



## Degree Course in Medicine and Surgery 2025/2026

Integrated Teaching: **Immunology and Immunopathology**

SSD Course: **MEDS-02/A**

ECTS credit: 4

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### PREREQUISITES

Basic knowledge of Human Anatomy, Biology, Molecular Biology, Histology, and Biochemistry is required.

### LEARNING OBJECTIVES

The integrated teaching of Immunology and Immunopathology aims to provide the student with the fundamentals for understanding the cellular and molecular mechanisms underlying the immune response. In particular, the student will have to learn:

- the general features of antigens, antibodies, and cytokines; the cells, tissues, and organs of the immune system; the regulatory mechanisms of central and peripheral tolerance; the components and molecular mechanisms of innate and adaptive immune responses
- the main immunopathologic mechanisms, in particular: hypersensitivity reactions, immunodeficiencies, autoimmune disorders, transplantation, and tumor immunology.

### LEARNING OUTCOMES

The expected learning outcomes are consistent with the general provisions of the Bologna Process and the specific provisions of Directive 2005/36/EC. They are found within the European Qualifications Framework (Dublin descriptors) as follows:

#### **Knowledge and understanding**

At the end of the teaching, the student must be able to:

- know and explain the basic concepts of immunology
- know and explain the cellular and molecular mechanisms underlying the activation of the innate and adaptive immune response
- know and explain the main immunopathologic mechanisms

#### **Applying knowledge and understanding**

At the end of the teaching, the student must be able to:

- use the acquired knowledge for in-depth study of several aspects related to the specific field to which the student will dedicate herself/himself as part of her/his professional activity



- apply the acquired knowledge to analyze and understand the alterations of the cellular, immunological, and genetic mechanisms underlying human pathologies

### **Communication skills**

At the end of the teaching, the student should demonstrate the capability to:

- clearly and unambiguously communicate information, ideas, problems, and solutions, related to the main molecular mechanisms of immune response activation as well as immunopathologic mechanisms to both expert and non-expert recipients
- use the scientific terminology as appropriate

### **Making judgments**

At the end of the teaching, the student must be able to:

- independently make general assessments related to the topics covered
- independently use the acquired knowledge to identify and explain the molecular, immunological, and pathophysiological mechanisms that lead to disease.

### **Learning skills**

At the end of the teaching, the student must be able to:

- acquire the appropriate learning methods for studying and updating
- improve skills in the field of Immunology and Immunopathology by consulting texts, scientific literature, and databases

## **COURSE SYLLABUS**

### **IMMUNOLOGY AND IMMUNOPATHOLOGY (MEDS-02/A)**

#### **The Immune System**

- General features of the innate and adaptive immune response: specificity, diversity, immunological memory. Primary and secondary response.
- Cells and tissues of the immune system. Haematopoiesis. Primary and secondary lymphoid organs: anatomy and functions. The lymphatic system.
- Lymphocyte segregation in secondary lymphoid organs. Leukocyte circulation and migration in tissues.

#### **The Innate Immunity**

- Pathogen recognition. Receptors of innate immunity. The complement system: activation and biological functions.
- The effector functions of innate immunity: the inflammatory response, pro-inflammatory cytokines (local and systemic effects), and antiviral defences.

#### **The Adaptive Immunity**

- Antibodies: structural features and biological fragments. Antigen-antibody interaction.
- Major histocompatibility complex (MHC I, MHC II). Antigen processing and presentation. Antigen receptors (BCR, TCR): somatic recombination and receptor repertoire diversity. Development, maturation and activation of T and B lymphocytes. Maturation defects and lymphocyte activation.
- Helper and cytotoxic T lymphocytes: differentiation and effector functions.



- Antibody production. Germinal centre reaction: affinity maturation, isotype switch. Effector functions of antibodies.

#### Hypersensitivity reactions

- Mechanisms and classification of hypersensitivity reactions.
- Immediate hypersensitivity (Allergy). Antibody-mediated diseases. Immucoplex-mediated diseases. Pathogenetic mechanisms of tissue damage. Delayed hypersensitivity

#### Immunological tolerance and autoimmunity

- Central and peripheral tolerance. Tolerance to commensal pathogens and fetal antigens
- Autoimmunity: genetic (HLA polymorphisms) and environmental (infections, molecular mimicry) factors.

#### Transplant Immunology

- General principles of transplant immunology. Immune responses to transplantation: direct and indirect recognition of alloantigens.
- Activation of alloreactive T and B lymphocytes
- Transplant rejection: acute, hyperacute, chronic rejection. Prevention and treatment. Transfusion reaction: blood group antigens.

#### Tumour Immunology

- Tumour antigens. Tumour microenvironment. Tumour immunotherapy
- Stimulation of host antitumor responses. Evasion mechanisms.

## **COURSE STRUCTURE**

The teaching comprises 40 hours of lectures. Lectures will be structured in 2 or 3-hour theoretical lessons according to the academic calendar. The learning material will be organized in PowerPoint slides, video illustrating, and resuming updated program topics that will allow students to achieve the learning objectives. Interactive discussion with the students will be encouraged to improve active learning.

## **COURSE GRADE DETERMINATION**

The knowledge acquired by the student will be evaluated through a written and oral exam.

- Written exam: 30 multiple-choice questions. One point will be assigned for each correct answer. Eighteen points will be required to be admitted to the oral exam.
- Oral exam: the students should take the final oral exam consisting of questions on the program's covered topics. Considering the learning objectives, the examining committee will assess the acquired student's knowledge and judgment ability, by evaluating the ability to argue and reason on the contents. The student's communication skills by using the appropriate scientific terminology will be also evaluated.

The exam will be assessed according to the following criteria:

**18-20:** Just enough knowledge and understanding of the topics, with obvious imperfections; just sufficient capacity for analysis, synthesis, and autonomy of judgment; poor ability to use technical language.

**21-23:** Sufficient knowledge and understanding of the topics; sufficient ability to analyze and synthesize with the ability to reason with logic and coherence the required contents; sufficient



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ability to use technical language.

**24-26:** Fair knowledge and understanding of the topics; discrete ability to analyze and synthesize with the ability to rigorously argue the required contents; good ability to use technical language.

**27-29:** Good knowledge and understanding of the required contents; good ability to analyze and synthesize with the ability to rigorously argue the required contents; good ability to use technical language.

**30-30L:** Excellent level of knowledge and understanding of the required content with excellent ability to analyze and synthesize with the ability to argue the required content in a rigorous, innovative, and original way; excellent ability to use technical language.

### **OPTIONAL ACTIVITIES**

To further clarify, the Teachers are available to meet the students through appointments taken by e-mail.

### **READING MATERIALS**

The teachers will provide learning materials and scientific literature on the university WebApp  
Textbook:

- Cellular and Molecular Immunology, 10th Edition, Abul Abbas, Andrew H. Lichtman, Shiv Pillai. Elsevier.
- Immunobiology di Janeway, 10 Ed. Kenneth Murphy & Casey Weaver-Piccin

### **COORDINATOR AVAILABILITY**

Office hours by appointment, by e-mail

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