UAB
Universitat Autònoma de Barcelona

Immunology

Code: 100918
Credits: 6

2026/2027

Degree programme	Type	Course
Biotechnology	OB	3

Contact lecturer

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Group languages

You can consult this information at the end of the document.

Prerequisites

There are no official prerequisites, but it is understood that the students of the Immunology course must have achieved the learning competencies of subjects programmed in the first and second year of the Degree such as cellular biology, physiology and biochemistry.

On the other hand, in a scientific discipline such as Immunology the most up-to-date sources of information are in English. Therefore, it is recommended that students have at least a basic knowledge of this language.

Objectives

Contextualization:

Immunology is the branch of Biotechnology that studies the physiological and pathological mechanisms of specific response of organisms to the presence of foreign agents that can potentially cause damage, such as microorganisms and toxins. This is a compulsory subject of the degree of Biotechnology. Immunology is an integrative subject allowing the students to understand the interrelation established between the pathogen and the host using the previously acquired knowledge on cell biology, biochemistry, microbiology, virology, genetics and molecular genetics, physiology and animal biology.

Objectives of the subject:

The Immunology subject, worth 6 ECTS, will be divided into four thematic blocks for which specific learning competences have been defined and that the student will achieve at the completion of the Immunology course.

Block I. Basic Immunology. Elements of the Immune System

- To know the concepts of innate and adaptive immunity as well as to understand their role on the immune response

- To identify the elements that intervene in both innate and adaptive responses

- To enumerate and explain the structural and functional characteristics of the molecular and cellular components of the innate and adaptive immunity

- To understand the connection between the immune system components through the blood and the lymphatic system circulation, as well as the anatomical location of the immune response

Block II. Organization of the Immune Response

- To integrate the molecular and cellular elements described in Block I to the three phases of the immune response: 1) activation; 2) effector phase; and 3) regulation and homeostasis

Block III. Response to pathogens.

- To determine the characteristics of the immune response according to the type of infectious agent: bacteria, virus, fungus or parasites

- To identify the evasion mechanisms used by different pathogens to avoid the immune response

- Describe possible pathological consequences of the immune response

Block IV. Immunopathology and immunotherapy

- To identify the dysfunctions of the immune system causing immunopathologies: hypersensitivity, autoimmunity and immunodeficiency

- To know immunotherapeutic strategies for the manipulation of the immune response both to potentiate or to suppress it

Learning outcomes

- CM25 (Work collaboratively in teams to solve problems in the field of systems biology.) Work collaboratively in teams to solve problems in the field of systems biology.
- KM26 (Describe the molecular, cellular, and physiological foundations of the organization, functioning, and integration of the immune system.) Describe the molecular, cellular, and physiological foundations of the organization, functioning, and integration of the immune system.
- SM24 (Quantitatively model a biological process or system.) Quantitatively model a biological process or system.

Contents

Each block is divided into teaching units (TU) that define the specific learning descriptors associated to the specific competencies.

Block I. BASIC IMMUNOLOGY: ELEMENTS OF THE IMMUNE SYSTEM

TU-1: Introduction. What is Immunology? Elements of the immune system (organs, cells and molecules). Definition of innate and adaptive immunity. Basis of the adaptive immune response: humoral and cellular response. Concepts of immunogenicity, specificity, clonality, and immunological memory.

TU-2: Innate Immunity. Molecular elements of the innate immunity. Inflammation. The Complement System. Innate immunity cells.

TU-3: Adaptive immunity. Antigen recognition by B lymphocytes. B cell antigen receptor (BCR). Immunoglobulins, structure and gene organization. Ontogeny and maturation of B lymphocytes in the bone marrow. Subpopulations of B lymphocytes.

TU-4: Adaptive immunity. Antigen recognition by T lymphocytes. Antigen receptor of T cells (TCR). T lymphocytes development. Thymic selection. Generation of T lymphocytes repertoire. T lymphocyte subpopulations.

TU-5: Adaptive immunity. Antigen processing and presentation. Molecules of the Major Histocompatibility Complex. Structure and genetics. Antigen processing and presentation. Antigen presenting cells APC).

TU-6: Immune System Organs and circulation of immune cells. Cytokines and Chemokines. Lymphatic system. Organization ofthe primary and secondary lymphoid organs. Leukocyte circulation.

Block II. ORGANIZATION OF THE IMMUNE RESPONSE

TU-7: Cellular immune response. Activation and T effector cell differentiation. Intracellular transduction of activation signals. Effector mechanisms of the different T cell subpopulations. Generation of memory T lymphocytes.

