



**CD 8.5.1 CURRICULUM DISCIPLINĂ PENTRU  
STUDII UNIVERSITARE**

**Edition: 09**

**Date: 08.09.2021**

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**FACULTY OF MEDICINE  
CURRICULUM 09.12.1 MEDICINE  
CHAIR OF PATHOPHYSIOLOGY AND CLINICAL  
PATHOPHYSIOLOGY**

**APPROVED**

at the meeting of the Commission for Quality  
Assurance and Curriculum Evaluation of the  
Curriculum in Medicine Faculty

Minutes No. 1 of 16.09.21

Chairman, PhD, Associate prof.

Suman Serghei 

**APPROVED**

at the Council meeting of the Faculty  
Medicine

Minutes No. 1 of 21.09.21

Dean of Faculty, PhD, Associate prof.

Placinta Gheoghe 

**APPROVED**

at the meeting of the chair Physiopathology and Clinical  
Physiopathology

Minutes No.1. of 09.09.2021

Head of chair, PhD, prof.

Cobet Valeriu 

**SYLLABUS  
IMMUNOLOGY**

**Integrated studies / Cycle I, License**

Type of course: **Compulsory**

Curriculum developed by the team of authors:

Cobet Valeriu, PhD, professor

Vorojbit Valentina, PhD, associate professor

Brocovschi Victoria, PhD, associate professor

Chisinau, 2021



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### I. INTRODUCTION

● **General presentation of the discipline: the place and role of the discipline in the formation of the specific competences of the professional/specialty training program.**

● Immunology is an integrative, interdisciplinary medical discipline, one of the basic specialties in the university training of physicians regardless of the specialty they will choose later.

● Within the discipline of immunology is ensured the acquisition by students of the notions of fundamental immunology, physiological elements and deviations from normal, as well the reaction of the human body to the action of pathogens (allergens, tumor cells, infections, etc.) and pathophysiological mechanisms of appearance and manifestation of immune system pathologies.

● The objectives of the discipline are: knowledge, deepening and correct use of immunology notions, knowledge of cellular and molecular biology of the normal humoral immune response with reference to the types of involved cells, their phenotypic characteristics, their activation mechanisms, their effector functions; knowledge of the main chapters of immunopathology of major importance for current medical practice; knowledge of the main methods of immunological investigations to establish a correct functional diagnosis.

● **Mission of the curriculum in professional training**

Immunology has the role of students providing with theoretical knowledge and practical skills, in order to use the received knowledge in different areas of medicine/medical practice. Immunology is a useful tool for clinician in diagnosis, treatment and monitoring of infectious pathologies and immunopathologies, social reintegration of these patients, as well as in medical research.

The discipline aims to provide students with optimal premises for the next years of study within the Bachelor of Medicine program, with a view to successful employment, immediately after graduation, in residency programs.

● **The language (s) of discipline teaching:** Romanian, English, Russian;

● **Beneficiaries:** third year students, Faculty of Medicine I and II, specialty of Medicine.

### II. DISCIPLINE ADMINISTRATION

Discipline code	S. 06.O.053		
The name of the discipline	Immunology		
Discipline manager (s)	Cobeț Valeriu, Vorobjit Valentina, Brocovschi Victoria		
Year	III <sup>rd</sup>	Semester/Semesters	6





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Total numbers of hours, including:			
Course	20	Training courses/ laboratory work	15
Seminars		Individual work	25
Evaluation form	E	Number of credits	2

### III. OBJECTIVES OF DISCIPLINE TRAINING

*At the end of the discipline studying the student will be able to:*

● **at the level of knowledge and understanding:**

- \* Knowledge and correct use of the notions of immunology, immune system, antigenicity and immunogenicity.
- \* Knowledge of the immune system components. Understanding of mechanisms of self/non self discrimination.
- \* Understanding of the reasons and mechanisms underlying the defense response (innate, acquired immunity).
- \* Knowledge of the main characteristics of diseases with immuno-allergic mechanisms.
- \* Understanding of principles of some techniques used in immunology.
- \* Knowledge of diagnostic elements in infectious and immunological pathologies.
- \* Knowledge of the treatment elements and principles in the pathologies of the immune system.

