

**Immunology**

Code: 101981  
ECTS Credits: 6

Degree	Type	Year	Semester
2500890 Genetics	OT	4	0

**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 students should have obtained the competences of the previous degree courses.

**Objectives and Contextualisation**

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 four thematic blocks with specific learning competences.

*Block I. Basic immunology (2 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 (2 ECTS)*

- To integrate the elements of the immune system in the three phases of the immune response: 1) activation phase; 2) effectorphase; 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 identify the evasion mechanisms used by pathogens against the immune system.

#### *Block III. Applications of Immunology (1,5 ECTS)*

- 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.

#### *Block IV. Introduction to Immunopathology (0.5 ECTS)*

- To know the basics of dysfunctions of the immune system that originate immunopathologies.

### **Skills**

- Describe and identify the structural and functional characteristics of nucleic acids and proteins including their different organisational levels.
- Describe the genetic bases of the development and control of genic expression.
- Develop self-directed learning.
- Reason critically.
- Use and manage bibliographic information or computer or Internet resources in the field of study, in ones own languages and in English.

### **Learning outcomes**

1. Describe the mechanisms for regulating genic expression in viruses, bacteria and eukaryotes.
2. Develop self-directed learning.
3. Reason critically.
4. Relate the structure of nucleic acids with their biological functions.
5. Use and manage bibliographic information or computer or Internet resources in the field of study, in ones own languages and in English.

### **Content**

#### **Contents of the subject**

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

**Block II. Organization of the Immune Response (2 ECTS).**

**Block III. Applications of Immunology (1 ECTS).**

**Block I. Basic immunology: elements of the immune system (2 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 (2 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

### **Immune response in front of pathogens and evasion mechanisms**

TOPIC 22: Immune response in front of bacteria

TOPIC 23: Immune response in front of fungi and parasites

TOPIC 24: Immune response in front of viruses (AAP)

TOPIC 25: Immunity to tumors

TOPIC 26: Transplantation

### Block III. Applications of Immunology (1 ECTS)

TOPIC 27: Cellular and molecular techniques

TOPIC 28: Immunodeficiencies

TOPIC 29: Immunopathology associated with the immune response: hypersensitivity and autoimmunity

TOPIC 30: Immunotherapy. Vaccines

### Methodology

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

Classroom practices will be taught in 8 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 30 themes of the program will be held in 37 sessions.

**Problem Based Learning (PBL) or Cases** (also called **classroom practices**):

8 works will be scheduled for groups of 4 students, who will prepare them cooperatively. Some of them will be tracking topics that have emerged from news of the daily press or of the scientific press related to Immunology. Others will be issues or clinical cases that teachers will prepare so that students can develop their work. The information about each work and the application guidelines will be stored on the Virtual Campus (CV). Each group will prepare the oral presentation of their work based on a power point presentation (or similar). There is no written presentation of the work. Each session of classroom practices (1h) will present 1 work (40 min of exposure + 10 min of questions). The teacher and the rest of the students will ask questions about aspects of the topic presented. The final presentation (in PDF format) have to be stored in CV before the day of the presentation. The seminars will be subject to the exam with a question per topic.

Other groups of 4 students will carry out a seminar corresponding to one of the most widely applied immunology topics of blocks II and III, in the same format as the classroom practices, which will also be a matter of examination. The total number of seminars in this section will depend on the number of students enrolled, in such a way that each student will have to carry out a seminar or classroom practice.

### Activities

Title	Hours	ECTS	Learning outcomes
<b>Type: Directed</b>			
Classroom practices	8	0.32	2, 3, 5
Regular classes	37	1.48	1, 2, 3, 4
<b>Type: Supervised</b>			
Oral presentation of a topic, article or clinical case	8	0.32	2, 3, 5
<b>Type: Autonomous</b>			
Preparation of seminars	32	1.28	2, 3, 5
Study	58	2.32	2, 3, 5

## Evaluation

**Partial exams:** two partial exams, at the end of Blocks I and III. Each test will be worth 40% of the final grade. They will be exams of test type with questions with 5 options to choose one. In the correction, 1/5 of the value of each question will be subtracted by incorrect answer. The duration of each test will be approximately 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.

**Seminars:** Seminars and classroom practices help to develop the students self-learning, synthesis and written and oral communication skills. The evaluation will represent 20% of the final grade of the subject and the content, the written presentation of the seminar, the oral presentation, the answer to questions and the participation in the discussion will be valued.