TU-8: Humoral response. B lymphocytes activation and differentiation to effector cells.Intracellular transduction of activation signals. Germinal center formation. Effector mechanisms of the different B lymphocytes subpopulations. Antibody production.Generation of memory B cells and plasma cells.

TU-9: Regulation of the immune response. Immune Tolerance: central and peripheral tolerance. Regulatory elements and mechanisms during and after an immune response.

Block III. IMMUNE RESPONSE TO PATHOGENS

TU-10: Immune response against bacteria. Effector mechanisms of the innate and adaptive immune response to extracellular and intracellular bacteria. Immune response evasion mechanisms. Pathological consequences of the response to bacteria.

TU-11: Immune response against viruses. Effector mechanisms of the innate and adaptive immune response to viruses. Evasion mechanisms. Pathological consequences of the immune response to viruses.

TU-12: Immune response to fungi and parasites. Mechanisms of the innate and adaptive immune response to fungi and parasites. Evasion mechanisms. Pathological consequences of the response.

Block IV. IMMUNOPATHOLOGY AND IMMUNOTHERAPY

TU-13: Hypersensitivity reactions. Hypersensitivity concept and Type of hypersensitivity reactions. Examples.

TU-14: Autoimmunity. Tolerance and autoimmunity. Predisposing factors. Effector mechanisms of autoimmunity. Autoimmune diseases.

TU-15: Immunodeficiencies. Congenital or acquired immunodeficiencies. Innate immunity and adaptive immunity immunodeficiencies.

TU-16: Vaccines and Immunomanipulation. Immunization systems. Immune response to the different types of vaccines. Adjuvants. Immunomodulators. Immunosuppressants.

Learning activities and methodology

Title	Hours	ECTS	Learning outcomes
4. Research project presentation (PPR)	2	0.08	CM25
5. Self-assessment sessions	2	0.08	KM26
5. Research project proposal development	9	0.36	CM25, KM26, SM24
1. Consolidation of the theoretical lessons	60	2.4	KM26, SM24
3. Bibliography search	7	0.28	CM25
2. Consolidation of experimental learning techniques	4	0.16	CM25, KM26
2. Experimental techniques seminars	3	0.12	KM26, SM24

4. Reading and proposal of a research project	6	0.24	CM25, KM26
6. Reports and presentation preparation	8	0.32	KM26, SM24
1. Master class	30	1.2	KM26, SM24
7. Self-assessment sessions preparation	3	0.12	KM26
3. Research project development (DPR)	8	0.32	CM25, KM26, SM24

The subject of Immunology consists of theoretical classes, classroom practices and tutorials. The following describes the organization and the teaching methodology that will be followed in these training activities.

Lectures

The content of the theory program will be covered in 30 sessions in the form of master classes with audiovisual support. Lectures will be available online on the Virtual Campus (CV). A list of reference materials available at the library is provided in the bibliography section of this Teaching Syllabus.

Classroom Practicals

These sessions will include the following activities:

1.- Seminars of experimental techniques (TE) (2 sessions).

For these seminars the group will be divided into two subgroups of approximately 40 students each.

Immunology is an experimental science and therefore one of the objectives of the subject is for the student to acquire the skills necessary to understand a research project. Therefore, lectures, discussions and problems solving related to the techniques presented will be carried out. Exams will include questions about these seminars. Further, knowing these techniques will be necessary for the development of the research project.

The scheduled sessions and the specific aims are:

- TE1 (1 h): The objective of this session is to provide an in-depth understanding of antigen-antibody interactions and their application as a system for the specific detection of antigens in different sample types. The session will cover the principles and applications of immunohistochemistry (IHC), immunofluorescence (IF), ELISA, and ELISPOT.
- TE2 (1 h): The objective of this session is to provide an overview of the techniques used to analyse cellular and humoral immune responses. It will cover the main assays used to assess T-cell functionality, including cytokine production and clonal expansion.
- TE3 (1 h): The objective of this session is to examine the functional properties of different T-cell subsets. The session will describe the main assays used to evaluate proliferation and cytotoxicity by flow cytometry among others.

2.- Research project development seminars (DPR) (4 sessions).

For this activity, the group will be divided into four subgroups of approximately 20 students each. In addition, as the activity is based on cooperative learning, students will be organized into working groups of four members, established at the beginning of the semester.

The aim of these seminars is to consolidate the concepts previously covered in the theoretical classes and to promote their integration through the development of a research project aimed at solving a real-world problem. To achieve this objective, students will be required to search for theoretical and experimental information in scientific databases and specialized sources, formulate a research hypothesis, define the research objectives, and design an appropriate methodology to address them.

