

**COURSE DATA****Data Subject**

<b>Code</b>	33149
<b>Name</b>	Immunology and immunopathology
<b>Cycle</b>	Grade
<b>ECTS Credits</b>	6.0
<b>Academic year</b>	2022 - 2023

**Study (s)**

<b>Degree</b>	<b>Center</b>	<b>Acad. Period</b>
1109 - Degree in Biochemistry and Biomedical Sciences	Faculty of Biological Sciences	4 First term

**Subject-matter**

<b>Degree</b>	<b>Subject-matter</b>	<b>Character</b>
1109 - Degree in Biochemistry and Biomedical Sciences	11 - Integración fisiológica y fisiopatológica	Obligatory

**Coordination**

<b>Name</b>	<b>Department</b>
COSTELL ROSSELLO, M.MERCEDES	30 - Biochemistry and Molecular Biology
GIL HERRERO, M LUISA	275 - Microbiology and Ecology

**SUMMARY**

The subject immunology and immunopathology is located in the fourth and final year of the Degree in Biochemistry and Biomedical Sciences of the University of Valencia. It is a compulsory 6-credits subject, coursed during the first semester which has been preceded by the study, among others, of the matters of Cell Biology, Microbiology, Biochemistry, Genetics and Molecular Biology and Methods in Molecular Biosciences, as well as the subjects of Cell dynamic and signalling, Tissue organization and Physiology, in which the student has developed and assimilated knowledge as a basis for Immunology.

The aim of the curriculum of Immunology and immunopathology is introduce the students to the general principles of organism defence. The program will develop the cellular and molecular processes of natural immunity and specific immunity, in order to understand the mechanisms of recognition, activation, maturation and activity of immune effectors. It also delves into the immunopathological mechanisms responsible for diseases caused by alterations of the immune response. Finally, students will become familiar with the main techniques used in laboratories for serological and immunological diagnostic.



## PREVIOUS KNOWLEDGE

### Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

### Other requirements

## COMPETENCES (RD 1393/2007) // LEARNING OUTCOMES (RD 822/2021)

### 1101 - Degree in Biochemistry and Biomedical Sciences

- Comprensi3n y manejo de las estrategias experimentales y m3todos utilizados en la investigaci3n de las materias.
- Conocer las bases celulares y moleculares de los procesos de inmunidad innata e inmunidad espec3fica.

## LEARNING OUTCOMES (RD 1393/2007) // NO CONTENT (RD 822/2021)

To demonstrate the knowledge of basic aspects of the immune system organization, as well as to understand the diseases resulting from its malfunction.

To demonstrate theoretical and practical knowledge of the experimental methodology used in immunology.

To know how to interpret, integrate and critically evaluate experimental data on the subject.

## DESCRIPTION OF CONTENTS

### 1. Introduction and basic components

Introduction to the immunology. Historical overview of immunology. Overview of immune responses. The anatomy of the immune system. Cells, organs and tissues of the immune system. Lymphocyte traffic and recirculation. Analysis and selection of immune cells by flow cytometry.

### 2. Antigen recognition

Antigens and antibodies. Immunoglobulin structure: isotypes and their functions. B lymphocyte receptor. Generation of antibody diversity. Major Histocompatibility Complex. Structure of the MHC and CD1 molecules. Pathways for antigen processing and presentation to T lymphocytes  
T-cell receptor. Structure of T lymphocyte receptor for antigen and accessory molecules. Generation of diversity.



### **3. Maturation and regulation of lymphocytes**

Maturation of B and T lymphocytes. B-cell maturation in the bone marrow. T cell maturation. Mechanisms for generating central tolerance. Survival of lymphocytes in peripheral lymphoid tissues. Receptor signalling in lymphocytes. Cytokines. Cytokines that mediate and regulate innate and adaptive immunity. Chemokines.

### **4. Effector mechanisms of the innate immune response**

Natural immunity. Pathogen-associated molecular pattern receptors. Activation of macrophages and dendritic cells and phagocytosis. The complement system. Acute phase response.

### **5. Effector mechanisms of the adaptive immune response**

Effector mechanisms of adaptive immunity mediated by cells. Mechanisms for helper and cytotoxic T-cell activation. Regulatory T-cells. Lymphocytes T gamma-delta, NK and NKT. Effector mechanisms of the adaptive humoral response. Effector B-cell activation. Isotype switching, plasma and memory cells. Mucosal Immunity. Oral tolerance. Types of immunoglobulins and antigen presenting cells characteristic of mucous membranes. Inflammatory process. Inflammatory mediators. Molecules of adhesion. Extravasation of leukocytes.

