

COURSE DESCRIPTION

Molecular Immunology

Academic year 2026-2027

1. Programme-related data

1.1. Higher Education Institution	Babeş-Bolyai University of Cluj-Napoca
1.2. Faculty	Biology and Geology
1.3. Department	Molecular biology and Biotechnology
1.4. Field	Biology
1.5. Level of study	Master
1.6. Degree programme / Qualification	Medical Biology
1.7. Form of education	Full time

2. Course-related data

2.1. Course title	Molecular Immunology	Course code	BME1301
2.2. Course coordinator	Emilia Licarete, PhD		
2.3. Seminar coordinator	Emilia Licarete, PhD		
2.4. Year of study	II	2.5. Semester	3
		2.6. Type of assessment	Exam
2.7. Course status	Compulsory	2.8. Course type	Specialisation subject

3. Total estimated time (hours per semester of teaching activities)

3.1. Number of hours per week	4	of which: 3.2. course	2	3.3. seminar/ laboratory/ project	2
3.4. Total of hours in the curriculum	154	of which: 3.5. course	28	3.6. seminar/ laboratory	28
Time allocation for individual study (IS) and self-taught activities (ST)					hours
Learning from textbooks, course materials, bibliography, and notes (IS)					40
Additional research in the library, on subject-specific electronic platforms, and on-site					15
Preparing seminars/ laboratories/ projects, assignments, reports, portfolios, and essays					15
Tutoring (professional guidance)					24
Examinations					4
Other activities					
3.7. Total hours of individual study (IS) and self-taught activities (ST)				98	
3.8. Total hours per semester				154	
3.9. Number of credits				7	

4. Prerequisites (where applicable)

4.1. curriculum-related	
4.2. skills-related	

5. Specific conditions (where applicable)

5.1. course-related	
5.2. seminar/laboratory-related	Attendance of a minimum of 80% of practical/ seminar classes

6.1. Competencies resulting from the completion of the degree programme (as referred to in the curriculum)

Professional competencies	
Competency code	Competency

PC1	Correct application of laboratory techniques used in medical diagnostics (biochemistry, haematology, immunology, microbiology, molecular biology), in accordance with standardized protocols;
PC2	Operation and maintenance of laboratory equipment (automated analysers, centrifuges, PCR systems, microscopes), including calibration and performance validation.
PC3	Ability to critically analyse scientific data, evaluate modern methods and technologies;
PC4	Accurate interpretation of laboratory results and correlation with potential clinical conditions, within the limits of professional competence;
PC5	Safe handling of biological specimens (blood, body fluids, microbial cultures), while complying with biosafety regulations and contamination prevention procedures;
Transversal competencies	
Competency code	Competency
TC1	Ability to collaborate within a multidisciplinary team to improve workflow and service quality;
TC2	Adherence to professional ethics, confidentiality standards, and regulations related to data protection and biosafety;
TC3	Ability to communicate effectively about results, procedures, and technical issues.

6.2. Learning outcomes relevant to the degree programme (as referred to in the curriculum)

Learning outcomes targeted by the subject		
Competency code	Knowledge and comprehension	Specific academic skills
PC14	1. The student understands the structure and function of the immune system, the molecular mechanisms of innate and adaptive immune responses, and the fundamentals of immunopathology.	1. The student is able to analyse and interpret experimental data in molecular immunology and correlate immune mechanisms with pathological processes.

7. Subject-specific learning outcomes

Knowledge and comprehension
1. Describe the structure and functions of immune system components (cells, organs, effector molecules).
2. Explain the cellular and molecular mechanisms involved in innate and adaptive immune responses.
3. Analyze the genetic and molecular mechanisms underlying lymphocyte receptor diversity and immune response specificity.
4. Explain and compare immunopathological mechanisms involved in autoimmunity, immunodeficiencies, and anti-tumor immune responses.
Specific academic skills
1. Apply laboratory techniques specific to molecular immunology (e.g., antibody purification, cellular functional assays).
2. Perform laboratory experiments to investigate immune responses, following standardized protocols.
3. Analyze and interpret experimental data using specific methods.
4. Develop and present scientific materials (presentations, case studies) based on specialized literature.

