

# **IDENTIFICATION DETAILS**

Degree:	Biotechnology			
Scope	Biology and Genetics			_
Faculty/School:	Experimental Sciences			
Course:	IMMUNOLOGY			
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Туре:	Compulsory		ECTS credits:	6
		_		
Year:	4	ſ	Code:	2040
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Teaching period:	Seventh semester			
Subject:	Molecular Biomedicine			
Module:	Biochemistry and Molecular Biology			
Teaching type:	Classroom-based			
Language:	Spanish			
Total number of student study hours:	150			

### SUBJECT DESCRIPTION

The purpose of this course is for students to know the basic elements of the normal functioning of the immune system, the mechanisms of regulation of the immune response and the bases and foundations of immune pathologies of various kinds. In addition, various immunological techniques, diagnostic techniques will be introduced on the state of the immune system and the value of immunoglobulins as diagnostic tools.

#### GOAL

1. Know the basic elements of the normal functioning of the immune system (antibodies, cytokines, complement, myeloid and lymphoid cells and primary and secondary lymphoid organs). Understand how these elements are

related to each other to organize the immune response to foreign antigens. Learn about the complex mechanisms of information exchange between dendritic cells and T and B cells.

2.- To know the global overview of the immune response: innate immunity, adaptive response, cell-mediated immunity and humoral immunity

3. Understand the mechanisms of regulation of the immune response.

4. To know the cellular and molecular bases of the different diseases of immune etiology: Hypersensitivity and allergy, autoimmune diseases, immunodeficiencies, tumor response and transplants.

5. Understand the great value of immunoglobulins both as diagnostic tools and specific detection of molecules and as therapeutic tools.

6. Know the basis of immunology laboratory diagnostic techniques to obtain information about the state of the immune response. Understand the different techniques used to study the components of the immune system, both at the phenotypic and functional levels.

### PRIOR KNOWLEDGE

In order to cope with the subject, the following knowledge will be required on the part of the students: Biology: Structure of the eukaryotic and prokaryotic cell; differences between the two. Structure of the DNA molecule.

Macromolecule biosynthesis: DNA replication, RNA transcription, protein translation...

Genetic engineering: extraction, purification and analysis of nucleic acids, hybridization of nucleic acids, labeling of nucleic acids, enzymology of genetic engineering (restriction enzymes, ligases, polymerases...), cloning vectors, expression systems...

Genomics: chromosomal organization of the human genome, types of sequences, structure of genes, regulation of gene expression...

Instrumental techniques: nucleic acid electrophoresis, capillary electrophoresis, UV-visible absorption spectroscopy, fluorescence emission spectroscopy...

# COURSE SYLLABUS

BASES OF IMMUNOLOGY.

TOPIC 1. The immune system. Properties

TOPIC 2. Immune system cells and tissues. Lymphocyte trafficking

TOPIC 3. Innate Immune System Cells. Antigen recognition and effector mechanisms.

TOPIC 4. The complement system.

TOPIC 5. Immunoglobulins. Structure. Function. Receivers.

TOPIC 6. Major Histocompatibility Complex (CPH). Structure. Antigenic processing and presentation.

Polymorphism.

TOPIC 7. B lymphocytes. Ontogeny. BCR. Subpopulations. Activation.

TOPIC 8. T lymphocytes. Ontogeny. Positive and negative selection. TCR and activation signals. Subpopulations.

TOPIC 9. Global overview of the immune response.

APPLIED IMMUNOLOGY.

TOPIC 10. Inflammation. Phases. Acute and chronic inflammation. Mediators. Treatments.

TOPIC 11. Hypersensitivity disorders.

TOPIC 12. Primary immunodeficiencies: causes and symptoms, classification.

TOPIC 13. Secondary immunodeficiencies. AIDS.

TOPIC 14. Tolerance mechanisms. Autoimmunity and autoimmune diseases.

TOPIC 15. Transplant immunology.

TOPIC 16. Tumor immunology. Tumor escape mechanisms.