● **at the level of application:**

Familiarization of students with aspects related to the application of theoretical and practical principles of immunology with emphasis of diagnostic methods use: serological, histological, immunofluorescence, in vivo testing).

● **at the level of integration:**

- \* Familiarization with the main research directions in the areas of immunology.
- \* Formation of an integrative attitude of the acquired knowledge and skills.
- \* Exercising the capacity of synthesis and bibliographic documentation.

### IV. CONDITIONS AND PREREQUISITES

For learning of Immunology discipline:

- knowledge of the language of instruction;
- digital skills (internet use, document processing, electronic tables and presentations);
- ability to communicate and work in a team;
- qualities –tolerance, compassion, autonomy.





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- deep knowledge in fundamental sciences: anatomy, human physiology, molecular biology and medical genetics, microbiology, physiopathology, medical semiology, etc.)

**V. THEMATIC AND ORIENTATIVE DISTRIBUTION OF HOURS**

*Courses (lectures), practical trainings/laboratory works/seminars and individual work*

Nr. d/o	THOPIC	Number of hours		
		Lectures	Practical training	Individual work
1.	Overview of the Immune System (IS). Innate immune system-features, components, recognition of foreign structures.	2		
2.	Adaptive immune system, characteristic, components. Organs and tissue of IS. Ontogenesis of T and B lymphocytes. Antigen receptors of T and B lymphocytes.	2		
3.	Antigens. Antibodies (Immunoglobulins).	2		
4.	Antigen presentation and recognition. Major histocompatibility complex (MHC), antigen presenting cells (APC).	2		
5.	T (cellular) immune response- steps, triggering of T cell lymphocytes by APC, outcomes of T cells lymphocytes activation, T cells lymphocytes differentiation, effector mechanisms (Th, Tc).	2		
6.	B (humoral) immune response-stages, B cells activation, humoral immune response to T-independent and T-dependent Ag, effector mechanisms.	2		
7.	Immunological methods of diagnosis.	2		
8.	Immune tolerance and pathological immune reactions (hypersensitivity, autoimmunity, immunodeficiencies).	2		
9.	Transplant immunity. Principles and types of immunotherapy.	2		
10.	Anti-tumor immunity. Principles and types of immunotherapy in tumors.	2		
11.	Immunogenesis, immune memory, antigen types, APC, Major histocompatibility complexes types I and types II (MHC), complement cascade.	-	3	5
12.	Cellular and humoral immune response. Principles of cooperation between T lymphocytes and B lymphocytes. Immune tolerance.	-	3	5
13.	Immunodiagnostic techniques: techniques based on Ag-Ab reaction: RA, RP, immunochromatography, RN, RIF, ELISA, ALFA, CLIA-principle, applications. Flow cytometry-principles, applications.	-	3	5
14.	Congenital and acquired immunodeficiencies. Incompetence of T lymphocytes, B lymphocytes, antibodies, complement, phagocytosis. Immunosuppression. Anti-tumor and transplant immunity.	-	3	5
15.	Hypersensitivity and autoimmune diseases (case presentations). The pathogenetic entity of type II, III, and IV hypersensitivity across of evolution of immune pathologies.	-	3	5
<b>Total</b>		<b>20</b>	<b>15</b>	<b>25</b>





