University of Gdańsk

Subject card

Subject name and code	Molecular Basis of Immunology, PG_00179584						
Field of study	Chemistry						
Date of commencement of studies	October 2026		Academic year of realisation of subject	2027/2028			
Education level	Master's studies		Subject group	Optional subject group			
Mode of study	full-time studies		Mode of delivery	at the university			
Year of study	2		Language of instruction	Polish			
Semester of study	4		ECTS credits	1.0			
Learning profile	academic		Assessment form	credit			
Conducting unit	Faculty of Chemistry -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. Marta Spodzieja				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	0.0	0.0	15
	E-learning hours included: 0.0						
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan		Participation in consultation hours		Self-study	SUM
	Number of study hours	15		2.0		8.0	25
Subject objectives	The aim of this course is to provide students with fundamental knowledge in immunology, with a particular focus on the molecular basis of immune system function. The course will cover the key components of innate (nonspecific) and adaptive (specific) immunity, as well as how the body recognizes and responds to pathogens and other antigens. Students will learn about the structure and function of major molecules involved in immune responses, such as antibodies, lymphocyte receptors (BCR, TCR), cytokines, major histocompatibility complex (MHC) molecules, and components of the complement system. The course will also introduce basic laboratory techniques used in immunology, especially methods based on antigenantibody interactions, such as ELISA and immunoprecipitation. An additional goal of the course is to help students understand how these processes and techniques are applied in diagnostics, scientific research, and the treatment of immune-related diseases.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[CHEMMU2_K01] Knows the limitations of her/his own knowledge; understands the need for further education and can inspire other people to do so.	The student recognizes the limitations of their knowledge in the field of molecular foundations of immunology, understands the necessity of continuous learning and development in immunology and related disciplines, and is able to inspire others to systematically enhance and broaden their knowledge in this area.	[SK4] test/exam - oral or written
[CHEMMU2_U07] Defines and implements the directions of own further education.	The student is able to independently identify and pursue directions for further education in the field of immunology and related disciplines, such as molecular biology and biochemistry, based on the knowledge and skills acquired.	[SU4] test/exam - oral or written
[CHEMMU2_W05] Has extended knowledge in the field of the specialisation studied.	The student applies advanced knowledge of the molecular foundations of immunology, including the mechanisms of immune system function and molecular processes involved in immune responses.	[SW4] test/exam - oral or written
[CHEMMU2_U04] Applies acquired knowledge of chemistry and related scientific disciplines.	The student is able to apply acquired knowledge from chemistry and related disciplines (such as biochemistry and molecular biology) to analyze and interpret the molecular mechanisms of immune system function.	[SU4] test/exam - oral or written

Subject contents

Basic concepts and definitions of immunology
Introduction to the immune system, its role in protecting the organism and maintaining homeostasis.

Structure and functions of key immune system molecules
Discussion of B and T lymphocyte receptors, MHC molecules their structure and role in antigen presentation, as well as cytokines and chemokines functions.

Antibodies (immunoglobulins)
Structure of antibodies, their classes (IgG, IgA, IgM, IgE, IgD) and specific functions.

Molecular mechanisms of immune response
Mechanisms of antigen recognition, signaling pathways activating immune cells, differences between innate and adaptive immunity.

Importance of immunology in disease diagnosis and therapy
The role of immunology in disease detection and treatment, with emphasis on diagnostic techniques.

Immunotherapy
Principles of vaccine action, monoclonal antibody therapy, and immune checkpoint inhibitors.

Basic diagnostic techniques based on antigen-antibody reactions
Methods such as ELISA, Western blot, and flow cytometry principles and applications.

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
examination	51.0%	100.0%

Recommended reading

Basic literature	**Gołąb, J., Jakóbisiak, M., Lasek, W., & Stokłosa, T**. *Immunology*. Polish Scientific Publishers PWN.

	Supplementary literature	**Dziarski R.** *Immunologia molekularna*, PZWL **Sanak M. (red.)** *Immunologia. Podręcznik dla studentów medycyny i nauk przyrodniczych*, Urban & Partne **Lasek W.** *Immunologia. Podstawowe zagadnienia i aktualności*, PWN
	eResources addresses	
Example issues/ example questions/ tasks being completed	• Explain the concept of immune tolerance and its significance. • Describe the main functions of the immune system in maintaining homeostasis. • Compare the structure and function of B-cell and T-cell receptors (BCR and TCR). • Explain the role of MHC class I and II molecules in antigen presentation. • What are cytokines and what is their function in the immune response? • Describe the structure of an antibody molecule, indicating the function of Fab and Fc regions. • List the classes of immunoglobulins and indicate their major functions and distribution. • How does IgM differ from IgG in terms of structure and immune function? • Explain the differences between innate and adaptive immunity at the molecular level. • Describe the activation pathway of a T cell after antigen recognition. • What molecular mechanisms are responsible for immunological memory? • What is the principle of the ELISA test and what is it used for? • Explain what monoclonal antibodies are and how they are used in cancer therapy. • Provide an example of how immunology is applied in the treatment of autoimmune diseases. • Describe the principle of mRNA vaccine action. • What are immune checkpoint inhibitors and in what diseases are they used? • Explain how the immune system can be used in targeted therapy. • Describe the basic principle of flow cytometry. • In which situations is the Western blot technique used? • What is the difference between quantitative and qualitative immunodiagnostic tests?	
Work placement	Not applicable	

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