### **EDUCATION ACTIVITIES**

Participatory exhibition classes. The theoretical contents of the subject will be taught in master classes presented by the teacher or by guest teachers. Student participation in the development of the class will be encouraged by proposing questions to the attendees in order to ensure a greater understanding of the concepts taught. Selfevaluation, review and reinforcement exercises can be carried out both individually and together. On the other hand, to strengthen content and promote critical thinking, students will find study material in the Virtual Classroom consisting of presentations, articles, links to web pages and additional teaching material. Seminars and/or exhibition of individual or group works. Additionally, in person, self-evaluation, review and reinforcement exercises will be carried out both individually and together in the classroom. Exercise classes, problems or clinical cases.

Current reviews of topics related to Immunology that will be uploaded to the virtual classroom by the teacher. Through individual and group tutoring, the teacher, at the request of the student and at the established time for this purpose, will answer questions or discuss the questions posed to him by the student, in order to guide him in learning the subject.

### DISTRIBUTION OF WORK TIME

TEACHER-LED TRAINING ACTIVITIES	INDIVIDUAL WORK
55 Horas	95 Horas

## SKILLS

#### **Basic Skills**

Students must have demonstrated knowledge and understanding in an area of study that is founded on general secondary education. Moreover, the area of study is typically at a level that includes certain aspects implying knowledge at the forefront of its field of study, albeit supported by advanced textbooks

Students must be able to apply their knowledge to their work or vocation in a professional manner and possess skills that can typically be demonstrated by coming up with and sustaining arguments and solving problems within their field of study.

Students must have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgments that include reflections on pertinent social, scientific or ethical issues

Students must be able to convey information, ideas, problems and solutions to both an expert and non-expert audience

Students must have developed the learning skills needed to undertake further study with a high degree of independence

To acquire firm theoretical, practical, technological and humanistic training needed to develop professional activity.

To foster a concern for knowledge as a key tool in the personal and professional growth process of a student.

To develop capacity for and a commitment to learning and personal development.

To be familiar with the basic principles and theories of human and experimental sciences.

To develop oral and written communication skills.

To acquire the skills needed for experimental work: design, preparation, the compilation of results and the obtainment of conclusions, understanding the limitations of an experimental approach.

#### **General Skills**

To acquire firm theoretical, practical, technological and humanistic training needed to develop professional activity.

To foster a concern for knowledge as a key tool in the personal and professional growth process of a student.

To develop capacity for and a commitment to learning and personal development.

To be familiar with the basic principles and theories of human and experimental sciences.

To develop oral and written communication skills.

To acquire the skills needed for experimental work: design, preparation, the compilation of results and the obtainment of conclusions, understanding the limitations of an experimental approach.

#### Specific skills

Know the general principles and molecular mechanisms of the body's defense.

Understand the principles and foundations of animal and plant physiological responses to the environment.

Recognize the main causes and types of response to cellular, molecular, subcellular, organ and tissue damage.

Identify the basic mechanisms and processes of different human pathologies.

Ability to communicate the knowledge acquired orally and in writing.

Know how to work as a team in an effective and coordinated way.

Analyze and synthesize the main ideas and contents of all types of texts; discover the theses contained in them and the issues they raise, and critically judge their form and content.

### LEARNING RESULTS

The student distinguishes the most important components of the immune system.

The student classifies the types of immune response and the effector and regulatory mechanisms involved.

The student knows the molecular mechanisms associated with the different diseases of the IS.

The student describes the targets and drugs used in diseases of immune etiology.

The student identifies which basic immunological techniques are used depending on the disease or immune response to be measured.

The student recognizes the importance of immunology applied to the clinical, pharmaceutical and biotechnology sectors.

The student correctly interprets and explains the results of bibliographic searches and laboratory practices

#### LEARNING APPRAISAL SYSTEM

1. Ordinary evaluation system.

Evaluation of the theoretical content of the subject:

Exam (80% of the final grade). There may be test-type questions and/or questions to be developed or brief questions. All students must pass the exam with a score of 5 or more to average the rest of the grades in the subject.

