

## COURSE UNIT DESCRIPTION - IMMUNOTECHNOLOGIES

Course unit title	Code
IMMUNOTECHNOLOGIES	

Lecturer(s)	Department(s)
<b>Coordinator:</b> Assoc. Prof. Irutė GIRKONTAITĖ <b>Other(s):</b>	Centre of Innovative Medicine Department of Immunology, Molėtų pl. 29, LT-08409, Vilnius

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

Mode of delivery	Period of delivered	Language(s) of instruction
Face to face	2 <sup>nd</sup> semester, spring	Lithuanian

Prerequisites and corequisites	
<b>Prerequisites:</b> Completed courses: immunology, molecular biology, biochemistry, genetics,	<b>Corequisites (if any):</b>

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 on the basic principles and definitions of immunology, its modern achievements and practical ways of implementation;</li> <li>understanding of the principles of operation of immunological methods and their use in diagnostics, medicine, biotechnology, and scientific research;</li> <li>skills to analytically, critically and systemically analyze and evaluate information related to immunotechnologies;</li> <li>skills to apply knowledge in practice, research and independent work;</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 for group work, logical argumentation, critical thinking;</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
<ul style="list-style-type: none"> <li>Describes the basics of modern immunotechnology, the development of the products of the immunotechnology, the application of immunological methods in biotechnology, pharmacy, diagnostics, therapy and scientific investigation;</li> </ul>	Problem-based teaching during the lectures, discussions during the seminars, laboratory work, independent work reading and analyzing of the literature	Test, the reports of laboratory work, discussions during the seminars
<ul style="list-style-type: none"> <li>Explains the connection between immunotechnology and other nature sciences.</li> <li>Explains the importance of immunotechnology for the development of other sciences, the input of immunotechnology to the biotechnology.</li> </ul>	Problem-based teaching during the lectures, discussions during the seminars, independent work reading and analyzing of the literature	Test, discussions during the seminars
<ul style="list-style-type: none"> <li>Explains the basic use of the concepts of immunotechnology, adapting them to the laboratory work;</li> <li>Analyzes and summarizes the scientific information.</li> </ul>	Discussions during the seminars, laboratory work, consultations	Test, discussions, the reports of laboratory work

<ul style="list-style-type: none"><li>Ability to work independently and in the groups, to lead the group discussions and to participate in the discussion, to do research work, to link theory with practical work; to prepare the presentations and critically evaluate the presentations prepared by the colleagues</li></ul>	Discussions during the seminars, laboratory work, independent reading and analyzing of the literature							Test, the reports of laboratory work, discussions during the seminars	
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
1. Preparation and purification of monoclonal and polyclonal antibodies	14		6		12		32	21	Independent study of scientific literature Analysis of the topic-related scientific papers; seminar presentation, self-directed learning. Preparation for the laboratory work and the seminar, seminars and tests.
The structure and functions of antibodies and immunoglobulins. B cell activation and antibody production	2						2	3	
Production of polyclonal and monoclonal antibodies. Antigen preparation, immunizations, animals used to produce polyclonal antibodies.	2		2		2		6	4	
Production of monoclonal antibodies. Hybridoma technology.	2		2		10		14	2	
Purification of monoclonal and polyclonal antibodies. The fractionation and labeling of antibodies.	2						2	2	
The construction of recombinant antibodies Therapeutic antibodies and their production. Humanized and human antibodies. Production of human monoclonal antibodies	2						2	2	
Construction of high affinity antibodies using phage display. Ribosomal and mammalian cell display technologies	2		1				3	4	
The production of recombinant antibodies in bacteria, yeasts, insect and mammalian cells, transgenic plants and animals. Practical applications of antibodies for diagnostic, therapy, biotechnology, scientific investigations. Production of therapeutic antibodies.	2		1				3	4	
2. The main immunological methods and their application	16		8		12		36	15	Independent study of scientific literature Analysis of the topic-related scientific papers; seminar presentation, self-

									directed learning. Preparation for the laboratory work and the seminar, seminars and tests.
Surface resonance method, precipitation and agglutination reactions: principle of the methods and application. Radioimmunoassay (RIA).	2						2	2	
Immunochemical methods and their application: ELISA , antibody array	3				5		8	2	
Immunochemical methods and their application: Western blotting, Dot blotting	2		1				3	2	
Immunochemical methods and their application: immunoprecipitation	2		2				4	3	
Immunological methods for cell investigation: cell ELISA. ELISPOT. The investigation of cell proliferation .	3		2		2		7	2	
Microscopy. Light, fluorescence and electronic microscopy for immunochemical methods. Immunohistochemistry, immunofluorescence, immunohistochemistry, immunocytochemistry.			1				1		
Flow cytometry – a method for cell investigation.	2		1		5		8	2	
Cell separation. Using antibodies for cell separation	2		1				3	2	
<b>3. The application of immunological methods and components of immune system to biopharmacy.</b>	<b>2</b>		<b>2</b>				<b>4</b>	<b>5</b>	
Vaccines and cytokines for pharmaceutical industry.	1		2				3	2	
The cells of immune system used for therapy. Dendritic cell vaccines. Immunotherapy, elimination of cells producing autoantibodies.	1						1	3	
Preparation for the exam								<b>20</b>	Preparation for the exam.
<b>Total</b>	<b>32</b>		<b>16</b>		<b>24</b>		<b>72</b>	<b>61</b>	