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**VI. REFERNCE OBJECTIVES AND UNITS OF CONTENT**

<b>Objectives</b>	<b>Content units</b>
<b>Topic (1<sup>st</sup> chapter). Overview of the Immune System (IS). Innate immunity. Innate immune system-feature, components, recognition of foreign structures.</b>	
<ul style="list-style-type: none"><li>To define</li></ul>	General notions of immunity and its types. Innate immunity.
<ul style="list-style-type: none"><li>To know</li></ul>	Innate immunity. Mechanisms of natural immunity. Barrier factors. Cellular factors of innate immunity. Pathogen recognition. Phagocytic cells. Phagocytosis. The role of phagocytosis in acquired immunity. Humoral factors of innate immunity (lysozyme, lysines, interferons, etc.). Compliment-nature, features, pathways of activation. The role of innate immunity in defense against infections, in cooperation with acquired defense mechanisms in the elimination of non-self agents, in activating the adaptive immune system.
<ul style="list-style-type: none"><li>To demonstrate</li></ul>	Abilities to understand mechanisms of recognition involved in activating the innate immune response. Knowledge of pathogen-associated molecular patterns (PAMP) and pathogen recognition receptors (PRRs). Abilities to understand the effector mechanisms of innate immunity.
<ul style="list-style-type: none"><li>To apply</li></ul>	Knowledge of the role of innate immune factors in eliminating non-self agents and in assessing immune status.
<ul style="list-style-type: none"><li>To integrate</li></ul>	Knowledge of the role of innate immunity factors in initiating of acquired (adaptive) immunity.
<b>Topic (chapter) 2. Adaptive immune system, characteristic, components. Organs and tissues of IS. Ontogenesis of T and B lymphocytes.</b>	
<ul style="list-style-type: none"><li>To define</li></ul>	Notion of acquired immunity (adaptive). Types of acquired immunity (humoral and cellular, natural, artificial). Immunocompetent cells. Antigen receptors, somatic recombination.
<ul style="list-style-type: none"><li>To know</li></ul>	The immune system (IS). Features of the adaptive immune response. Organs and tissues of IS. Primary (central) and secondary (peripheral) lymphoid organs. B and T lymphocytes. Origin, maturatuion selection, biological role. Antigen receptors of B and T lymphocytes. The structure of BCR and TCR and associated membrane molecules, mechanisms of production of structural diversity of receptors.
<ul style="list-style-type: none"><li>To demonstrate</li></ul>	Abilities to understand the role of the adaptive immune system in recognizing and eliminating of non-self elements. Abilities to differentiate the processes of T and B lymphocytes ontogenesis and their role in the development of humoral and cellular immune response. Abilities to describe the migration of monocytes, granulocytes, naive lymphocytes under homeostatic conditions. Abilities to explain the usefulness of lymphocyte recirculation through the sple, lymph nodes, MALT. Ability to understand the features of antigen recognition through BCR and TCR.





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<b>Objectives</b>	<b>Content units</b>
<ul style="list-style-type: none"><li>To apply</li></ul>	Knowledge of the structure and functions of the central and peripheral lymphoid organs in understanding how to achieve the immune response. Knowledge of the stages of differentiation and maturation of T and B lymphocytes in understanding the type of immune response initiated.
<ul style="list-style-type: none"><li>To integrate</li></ul>	Knowledge of the organs and tissues of the immune system. Knowledge of the ontogenesis of T and B lymphocytes. Knowledge of T lymphocyte (TCR) and B (BCR) antigen receptors

**Topic (chapter) 3. Antigens. Antibodies (imunoglobulines).**

<ul style="list-style-type: none"><li>To define</li></ul>	Definition of antigen, epitope, immunogenicity, antigenicity (specificity), antigen valence, affinity and avidity. Notions of antibodies (Ig), complete and incomplete antibodies
<ul style="list-style-type: none"><li>To know</li></ul>	Antigens and their characteristic. Types of antigens. Complete and incomplete (haptene) antigens. Types of epitopes and valence of antigens. T-dependent and T independent antigens. Antigenic structure of bacteria and viruses. Ways of recognizing antigens by B and T lymphocytes. Antibodies (immunoglobulins), their structure. Immunoglobulin classes and their biological functions. Complete and incomplete antibodies.
<ul style="list-style-type: none"><li>To demonstrate</li></ul>	Abilities to distinguish between T-dependent and T-independent antigens. Ability to understand the differences in antigen recognition by B and T lymphocytes. Abilities to differentiate immunoglobulin classes (isotypes).
<ul style="list-style-type: none"><li>To apply</li></ul>	Knowledge of the antigenic structure of bacteria and viruses in establishing the etiological diagnosis of infections caused. Knowledge of the properties of immunoglobulin classes in understanding the humoral immune response.
<ul style="list-style-type: none"><li>To integrate</li></ul>	Knowledge of antigens and antibodies in understanding and mastering the subject taught in the disciplines of epidemiology, infectious diseases, allergology, oncology, etc.