### **6. Immunity in the defense and disease**

Characteristics of the immune responses against microorganisms. Immunity against bacteria, viruses, fungi and parasites. Immunodeficiencies: main congenital and acquired immunodeficiencies. Hypersensitivity reactions: general characteristics and types. Autoimmunity: central and peripheral tolerance. Autoimmune diseases: examples and etiology. Tumor immunology: changes in the surface of tumor cells. Immune responses against tumors. Hematopoietic cancers. Immunotherapy of cancer. Transplantation Immunology. Mechanisms of graft rejection.

### **7. Applications of immunogenicity**

Regulation of the immune response. Production of monoclonal and polyclonal antibodies. Monoclonal antibody engineering. Vaccine design.

### **8. Practical classes**

Practice 1. Quantification of phagocytic and microbicidal capacity of human blood.  
Practice 2. Indirect and competitive ELISA. Titration of a rabbit antiserum, affinity analysis, and quantitation of antigens.

**WORKLOAD**

ACTIVITY	Hours	% To be attended
Theory classes	42,00	100
Laboratory practices	15,00	100
Tutorials	3,00	100
Study and independent work	45,00	0
Readings supplementary material	3,00	0
Preparation of evaluation activities	21,00	0
Preparing lectures	12,00	0
Preparation of practical classes and problem	4,00	0
Resolution of case studies	5,00	0
<b>TOTAL</b>	<b>150,00</b>	

**TEACHING METHODOLOGY**

The course is organised into:

1. Thirty-six lectures of one hour for the development of the theory program, which should be preceded by the student reading of the chapters or sections indicated in the Study Guides. From the beginning until the end of the course. Attendance at these sessions is optional for the student.
2. Laboratory sessions (15 hours) to implement the program of practical classes, after reading the booklet of practices, facilitated by the professor. Attendance at practical sessions is compulsory for all students and failure to attend 20% or more sessions will disqualify the student to pass that part of the course.
3. Three hours of tutorials focused on solving in group test questions and questions examples similar to the exam.
4. Two hours of seminars to be taught by visiting researchers

**EVALUATION**

The numerical rating of knowledge and skills acquired shall be set up by methods that allow objective and comparable measuring, with a record of results, which means the rating of written evaluations.

To approve It is necessary to obtain a minimum of 50 out of 100, with the following distribution:

THEORY: 75 out of 100.



- Class attendance: optional
- Written examination of theory: 75 points.

PRACTICAL CLASSES: 20 out of 100.

- Compulsory attendance: entitles test (minimum 80% attendance).
- Exam of the practical course: up to 20 points.

SEMINARS: 5 out of 100.

- Mandatory attendance.
- Written examination about the seminars taught by visiting researchers: 5 points.

## REFERENCES

### Basic

- Inmunología. Fundamentos (12ª Edición). Roitt, Ivan y col. Editorial Médica Panamericana, 2014.
- Inmunología Celular y Molecular (10ª Edición). Abbas, Abul K y col. Ediciones Elsevier, 2022. Disponible en la plataforma e.Library.
- Inmunología. Biología y patología del sistema inmunitario (5ª Edición). Regueiro Gonzalez y col. Editorial Médica Panamericana, 2022.
- Inmunología. (2ª Edición) Parham Peter. Adaptación de Immunobiology de Janeway Ch.A. Editorial Médica Panamericana, 2006.
- Inmunología de Kuby. (8ª Edición). Kindt, Thomas y col. Editorial McGraw-Hill Interamericana, 2020. Disponible como libro electrónico en la biblioteca.
- Inmunología. (9ª Edición). David Male y col. Ediciones Elsevier, 2021.

### Additional

- Revistas científicas especializadas en revisiones: Annu. Rev. Immunol., Nat. Rev. Immunol., Curr. Opin. Immunol., Immunol Rev., Trends Immunol.
- Libre acceso a artículos científicos a través de PubMed:  
<http://www.ncbi.nlm.nih.gov/sites/entrez>
- Libre acceso a libros on-line (NCBI Bookshelf):  
<http://www.ncbi.nlm.nih.gov/sites/entrez/query.fcgi?db=Books>