IMMUNOLOGY, INFECTION, INFLAMATION

MICROORGANISMS, IMMUNITY, AND TUMORS

SECOND YEAR

2025/2026.

Subject:

IMMUNOLOGY, INFECTION, INFLAMMATION

The course is evaluated with 6 ECTS. There are 6 hours of active teaching per week (3 hours of lectures and 3 hours of work in a small group).

Teachers:

N	name	email	title
1.	Ivan Jovanovic	ivanjovanovic77@gmail.com	Full professor
2.	Gordana Radosavljevic	perun.gr@gmail.com	Full professor
3.	Marija Milovanovic	marijaposta@gmail.com	Full professor
4.	Jelena Pantic	panticjelena55@gmail.com	Full professor
5.	Sladjana Pavlovic	sladjadile@gmail.com	Associate professor
6.	Aleksandar Arsenijevic	aleksandar.arsenijevic@yahoo.com	Associate professor
7.	Nevena Gajovic	gajovicnevena@yahoo.com	Assistant professor
8.	Vladimir Markovic	vladimirmarkovic.vlad@gmail.com	Junior teaching assistant
9.	Isidora Kostic	isidorastanisavljevic97@gmail.com	Junior teaching assistant
10.	Katarina Mijacic	katarinamijacic.99@gmail.com	Junior teaching assistant

COURSE STRUCTURE:

Module	Week	Lectures weekly	Work in a small group per week	Teacher
1	8	3	3	Prof. dr Ivan Jovanovic
2	7	3	3	
				Σ45+45=90

EVALUATION:

The grade is based on the number of earned points (maximum 100). Points are earned in two ways: through pre-exam activities and final exam:

PRE-EXAM ACTIVITIES: In this way, the student can earn up to 30 points by actively participating in small group activities and answering questions related to the week's lesson. Based on demonstrated knowledge, the student can earn between 0-2 points per week. To pass the module, student must acquire more than 50% of the total points for that module (see table).
Students who do not earn more than 50% of the points in pre-exam activity will take the exam by answering 2 questions from each module that they have not passed.

MODULE	MAXIMUM POINTS
	Activity during work in a small group
1	16
2	14
Σ	30

FINAL EXAM: In this way, the student can earn up to 70 points. The student takes the test which includes 35 questions that are covering the entire subject material. If the student does not achieve more than 50% correct answers, he/she has not passed the final exam.

The final grade is formed as follows:

In order to pass the course, the student must obtain a minimum of 51 points, pass the pre-exam activities for all modules, and pass the final exam (test).

number of points won	grade
0 - 50	5
51 - 60	6
61 - 70	7
71 - 80	8
81 - 90	9
91 - 100	10

LITERATURE:

module	the name of the textbook	authors	publisher	the library
1 and 2	Basic Immunology: Functions and Disorders of the Immune System, 6th edition.	*Abul K.Abbas and Andrew H. Lichtman*	Elsevier, Philadelphia 2019.	Yes
1 and 2	Essentials of Clinical Immunology. 6th edition. Chichester:	*Chapel H, Haeney M, Misbah S, Snowden N.*	Wiley Blackwell; 2015.	Yes
1 and 2	Case Studies in Immunology: a Clinical Companion. 7th edition.	*Geha RS, Notarangelo L.*	New York: Garland Science; 2016.	No
1 and 2	Schaechter's Mechanisms of Microbial Disease	*N. Cary Engleberg*	Walters Kluwer, 2012	Yes
1 and 2	Schaechter's Mechanisms of Microbial Disease	*N. Cary Engleberg*	Walters Kluwer, 2021	No

PowerPoint presentations of lectures and handouts are available on the website of the Faculty of Medical Sciences: **www.medf.kg.ac.rs**

PROGRAM:

FIRST MODULE

TEACHING UNIT 1 (FIRST WEEK)

INTRODUCTION TO THE IMMUNE SYSTEM

3 hours lecture

Concepts, dictionary.
Innate and acquired immunity.
Types of acquired immunity.
Properties of the acquired immune response: specificity and diversity, memory.
Cells of the immune system: lymphocytes, antigen-presenting cells, effector cells.
Tissues of the immune system: peripheral lymphoid organs, lymphocyte recirculation and migration to tissues.

