

**MINISTRY OF EDUCATION OF THE REPUBLIC OF AZERBAIJAN
KHAZAR UNIVERSITY**

**SCHOOL OF SCIENCE AND ENGINEERING
DEPARTMENT OF LIFE SCIENCES**

Immunology and serology

SYLLABUS

Academic year and semester
Fall 2026

Agreed

Approved

Head of Department: PhD. Jamala Eldarova

Identification	Subject	Immunology and Serology, VET 220, 2 ECTs
	Department	Life Sciences
	Program (Undergraduate, Graduate)	Bachelor's Degree
	Term	Fall Semester, 2026/2027 Academic year
	Instructor	Ph.D Turkan Samadova
	Email:	turkansamedova@gmail.com
	Classroom/hours	By appointment with students
Prerequisites		
Language	English	
Compulsory/Elective	Compulsory	
Textbooks and course materials	Main textbooks and materials: 1. Fifth Edition, C 2003 by Lippincott. <i>Fundamental immunology</i> / edited by William E. Paul. ISBN-13: 978-0-7817 2. Duan L, Mukherjee E. Janeway's Immunobiology, Ninth Edition. Yale J Biol Med. 2016 Sep 30;89(3):424–5. PMID: PMC5045153. 3. 1. Məmmədov Z., Axundov R. İmmunologiyanın əsasları. Dərslik. Bakı, "Müəllim" nəşriyyatı, 2018, 396 s. 4. Mary Louise Turgeon, Clinical Immunology and Serology 5th edition. 5. Lefranc, Marie-Paule & Lefranc, Gerard. (2017). The Immunoglobulin FactsBook. 6. Abbas AK, Lichtman AH, Pillai S, Henrickson SE. Cellular and Molecular Immunology. 11th ed. Elsevier; 2025. 7. Langerak, A. W. (Ed.). (2022). <i>Immunogenetics</i>. Methods in Molecular Biology, Vol. 2453. 8. Parker, N., Schneegurt, M., Tu, A.-H. T., Lister, P., & Forster, B. M. (2016). <i>Microbiology</i>. OpenStax. Supplementary Materials: 1. Lodish et.al. Molecular Cell Biology (8th ed), 2016, p. 1247 2. Materials prepared by the teacher. 3. Online resources: - Lefranc MP, Lefranc G. Immunoglobulins or Antibodies: IMGT® Bridging Genes, Structures and Functions. Biomedicines. 2020 Aug 31;8(9):319. doi: 10.3390/biomedicines8090319. PMID: 32878258; PMID: PMC7555362. - Lefranc M-P (2014) Immunoglobulin and T Cell Receptor Genes: IMGT® and the Birth and Rise of Immunoinformatics. Front. Immunol. 5:22. doi: 10.3389/fimmu.2014.00022	
Course description	The Immunology and Serology course is dedicated to the study of the structure and function of the immune system and the mechanisms by which the body defends itself against internal and external antigens. The course provides fundamental knowledge of the major components of innate and adaptive immunity, immune system cells and organs, antigen recognition, the functions of B and T lymphocytes, antibodies, cytokines, and immunological tolerance. The course also provides a brief overview of the role of genes in the immune system, the diversity of immune receptors, and V(D)J recombination within the field of immunogenetics. The serology component of the course introduces antigen–antibody reactions and the major serological methods.	
Course objectives	General Objective:	

	The main objective of the course is to provide students with fundamental knowledge of the structure and function of the immune system, the molecular and cellular mechanisms of immune responses, immunological disorders, and the basic principles of serological diagnostics. Specific Objectives: - To identify students' academic potential, encourage their interest in scientific research, and support them in realizing their potential. - To encourage students' active participation in the course and foster an environment of mutual respect and understanding.		
Learning Outcomes	By the end of the course, students will be able to: - Describe the structure and functions of the immune system; - Demonstrate theoretical knowledge of the fundamental principles of immunity; - Explain the main characteristics and mechanisms of innate and adaptive immunity; - Define the concepts of antigen, immunogen, epitope, antibody, and immune complex, and explain the basic principles of antigen-antibody reactions; - Describe the development and functions of B and T lymphocytes in immune responses; - Describe the major classes, structure, and functions of immunoglobulins; - Explain the role of cytokines in immune responses and their regulation; - Describe the main mechanisms of immunological tolerance and the consequences of its disruption; - Describe the major forms of immunodeficiency and hypersensitivity reactions; - Explain the main mechanisms underlying genetic diversity in the immune system, including V(D)J recombination; - Describe the major serological methods and their applications; - Explain the importance of serology in diagnostics and interpret the results of serological tests based on fundamental immunological principles; - Independently search for, evaluate, and analyze scientific information in the fields of immunology and serology; - Apply knowledge acquired from this course when studying other biological disciplines.		
Teaching methods	Case analysis		X
	Group discussion		X
	Lecture		X
	Simulation		X
Evaluation Criteria	Methods	Date/deadlines	Percentage (%)
	Midterm Exam	TBA	30
	Quizzes	Once during the semester	10
	Practical Assignments	Once during the semester	10
	Activity	During the semester	5
	Attendance	End of the semester	5
	Final Exam	TBA	40
	Total		100
Class Policy	<u>Course Organization</u> - General information related to the course will be provided to students during lectures. - Students' knowledge of the previous topic will be assessed during class sessions.		

