

**Immunology**

Code: 100869  
ECTS Credits: 6

| Degree               | Type | Year | Semester |
|----------------------|------|------|----------|
| 2500252 Biochemistry | OB   | 3    | 1        |

**Contact**

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**Use of Languages**

Principal working language: spanish (spa)  
Some groups entirely in English: No  
Some groups entirely in Catalan: No  
Some groups entirely in Spanish: Yes

**Prerequisites**

The student who has to study Immunology must have obtained the learning competences in the subjects programmed for the first course of the Degree.

**Objectives and Contextualisation**

**OBJECTIVES**

At the end of the course, students will have to:

- To know the components of the immune system: molecules, cells and lymphoid organs.
- To understand the innate and adaptive immune response, humoral and cellular; the phases of the immune response and the regulation and homeostasis of the immune system.
- To know the communication between components of the immune system through blood and lymphatic traffic, and the anatomical location of the immune response.
- To apply the knowledge of the immune response in infections for viruses, bacteria, protozoa, helminths and fungi.
- To know the cellular and molecular immunological techniques applicable to the different biological systems.
- To know how to apply the reactions of the immune system and its specificity to the study of biomolecules, diagnosis, vaccines and immunotherapy.
- To know the basics of immunopathology.

The 6 ECTS of the subject of Immunology will be divided into two thematic blocks with specific learning competences.

**Block I. Basic immunology (3 ECTS)**

- To know the components of the immune system: molecules, cells and lymphoid organs.

- To know the concepts of innate immunity and specific immunity.
- To identify the elements that intervene in both responses.
- To enumerate and explain the structural and functional characteristics of each molecular and cellular component of innate and adaptive immunity.

#### Block II. Organization of the Immune Response and its application (3 ECTS)

- To integrate the elements of the immune system in the three phases of the immune response: 1) activation phase; 2) effector phase; and 3) phase regulation and homeostasis of the immune response.
- To know the communication between components of the immune system through blood and lymphatic traffic; And the anatomical location of the immune response.
- To know the mechanisms that participate in the immune response against infections for viruses, bacteria, protozoa, helminths and fungi.
- To know the cellular and molecular immunological techniques applicable to the different biological systems.
- To know how to apply the reactions of the immune system and its specificity to the study of biomolecules, diagnosis, vaccines and immunotherapy.
- To know the basics of dysfunctions of the immune system that originate immunopathologies.

### Competences

- Act with ethical responsibility and respect for fundamental rights and duties, diversity and democratic values.
- Collaborate with other work colleagues.
- Combine research and the generation of knowledge with problem-solving in one's own field, showing sensibility to ethical and social questions.
- Define the structure and function of proteins and describe the biochemical and molecular bases of their folding, intracellular traffic, post-translational modification and replacement.
- Demonstrate understanding of the components of the immune system, their structure and function and their mechanisms of action.
- Design experiments and understand the limitations of experimental approaches.
- Interpret experimental results and identify consistent and inconsistent elements.
- Introduce changes in the methods and processes of the field of knowledge to provide innovative responses to the needs and demands of society.
- Make an oral, written and visual presentation of one's work to a professional or non-professional audience in English and understand the language and proposals of other specialists.
- Manage information and the organisation and planning of work.
- Read specialised texts both in English and one's own language.
- Take account of social, economic and environmental impacts when operating within one's own area of knowledge.
- Take responsibility for one's own learning after receiving general instructions.
- Take sex- or gender-based inequalities into consideration when operating within one's own area of knowledge.
- Think in an integrated manner and approach problems from different perspectives.
- Understand the language and proposals of other specialists.

### Learning Outcomes

1. Act with ethical responsibility and respect for fundamental rights and duties, diversity and democratic values.
2. Analyse the relationship between the nature of the immune response and the molecular and physical characteristics of the antigens that induce it.

3. Collaborate with other work colleagues.
4. Combine research and the generation of knowledge with problem-solving in one's own field, showing sensibility to ethical and social questions.
5. Define the properties of adaptive immune response and how it differs from innate response.
6. Describe the activation pathways of the receptors of the immune system and the intracellular and extracellular intermediaries involved in these pathways.
7. Describe the clonal distribution of lymphocyte antigen receptors and justify the theory of clonal selection: one lymphocyte, one receptor.
8. Describe the theoretical principles of immunological techniques.
9. Design experiments and understand the limitations of experimental approaches.
10. Explain the mechanisms of activation and regulation of cellular and humoral immune response.
11. Explain the processes of diversity generation in the clone receptors of the immune system.
12. Identify and analyse the proteins involved in the principal functions of the immune system: innate response, antigen presentation, antigen elimination, response regulation.
13. Interpret experimental results and identify consistent and inconsistent elements.
14. Introduce changes in the methods and processes of the field of knowledge to provide innovative responses to the needs and demands of society.
15. Make an oral, written and visual presentation of one's work to a professional or non-professional audience in English and understand the language and proposals of other specialists.
16. Manage information and the organisation and planning of work.
17. Read specialised texts both in English and one's own language.
18. Take account of social, economic and environmental impacts when operating within one's own area of knowledge.
19. Take responsibility for one's own learning after receiving general instructions.
20. Take sex- or gender-based inequalities into consideration when operating within one's own area of knowledge.
21. Think in an integrated manner and approach problems from different perspectives.
22. Understand the language and proposals of other specialists.

