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**Federal State Autonomous Educational Institution of Higher Education**  
**PEOPLES' FRIENDSHIP UNIVERSITY OF RUSSIA**  
**NAMED AFTER PATRICE LUMUMBA**  
**RUDN University**

**Institute of Medicine**

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educational division (faculty/institute/academy) as higher education programme developer

**COURSE SYLLABUS**

**ECONOMICS**

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course title

**Recommended by the Didactic Council for the Education Field of:**

31.05.01 General Medicine

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field of studies / speciality code and title

**The course instruction is implemented within the professional education  
programme of higher education:**

General Medicine

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higher education programme profile/specialisation title

**2026**

## 1. COURSE GOAL(s)

The main purpose is to form students' modern knowledge about the structure and functions of the immune system, types of immunity; distinctive characteristics of immune reactions under normal or pathological conditions; methods of clinical, laboratory and instrumental diagnostics, traditional and innovative directions in prevention, treatment of patients with immunopathology.

The above goal can be reached by the solution of a number of objectives:

- building up the students' skills in comprehension about the structure of immune system, its characteristics in different ages, cellular and molecular development mechanisms and functioning of the immune system, the main stages, types, genetical control of immune response, immune diagnosis.
- building up the students' knowledge and skills on estimating laboratory results in immunodeficiency conditions, allergic and other types of immune-dependent diseases.
- building up the students' knowledge in primary immunodeficiency, HIV-infection, AIDS and secondary immunodeficiency conditions.
- building up the students' skills in determination of the AB0 and RhD blood group systems.
- building up the students' knowledge about hypersensitivity reactions, classification its according to Gell and Coombs, etiology and pathogenesis of I-IV hypersensitivity types.
- building up the students' knowledge about transplantation immunology, graft rejection reactions.
- building up the students' knowledge about tolerance and autoimmunity.
- building up the students' knowledge about antitumor immunity.

## 2. REQUIREMENTS FOR LEARNING OUTCOMES

The mastering of the course «**Immunology**» is aimed at the formation of the following competencies of students: **GPC-5, PC-2**

*Table 2.1. List of competences that students acquire through the course study*

<b>Competence code</b>	<b>Competence descriptor</b>	<b>Competence formation indicators</b> (within this course)
<b>GPC-5</b>	Being able to assess morpho-functional, physiological conditions and pathological processes in the human body to solve professional tasks	GPC-5.1. Mastering the algorithm of clinical, laboratory and functional diagnosis when dealing with professional tasks. GPC-5.2. Being able to evaluate the results of clinical, laboratory and functional diagnosis when dealing with professional tasks, including with the use of artificial intelligence technologies. GPC-5.3. Being able to determine morpho-functional, physiological states and pathological processes of the human body.
<b>PC-2</b>	Being able to examine a patient in order to	PC-2.3. Being able to refer a patient to a laboratory examination in case there are

Competence code	Competence descriptor	Competence formation indicators (within this course)
	determine a diagnosis	medical indications in accordance with the current procedures for the provision of medical care, clinical guidelines (treatment protocols) on the provision of medical care taking into account the medical care standards.

### 3. COURSE IN HIGHER EDUCATION PROGRAMME STRUCTURE

*The course refers to the core/variable/elective\* component of (B1) block of the higher educational programme curriculum.*

\* - Underline whatever applicable.

Within the higher education programme students also master other (modules) and / or internships that contribute to the achievement of the expected learning outcomes as results of the course study.

*Table 3.1. The list of the higher education programme components/disciplines that contribute to the achievement of the expected learning outcomes as the course study results*

Competence code	Competence descriptor	Previous courses/modules*	Subsequent courses/modules*
<b>GPC-5</b>	Being able to assess morpho-functional, physiological conditions and pathological processes in the human body to solve professional tasks	Biochemistry; Normal Physiology; Biology; Microbiology, Virology; Propaedeutics of Internal disease; Chemistry; Bioorganic Chemistry; Anatomy; Histology, Embryology, Cytology	General Surgery; Obstetrics and Gynecology; Oncology, Radiation Therapy; Pathophysiology, Clinical Pathophysiology; Molecular Genetics in Practical Biology and Medicine; Methods of Microbiological Diagnostics; Propaedeutics of Internal disease; Pathological Anatomy, Clinical Pathological Anatomy; Radiology; Medical Elementology; Phthisiology; Anesthesiology, Resuscitation, Intensive Care; Ophthalmology; Methods in Cell Biology