Four seminars will be scheduled for each subgroup. In the first session, the research project will be presented and the tasks to be carried out by each group will be defined. In the following sessions, the information gathered will be presented, doubts will be raised, and the strategies developed by each working group will be discussed. In each session, both the presentation of each group's proposal and participation in the discussion will be assessed.

Attendance and participation in these sessions are mandatory for all members of each group.

3.- Research project presentation seminars (PPR) (2 sessions).

The aim of these seminars is for each of the four subgroups to present and defend the research project they have developed. Each group will present its research hypothesis, objectives, proposed experimental design, and expected outcomes, with the goal of fostering scientific discussion and the exchange of ideas among the different subgroups.

Each group will deliver a final oral presentation supported by audiovisual materials. The presentation will be assessed by the instructor and by the other working groups. In this case, the final presentation grade will be based on the average of the evaluations provided by the members of each working group.

Students' contributions to the scientific discussion will also be assessed. Therefore, attendance and active participation in these seminar sessions are mandatory.

4.- Self-assessment (2 sessions)

A self-assessment session will be scheduled at the end of blocks I and IV. Model exams will be uploaded to the Virtual Campus (CV) and discussed during these sessions. Both correct and incorrect answers will be reviewed and explained.

For this course, the use of Artificial Intelligence technologies is permitted exclusively for tasks related to literature and information searches and data analysis in the development of the research project (DPR). In all submitted assignments and in the final report, students must clearly identify any parts generated using AI technologies, specify the tools used, and include a critical reflection on how these tools influenced both the process and the final outcome of the work. Failure to disclose the use of AI in this assessed activity will be considered a breach of academic integrity and may result in a partial or full penalty in the grade for the activity, or more severe disciplinary sanctions in serious cases.

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.

Assessment

Continuous assessment activities

Title	Weight	Hours	ECTS	Learning outcomes
1. Midterm exam 1	35	2	0.08	CM25, KM26, SM24
3. Evaluation of the research project development	25	2	0.08	CM25, KM26
2. Midterm exam 2	35	2	0.08	CM25, KM26, SM24
4. Evaluation of the research project presentation	5	2	0.08	CM25, KM26

CONTINUOUS EVALUATION

The evaluation activities programmed are:

Individual learning:

• Midterm exams: two midterm exams, at the end of Block I and IV, which will include questions from the corresponding experimental techniques seminars. Each test will be worth 35% of the final grade. The exam will consist on 40-45 multiple choice questions with 5 options with a single correct one. To be evaluated, 70% of the questions must be answered. One fith of the value of each question will subtracted by each incorrect answer. The duration of the test will be of a maximum of 120 minutes.

Students must reach a minimum of 1.5 points in each midterm exam to be able to add up both marks. The sum must be equal to or greater than 3.2 points to be able to add with the grade of classroom practicals.

• Reassessment exam: A final exam will be scheduled for students who have not achieved the minimum required score or who wish to improve the grade obtained in one or both midterm exams. The final exam will account for 70% of the final course grade, to which the grade from the Classroom Practicals will be added.

If the minimum score required to combine grades is not achieved in the final exam, the grade recorded in the academic transcript will be that obtained in the theoretical assessments. From the moment students choose to take the resit exam, they waive the grade previously obtained in individual assessments.

To be eligible for the resit process, students must have been previously assessed in a set of activities representing at least two-thirds of the total course grade. Therefore, students will receive a "Not Assessable" grade when the completed assessment activities account for less than 67% of the final grade.

Group learning:

• Research project development (DPR). The search and selection of information as well as the ability to design experiments to develop the project will be evaluated. Also the ability to summarize and focus the proposal for each one of the sessions and the participation in the discussion during the seminar. The evaluation will be based on a rubric for each group in each of the seminars and the final project proposal. The proposal will be submitted to a similarity detection software (URKUND). Similarity percentages higher than 20% with a published text or the proposal of another group will not be accepted. The set of rubrics for these sessions will account for 25% of the final grade of the course.

The aim of this activity is to encourage students' team work skills so all the group member should be actively involved in the development of the project. Therefore, the final grade will be based on the contribution of each group member to the tasks assigned.

• Presentation of research project (PPR). Evaluation of the presentation will account for 5% of the final grade of the course. It will include the oral presentation, discussion, and responses to questions posed by both students and the instructor for the entire group. Therefore, the grade for this activity will correspond to the average score obtained by each member of the group.

The aim of this activity is to promote teamwork and ensure that all group members actively participate in the project. Therefore, the final grade will take into account each student's contribution to the tasks carried out. Upon submission of the final project, each group must include a participation form indicating the percentage contribution of each group member to the activity.