TEACHING UNIT 2 (SECOND WEEK)

INNATE IMMUNITY

3 hours lecture

General properties and specificity of the innate immune response.
Cell receptors for microorganisms and damaged cells: Toll-like receptors, NOD-like receptors, and inflammasome.
Components of innate immunity: epithelial barriers, phagocytes, dendritic cells, mast cells, NK cells, complement system, cytokines of innate immunity.
Reactions of innate immunity: inflammation, antiviral defense.
How microorganisms evade innate immunity.
The role of innate immunity in stimulating acquired immune response.

TEACHING UNIT 3 (THIRD WEEK)

ANTIGEN CAPTURE AND PRESENTATION TO LYMPHOCYTES

3 hours lecture

What do T cells see?
Antigens recognized by T cells.
How antigen-presenting cells capture protein antigens.
Structure and function of major histocompatibility complex (MHC) molecules.
Properties of MHC genes and proteins.
Binding of peptides to MHC molecules.
Processing and presentation of protein antigens in the context of MHC class I.
Processing and presentation of protein antigens in the context of MHC class II.
Cross-presentation of internalized antigens to $CD8^+$ T cells.
Physiological significance of antigen presentation in the context of MHC molecules.
Other functions of antigen-presenting cells.
Antigens recognized by B cells.

TEACHING UNIT 4 (FOURTH WEEK)

RECOGNITION OF ANTIGENS IN ACQUIRED IMMUNITY

3 hours lecture

Antigen receptors of B and T cells.
Antibodies; antibody classes; monoclonal antibodies.
TCR (T cell receptor).
Development of the immune repertoire.
Early maturation of lymphocytes.
Formation of different antigen receptors.
Maturation and selection of B cells.
Maturation and selection of T cells.

TEACHING UNIT 5 (FIFTH WEEK)

CELLULAR IMMUNE RESPONSE

3 hours lecture

Phases of T-cell response.
Antigen recognition and co-stimulation.
Recognition of peptides within MHC molecules.
Role of adhesion molecules in T-cell response.
Role of co-stimulation in T-cell activation.
Stimulatory signals for activation of $CD8^+$ T cells.
Biochemical pathways of T-cell activation.
Functional response of T cells to antigen and co-stimulation.
Cytokine secretion and expression of cytokine receptors.
Clonal expansion.
Differentiation of naïve T cells into effector cells.
Generation of memory T cells.
Weakening of the immune response.

TEACHING UNIT 6 (SIXTH WEEK)

EFFECTOR MECHANISMS OF CELLULAR IMMUNITY

3 hours lecture

Types of cellular immune reactions.
Migration of effector T cells in cellular immune reactions.
Effector functions of $CD4^+$ helper T cells.
Role of Th1, Th2, and Th17 cells in organism defense.
Pathogenesis of tuberculosis and leprosy.
Effector functions of $CD8^+$ cytotoxic T cells.
Resistance of pathogens to cellular immune mechanisms.

TEACHING UNIT 7 (SEVENTH WEEK)

HUMORAL IMMUNE RESPONSE

3 hours lecture

Phases and types of humoral immune response.
Stimulation of B cells by antigen.
Antigen-induced signal transduction in B cells.
Role of complement proteins and other innate immunity signals in B cell activation.
Functional consequences of B cell activation.
Function of helper T cells in humoral immune response to protein antigens.
Activation and migration of helper T cells.
How B cells present antigens to helper T cells.
Mechanisms of B cell activation mediated by helper T cells.
Reactions occurring outside follicles and in germinal centers.
Antibody class switching.
Affinity maturation.
Humoral response to T-independent antigens.
Regulation of humoral immune response: antibody feedback regulation.

TEACHING UNIT 8 (EIGHTH WEEK)

EFFECTOR MECHANISMS OF HUMORAL IMMUNITY

3 hours lecture

Properties of antibodies determining their effector function.
Neutralization of microorganisms and their toxins.
Opsonization and phagocytosis.
Antibody-dependent cellular cytotoxicity (ADCC).