**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 any 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 partial and will count 40% each one of them. In order to pass the subject, a minimum grade of 4 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 weighthin of all conducted evaluation activities is less than 67% of the final score**

## Evaluation activities

Title	Weighting	Hours	ECTS	Learning outcomes
Partial Exam 1	40%	3	0.12	2, 3, 5
Partial Exam 2	40%	3	0.12	1, 3, 4
Presentation of a group work	20%	1	0.04	2, 3, 5

## Bibliography

**Janeway's Immunobiology** by K Murphy. Ltd/Garland Science, NY & London, 8th ed (2011)

**Kuby Immunology** (with web support) by J Owen, J Punt and S Stranford, 7th Edition revised, (2013)

**Cellular and Molecular Immunology** by Abul K. Abbas, Andrew H. Lichtman, Shiv Pillai, Saunders, 7th ed (2011).

**Roitt's Essential Immunology** by [Peter Delves](#), [Seamus Martin](#), [Dennis Burton](#), [Ivan Roitt](#), Wiley-Blackwell Ed., 12th ed (2011)

**Fundamental Immunology** by William E. Paul, LWW; 7th edition (2012)

Advances in Immunology

[http://www.elsevier.com/wps/find/bookdescription.cws\\_home/716912/description#description](http://www.elsevier.com/wps/find/bookdescription.cws_home/716912/description#description)

<http://www.sciencedirect.com/science/bookseries/00652776>

Annual Review of Immunology

<http://arjournals.annualreviews.org/loi/immunol>

Current Opinion in Immunology

[http://www.elsevier.com/wps/find/journaldescription.cws\\_home/601305/description#description](http://www.elsevier.com/wps/find/journaldescription.cws_home/601305/description#description)

<http://www.sciencedirect.com/science/journal/09527915>

Immunological Reviews

<http://www3.interscience.wiley.com/journal/118503650/home>

Nature Reviews in Immunology

<http://www.nature.com/nri/index.html>

Seminars in Immunology

[http://www.elsevier.com/wps/find/journaldescription.cws\\_home/622945/description#description](http://www.elsevier.com/wps/find/journaldescription.cws_home/622945/description#description)

Trends in Immunology

<http://www.cell.com/trends/immunology/>

### **Recursos d'Internet**

**Immunobiology** by C. A. Janeway, P. Travers, M. Walport and M. Shlomchik, Garland Science 2001

<http://www.ncbi.nlm.nih.gov/bookshelf/br.fcgi?book=imm>

**Roitt's Essential Immunology**, by [Peter Delves](#), [Seamus Martin](#), [Dennis Burton](#), [Ivan Roitt](#), Wiley-Blackwell Ed., 11 th ed., (2006).

<http://www.roitt.com/>

**Kuby Immunology** (with web support) by T.J. Kindt, R.A. Goldsby, B.A. Osborne. W.H. Freeman Co., 6 th ed, (2006).

<http://www.whfreeman.com/kuby/>

<http://bcs.whfreeman.com/immunology6e/>

**Microbiology and Immunology On line. School of Medicine, University of South Carolina**

<http://pathmicro.med.sc.edu/book/welcome.htm>

**Faculty of Medicine, Dalhousie University (Halifax, Nova Scotia, Canada)**

<http://immunology.medicine.dal.ca/bookcase/>

**The Infectious Diseases WebLink**

<http://webpages.charter.net/deziel/>

**Departament of Molecular and Cellular Biology, Harvard University**

<http://mcb.harvard.edu/BioLinks/Immunology.html>

**Biology Animations**

<http://biology-animations.blogspot.com/>

**Molecular Expressions: Images from the microscope, Florida State University**

<http://micro.magnet.fsu.edu/primer/virtual/virtual.html>

### **Introduction Immune System**

<http://www.biology.arizona.edu/immunology/tutorials/immunology/main.html>

### **Immunobiology**

<http://www.skidmore.edu/academics/biology/courses/erubnst/BI348/pages/resources.html>

### **Janeway's animations**

<http://www.blink.biz/immunoanimations/>

### **Davison College (Immunology course, Molecular Movies)**

<http://www.bio.davidson.edu/courses/Immunology/Bio307.html>

### **Pathology of Infectious Diseases (images of infected tissues by bacterial, fungi and viruses)**

<http://info.fujita-hu.ac.jp/~tsutsumi/index.html>

### **Movies from Ronald Germain**

<http://www.niaid.nih.gov/LabsAndResources/labs/aboutlabs/li/lymphocyteBiologySection/Pages/videos.asp>

### **The von Andrian Laboratory**

<http://labs.idi.harvard.edu/vonandrian/>