	Period of delivered	Language(s) of instruction
Face to face	1 <sup>st</sup> semester, autumn	Lithuanian

Prerequisites and corequisites	
<b>Prerequisites:</b> Cell biology, biochemistry, molecular biology, gene engineering	<b>Corequisites (if any):</b> None

Number of credits allocated to the course unit	Student's total workload	Contact hours	Self-study and research hours
5	133	72	61

Purpose of the course unit: programme competences to be developed		
<p>Upon the successful completion of this course, students will acquire:</p> <p><i>Subject-specific competences:</i></p> <ul style="list-style-type: none"> <li>• knowledge in the cell characteristics at the molecular level, necessary for independent scientific research;</li> <li>• knowledge and skills to apply cell technologies in biomedical research;</li> <li>• skills to analytically, critically and systemically analyze and evaluate information related cell technologies and their application;</li> <li>• skills to integrate knowledge of different scientific fields to solve cell molecular biology-related problems.</li> </ul> <p><i>General competences:</i></p> <ul style="list-style-type: none"> <li>• skills to perform research and practical work requiring analytical and innovative thinking;</li> <li>• skills to improve and update knowledge and skills and to seek new ones;</li> <li>• skills to clearly and scientifically present knowledge on the cell technologies to the professionals and non-professionals;</li> </ul>		
Learning outcomes of the course unit	Teaching and learning methods	Assessment methods
Describes stem cell origin critically, describes their characteristics and possible application for biomedical and biotechnological purposes.	Lectures, seminars, self-study	Midterm exams; topic-related seminar presentation
Uses the cell culture as a model for evaluation of safety/toxicity of substances, in cancer biology research, genetic engineering, gene therapy, tissue engineering, drug screening and vaccine production.	Lectures, seminars, self-study	Midterm exams; topic-related seminar presentation
Establishes the primary stem cell lines, evaluates their characteristics and applies the acquired knowledge in solving of problems of bioengineering.	Practical classes, self-study	Practical work report
Applies techniques of molecular cell biology to investigate cells, adjust the obtained results in practical solution of cell technology problems.	Journal club, practical classes, self-study	Topic-related seminar presentation; analysis of scientific paper
Integrates knowledge of molecular biology, medicine and physical sciences.	Lectures	Midterm exam

Content: breakdown of the topics	Contact hours						Self-study work: time and assignments		
	Lectures	Tutorials	Seminars	Exercises	Laboratory work	Internship/work placement	Contact hours	Self-study hours	Assignments
<b>1. Working with cell cultures</b>	<b>4</b>						<b>4</b>	<b>4</b>	Analysis of the topic-related scientific papers; self-directed learning.
The main aspects of the cell culture	2						2	2	
Cell lines – primary and continuous	1						1	1	
Application of the cell cultures and their cryopreservation	1						1	1	
<b>2. Stem cells</b>	<b>8</b>		<b>4</b>				<b>12</b>	<b>12</b>	Analysis of the topic-related scientific papers; seminar presentation, self-directed learning.
Features, markers, sources of the stem cells	2		1				3	3	
Embryonic stem cells	1		1				2	2	
Adult organism-derived stem cells	1		1				2	2	
Signalling pathways governing stem-cell fate	2						2	2	
iPSC	2		1				3	3	
<b>3. Tissue engineering</b>	<b>12</b>		<b>7</b>				<b>19</b>	<b>19</b>	Analysis of the topic-related scientific papers; seminar presentation, self-directed learning.
Principles of artificial tissue engineering	4		2				6	6	
Cell interaction with extracellular microenvironment	2		1				3	3	
Biomolecules for the tissue engineering	2		1				3	3	
Tissue engineering. Fields of application	4		3				7	7	
<b>4. Cell culture as a model system</b>	<b>8</b>		<b>5</b>				<b>13</b>	<b>14</b>	Analysis of the topic-related scientific papers; seminar presentation, self-directed learning.
Studies of cell migration/invasion	2		2				4	4	
Genetic modifications of the cells	2		1				3	4	
Toxicological studies	2		1				3	3	
The application of cell technologies to drug discovery	2		1				3	3	
<b>Practical classes</b>					<b>24</b>		<b>24</b>	<b>12</b>	Completion of practical task, preparation of practical work report, self-directed learning.
1. Establishment of adult organism-derived stem cells					4		4	2	
2. Induction and assessment of adult organism-derived stem cell differentiation					8		8	4	
3. Cell labelling by vital dyes					4		4	2	
4. Assessment of cell adhesion					4		4	2	
5. Hematopoietic cell differentiation and					4		4	2	

evaluation								
<b>Total</b>	<b>32</b>		<b>16</b>		<b>24</b>		<b>72</b>	<b>61</b>