## Content

Contents of the subject

Block I. Basic immunology (3 ECTS).

Block II. Organization of the Immune Response and its application (3 ECTS).

Introduction

TOPIC 1: Introduction: general view of the immune system. Basic concepts.

TOPIC 2: Introduction: general view of the immune system. Components and actions of the immune response.

TOPIC 3: Anatomy: organs and tissues immune

Innate immunity

TOPIC 4: Inborn immunity: immediate and induced

TOPIC 5: Inborn immune response cells: macrophages, granulocytes, APC and NK

TOPIC 6: The System of the Complement

Acquired immunity - Antigen-specific cells and receptors and antigen recognition

TOPIC 7: Structure of immunoglobulins and antigen receptor of B cells (BCR)

TOPIC 8: Organization and reordering of immunoglobulin genes

TOPIC 9: Antigen-antibody interaction

TOPIC 10: Lymphocytes B: Selection in bone marrow and subpopulations of lymphocytes B

TOPIC 11: Main Complex of Histocompatibility: structure of function and gene organization

TOPIC 12: MHC: antigenic processing and presentation

TOPIC 13: Cell T antigen receptor (TCR): structure and genetics

TOPIC 14: Lymphocytes T: thymic selection and subpopulations of T lymphocytes

Block II. Organization of the Immune Response and its application (3 ECTS)

Organization of the immune response

TOPIC 15: Cytokines and chemokines (AAP)

TOPIC 16: Chemokines and Molecules of adhesion

TOPIC 17: Lymphocyte traffic and recirculation of lymphocytes: homing.

TOPIC 18: Activation of the immune response: coreceptors and co-stimulation

TOPIC 19: Cellular immune response

TOPIC 20: Humoral Immune Response

TOPIC 21: Regulation of the immune response: tolerance

Applications of Immunology

TOPIC 22: Immune response in front of pathogens: generalities

TOPIC 23: Immunopathology associated with the immune response

TOPIC 24: Immunotherapy: tumors, vaccines and transplants

TOPIC 25: Cellular and molecular techniques

## **Methodology**

The group for lectures and classroom practices will be the total number of students enrolled.

Classroom practices will be taught in 12 hours in which cases and articles will be discussed. During the course there will also be 3-4 seminars that will be taught by experts in each subject.

Expositive Classes (lectures):

The 25 themes of the program will be held in 33 sessions.

Classroom practices:

12 works will be scheduled for groups of 4 students, who will prepare them cooperatively. Each group has to prepare a thematic set of those given in class to solve all the doubts or questions that the class, or where appropriate the teacher, asks them in each session. They will also prepare questions to direct to the class so that they can be answered by the students and explain the doubts they generate. The group will have to deliver a summary dossier beforehand with the most relevant aspects of the topic and the doubtful aspects that may

focus the questions that will address the class. Each classroom practice session will last 50 minutes. The teacher and the other students will ask questions on the subject.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

## Activities

| Title               | Hours | ECTS | Learning Outcomes                    |
|---------------------|-------|------|--------------------------------------|
| Type: Directed      |       |      |                                      |
| Classroom practices | 12    | 0.48 | 3, 9, 16, 13, 17, 21, 4, 15, 19      |
| Lectures            | 33    | 1.32 | 2, 3, 5, 7, 8, 6, 10, 11, 12, 15, 19 |
| Type: Supervised    |       |      |                                      |
| Data interpretation | 8     | 0.32 | 3, 16, 13, 17, 21, 4                 |
| Type: Autonomous    |       |      |                                      |
| Seminar preparation | 32    | 1.28 | 3, 9, 16, 13, 17, 21, 15, 19         |
| Study               | 58    | 2.32 | 3, 16, 13, 17, 21, 4, 19             |

## Assessment

Partial exams: two partial exams, at the end of Blocks I and II. Each test will be worth 40% of the final grade. They will be exams of test type with questions with 4-5 options to choose one. In the correction,  $\frac{1}{4}$  or  $\frac{1}{5}$  of the value of each question will be subtracted by incorrect answer. The duration of each test will be a minimum of 2 hours. The subject can be approved by partial as long as the average between the two tests and the seminars is 5, taking into account that it can be done only when the student has a minimum grade of 4 in both partials. Partial exams are recoverable matter.