			and Histology; Pharmacology; Topographic Anatomy and Operative Surgery; Forensic Medicine; Maxillofacial Surgery; Medical Forensics; Otorhinolaryngology; Paediatrics; Autopsy Course;
<b>PC-2</b>	Being able to examine a patient in order to determine a diagnosis	Propaedeutics of Internal disease; Microbiology, Virology; Molecular Genetics in Practical Biology and Medicine	General surgery; Dermatovenereology; Neurology, medical genetics, neurosurgery; Ophthalmology; Faculty Surgery; Professional Diseases; Hospital Therapy; Endocrinology; Polyclinic Therapy; Hospital Surgery, Pediatric Surgery; Pediatrics; Obstetrics and Gynecology; Anesthesiology, Resuscitation, Intensive Care; Oncology, Radiation Therapy; Otorhinolaryngology; Reproductive Health; Traumatology, Orthopedics; Faculty Therapy; Maxillofacial Surgery; General Medical Skills; Emergency Medicine; Propaedeutics of Internal disease; Urology; Infectious diseases; Psychiatry, Medical Psychology; Allergology; Phthisiology; Endoscopic Urology; Telemedicine; Clinical Dentistry;

			<p>Topical Issues of Neonatology; Cardiology Case Challenges; Medical Enzymology; Molecular Genetics in Practical Biology and Medicine; Methods of Microbiological Diagnostics; Evidence-based Medicine; Autopsy Course; Radiology; Pathophysiology, Clinical Pathophysiology; Pathological Anatomy, Clinical Pathological; Medical Elementology;</p> <p><b>Practice:</b>  Practice of surgical profile: assistant surgeon;  Assistant physician of the therapeutic profile: assistant physician therapist;  General medical practice: assistant to an outpatient clinic doctor;  Practice of obstetric and gynecological profile: assistant gynecologist;  Practice of obstetric and gynecological profile: assistant obstetrician;  General Medical practice: Assistant Pediatrician</p>
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#### 4. THE DISCIPLINE WORKLOAD AND ACADEMIC ACTIVITIES

The total workload of the course is 2 credits (72 academic hours).

*Table 4.1. Types of academic activities during the periods of higher education programme mastering (full-time training)\**

Type of academic activities	Total academic hours	Semesters/training modules
		5
Contact academic hours	54	54

Type of academic activities		Total academic hours	Semesters/training modules
			5
Lectures (LC)		18	18
Lab work (LW)		36	36
Seminars (workshops/tutorials) (S)		-	-
<i>Self-studies</i>		15	15
<i>Evaluation and assessment (exam/passing/failing grade)</i>		3	3
<b>Course workload</b>	ac.h.	72	72
	credits	2	2

## 5. THE COURSE MODULES AND CONTENTS

Table 5.1. The content of the discipline and types of academic activities

Course module title	Course module contents (topics)	Academic activities types
<b>Module 1</b> Basic immunology	1.1. Introduction to immunology. Subject, objectives, and theories of immunity Immunology as a scientific discipline. The concept of immunity and its role in maintaining homeostasis. Major theories of immunity (cellular, humoral, clonal selection theory, and pattern recognition theory). Historical development of immunology.	LC, LW
	1.2. Structure of the immune system. organs, hematopoiesis, and types of immunity The immune system: organs, tissues, cells, and molecules. Primary (bone marrow, thymus) and secondary (spleen, lymph nodes, mucosa-associated lymphoid tissue) lymphoid organs. Hematopoiesis: lymphopoiesis (immunopoiesis) and myelopoiesis as processes of differentiation and maturation of immune cells. Age-related changes of the thymus. Innate and adaptive immunity.	LC, LW
	1.3. Innate immunity. Pattern recognition receptors (PRRs) and signaling pathways Innate immunity: properties and functions. Pattern recognition receptors (PRRs) and their ligands (PAMPs, DAMPs). PRR families (TLR, NLR, RLR, CLR, ALR, cGAS-STING). Signaling pathways (MyD88, TRIF, MAVS, STING; NF- $\kappa$ B, IRF). Production of cytokines and interferons.	LC, LW