The grade for classroom practicals will be retained only until the following academic year. After that period, students will be required to repeat the practicals in order to be assessed again.

SINGLE EVALUATION

Individual learning

The single assessment will consist of a multiple-choice test on the contents of the entire theory program. It will account for 70% of the final grade of the subject. The test will have the characteristics described for the continuous assessment and will coincide with the last continuous assessment test of the subject. The same retake system will be applied as for the continuous assessment.

To pass the subject, students must obtain a minimum final grade of 3.2 over 10 points.

Group learning

The remaining 30% of the subject grade will correspond to cooperative learning and will be assessed as described for continuous assessment.

Any irregularity committed during an assessment activity (including academic fraud, plagiarism, or the improper use of AI, unless such use is expressly authorized in the course syllabus) that may lead to a significant alteration of the assessment outcome will result in a grade of 0 for that assessment activity. If the course syllabus stipulates that obtaining a minimum grade in that assessment activity is an essential requirement for passing the course, or if multiple irregularities are committed in the assessment activities of the same course, the final grade for the course will be 0. In addition, disciplinary proceedings may be initiated against any student who commits any of these irregularities.

Bibliography

ENGLISH TEXTBOOKS:

- Janeway's Immunobiology by K Murphy, P. Travers, M. Walport. Ltd/Garland Science, NY & London, 8th ed, 2011.
- Roitt's essential immunology. Delves, Peter J., Martin, Seamus J., Burton, Dennis R., Roitt, Ivan M. John Wiley & Sons, Ltd., 2017, 13th Edition.
- Kuby immunology by Jenni Punt, Sharon A. Stranford, Patricia P. Jones and Judith A. Owen. W. H. Freeman Macmillan Learning, 8th ed, 2018. *Biblioteca UAB online*
- The immune system. Parham, P. W W Norton & Company, 2021, Fifth edition.
- Cancer Immunology and Immunotherapy. Amiji, Mansoor M, and Lara Scheherazade Milane. vol. 1. Academic Press, 2021. *Biblioteca UAB online*
- Cellular and Molecular Immunology. Abbas, Abul K, Andrew H Lichtman, and Shiv Pillai. Elsevier, 2022. Tenth edition. *Biblioteca UAB online*
- Molecular Immunology: : How Science Works. Carlberg, Carsten, and Eunike Velleuer. Springer International Publishing AG, 2022. *Biblioteca UAB online*
- Clinical Immunology: Principles and Practice. Rich, Robert R et al.. Sixth edition. Chantilly: Elsevier, 2022. *Biblioteca UAB online*
- Basic immunology : functions and disorders of the immune System. Abbas, Abul K., Baker, David L., Lichtman, Andrew H., Pillai, Shiv. Elsevier 2024/ 7th edition
- Immunology. Male, D. K. Elsevier 2026, 10th edition. *Biblioteca UAB online*

SPANISH TEXTBOOKS:

- Inmunología básica: funciones y trastornos del sistema inmunitario. Abbas, A. K., Lichtman, A. H., & Pillai, S. Elsevier 2024. Séptima edición. *Biblioteca UAB online*
- Kuby Inmunología. Punt, J., Stranford, S. A., Jones, P. P., & Owen, J. A. McGraw-Hill Education LLC, 2020, Octava edición. *Biblioteca UAB online*
- Roitt Inmunología: fundamentos. Peter J. Delve. Diferents edicions. *Biblioteca UAB online*
- Inmunología celular y molecular. Abul K. Abbas, Andrew H. Lishtman, Shiv Pillai. 10a edición. Barcelona: Elsevier, 2022. *Biblioteca UAB online*
- Molecular Immunology: How Science Works. Carlberg, Carsten, and Eunike Velleuer. Springer International Publishing AG, 2022. *Biblioteca UAB online*

- Inmunología. Biología y patología del sistema inmunitario. JR Regueiro, E. Martínez Naves, C López Larrea, S González, A Corell. Ed Médica Panamericana, 5ª ed, 2022
- Tus defensas frente al coronavirus: Una breve introducción al sistema inmunitario. Jorge Laborda. Ed. Lulu. 2020.

Software

Nospecific software will be used.

Course groups and languages

The information provided is provisional until November 30. After this date, you will be able to consult the language of each group through this link. To access the information, you will need to enter the course CODE

Type of teaching	Group	Language	Semester	Shift
(TE) Theory	43	Catalan	second semester	morning-mixed
(PAUL) Classroom practices	431	Catalan	second semester	morning-mixed
(PAUL) Classroom practices	432	Catalan	second semester	morning-mixed