Continuous evaluation (20% of the final grade): Carrying out exercises and tasks (in a different format), case study or participation in forums/debates that will be raised throughout the course.

To pass the course, it will be necessary to pass both the written exam and the continuous evaluation. If they do not pass the block of continuous evaluation tasks, a written or oral activity will be proposed to the student in order to pass the subject in an extraordinary call.

Grades will not be saved for future calls.

2. Alternative evaluation system.

Only in the case of students in the second call and later, and students with academic exemption, can they choose to take advantage of the ordinary system specified previously or to take advantage of the alternative system in which the following percentages will be applied:

- Exam 80%. It is necessary to pass the exam with a 5 or more in order to pass the subject.

- Delivery of homework proposed by the teacher on subjects related to the subject: 20%. It is essential that students submit their work on time and form in order to pass the course. In the event that the student does not submit the proposed assignment, a written or oral activity will be proposed to him to be able to pass the subject in an extraordinary call.

Students in second and subsequent enrollment must contact the teacher to request to take advantage of this system. If you do not report, the evaluation will be taken over by the ordinary system.

Plagiarism, as well as the use of illegitimate means in evaluation tests, will be sanctioned in accordance with those established in the Evaluation Regulations and the University's Coexistence Regulations.

# ETHICAL AND RESPONSIBLE USE OF ARTIFICIAL INTELLIGENCE

1.- The use of any Artificial Intelligence (AI) system or service shall be determined by the lecturer, and may only be used in the manner and under the conditions indicated by them. In all cases, its use must comply with the following principles:

a) The use of AI systems or services must be accompanied by critical reflection on the part of the student regarding their impact and/or limitations in the development of the assigned task or project.

b) The selection of AI systems or services must be justified, explaining their advantages over other tools or methods of obtaining information. The chosen model and the version of AI used must be described in as much detail as possible.

c) The student must appropriately cite the use of AI systems or services, specifying the parts of the work where they were used and describing the creative process followed. The use of citation formats and usage examples may be consulted on the Library website(<u>https://www.ufv.es/gestion-de-la-informacion\_biblioteca/</u>).

d) The results obtained through AI systems or services must always be verified. As the author, the student is responsible for their work and for the legitimacy of the sources used.

2.- In all cases, the use of AI systems or services must always respect the principles of responsible and ethical use upheld by the university, as outlined in the <u>Guide for the Responsible Use of Artificial Intelligence in Studies at UFV</u>. Additionally, the lecturer may request other types of individual commitments from the student when deemed necessary.

3.- Without prejudice to the above, in cases of doubt regarding the ethical and responsible use of any AI system or service, the lecturer may require an oral presentation of any assignment or partial submission. This oral evaluation shall take precedence over any other form of assessment outlined in the Teaching Guide. In this oral defense, the student must demonstrate knowledge of the subject, justify their decisions, and explain the development of their work.

# **BIBLIOGRAPHY AND OTHER RESOURCES**

### Basic

Abbas, Abul K. Cellular and Molecular Immunology/9th ed. Philadelphia:Elsevier, 2018.

Salinas Carmona, Mario Cesar. Immunology in Health and Disease/2nd ed., 1st Reimp. Buenos Aires [etc.] : Pan American, 2019.

R.J Regueiro González... [et al.]. Immunology: Biology and Pathology of the Immune System/4th ed., 3rd reimp. Buenos Aires [etc.] :Panamericana, 2016.

Abbas, Abul K. Cellular and Molecular Immunology [Electronic Resource]/9th ed. Madrid: Elsevier, 2018.

Laborda, Jorge, author. Inflamed Immunology: An Introduction to the Immune System and Its Pathologies/

Copioli, Juan Carlos. Immunology and Immunopathology: From Biomolecular Complexity to Conceptual Simplification/

(Copioli, Juan Carlos. Immunology and Immunopathology: From Biomolecular Complexity to Conceptual Simplification/, ||Janeway, Charles A. Janeway Immunology/)