Course module title	Course module contents (topics)	Academic activities types
	<p>1.4. Cells of innate immunity. Phagocytosis. Innate lymphoid cells Innate immune cells of myeloid lineage: neutrophils, monocytes/macrophages, dendritic cells (myeloid and plasmacytoid), basophils, eosinophils, and mast cells. Phagocytosis: main stages and mechanisms. Innate lymphoid cells (ILC1, ILC2, ILC3), natural killer (NK) cells. Trained immunity.</p>	LC, LW
	<p>1.5. Humoral factors of innate immunity. The complement system: classical, alternative, and lectin pathways of activation; effector functions (opsonization, lysis, inflammation). Endogenous antimicrobial peptides: defensins (<math>\alpha</math> and <math>\beta</math>), cathelicidins (LL-37). Antimicrobial proteins (lysozyme, lactoferrin). Interferons: type I (IFN-<math>\alpha/\beta</math>), type II (IFN-<math>\gamma</math>), and type III (IFN-<math>\lambda</math>): sources and functions. Acute-phase proteins (C-reactive protein, mannose-binding lectin).</p>	LC, LW
	<p>1.6. Cytokines, chemokines, and intercellular interactions Intercellular interactions in the immune response: direct and indirect mechanisms. Adhesion molecules: selectins (rolling), integrins (firm adhesion), and immunoglobulin superfamily molecules (ICAM, VCAM). Cytokines: classification (interleukins, interferons, tumor necrosis factors, colony-stimulating factors) and functions (regulation of cell growth, differentiation, and activity). Chemokines and their receptors: regulation of directed migration (chemotaxis). Lymphocyte homing: mechanisms of selective migration to lymphoid organs and tissues (chemokine gradients, adhesion molecules).</p>	LC, LW
	<p>1.7. Major histocompatibility complex (HLA). Antigen presentation Major histocompatibility complex (MHC; HLA in humans): organization and functions. HLA class I and II molecules: expression and role in presenting endogenous and exogenous antigens to CD8<sup>+</sup> and CD4<sup>+</sup> T lymphocytes. Antigen-presenting cells.</p>	LC, LW

Course module title	Course module contents (topics)	Academic activities types
	Antigen processing: endogenous and exogenous pathways. Cross-presentation of antigens.	
	1.8. Antigens and antibodies Antigens: properties and interaction with immune receptors (BCR, TCR), epitopes. Types of antigens (T-dependent, T-independent, superantigens). Antibodies (immunoglobulins): structure and functions (Fab, Fc). Classes of immunoglobulins (IgG, IgA, IgM, IgE, IgD). Mechanisms of the humoral response: class switching and somatic hypermutation. Antibody affinity and avidity.	LC, LW
	1.9. T and B lymphocytes Development and maturation of T and B lymphocytes (thymus, bone marrow), T-cell selection. T-lymphocyte subsets (CD4+: Th1, Th2, Th17, Tfh, Treg; CD8+: cytotoxic T cells). B lymphocytes and their differentiation. Antigen-specific receptors (TCR, BCR): structure and functions. Generation of receptor diversity: V(D)J recombination.	LC, LW
	1.10. Immune response. Types and effector mechanisms The immune response: main stages (antigen recognition, activation, proliferation, and differentiation of lymphocytes, effector phase). Types of T-helper responses (Th1, Th2, Th17, Tfh, Treg) and their functions. Effector mechanisms (cell-mediated and humoral immunity). Mucosal immunity: features, role of IgA and mucosa-associated lymphoid tissue.	LC, LW
	1.11. Regulation of the immune response. Tolerance. Transplantation immunity Mechanisms of immune response regulation. Apoptosis as a mechanism of programmed cell death. Immune suppression (regulatory T cells, myeloid-derived suppressor cells). Immunological tolerance: central and peripheral. Immune-privileged tissues and their protective mechanisms. Transplantation immunity: graft rejection and the importance of HLA compatibility.	LC, LW
<b>Module 2</b> Clinical immunology	2.1. Immunopathology. Hypersensitivity Reactions	LC, LW