**Topic (chapter) 4. Presentation and recognition of antigens. Major Complex of Histocompatibility (MCH), antigen presenting cells (APC).**

<ul style="list-style-type: none"><li>To define</li></ul>	Definition of major histocompatibility complex. Definition of antigen presenting cell. Definition of HLA genes.
<ul style="list-style-type: none"><li>To know</li></ul>	Cells that engage MHC type I and type II, as well as patterns of functioning in adaptive immunity. Professional immunocompetent antigen presenting cells, function, main classes, and imminent locations in the body. The role of MHC in allo-antigen recognition and graft rejection.
<ul style="list-style-type: none"><li>To demonstrate</li></ul>	Ability to distinguish between the T-CD <sub>8</sub> cell antigen presentation model by MHC I-expressing nuclear cells and the T-CD <sub>4</sub> cell by MHC-expressing APC.
<ul style="list-style-type: none"><li>To apply</li></ul>	Knowledge of the polygenic and polymorphological aspects of MHC in order to activate T-CD <sub>8</sub> cells and trigger the immune response by activating T-CD <sub>4</sub> by APC, including in the cooperation interface of B lymphocytes and T-CD <sub>4</sub> lymphocytes (Th <sub>1</sub> and Th <sub>2</sub> ) important in regulating the synthesis of antibodies and immunoglobulins.





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	Knowledge of T lymphocyte receptors involved in antigen recognition and B lymphocytes involved in promoting humoral immunity.
<ul style="list-style-type: none"><li>To integrate</li></ul>	Knowledge of the functionality of MHC I and MHC II regarding the processing and presentation of T-CD8 and T-CD4 cell antigen in understanding and mastering the subject taught in the disciplines of epidemiology, infectious diseases, allergology, oncology, etc.
<b>Topic (chapter) 5. T cell immune response (cellular) – stages, activation of T cells by APC, consequences of T cell activation, differentiation of T cells, T effector mechanisms (Th, Tc).</b>	
<ul style="list-style-type: none"><li>To define</li></ul>	Definition of cellular immune response. Definition of T lymphocyte population and imminent subtypes.
<ul style="list-style-type: none"><li>To know</li></ul>	Mechanisms, stages of T lymphocyte activation and inherent consequences. Initial signaling step by recognition of APC antigen by glycoprotein receptors of T-CD4 and T-CD8. The stage of proliferation of T lymphocytes that engage specific co-stimulation molecules, such as CD28 on the T-CD4 surface that binds CD80 and CD86-APC-MHC II or CD70 and CD137 expressed on CD-8. The extent of T lymphocyte differentiation in Th1 and Th2 subpopulations. The mechanism of promoting the cellular immune response through CD-4 (Th1 and Th2), which through cytokines cooperates with B lymphocytes and ensures the inflammatory response or through CD-8 which induces apoptosis and cytolysis of infected cells (cytotoxic lymphocytes).
<ul style="list-style-type: none"><li>To demonstrate</li></ul>	Abilities to distinguish between T-CD4 and T-CD8 lymphocyte activation patterns, as well as the role of these 2 classes of lymphocytes in promoting the cellular immune response.
<ul style="list-style-type: none"><li>To apply</li></ul>	Knowledge related to the activation, proliferation and differentiation of T lymphocytes in ensuring the cellular immune response, aimed at the elimination of pathogenic antigen.
<ul style="list-style-type: none"><li>To integrate</li></ul>	Knowledge about the entity of the cellular immune response in understanding and mastering adaptive immunity, as well as the conceptual support of delayed hypersensitivity.
<b>Topic (chapter) 6. B cell immune response (humoral) – stages, activation of B cells, humoral immune response to T-independent and T-dependent antigens, effector mechanisms</b>	
<ul style="list-style-type: none"><li>To define</li></ul>	Definition of humoral immune response. Definition of B lymphocytes, plasma cells, immunoglobulins and antibodies. Definition of T-independent and T-dependent antigens.
<ul style="list-style-type: none"><li>To know</li></ul>	The mechanism of B lymphocyte activation, the role of T lymphocyte and other cell cytokines in plasma cell differentiation and segregation of the synthesized antibody type. The role of CD40, IL-4 and IL-21 in the activation of B lymphocytes in the action of T-dependent Ag, stopped by MHC II. The phenomenon of blast-transformation (proliferation) of B lymphocytes, the formation in the lymphoid tissue of populations of B-memory lymphocytes and antibody-producing plasma cells in adaptive immunity. Mechanism of B lymphocyte activation unassisted by T lymphocytes (independent Ag T represented primarily by bacterial polysaccharides). Functional characteristic of the 5 classes of antibodies.
<b>Objectives</b>	<b>Units of content</b>