- New topics will be explained using visual materials (PPT presentations).
- Students' level of understanding will be assessed through quizzes before the midterm and final examinations.
- During class sessions, students' understanding of the previous topic will be assessed through oral and written questioning in each class, and an overall grade for participation will be assigned at the end of the semester.

General Rules

Attendance

Attendance at all classes is required. Students who are unable to attend classes for valid reasons (illness, family circumstances, etc.) must provide the relevant information to the Faculty Dean's Office. Students who miss more than 25% of the classes will not be permitted to take the examination.

Late Arrival and Other Class Disruptions

Students arriving more than 10 minutes late will be marked absent. However, they will still be allowed to attend the class.

Quiz

A student who is unable to participate in a quiz for a reason communicated to the instructor and the Dean's Office in advance may take the quiz during the following week.

Examinations

All matters concerning a student's participation in or absence from an examination are handled by the Faculty administration. Absence from an examination is permitted only with the approval of the Dean's Office. Absence from examinations due to participation in public activities is not permitted.

The topics covered in the midterm and final examinations will be provided to students before the examinations. The majority of questions in the final examination will be based on the material covered after the midterm examination.

Violations of Examination Rules

During midterm and final examinations, students are prohibited from disrupting the examination process or engaging in academic misconduct, including cheating. Failure to comply with these rules will result in the cancellation of the examination paper and the student will be dismissed from the examination with a grade of 0 (zero).

Course Completion Requirements

In accordance with university regulations, a minimum overall achievement of 60% is required to successfully complete the course. A student who fails the course may retake it in the following semester or academic year.

Rules for using Generative Artificial Intelligence (GAI)

Within the framework of this subject, the use of GAI tools is permitted in accordance with the University's "Rules for the use of GAI" to support and enhance the teaching and learning process. Students may use these tools when generating ideas related to the topic, determining initial approaches, and developing a preliminary concept. However, all GAI tools used, as well as their purpose and manner of use, must be disclosed in accordance with the requirements set out in Section 8 ("Citation and Disclosure Rules"). Students are fully responsible for verifying the accuracy, relevance, and reliability of any information obtained through GAI tools. The final work must clearly demonstrate the student's independent approach, personal analysis, critical thinking, and individual intellectual contribution to the topic.

Classroom Conduct

Students must make every reasonable effort to maintain an appropriate academic environment during class. Unauthorized conversations, unnecessary movements, and other forms of unethical behavior are strictly prohibited. Students are expected to participate actively in class, ask questions when necessary, and engage in discussions.

Disrupting the teaching process or violating ethical rules during class, as well as unauthorized discussions among students and the use of mobile phones, are prohibited.

Tentative Schedule

Week	Date/Day (tentative)	Topics	Textbook/Assignments
1	21.09.2026	Introduction to Immunology and Fundamentals of the Immune System. The scope of immunology and its importance. The concept of immunity and the major functions of the immune system. General overview of the major organs, tissues, and cells of the immune system. Main characteristics of innate and adaptive immunity. General concepts of specificity, diversity, immunological memory, and tolerance in immune responses. Relationship of immunology to biology, genetics, microbiology, and other natural sciences.	Main Textbook 1, Chapter I; Main Textbook 2, Chapter I; Main Textbook 1, p. 1
2	28.09.2026	Innate Immunity. General characteristics of innate immunity and its role in host defense. Physical and chemical defense barriers, including the skin and mucous membranes. Phagocytes, natural killer (NK) cells, and other major cellular components. The complement system and its role in immune defense. Main characteristics of the inflammatory response and its importance in the development of immune responses. Interaction between innate and adaptive immunity.	Main Textbook 1, Chapter I; Main Textbook 2, Chapter I; Main Textbook 1, p. 1
3	05.10.2026	Main characteristics of adaptive immunity. B and T lymphocytes and their roles in immune responses. Development and major functions of lymphocytes. General overview of humoral and cell-mediated immune responses. Interaction of lymphocytes with antigens, lymphocyte activation, and proliferation. Formation of immunological memory and key characteristics of adaptive immunity.	Main Textbook 2, Chapter IV, p. 345
4	12.10.2026	Antigens and Antigen Recognition. Concepts of antigen and immunogen. General overview of epitopes and antigenic determinants. Major characteristics of antigens and factors affecting immunogenicity. Basic principles of antigen recognition by B and T lymphocytes. Main features of antigen-receptor interactions. Role of antigens in the development of immune responses.	Main Textbook 2, Chapter II, p. 139
5	19.10.2026	Antigen Presentation and Interactions Between Immune Cells. The concept of antigen presentation and its role in the development of immune responses. General overview of MHC molecules and their role in presenting antigens to T lymphocytes. Major antigen-presenting cells and their functions in immune responses. Basic principles of antigen recognition and activation of T lymphocytes. Role of cytokines in communication between immune cells. Effects of antigen presentation and intercellular signaling on the development of immune responses.	Main Textbook 2, Chapter II, p. 213
6		B Lymphocytes and Humoral Immune Responses. Development and major characteristics of B lymphocytes.	Main Textbook 1, Chapter III, p. 289

