

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

<b>Code</b>	33066
<b>Name</b>	Immunology
<b>Cycle</b>	Grade
<b>ECTS Credits</b>	5.0
<b>Academic year</b>	2022 - 2023

**Study (s)**

<b>Degree</b>	<b>Center</b>	<b>Acad. Period</b>	<b>year</b>
1100 - Degree in Biology	Faculty of Biological Sciences	4	Second term

**Subject-matter**

<b>Degree</b>	<b>Subject-matter</b>	<b>Character</b>
1100 - Degree in Biology	16 - Fundamentals of health biology	Optional

**Coordination**

<b>Name</b>	<b>Department</b>
GIL HERRERO, M LUISA	275 - Microbiology and Ecology
YAÑEZ BOYER, ALBERTO	275 - Microbiology and Ecology

**SUMMARY**

The subject of Immunology is located on the fourth and final year of Degree in Biology from the University of Valencia. It is an elective course that is part of the intensification Fundamentals of Health Biology (FBS), which propose introductory concepts to health and a biomedical profile to biologists. The study of immunology has been preceded by the subjects of Cell Biology I: Cell Structure, Biochemistry, Genetics, Cell Biology II: Cell and Tissue Biology, Microbiology, Animal Biology II: Animal Physiology, as well as the subjects Molecular Methods in Biology and Integrated Experiments in Biology, in which the student has developed and assimilated basic theoretical and practical knowledge for Immunology. The subject, therefore, will not develop these aspects, since they represent previously acquired knowledge, but they will be necessary for the topic.

The aim of the program of Immunology is to introduce students to the general principles of body defense. The program will develop the cellular and molecular basis of the processes of natural immunity and specific immunity, in order to understand the mechanisms of recognition, activation, maturation and immune effectors. It also delves into the immunopathological mechanisms responsible for diseases caused by alterations of the immune response. Finally, students 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

The student must have passed 120 ECTS

## OUTCOMES

### 1100 - Degree in Biology

- Conocer y saber aplicar el método científico.
- Capacidad de organización, planificación y gestión de la información usando bases de datos bibliográficas adecuadas.
- Utilización del vocabulario específico de la Biología sanitaria.
- Capacidad de resolución de problemas y toma de decisiones.
- Capacidad de elaborar artículos, informes o proyectos y de exponerlos a diferentes auditorios.
- Habilidad para el trabajo en equipo y en contextos multidisciplinares.
- Capacidad de análisis crítico de textos científicos.
- Aprendizaje autónomo y adaptación a nuevas situaciones.
- Potenciar la creatividad, iniciativa y espíritu emprendedor.
- Apreciación del rigor, el trabajo metódico, y la solidez de los resultados.
- Potenciación de la capacidad de liderazgo.
- Capacidad de utilización de herramientas matemáticas y estadísticas.
- Reflexión ética sobre la actividad profesional.
- Conocimiento de bases de legislación relacionada con la Biología.
- Saber analizar datos usando herramientas estadísticas apropiadas.
- Conocimiento de sistemas de gestión en tareas profesionales en Biología sanitaria.
- Conocer los principales métodos y técnicas experimentales aplicadas al estudio de las enfermedades humanas, su etiología y la efectividad de los tratamientos.
- Conocimiento de las enfermedades y disfunciones más frecuentes durante las distintas etapas de la vida.
- Comprender los procesos moleculares que median la generación de diversidad en el repertorio de linfocitos T e inmunoglobulinas.



- Conocer las bases moleculares, celulares e histológicas de las respuestas inmunitarias humoral y celular.
- Conocer las bases biológicas de las disfunciones del sistema inmunitario y las estrategias para su tratamiento.
- Conocer los fundamentos de los métodos experimentales con una base inmunológica.

## LEARNING OUTCOMES

**A.** To understand and apply basic immunological concepts correctly. So the student will be able to:

- Be familiar with cellular and molecular basis of the processes of natural immunity and specific immunity.
- To understand the role and mechanisms of action at the molecular level of key cytokines and chemokines and inflammatory mediators.
- To know the characteristics of the different phases of the immune response.
- To understand the mechanisms of regulation and integration of the immune response to pathogens.
- To understand the cellular and molecular basis of hypersensitivity, allergy, autoimmune diseases and more common immunodeficiencies
- To know the molecular basis of transplant-host relationship and graft rejection.

**B.** To develop the habit of study planning and independent and continuous learning.

**C.** To acquire skills of critical study of the different immunological aspects discussed during the program, emphasizing the synthesis capacity and relationships between different concepts

**D.** To develop the capacity and skills to design, plan and conduct laboratory experiments.

**E.** To develop the ability to search bibliographic sources -both from books and journals and web searches- and the habit of making public presentations of their work.

## DESCRIPTION OF CONTENTS

### 1. INTRODUCTION TO IMMUNOLOGY

Item 1. Overview of immune responses.

