

# STUDENT GUIDE

## **2025-2026**

FACULTY OF SCIENCE, TECHNOLOGY AND ENGINEERING

**DEGREE IN BIOMEDICINE**



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## SYLLABUS

| Subject area                      | Credits |
|-----------------------------------|---------|
| Basic Training (BT)               | 66      |
| Compulsory (OB)                   | 126     |
| Optional (OP)                     | 30      |
| Final Year Project (TFG)          | 12      |
| External Academic Practicum (PAE) | 6       |
| Total                             | 240     |

| FIRST YEAR                                       |          |         |      |
|--|----------|---------|------|
|  | Semester | Credits | Type |
| Cell and Tissue Biology                          | 1st      | 6.0     | FB   |
| Chemistry  | 1st      | 6.0     | FB   |
| Chemistry Laboratory and Instrumental Techniques | 1st      | 6.0     | FB   |
| Human Genetics                                   | 1st      | 6.0     | FB   |
| Integrated Project I                             | 1st      | 6.0     | OB   |
| Biochemistry                                     | 2nd      | 6.0     | FB   |
| Biochemistry and Biology Laboratory              | 2nd      | 6.0     | FB   |
| Biophysics                                       | 2nd      | 6.0     | FB   |
| Integrated Project II                            | 2nd      | 6.0     | OB   |
| Molecular Genetics                               | 2nd      | 6.0     | FB   |

| SECOND YEAR   |          |         |      |
|---|----------|---------|------|
|   | Semester | Credits | Type |
| Cell Signalling and Gene Regulation                 | 1st      | 6.0     | OB   |
| Experimental Design, Biostatistics and Epidemiology | 1st      | 3.0     | OB   |
| Human Physiology and Anatomy I                      | 1st      | 6.0     | FB   |
| Integrated Project III                              | 1st      | 6.0     | OB   |
| Microbiology  | 1st      | 6.0     | FB   |
| Omics Technologies                                  | 1st      | 3.0     | OB   |
| Regulation of Metabolism                            | 1st      | 6.0     | OB   |
| Cell Culture and Tissue Engineering                 | 2nd      | 6.0     | OB   |
| Human Physiology and Anatomy II                     | 2nd      | 6.0     | FB   |
| Immunology  | 2nd      | 6.0     | OB   |
| Integrated Project IV                               | 2nd      | 6.0     | OB   |
| Omics Data and Bioinformatics I                     | 2nd      | 3.0     | OB   |
| Virology  | 2nd      | 3.0     | OB   |

**THIRD YEAR**

|   | <b>Semester</b> | <b>Credits</b> | <b>Type</b> |
|---|-----------------|----------------|-------------|
| Cell Culture and Tissue Engineering Laboratory          | 1st             | 6.0            | OB          |
| Developmental Biology                                   | 1st             | 3.0            | OB          |
| Genetic Engineering                                     | 1st             | 6.0            | OB          |
| Integrated Project V                                    | 1st             | 6.0            | OB          |
| Molecular and Cellular Basis of Disease                 | 1st             | 6.0            | OB          |
| Omics Data and Bioinformatics II                        | 1st             | 3.0            | OB          |
| Clinical Genomics                                       | 2nd             | 3.0            | OB          |
| Diagnostic Imaging Techniques                           | 2nd             | 3.0            | OB          |
| Endocrine System Diseases                               | 2nd             | 3.0            | OB          |
| Immunology  | 2nd             | 6.0            | OB          |
| Integrated Project VI                                   | 2nd             | 6.0            | OB          |
| Neurobiology and Diseases of the Central Nervous System | 2nd             | 3.0            | OB          |
| Pharmacology and Toxicology                             | 2nd             | 6.0            | OB          |

**FOURTH YEAR**

|  | <b>Semester</b> | <b>Credits</b> | <b>Type</b> |
|--|-----------------|----------------|-------------|
| Bioethics                                      | 1st             | 3.0            | OB          |
| Cancer Biology                                 | 1st             | 6.0            | OB          |
| Cardiovascular and Respiratory System Diseases | 1st             | 3.0            | OB          |
| External Practicum                             | 1st or 2nd      | 6.0            | PAE         |
| Final Year Project                             | 1st or 2nd      | 12.0           | TFG         |
| Optional subjects                              |                 | 30.0           | OP          |

**OPTIONAL SUBJECTS - WITHOUT SPECIALIST TRACK**

|                                      | <b>Credits</b> |
|--------------------------------------|----------------|
| Proteomics                           | 6.0            |
| Nutritional Biochemistry             | 6.0            |
| Human Reproduction                   | 6.0            |
| Applied Epigenetics                  | 3.0            |
| Emerging and Re-emerging Infections  | 3.0            |
| Advanced Pharmacology and Toxicology | 6.0            |
| Bioscience and Business              | 6.0            |
| Optional External Practicum          | 6.0            |
| Bioengineering and Medical Devices   | 6.0            |
| Clinical Biochemistry                | 6.0            |

# COMPULSORY SUBJECTS IN THE FIRST YEAR

## Biochemistry and Biology Laboratory

**Type:** Basic Training (BT)

**Credits:** 6.0

**Semester:** 2nd

| Group                                | Language of instruction | Teachers   |
|--------------------------------------|-------------------------|--|
| G11, classroom instruction, mornings | Catalan                 | Anna Buisan Farre<br>Manuel Joaquin Caudet<br>Patricia Fernandez Nogueira<br>Paulina Carriba Domínguez<br>Susana Bodoy Salvans |

### OBJECTIVES

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This subject introduces students to the most commonly used laboratory techniques in biochemistry, molecular biology and also histology. Students become familiar with the management and safety standards in a biomedical laboratory and with the manipulation and preparation of biological samples for analysis. They also learn basic techniques in a biochemical laboratory and are introduced to histological tools.