Course module title	Course module contents (topics)	Academic activities types
	<p>Immunopathological reactions: mechanisms and causes. Classification of hypersensitivity according to Gell and Coombs (types I–IV). Major types: IgE-mediated, antibody-dependent cytotoxic, immune complex-mediated, and cell-mediated reactions. Subtypes of type IV (IVa–IVd). Clinical manifestations and diagnostic principles.</p>	
	<p>2.2. Allergy. Pathogenesis, diagnosis, and treatment Allergy: definition and allergens. Immunological mechanisms (predominantly IgE-mediated reactions involving Th2 responses, with possible involvement of other hypersensitivity types). Effector cells (mast cells, basophils, eosinophils, T lymphocytes). Inflammatory mediators and phases of allergic reactions. Clinical forms of allergy. Diagnostics (skin tests, specific IgE, provocation tests). Principles of therapy (allergen avoidance, pharmacotherapy, allergen-specific immunotherapy, biological therapy).</p>	LC, LW
	<p>2.3. Autoimmune diseases. Pathogenesis, diagnosis, and treatment Autoimmune diseases: breakdown of immunological tolerance to self-antigens. Etiology (genetic predisposition, environmental triggers). Immunopathogenesis (activation of autoreactive T and B lymphocytes, autoantibody production, chronic inflammation). Organ-specific and systemic forms. Diagnostics (detection of autoantibodies). Principles of therapy (immunosuppressants, glucocorticoids, targeted biological agents).</p>	LC, LW
	<p>2.4. Inborn errors of immunity (IEI) and secondary immunodeficiencies Inborn errors of immunity (IEI): genetically determined disorders of the immune system. IUIS classification. Main clinical manifestations (infections, autoimmunity, lymphoproliferation, hyperinflammation). Diagnostics (assessment of cellular and humoral immunity, molecular genetic methods). Principles of therapy (immunoglobulin replacement therapy, hematopoietic stem cell transplantation, gene therapy). Secondary</p>	LC, LW

Course module title	Course module contents (topics)	Academic activities types
	immunodeficiencies: causes (infections, immunosuppressive therapy, metabolic and oncological diseases), mechanisms of development. Diagnostics and treatment principles (elimination of the underlying cause, infection prevention, replacement therapy).	
	2.5. Antitumor immunity. Antitumor immunity: mechanisms of recognition and elimination of transformed cells. Cancer immunoediting (elimination, equilibrium, escape). Tumor antigens (TAA, TSA, neoantigens). Effector mechanisms of antitumor immunity. Mechanisms of tumor immune evasion. General principles of cancer immunotherapy.	LC, LW
<b>Module 3</b> Immunodiagnosis, immunoprophylaxis, immunotherapy	3.1. Methods for assessing the immune system Assessment of immune status (immunogram): quantitative and functional parameters. Quantitative methods (leukocyte differential count, lymphocyte subsets). Functional methods (phagocytosis, complement system, lymphocyte proliferation, cytokine production). Modern techniques (flow and mass cytometry, ELISpot, molecular genetic technologies). Monoclonal antibodies: production and applications in diagnostics and therapy.	LC, LW
	3.2. Vaccines and immunotherapy  Vaccines: concept and mechanisms of active immunity formation. Types of vaccines (live attenuated, inactivated, subunit, conjugate, toxoids, mRNA vaccines, vector-based vaccines). Vaccination strategies (national immunization schedules, herd immunity, revaccination). Immunotherapy: active and passive approaches. Main directions (immune checkpoint inhibitors, cellular therapies, monoclonal antibodies). Applications of immunotherapy in oncology, autoimmune, and allergic diseases.	LC, LW

## 6. CLASSROOM EQUIPMENT AND TECHNOLOGY SUPPORT REQUIREMENT

*Table 6.1. Logistical and material provision of the discipline.*

<b>Classroom for Academic Activity Type</b>	<b>Classroom Equipment</b>	<b>Specialized educational/laboratory equipment, software and materials for the mastering of the discipline</b>
Conference room	Conference room equipped with a set of specialized furniture and digital equipment;	
Lab-work	A classroom designated for laboratory classes, individual consultations, ongoing assessment, and interim assessment, equipped with specialized furniture and laboratory equipment.	
Seminar	A classroom designated for seminar classes, group and individual consultations, ongoing assessment, and interim assessment, equipped with specialized furniture, laboratory equipment (biological microscopes – 8 units; digital microscopy cameras – 2 units; laboratory sinks – 1 unit), and a set of pipette dispensers (4 units) for precise measurements. Classroom 207, ATI	
Lab-work	A classroom designated for laboratory and seminar classes, group and individual consultations, ongoing assessment, and interim assessment, equipped with specialized furniture, as well as laboratory, diagnostic, and medical equipment.	
Self-studies	Classroom for self-studies of students (can be used for seminars and consultations), equipped with a set of specialized furniture, computers with stable wireless Internet connection.	