<b>Assessment strategy</b>	<b>Weight,%</b>	<b>Assessment period</b>	<b>Assessment criteria</b>
Midterm exam I	15	5 <sup>th</sup> week of the course	Examination in written form: answers to the three (3) open questions; maximum value: 10 points. Evaluation criteria: 2-4 (insufficient) - student does not understand the question, answer insufficient or non correct. 5 (sufficient) - sufficient knowledge and text layout, some essential mistakes; 6 (satisfactory) - satisfactory knowledge and text layout, some mistakes; 7 (highly satisfactory) – highly satisfactory knowledge and text layout, some non-essential mistakes; 8 (good) - good knowledge and text layout, some non-essential mistakes; 9 (very good) – very good knowledge; correct understanding of the problem; correct language, text layout is logical; 10 (excellent) - perfect knowledge; correct understanding of the problem; correct language, text layout is logical.
Midterm exam II	15	10 <sup>th</sup> week of the course	Examination in written form: answers to the three (3) open questions; maximum value: 10 points. Evaluation criteria: 2-4 (insufficient) - student does not understand the question, answer insufficient or non correct. 5 (sufficient) - sufficient knowledge and text layout, some essential mistakes; 6 (satisfactory) - satisfactory knowledge and text layout, some mistakes; 7 (highly satisfactory) – highly satisfactory knowledge and text layout, some non-essential mistakes; 8 (good) - good knowledge and text layout, some non-essential mistakes; 9 (very good) – very good knowledge; correct understanding of the problem; correct language, text layout is logical; 10 (excellent) - perfect knowledge; correct understanding of the problem; correct language, text layout is logical.
Midterm exam III	15	15 <sup>th</sup> week of the course	Examination in written form: answers to the three (3) open questions; maximum value: 10 points. Evaluation criteria: 2-4 (insufficient) - student does not understand the question, answer insufficient or non correct. 5 (sufficient) - sufficient knowledge and text layout, some essential mistakes; 6 (satisfactory) - satisfactory knowledge and text layout, some mistakes; 7 (highly satisfactory) – highly satisfactory knowledge and text layout, some non-essential mistakes; 8 (good) - good knowledge and text layout, some non-essential mistakes; 9 (very good) – very good knowledge; correct understanding of the problem; correct language, text layout is logical; 10 (excellent) - perfect knowledge; correct understanding of the problem; correct language, text layout is logical.
Topic 2-4 - related seminar presentation	5	Every other week	Maximum value: 10 points. Evaluation criteria: 2-4 (insufficient) 5 (sufficient) 6 (satisfactory) 7 (highly satisfactory) 8 (good) 9 (very good)

			10 (excellent)
Exam	50	22 <sup>th</sup> week of the course	It is obligatory to complete all practical classes before the exam. Examination in written form: answers to the three (3) open questions; maximum value: 10 points. Evaluation criteria: 2-4 (insufficient) - student does not understand the question, answer insufficient or non correct. 5 (sufficient) - sufficient knowledge and text layout, some essential mistakes; 6 (satisfactory) - satisfactory knowledge and text layout, some mistakes; 7 (highly satisfactory) – highly satisfactory knowledge and text layout, some non-essential mistakes; 8 (good) - good knowledge and text layout, some non-essential mistakes; 9 (very good) – very good knowledge; correct understanding of the problem; correct language, text layout is logical; 10 (excellent) - perfect knowledge; correct understanding of the problem; correct language, text layout is logical.
Total	100		The final assessment consists of a seminar presentations, midterm exams and exam self-report drawn up, intermediate surveys and exam ratio of 5:45:50.

Author	Year of publication	Title	Issue of a periodical or volume of a publication	Publishing place and house or web link
<b>Compulsory reading</b>				
	2008	“Interdisciplinary theoretical training for Lithuanian and foreign experts”, Parts I-II, issued in pursuance of EU supported project "Development of scientific society knowledge in stem cell and higher differentiation research field"		
	2008	“Practical and specialized laboratory courses”, issued in pursuance of EU supported project "Development of scientific society knowledge in stem cell and higher differentiation research field"		
R. Lanza, J. Gearhart, B. Hogan, D. Melton, R. Pedersen, J. Thomson, E.D.Thomas, M.West	2006	Essentials of stem cell biology.		Elsevier Inc.
Alberts, B., A. Johnson, J. Lewis, M. Raff, K. Roberts, and P. Walter	2008	Molecular Biology of the Cell, 5 <sup>th</sup> ed.		Garland Science
Topic-related scientific reviews.	2008-2013	Nature Reports Stem cells		Nature Publishing Group
Topic-related scientific reviews.	2008-2013	Tissue engineering, Parts A, B, & C		Mary Ann Liebert, Inc. publishers
<b>Optional reading</b>				

	2010	Stem cell handbook. Ed. by St. Sell		Humana Press
R. Ian Freshney	2010	Culture of animal cells: A manual of basic technique and specialized applications. 6th ed.		Wiley-Blackwell
	2002	Stem cells and the future of regenerative medicine / Committee on the Biological and Biomedical Applications of Stem Cell Research, Commission on Life Sciences National Research Council		National Academy Press
Information about application of cell technologies		<a href="http://www.biotechnologyonline.gov.au/">http://www.biotechnologyonline.gov.au/</a>		
Up-to-date information about cell research		<a href="http://www.cell.com/trends/cell-biology">http://www.cell.com/trends/cell-biology</a> -		