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<ul style="list-style-type: none"><li>To demonstrate</li></ul>	Abilities to distinguish between patterns of activation of B lymphocytes by the action of T-dependent and T-independent antigens. Abilities to highlight the time of humoral immune response to the action of T-dependent and T-independent antigens, as well as the functional feasibility of antibodies in these 2 patterns of B lymphocyte activation.
<ul style="list-style-type: none"><li>To apply</li></ul>	Knowledge of imminent B lymphocyte activation and promotion of humoral immune response, including in the assistance of T lymphocytes. Knowledge of the functional feasibility of memory B lymphocytes and plasma cells, as well as the 5 classes of antibodies.
<ul style="list-style-type: none"><li>To integrate</li></ul>	Knowledge of triggering the humoral immune response to the action of pathogenic antigen, as well as the interaction of antigen and antibodies in the study and understanding of autoimmune processes, endocrine, nervous diseases, etc.

**Topic (chapter) 7. Immunologic methods of diagnosis**

<ul style="list-style-type: none"><li>To define</li></ul>	Immunological method of diagnosis. Serological reactions. Definition of serodiagnosis and seroidentification
<ul style="list-style-type: none"><li>To know</li></ul>	The mechanism of antigen-antibody reactions in vitro. The main serological reactions used in medical practice (components, mechanism and principle of reaction, interpretation, use): Agglutination reaction (direct, indirect, on the blade, in tubes) Precipitation reaction (annular, gel immunodiffusion) Coombs immunofluorescence reaction (direct and indirect RIF) Direct and indirect enzyme-linked immunosorbent assay (ELISA, ELFA, CLIA).
<ul style="list-style-type: none"><li>To demonstrate</li></ul>	Ability to understand the difference between serodiagnosis and seroidentification and their practical use. Knowledge of the mechanisms and interpretation of the results of the studied serological reactions.
<ul style="list-style-type: none"><li>To apply</li></ul>	Knowledge of the mechanism of antigen-antibody reactions in vitro. Knowledge of the practical use of serological reactions.
<ul style="list-style-type: none"><li>To integrate</li></ul>	Knowledge of the interaction between antigen and antibody in vitro in the study of allergology, endocrinology, oncology, infectious diseases, epidemiology, and other disciplines.

**Topic (chapter) 8. Immune tolerance and pathologic immune reactions (hypersensitivity, autoimmunity, immunodeficiencies)**

<ul style="list-style-type: none"><li>To define</li></ul>	Hypersensitivity, immune tolerance, and autoimmunity highlight key elements in the definition. Primary and secondary immunodeficiencies and highlight key elements of the definition.
<ul style="list-style-type: none"><li>To know</li></ul>	Hypersensitivity reactions (HSR): differentiation of normal immune responses from pathological ones. Definition and classification of HSR. The mechanism of hypersensitivity. Examples of pathologies for types I-IV of hypersensitivity reactions. How to identify hypersensitivity. Type I hypersensitivity - allergic. Allergic diseases - mechanism, presentation, diagnosis, treatment. Examples of allergic diseases: rhinitis, asthma, anaphylactic shock, dermatitis, eczema. Principles for inducing immunological tolerance.