## 7. RESOURCES RECOMMENDED FOR COURSE STUDY

### *Main readings:*

#### ***Electronic sources:***

1. Immunology: textbook / R.M. Khaitov ; Khaitov R.M. - Moscow: GEOTAR-Media, 2021. - 272 p. - ISBN 978-5-9704-5861-7. -  
[https://mega.rudn.ru/MegaPro/UserEntry?Action=Link\\_FindDoc&id=518581&idb=0](https://mega.rudn.ru/MegaPro/UserEntry?Action=Link_FindDoc&id=518581&idb=0)

### *Additional reading:*

#### ***Electronic sources:***

1. Immunology: textbook / Rakhim M. Khaitov. - 2nd updated edition. - Moscow : GEOTAR-Media, 2022. - 272 с. - ISBN 978-5-9704-7089-3. -  
<https://www.studentlibrary.ru/book/ISBN9785970470893.html>
2. Medical Microbiology, Virology, Immunology : textbook : in 2 volumes. Vol. 1 / eds. V. V. Zverev, M. N. Boichenko. - Moscow : GEOTARMedia, 2022. - 384 с. - ISBN 978-5-9704-7072-5. -  
<https://www.studentlibrary.ru/book/ISBN9785970470725.html>
3. Medical Microbiology, Virology, Immunology : textbook : Vol. 2. / eds. V. V. Zverev, M. N. Boichenko. - Москва : ГЭОТАР-Медиа, 2020. - 392 с. - ISBN 978-5-9704-5719-1. -  
<https://www.studentlibrary.ru/book/ISBN9785970457191.html>
4. The Washington Manual Allergy, Asthma, and Immunology Subspecialty Consult / Edited by Andrew L. Kau, Jennifer M. Monroy, Brooke I. Polk, and Christopher J. Rigell; executive editor, Thomas Ciesielski. - Wolters Kluwer Health, 2022. - 411 с. - (Washington manual subspecialty consult series). - ISBN 9781975113261. -  
[https://mega.rudn.ru:443/MegaPro/UserEntry?Action=Rudn\\_FindDoc&id=513346&idb=0](https://mega.rudn.ru:443/MegaPro/UserEntry?Action=Rudn_FindDoc&id=513346&idb=0)

#### ***Internet (based) sources:***

1. Electronic libraries with access for RUDN students:
  - Electronic library network of RUDN – ELN RUDN  
<http://lib.rudn.ru/MegaPro/Web>
  - ELN «University Library online» <http://www.biblioclub.ru>
  - ELN Urait <http://www.biblio-online.ru>
  - ELN «Student Advisor» [www.studentlibrary.ru](http://www.studentlibrary.ru)
  - ELN «Lan» <http://e.lanbook.com/>
2. Databases and search engines:
  - Database elibrary.ru - scientific electronic library. The link:  
<http://elibrary.ru/defaultx.asp/>
  - Electronic libraries with access for RUDN students. The link:  
<http://lib.rudn.ru/MegaPro/Web/>
  - Electronic library of the medical university. The link:  
<http://www.studmedlib.ru/>
  - National Center for Biotechnological Information. The link:  
<https://www.ncbi.nlm.nih.gov/>

*Learning toolkits for self-studies during the development of the discipline*

1. Lectures Synopsis on the discipline "Immunology".
2. Methodological guidelines for the implementation and execution of control and independent work on the discipline "Immunology"

\* - All teaching materials for self-studying of students are placed in accordance with the current procedure on the discipline page in the RUDN LMS TUIS.

**8. EVALUATION TOOLKIT AND GRADE SYSTEM FOR ASSESSMENT**

Evaluation Toolkit (ET) and a point-rating system (PRS)\* for assessment the level of competence formation (part of competencies) based on the results of mastering the discipline "Immunology" are presented in the Appendix to this Work Program of the discipline.

\* - ET and PRS are formed on the basis of the requirements of the relevant local regulatory act of the RUDN

**DEVELOPERS:**

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department

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signature

name and surname

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