Assessment strategy	Weight, %	Assessment period	Assessment criteria
Test I	15	After the 1 <sup>st</sup> part of the course	Assessment criteria: The test consists of 45 questions(open or closed), each evaluated at one point. The test are prepared and written using VU VMA Virtual Learning Environment
Test II	15	After the 3 <sup>rd</sup> part of the course	Assessment criteria: The test consists of 45 questions(open or closed), each evaluated at one point. The test are prepared and written using VU VMA Virtual Learning Environment
Seminar	20	All semester	Assessment criteria: It is estimated for an individual task (10 points) and active participation (10 points). Each student receives an individual task at the beginning of the semester. The student has to do experimental design, to select appropriate methods and reagents and to "perform" virtually experiments.
Laboratory work reporting		All semester	Laboratory work attendance and discussing about the results is mandatory. The students do not get points for that. The aim of the discussion about the laboratory work is to determine whether students have understood the appropriate work

Exam	50	The end of the semester	<p>The examination is done using VU VMA Virtual Learning Environment. The students are required to answer 45-50 questions (open or closed). Depending on the complexity of the question, each answer can be evaluated from 1 to 6 points. The students are able to collect during the exam up to 90 points.</p> <p>The final assessment consists of seminars (20%) in both tests (30%) and exam (50%).</p> <p>Pass:</p> <p>10 (excellent) - <math>\geq 95\%</math>  9 (very good) - 85 - 94%  8 (good) - 75 - 84%  7 (highly satisfactory) - 65 - 74%  6 (satisfactory) - 55 - 64%  5 (sufficient) - 45 - 54%  insufficient  4 - 35 - 44%  3 - 25 - 34%  2 - 15 - 24%  1 - <math>\leq 14\%</math></p>
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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>				
Abul K. Abbas, Andrew H. H. Lichtman, Shiv Pillai	2011	Cellular and molecular immunology	7 edition	Amazon
<b>Optional reading</b>				
Delves, Peter J.	1995	Antibody Applications Essential Techniques		John Wiley & Sons, Incorporated
AP Johnstone and MW Turner	1997	Immunocytochemistry. A practical approach	Practical Approach Series, 177	Oxford University press
Edited by J.E. Bressley..	1993	Immunocytochemistry. A practical approach.		IRLPRESS
Edited by I. Lefkovits.	1997	Immunology Methods manual		Academic press,
Edited by J.H. Peters, H. Baumgarten.	1992	Monoclonal antibodies.		Springer-Verlag.
Thomas J. Kindt, Barbara A. Osborne, Richard A. Goldsby	2006	Kuby Immunology	6 edition	Amazon
Edited by Sera J. Morgan, David C. Darling..	1993	Animal cell culture.		Scientific Publishers.
Edited by T.S. Hawley, R.G. Hawley.	2004	Flow Cytometry Protocols	Second edition,	Volume 263 of Methods in Molecular Biology Series Biomed Protocols
Edited by W. Paul.	2013	Fundamental Immunology	7th edition	Wolters Kluwer Health
Edited by Rafael Fernandez-Botran, Vaclav Vetvicka	1995	Methods in Cellular Immunology		CRC Press,
Edited by P.M. O'Brien, R. Aitken.	2002	Antibody Phage Display. Methods and protocols.		Humana press.
Edited by B.K.C. Lo.	2004	Antibody Engineering. Methods and protocols.		Humana Press,
Current protocols in				<a href="http://onlinelibrary.wiley.com">http://onlinelibrary.wiley.com</a>

Immunology				/book/10.1002/0471142735
Current protocols in cell biology				<a href="http://onlinelibrary.wiley.com/book/10.1002/0471143030">http://onlinelibrary.wiley.com/book/10.1002/0471143030</a>
Edited by F.Ausubel, R.Brent, R.E.Kingston, D.D.Moore, J.G.Seidman, J.A.Smith, K.Struhl. Wiley.	1995	Short protocols in molecular biology	Third edition	John Wiley & Sons, New York.