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	<p>Type II hypersensitivity: definition, principle stages of HSR-II development (complement activation, acute inflammation, ADCC). Examples of pathologies and paraclinical evaluation.</p> <p>Type III hypersensitivity - definition, immune complexes (IC) to normal (origin, quantitative and qualitative features).</p> <p>Type IV hypersensitivity - definition, principle stages. Examples of pathologies and paraclinical evaluation.</p> <p>Tolerance and autoimmunity - mechanisms of production, methods of diagnosis, presentation, treatment, examples of autoimmune diseases: systemic lupus, rheumatoid arthritis.</p> <p>The mechanism and types of primary immunodeficiencies, methods of presentation of diseases by immunodeficiency, methods of diagnosis of primary immunodeficiencies, treatments used.</p> <p>Mechanism and types of secondary immunodeficiencies, methods of presenting immunodeficiency diseases, methods of diagnosis of secondary immunodeficiencies, treatments used.</p>
<ul style="list-style-type: none"><li>• To demonstrate</li></ul>	<p>Abilities to understand the pathogenetic mechanisms in hypersensitivity reactions, autoimmune pathologies and primary and secondary immunodeficiencies.</p> <p>Ability to analyze diagnostic methods in hypersensitivity, autoimmunity and primary and secondary immunodeficiencies.</p>
<ul style="list-style-type: none"><li>• To apply</li></ul>	<p>Knowledge related to the interpretation of normal and pathological values of hemo-leukogram and leukocyte formula.</p> <p>Knowledge related to performing and interpreting diagnostic tests in different types of hypersensitivity reactions.</p> <p>Knowledge related to the interpretation of autoantibodies in autoimmune pathologies, examples.</p> <p>Knowledge related to the diagnostic algorithm in primary and secondary immunodeficiencies, hypersensitivity or autoimmune pathologies.</p>
<ul style="list-style-type: none"><li>• To integrate</li></ul>	<p>Knowledge related to pathogenetic mechanisms, clinical and laboratory manifestations in autoimmune, allergic pathologies, immunodeficiencies.</p> <p>Knowledge about the pathogenetic mechanisms and aspects of immunotherapy in autoimmune pathologies, allergies, immunodeficiencies.</p>

**Topic (chapter) 9. Transplant immunity, principles and types of immunotherapy in transplant**

<ul style="list-style-type: none"><li>• To define</li></ul>	<p>Definition of transplant immunology and highlight key elements in the definition.</p>
<ul style="list-style-type: none"><li>• To know</li></ul>	<p>Types of transplants. Types of donors. Mechanisms for obtaining compatibility. Laboratory investigations in compatibility assessment.</p> <p>The role of MHC, mechanisms involved in the rejection of transplanted organs. Types of graft rejection. Graft reaction against the host.</p> <p>Immunosuppression. Immunosuppressive treatments in transplantation</p>
<ul style="list-style-type: none"><li>• To demonstrate</li></ul>	<p>Abilities to understand the pathogenetic mechanisms in transplantation, in the tolerance or rejection of transplanted structures or organs.</p> <p>Abilities to analyze the diagnostic methods of pre-transplant compatibility (donor-recipient).</p> <p>Abilities to understand the mechanisms and types of immunosuppression in transplantation.</p>