IgE and reactions mediated by mast cells and eosinophils.
Complement system: activation pathways, functions, and regulation.
Functions of antibodies at specific anatomical sites.
Mucosal immunity.
Neonatal immunity.
How microorganisms evade humoral immunity.

SECOND MODULE

TEACHING UNIT 9 (NINTH WEEK)

IMMUNE TOLERANCE AND AUTOIMMUNITY

3 hours lecture

Immune tolerance, significance, and mechanisms.
Central tolerance of T cells.
Peripheral tolerance of T cells: anergy, immune suppression mediated by regulatory T cells, deletion, apoptosis of mature lymphocytes.
Tolerance of B cells: Central tolerance of B cells, Peripheral tolerance of B cells.
Autoimmunity: pathogenesis, genetic factors, the role of infections, and the influence of other environmental factors.

TEACHING UNIT 10 (TENTH WEEK)

IMMUNOLOGY OF TUMORS AND TRANSPLANTATION

3 hours lecture

Immune response to transplanted tissues: transplant antigens, induction of immune response against grafts, immune mechanisms of graft rejection.
Prevention and therapy of graft rejection.
Transplantation of blood cells and hematopoietic stem cells.
Tolerance of the mother to fetal tissues.

TEACHING UNIT 11 (ELEVENTH WEEK)

HYPERSENSITIVITY

3 hours lecture

Types of hypersensitivity reactions.
Immediate hypersensitivity (Type I hypersensitivity): activation of Th2 lymphocytes and IgE antibody production, mast cell activation and mediator release, clinical syndromes, and therapy.
Diseases caused by antibodies and antigen-antibody complexes: etiology of antibody-mediated diseases, mechanisms of tissue damage and diseases, clinical syndromes, and therapy.
Diseases caused by T cells: etiology of T cell-mediated diseases, mechanisms of tissue damage, clinical syndromes, and therapy**.**

TEACHING UNIT 12 (TWELFTH WEEK)

CONGENITAL AND ACQUIRED IMMUNODEFICIENCIES

3 hours lecture

Concept of immunodeficiency.
Innate and acquired immunodeficiencies (genetic defects, malnutrition, infections).
Disorders of nonspecific immunity (barriers, phagocyte functions, complement component deficiencies).
Disorders of specific cellular and humoral immune response.
Acquired immunodeficiency syndrome (AIDS).

TEACHING UNIT 13 (THIRTHEENTH WEEK)

IMMUNE RESPONSE TO MICROORGANISMS. SEPSIS AND SEPTIC SHOCK

3 hours lecture

Concept of systemic inflammatory response and multiple organ dysfunction as a consequence of infection.
Etiology and pathogenesis of sepsis and septic shock.
Inflammatory mediators and regulatory cytokines in sepsis and shock, major tissue damage.
Treatment of sepsis and septic shock.

TEACHING UNIT 14 (FOURTEENTH WEEK)

IMMUNIZATION AND VACCINATION

3 hours lecture

Concept of immunization and vaccination.

TEACHING UNIT 15 (FIFTEENTH WEEK)

MICROBIOME AND THE IMMUNE SYSTEM

3 hours lecture

Microbiome.
The connection between the microbiome and the immune system.

Schedule of teaching lectures

PHARMACOLOGICAL HALL (H5) TUESDAY 13:45 - 16:00

Schedule of practical classes

WEDNESDAY	
R40	**R41**
12:45 - 15:00 **I group**	**12:45 - 15:00** **IV group**
15:00 – 17:15 **II group**	**15:00 – 17:15** **V group**
17:15 – 19:30 **II group**	**17:15 – 19:30** **VI group**