	26.10.2026	Interaction of B lymphocytes with antigens and B-cell activation. General overview of plasma cells and memory B cells. Structure and major functions of antibodies. General overview of the major immunoglobulin classes - IgM, IgG, IgA, IgE, and IgD. Role of humoral immune responses in the neutralization of antigens and pathogens and in host defense.	
7	02.11.2026	T Lymphocytes and Cell-Mediated Immune Responses. Development and major characteristics of T lymphocytes. General overview of CD4+ and CD8+ T lymphocytes. Major functions of T helper cells. Role of cytotoxic T lymphocytes in cell-mediated immune responses. Activation of T lymphocytes and their involvement in the development of immune responses. Importance of cell-mediated immunity in defense against infections and other foreign structures.	Main Textbook 1, Chapter IV, p. 313
		Midterm Exam	
8	09.11.2026	Regulation of Immune Responses and Immunological Tolerance. The concept of immune response regulation and its importance. Role of immune cells in enhancing and suppressing immune responses. General role of cytokines in communication between immune cells. The concept and main characteristics of immunological tolerance. General overview of central and peripheral tolerance.	Main Textbook 2, Chapter 15, p. 643. Chapter 16, p 401. Supplementary Materials
9	16.11.2026	Disorders of the Immune System. General overview of immune system disorders. Main characteristics of autoimmune reactions. General overview of hypersensitivity reactions and allergy. The concept of immunodeficiency and its major forms. General role of genetic and environmental factors in the development of immune system disorders.	Main Textbook 1, Chapter VIII, p. 1291
10	23.11.2026	Fundamentals of Immunogenetics. The concept of immunogenetics. General overview of the organization of immunoglobulin and T-cell receptor genes. V(D)J recombination and its role in generating immune receptor diversity. Brief overview of the study and biocuration of genetic information related to the immune system.	Main Textbook 7, Chapter 1, p 3. Online Materials
11	30.11.2026	Introduction to Serology and Antigen-Antibody Reactions. The concept of serology and its relationship to immunology. Basic principles of antigen-antibody reactions. Characteristics of antibody-antigen interactions. Serological significance of immunoglobulin isotypes and general overview of IgM, IgG, IgA, IgE, and IgD. Role of IgM and IgG antibodies at different stages of immune responses and their significance in serological testing. General overview of the major types of serological reactions.	Main Textbook 4, Chapter II, p 11. Supplementary Materials
12	07.12.2026	Agglutination and Precipitation Reactions. Basic principle of agglutination reactions. General overview of the major types and applications of agglutination reactions. Basic principle of precipitation reactions. Main differences between agglutination and precipitation reactions. Use of these reactions in serological testing and laboratory diagnostics.	Main Textbook 4, Chapter 10, p. 139. Supplementary Materials

13	14.12.2026	Immunoassay Methods. Basic principles of immunoassay methods. The use of antigen-antibody interactions in laboratory testing. General overview and basic principle of the ELISA method. General overview of the main types and applications of ELISA. The laboratory and diagnostic significance of immunoassay methods.	Main Textbook 4, Chapter 12, p. 160. Supplementary Materials
14	21.12.2026	Immunofluorescence and Other Serological Methods. Basic principle of immunofluorescence. General overview of direct and indirect immunofluorescence. Use of immunofluorescence for the detection of antigens and antibodies. General overview of other serological methods. Main applications of serological methods and their importance in laboratory diagnostics.	Main Textbook 8, Chapter 20.5, p 813. Supplementary Materials
15	28.12.2026	Use of Serology in Diagnosis. Role of serological testing in diagnosis. Use of serological methods in the diagnosis of infectious and other diseases. Laboratory detection of antigens and antibodies. General overview of the major serological markers of hepatitis A, B, and C infections. General overview of the applications of serological tests. Advantages and limitations of serological testing. Importance of serology in modern laboratory diagnostics.	Main Textbook 4, Chapter 23, p 287. Supplementary Materials
		Final Examination	

This syllabus provides comprehensive information about the course. Any changes to the syllabus will be communicated to students in advance.