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<ul style="list-style-type: none"><li>To apply</li></ul>	Knowledge related to transplant types and donor types. Knowledge of performing and interpreting diagnostic tests in assessing pre-transplant compatibility. Knowledge related to the interpretation of clinical manifestations of graft rejection, graft versus host disease. Knowledge related to diagnostic algorithm of the pre-transplant compatibility.
<ul style="list-style-type: none"><li>To integrate</li></ul>	Knowledge of pathogenetic mechanisms in transplantation, clinical and laboratory manifestations in graft rejection, graft-versus-host disease. Knowledge of pathogenetic mechanisms and aspects of immunotherapy in transplantation.
<b>Topic (chapter) 10. Anti-tumor immunity, principles and types of immunotherapy in tumors</b>	
<ul style="list-style-type: none"><li>To define</li></ul>	General notions about tumors, tumor cells, tumor antigens, oncogenes and anti-oncogenes and to highlight the key elements of the definition.
<ul style="list-style-type: none"><li>To know</li></ul>	Tumor antigens, oncogenic and anti-oncogenic antigens. Specific and non-specific immunity in anti-tumor defense. Immune methods of oncological surveillance. Immune control points. Immunoediting theory in tumors. Mechanisms of tumor cell proliferation. Tumor destruction methods. Immunological inactivation by tumors. Tumor markers. Paraneoplastic syndromes. Principles and types of immunotherapy and immunosuppression in tumors.
<ul style="list-style-type: none"><li>To demonstrate</li></ul>	Ability to understand the pathogenic mechanisms in tumors. Skills for analysis and understanding the mechanisms of tumor formation, immunoediting mechanisms in tumors and paraneoplastic syndromes. Abilities to understand the mechanisms and types of immunotherapy in tumors.
<ul style="list-style-type: none"><li>To apply</li></ul>	Knowledge of the types of immunological mechanisms in tumors and the proliferation of tumor cells. Knowledge related to the interpretation of clinical manifestations in paraneoplastic syndromes. Knowledge of the types of immunotherapy in tumors.
<ul style="list-style-type: none"><li>To integrate</li></ul>	Knowledge of pathogenic mechanisms in tumors and tumor cell proliferation. Knowledge of the pathogenic mechanisms and aspects of immunotherapy in tumors.

✓ **PROFESSIONAL (SPECIFIC (SC)) AND TRANSVERSAL (TC) COMPETENCES AND STUDY OUTCOMES**

✓ **Professional (specific) (SC) competences:**

- CP1. Responsible execution of professional tasks with the application of the values and norms of professional ethics, as well as in accordance with the current legislation;
- CP2. Profound knowledge of natural medical disciplines on morpho-functional features and adaptive-compensatory reactivity inherent in human body's homeostasis, its dysfunction, including the immune system, immune pathologies, and the interface relation between health and physical and social environment.
- CP3. Consolidation of the conceptual and technical-methodological algorithm in order to solve different problems and clinical situations at the connotation of the diagnosis of immune





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disorders and the designation of pathogenic treatment principles, as well as emergency medicine manoeuvres.

- CP4. Knowledge and application of landmarks to promote a healthy lifestyle, as well as prevention and self-care measures.
- CP5. The ability to integrate the specialist in the interdisciplinary activity, efficiently using the conceptual and technical-methodological potential.
- CP6. The intelligible approach and realization of actually scientific research in immunology domain.

### ✓ **Transversal competences (TC)**

- CT1. Formation of the professional ability regarding the autonomy and responsibility of the activity in solving the approaches and imminent requirements of the immunology discipline.

### ✓ **Study outcomes**

- To know the evolutionary peculiarities of the normal and pathological functions of the immune system.
- To know the particularities of pathogenetic mechanisms and diagnostic methodology of the immune system pathologies.
- To know the role of clinical, laboratory and instrumental investigations in the diagnosis of immune system diseases.
- To be able to deduce the interrelationships between immunology and other medical disciplines (allergology, microbiology, pediatrics, oncology, transplantation) performing multidisciplinary integration.
- To be able daily to learn new achievements in immunology.

**Note. Study findings** (are deduced from the professional competencies and formative valences of the informational content of the discipline).

### **III. SELF-TRENING WORK OF STUDENT**

Nr.	Expected product	Achievement strategies	Evaluation criteria	Deadline
1.	Working with information sources	Reading the material presented during the course and from the textbook at the respective topic. Highlighting subjects of the topic that need reflection. To familiarize with the list of additional information sources of the respective topic. Formulation of generalizations and conclusions regarding the importance of the approached topic.	Ability to extract the essential; interpretation skills; workload	During the semester
2.	Working with online sources	Studying online materials on sites with specialized databases and literature.	Presentation of information at practical works	During the semester