Classroom practices: Seminars and classroom practices help to develop students' self-learning, synthesis and written and oral communication skills. The evaluation will represent 20% of the final grade of the subject and the proven knowledge, the written summary, the response to and the ability to solve the questions raised and the relevance of the questions proposed to the class will be evaluated.

Recovery exam: A recovery exam will be scheduled for students who have not reached the minimum necessary (that is, do not have a minimum of 4 in both of the two partial or do not reach 5 in the total of the course) or who want to raise the note. The evaluation of this final exam will be by partials and will count 40% each one of them. In order to pass the subject, a minimum grade of 4 in the total exam is required, provided that the final result of the three evaluable activities is  $\geq 5$ .

To be eligible for the retake process, the student should have been previously evaluated in a set of activities equaling at least two thirds of the final score of the course or module. Thus, the student will be graded as "No Avaluable" if the weighing of all conducted evaluation activities is less than 67% of the final score

## Assessment Activities

| Title | Weighting | Hours | ECTS | Learning Outcomes |
|-------|-----------|-------|------|-------------------|
|-------|-----------|-------|------|-------------------|

|                     |     |   |      |                                                       |
|---------------------|-----|---|------|-------------------------------------------------------|
| First partial exam  | 40% | 3 | 0.12 | 5, 7, 6, 11, 16, 12, 19                               |
| Group seminar       | 20% | 1 | 0.04 | 1, 20, 18, 3, 8, 9, 22, 16, 13, 14, 17, 21, 4, 15, 19 |
| Second partial exam | 40% | 3 | 0.12 | 2, 8, 9, 10, 16, 13, 17, 21, 19                       |

## Bibliography

### Books in english

Kuby Immunology by J Owen, J Punt, S Stranford, P. Jones. Mc Graw Hill, 8th Edition (2019). Will be the main reference book for the course.

Janeway's Immunobiology by K Murphy and C Weaver. Ltd/Garland Science, NY & London, 9th ed (2016)

Cellular and Molecular Immunology by Abul K. Abbas, Andrew H. Lichtman, Shiv Pillai, Elsevier 10th ed (2021).

Basic Immunology de A.Abbas, A. H. Lichtman, S. Pillai. Elsevier, 6th ed, (2019)

Roitt's Essential Immunology by [Peter Delves](#), [Seamus Martin](#), [Dennis Burton](#), [Ivan Roitt](#), Wiley-Blackwell Ed., 13th ed (2017)

### Books in Spanish or catalan:

Inmunología de Kuby. J Owen, J Punt, S Stranford, P. Jones. Mc Graw Hill, 8ª edición (2019). Will be the main reference book for the course.

Inmunobiología de Janeway: K Murphy, P. Travers, M. Walport. Mc Graw Hill, 9ª ed, (2016).

Inmunología Celular y Molecular de A.Abbas, A. H. Lichtman, S. Pillai. Elsevier, 9ª ed, (2018).

Inmunología Básica de A.Abbas, A. H. Lichtman, S. Pillai. Elsevier, 6ª ed, (2020).

Introducción a la Inmunología Humana de L. Faimboim, J. Geffner. Ed Medica Panamericana, 7ª ed (2011).

Inmunología, Biología y Patología del Sistema Inmunitario de JR Regueiro, C López Larrea, S González Rodríguez, E Martínez Naves. Ed Médica Panamericana, 4ª ed, 2011.

Diccionari d'immunologia de TERMCAT, Centre de Terminologia, Ed Masson, Barcelona, 2005

In addition, we have acces to the platfomr on digital books <https://mirades.uab.cat/ebs/>). In the following link, you will find an infographics to facilitate findind of electronic books (<https://ddd.uab.cat/record/22492>).

Among the digital resources we highlight thecourse books:

[Kuby inmunología \[Recurs electrònic\]](#) / Judith A. Owen, Jenni Punt, Sharon A. Stranford ; con la colaboración de Patricia P. Jones ; traducción: Bernardo Rivera Muñoz [Owen, Judith A.](#)

[Inmunología celular y molecular \[Recurs electrònic\]](#) / Abul K. Abbas, Andrew H. Lichtman, Shiv Pillai ; ilustraciones de David L. Baker, Alexandra Baker [Abbas, Abul K.](#)

[Roitt inmunología \[Recurs electrònic\] : fundamentos](#) / Peter J. Delves ... [et al.]

[Introducción a la inmunología humana \[Recurs electrònic\]](#) / Leonardo Fainboim, Jorge Geffner [Fainboim, Leonardo](#)

## Software

Not necessary