Schedule of lectures, practical classes and tests – academic calendar

LESSON SCHEDULE FOR THE SUBJECT IMMUNOLOGY, INFECTION, INFLAMMATION

module	week	date	time	place	type	method unit name	teacher
1	1			**C1**	**L**	**Introduction to the immune system**	**Prof. dr Ivan Jovanovic**
					P		Prof. dr Ivan Jovanovic Assis. prof. dr Nevena Gajovic Isidora Kostic
	2			**C1**	**L**	**Innate immunity**	**Prof. dr Marija Milovanovic**
					P		Prof. dr Marija Milovanovic Assoc. prof. dr Sladjana Pavlovic Vladimir Markovic
	3			**C1**	**L**	**Antigen capture and presentation to lymphocytes**	**Prof. dr Gordana Radosavljevic**
					P		Prof. dr Gordana Radosavljevic Prof. dr Jelena Pantic Katarina Mijacic
	4			**C1**	**L**	**Recognition of antigens in acquired immunity**	**Assoc. prof. dr Sladjana Pavlovic**
					P		Assoc. prof. dr Sladjana Pavlovic Prof. dr Jelena Pantic Isidora Kostic
	5			**C1**	**L**	**Cellular immune response**	**Prof. dr Gordana Radosavljevic**
					P		Prof. dr Gordana Radosavljevic Assoc. prof. dr Aleksandar Arsenijevic Vladimir Markovic
	6			**C1**	**L**	**Effector mechanisms of cellular immunity**	**Assoc. prof. dr Sladjana Pavlovic**

LESSON SCHEDULE FOR THE SUBJECT IMMUNOLOGY, INFECTION, INFLAMMATION

module	week	date	time	place	type	method unit name	teacher
					P		Assoc. prof. dr Sladjana Pavlovic Prof. dr Ivan Jovanovic Katarina Mijacic
	7			**C1**	**L**	**Humoral immune response**	**Assis. prof. dr Nevena Gajovic**
					P		Assis. prof. dr Nevena Gajovic Prof. dr Marija Milovanovic Isidora Kostic
	8			**C1**	**L**	**Effector mechanisms of humoral immunity**	**Prof. dr Jelena Pantic**
					P		Prof. dr Jelena Pantic Prof. dr Gordana Radosavljevic Vladimir Markovic
2	9			**C1**	**L**	**Immune tolerance and autoimmunity**	**Prof. dr Jelena Pantic**
					P		Prof. dr Jelena Pantic Prof. dr Gordana Radosavljevic Katarina Mijacic
	10			**C1**	**L**	**Immunology of tumors and transplantation**	**Assoc. prof. dr Aleksandar Arsenijevic**

LESSON SCHEDULE FOR THE SUBJECT IMMUNOLOGY, INFECTION, INFLAMMATION

module	week	date	time	place	type	method unit name	teacher
					P		Assoc. prof. dr Aleksandar Arsenijevic Prof. dr Marija Milovanovic Isidora Kostic
	11			**C1**	**L**	**Hypersensitivity**	**Assis. prof. dr Nevena Gajovic**
					P		Assis. prof. dr Nevena Gajovic Prof. dr Ivan Jovanovic Vladimir Markovic
	12			**C1**	**L**	**Congenital and acquired immunodeficiencies**	**Assis. prof. dr Nevena Gajovic**
					P		Assis. prof. dr Nevena Gajovic Assoc. prof. dr Sladjana Pavlovic Katarina Mijacic
	13			**C1**	**L**	**Immune response to microorganisms. Sepsis and septic shock**	**Assoc. prof. dr Aleksandar Arsenijevic**
					P		Assoc. prof. dr Aleksandar Arsenijevic Prof. dr Marija Milovanovic Isidora Kostic
	14			**C1**	**L**	**Immunization and vaccination**	**Prof. dr Marija Milovanovic**
					P		Prof. dr Marija Milovanovic Assoc. prof. dr Aleksandar Arsenijevic Vladimir Markovic

LESSON SCHEDULE FOR THE SUBJECT IMMUNOLOGY, INFECTION, INFLAMMATION

module	week	date	time	place	type	method unit name	teacher
	15			**C1**	**L**	**Microbiome and the immune system**	**Prof. dr Ivan Jovanovic**
					P		Prof. dr Ivan Jovanovic Assis. prof. dr Nevena Gajovic Katarina Mijacic
					E	**FINAL EXAM**	