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3.	Practice different learning techniques		Workload The degree of understanding the essence of the subject The level of scientific argumentation Quality of conclusions Elements of creativity Demonstration of clinical rationality Demonstration of practical skills	During the semester
4.	Activity of patient examination during practical work	Clinical examination of the patient, identification of the immune system organs (primary and secondary), peculiarities in the laboratory and instrumental examination of patients with immune and allergic pathologies, acquisition of the diagnostic algorithm, differential diagnosis, discussion of clinical cases.	Correct analysis and argumentation of the mechanisms and types of immunological pathologies, the investigation plan and the principles of immunotherapy	During the semester
5.	Preparing and realising presentations on various immunology topics	Selecting the theme of the presentations and terms of realization	Workload The degree of understanding the essence of the subject The level of scientific argumentation Quality of conclusions Elements of creativity Formation of personal attitude Graphic presentation Presentation method	During the semester

#### **IV. METHODOLOGICAL SUGGESTIONS FOR TEACHING-LEARNING-EVALUATION**

- ***Teaching and learning methods used***

The discipline of Immunology is taught in a classical way: with lectures and seminars/practical works. The theoretical course is taught by the titular's course. In the theoretical lessons along with traditional methods also are used modern methods: lesson-debate, lesson-conference, lesson with problem exegesis, which are oriented towards effective learning and achievement of the teaching process objectives. In the practical works are used forms of individual, frontal, group activity, virtual laboratory works. During the lessons and extra-curricular activities the informational communication technologies are used - PowerPoint presentations, videos, etc.





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• **Applied teaching strategies / technologies (specific to the discipline)**  
„Brainstorming”, „Multi-voting”; „Round table”; „Group interview”; „Case study”; „Creative controversy ”; „Focus- group technique”; „Portfolio””.

• **Assessment methods (including how to calculate the final grade)**

**Current:**

- a) application of tests,
- (b) problem solving,
- (c) analysis of case studies,
- (e) control assessments

**Final: exam**

The final mark will consist of the average mark obtained in 3 current conclusions of the discipline (coefficient 0.5) and the final test in the computer system (coefficient 0.5).

**Method of mark rounding at different assessment stages**

Intermediate marks scale (annual average, marks from the examination stages)	National Assessment System	ECTS Equivalent
1,00-3,00	2	F
3,01-4,99	4	FX
5,00	5	E
5,01-5,50	5,5	
5,51-6,0	6	
6,01-6,50	6,5	D
6,51-7,00	7	
7,01-7,50	7,5	C
7,51-8,00	8	
8,01-8,50	8,5	B
8,51-9,00	9	
9,01-9,50	9,5	A
9,51-10,0	10	

The annual average mark and marks of all stages of final examination (computer-assisted, test, oral answer) - all will be expressed in numbers according to the grading scale (according to the table), and the final obtained mark will be expressed in numbers with two decimals, which will be written in the notebook.

*Absence on examination without good reason is recorded as "absent" and is equivalent to 0 (zero). The student has the right to have two re-examination on the non-passed exam.*





**CD 8.5.1 CURRICULUM DISCIPLINĂ PENTRU  
STUDII UNIVERSITARE**

**Edition: 09**

**Date: 08.09.2021**

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**V. RECOMMENDED BIBLIOGRAPHY:**

*A. Compulsory:*

1. Abbas A.K. et. al., *Cellular and Molecular Immunology, 9th edition.* 2019: p. 547.
2. Helbert M., *Immunology for medical students.* Third edition. 2017: p. 305.

*B. Additional:*

1. First Aid for the USMLE Step 1; 30th Anniversary Edition; . 2020.
2. Jeffrey K., *Introductory Immunology: Basic concepts for interdisciplinary applications;* second edition 2019.
3. Kaplan Medical, USMLE. STEP 1. *Lecture Notes 2018. Immunology and Microbiology.* 2018: p. 504.
4. Mak T.W., et. al., *The Immune Response. Basic and Clinical Principles.* 2006: p. 1216.
5. Punt J., Stranford S.A., et. al., *Kuby Immunology, 8th Edition.* 2018: p. 1905.
6. Rich R., Fleisher T., et. al., *Clinical Immunology: Principles and Practice;* 5th edition. 2019: p. 1357.
7. Spickett G.P. *Oxford Handbook of Clinical Immunology and Allergy.* Third edition. 2013.
8. Playfair J.H., et. al., *Immunology at a Glance.* 10th Edition. 2013: p. 120.