Item 2. Hematopoiesis and immune system cells. Organs and tissues of the immune system: anatomical basis of the immune response

Item 3. Innate immunity. Phagocytes and their receptors.



## **2. ANTIGEN RECOGNITION**

Item 4. Antigens and antibodies. Structure of immunoglobulins. Isotypes. The B cell receptor. Generation of antibody diversity.

Item 5. T cells and antigen receptor. Accessory molecules. Generation of diversity. Antigen-presenting molecules: the Major Histocompatibility Complex; CD1 molecules. Processing and presentation of antigens to T cells

## **3. LYMPHOCYTE MATURATION AND REGULATION**

Item 6. Differentiation of B lymphocytes

Item 7. T cell differentiation. T cell tolerance

## **4. EFFECTOR MECHANISMS OF IMMUNE RESPONSES**

Item 8. Immune messengers: cytokines and their receptors.

Item 9. Effector mechanisms of cell-mediated immunity. The generation of Th and Tc cell effectors. NK cells and their receptors. Macrophage activation.

Item 10. Effector mechanisms of humoral immunity. The complement.

The generation of effector B cells. Mucosal immune response.

Item 11. The inflammatory process. Adhesion molecules and their ligands. Leukocyte trafficking.

Item 12. Immunity against pathogens.

## **5. THE IMMUNE SYSTEM IN DISEASE**

Item 13. Defects of immunity: immunodeficiency diseases. Excesses of immunity: allergy and other hypersensitivities.

Item 14. Errors of immunity: autoimmunity. Disadvantages of immunity: alloimmunity or transplant rejection.

## **6. IMMUNOLOGICAL METHODS AND APPLICATIONS OF IMMUNITY**

Item 15. Fundamentals of immunological techniques. Obtaining polyclonal and monoclonal antibodies. Analysis of cell populations by flow cytometry.

## **7. Practical program**

(i) Double immunodiffusion technique or Ouchterlony, qualitative or semiquantitative technique used to study population-specific antibodies and antigens in serum.

(ii) The indirect ELISA (enzyme-linked immunosorbent assay) to quantify specific antibodies in serum and competitive ELISA to quantify antigens.

(iii) Quantification of phagocytic and microbicidal capacity of human blood.



## WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	26,00	100
Laboratory practices	22,00	100
Tutorials	2,00	100
Study and independent work	62,50	0
Preparing lectures	9,50	0
Preparation of practical classes and problem	3,00	0
<b>TOTAL</b>	<b>125,00</b>	

## TEACHING METHODOLOGY

The course is divided into:

1. **Theory sessions** of one hour where the professor will expose the items of the program. These theory sessions should be preceded by the reading by students of the chapters or sections of the basic text, indicated in the Study Guides. Attendance to these sessions is **optional** for the student.

2. **Laboratory sessions** to implement the program of practical classes, after reading the booklet of practices, previously facilitated by the teacher.

Attendance to practical sessions is **mandatory** for all students and non-attendance to 20% or more of the sessions disabled students to pass that part of the course.

3. Two hours of **group tutoring** sessions focussed in resolution of pre-test questions and presenting examples of examination tests.

**IMPORTANT NOTE:** Aula Virtual is considered the official notice board and current communication between professors and students. Examination announcements, schedule changes, notification of exam results and schedules will be announced in this platform and is student's responsibility to be aware of these communications and to use and maintain the mailbox that the University provides under suitable conditions to receive the messages. Also the students in their email communications with professors must use the e-mail account of the University and no other. Messages from other sources will be ignored.

## EVALUATION

The numerical grade of knowledge and skills acquired will be set to benefit from methods that allow objective and comparable measure them with a record of results, which means qualifying written tests.

To obtain a minimum of 50 out of 100 points is necessary to approve having them distributed as follows:





**THEORY:** 80 out of 100.

- Class attendance teacher: optional

**PRACTICES:** 20 out of 100.

- Mandatory attendance: entitles examination (minimum 80% attendance)

- Practical exam: up to 20 points.

- Students in second registration (repeaters) having the minimal number of practice sessions in the previous course may, if they decide it, not to attend the lab sessions.

-To request the advancement of call, should be made practical classes of the course (as activities of compulsory attendance).

## REFERENCES

### Basic

- Inmunología. Fundamentos (12ª Edición). Roitt, Ivan y col. Editorial Médica Panamericana, 2014.
- Inmunología. Biología y patología del sistema inmunitario (5ª Edición). Regueiro González 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 Universitat de Valencia.
- Inmunología (9ª edición). David Male y col. Ediciones Elsevier, 2021.
- Inmunología Celular y Molecular (10ª Edición). Abbas, Abul K y col. Ediciones Elsevier, 2022. Disponible en la plataforma e.Library de la Universitat de València.

### Additional

- Annu. Rev. Immunol
- Nat. Rev. Immunol.
- Curr. Opin. Immunol.
- Immunol Rev.
- Trends Immunol.
- "Inmunología" (La revista de la Sociedad Española de Inmunología)