8. Contents

8.1. Course	Teaching and learning methods	Remarks
1. Introductory course on cells and organs of the immune system, immune responses mediated by B and T lymphocytes.	frontal lecture, with the stimulation of interactivity through problematization.	2 h
2. Antigens, immunogens, haptens.	frontal lecture, with the stimulation of interactivity through problematization.	2 h

























3. Molecular mechanisms underlying the generation of B-lymphocyte/antibody and T-lymphocyte receptor diversity. Affinity maturation, immunoglobulin class switching.	frontal lecture, with the stimulation of interactivity through problematization.	4 h
4. Development of lymphocytes. Mechanisms of central and peripheral tolerance. Immunological memory.	frontal lecture, with the stimulation of interactivity through problematization.	4 h
5. Cell signaling through immune system receptors.	frontal lecture, with the stimulation of interactivity through problematization.	6 h
6. Immunity to pathogens (viruses, bacteria and fungi, protozoa and parasitic worms).	frontal lecture, with the stimulation of interactivity through problematization.	3 h
7. Molecular mechanisms of autoimmunity. Autoimmune diseases	frontal lecture, with the stimulation of interactivity through problematization.	3 h
8. Tumor immunology: tumor antigens, tumor microenvironment, anti-tumor immune responses, immunotherapies used in cancer.	frontal lecture, with the stimulation of interactivity through problematization.	6 h
Bibliography 1. Murphy, K and Weaver, C., Janeway's Immunobiology, Garland Science, 9th edition, 2016 2. Janeway C et al., Immunobiology, Garland Science New-York; 7th edition, 2007 3. Mak, T. and Saunders, M., The immune response: basic and clinical principles, Elsevier Academic Press, 2006 4. Abbas et al. – Cellular and Molecular Immunology – 6th ed. Elsevier, 2010 5. Scientific journals in the field		
8.2. Seminar/ laboratory	Teaching and learning methods	Remarks
1. Labor protection measures in the laboratory. - labor protection measures, protective equipment, hazardous waste - manipulation of biological material	Practical class	2h
2. Antibodies purification from sheep serum by affinity chromatography, concentration by Amicon filters - the principle of the method - work technique - concentration determination	Practical class	4h
3. Determination of activation markers expressed on the surface of dendritic cells following PMA stimulation - the principle of the method - concentration determination.	Practical class	5h
4. Purification of antibodies from egg yolk by the water dilution method - the principle of the method - work technique - concentration determination	Practical class	4h
5. Seminar-case studies, journal club	Seminar class problematization	4h
6. Activation of granulocytes with immune complexes - the principle of the work - work technique - interpretation of the results	Practical class	2h
7. Seminar-case studies, journal club	Face-to-face seminar in which students' ability to understand and present scientific information, as well as to apply theoretical knowledge to solve practical problems, is assessed.	5h
9. Practical class-recuperation	Practical class	2h
Bibliography		

9. Evaluation

Type of activity	9.1 Evaluation criteria	9.2 Evaluation methods	9.3 Percentage in the final grade
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9.4. Course	Knowledge of informational content: 1. Explain the cellular and molecular mechanisms of immune responses 2. Analyse the genetic mechanisms underlying lymphocytes receptor diversity and signal transduction 3. Explain the mechanisms responsible for self-tolerance of the immune system.	Exam	50%
	Ability to use information in a new context. 1. Analyse molecular mechanisms of immune responses in autoimmune diseases and cancer and identify the potential therapeutic targets.	Exam	25%
9.5. Seminar/ laboratory	Skills in initiating an experiment (the principle of the methods and experimental steps) and the ability to synthesize and present scientific information in the context of current research.	Presentation of a scientific article, type research, related to one of the topic discussed during the lectures.	25%
9.6 Minimum standard for passing			
Achieving a minimum grade of 5 in both the course and the seminar/laboratory assessment components.			

10. SDG labels (Sustainable Development Goals)

		Sustainable Development Generic Label						
								
								No label applies
								

Date of entry:
08.04.2026

Signature of course coordinator

Lecturer Emilia Licarete

Signature of seminar coordinator

Lecturer Emilia Licarete