### LEARNING OUTCOMES

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- LO1. Acquire skills in the preparation of biological samples.
- LO2. Become familiar with the main microscopy techniques.
- LO3. Integrates theoretical concepts with experimental evidence obtained in the laboratory in an argumentative manner.
- LO4. Acts with commitment and responsibility in common situations and those specific to the profession.
- LO5. Resolves problems and situations typical of professional practice with entrepreneurial and innovative attitudes.
- LO6. Analyzes one's own personal and professional capabilities in relation to different areas of professional practice.
- LO7. Acquires and demonstrates advanced knowledge of theoretical and practical aspects and work methodology in the field of biomedicine.
- LO8. Apply their knowledge to solve problems in complex or professional and specialized work areas that require the use of creative and innovative ideas.
- RA9. Moves with ease in complex situations or those that require the development of new solutions.

### COMPETENCIES

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#### General skills

- Carry out professional activities independently with initiative and respect for other health professionals.

#### Specific skills

- Apply the principles of chemistry and physics to the interpretation of biological phenomena and in the development of relevant biomedical technology.
- Have technical skills in a research laboratory for working on cell and tissue samples, and with experimental animals.

#### Basic skills

- Students can apply their knowledge to their work or vocation in a professional manner and have competencies typically demonstrated through drafting and defending arguments and solving problems in their field of study.
- Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.

#### Core skills

- Bring to bear values of entrepreneurship and innovation in one's academic and professional careers.
- Reflect critically on knowledge of all kinds, with a commitment to professional rigor and quality.

### CONTENT

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1. **Laboratory safety** (1 hour of class work + 2 hours of individual work)
2. **Biochemistry techniques** (19.5 hours of class work + 38 hours of individual work)
  - PCR
  - Protein quantification

- DNA and protein electrophoresis
- Enzyme activity
- Gel exclusion chromatography
- 3. **Molecular biology techniques** (8.5 hours of class work + 16 hours of individual work)
  - ELISA
  - PCR
- 4. **Basic histology techniques** (16 hours of class work + 31 hours of individual work)
  - Staining of blood, cells and tissue
  - Observation under the optical microscope
- 5. **Visit to the Biochemistry and Pathological Anatomy Laboratory of the University Hospital of Vic** (2.5 hours of class work + 4 hours of individual work)
- 6. **Examination** (3 hours of class work)

## EVALUATION

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1. **Course monitoring** (various activities that take place throughout the different sessions of the course, before and after daily practices)
  - 30% of the final grade (NF); non-recoverable
2. **Laboratory notebook**
  - 30% of the NF; non-recoverable
3. **Final exam**
  - 30% of the NF; recoverable; minimum required grade: 4.5
4. **Attitude and participation in class**
  - 10% of the NF; non-refundable. Laboratory work habits are assessed. This section reflects penalties for delays.

### Attendance is mandatory.

- Absences are not permitted, but you can be absent for justified reasons. More than 2 unexcused absences will result in failing the entire subject.
- Excused absences do not exclude students from doing the work derived from the session they did not attend.

They are considered **excused absences**:

- Hospital admission
- Judicial summons
- Death of a relative of the 1st or 2nd degree of consanguinity or affinity
- Medically diagnosed illness that prevents attendance at the session
- Attendance at a scheduled hospital visit, which cannot be postponed and which involves diagnosis, monitoring and/or medical treatment

In case of a **excused absence** it is necessary that:

- If there is an option, the student can retake the class in another group.

In the case of **unexcused absence**:

- The class cannot be made up and a penalty equivalent to a 10% reduction in the final grade of the subject is applied for each session missed. (Therefore, one absence means a 10% reduction in the final grade and two, a 20% reduction.)
- Absence from 3 or more sessions implies failing the subject.

### Important

Plagiarism or copying someone else's work is penalized in all universities and, according to the [UVic-UCC coexistence rules](#), constitute serious or very serious faults. Therefore, during the course of this subject, plagiarism or the improper appropriation of texts or ideas from other people (see [What is considered plagiarism?](#)) and the improper or undeclared use of artificial intelligence in an activity automatically result in a suspension or other disciplinary measures.

To cite texts and materials appropriately, you must consult the academic citation guidelines and guidelines available on the UVic Library website.

## METHODOLOGY

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The subject is developed through practical work in the laboratory in small groups.

## BIBLIOGRAPHY

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### Key references

- Ó'Fágáin, C., Cummins, P. M., O'Connor, B. F., Walls, D., and Loughran, S. T. (2017). *Gel-Filtration Chromatography*. Retrieved from [https://ucercatot.uvic-ucc.cat/permalink/34CSUC\\_UVIC/t1e3js/cdi\\_unpaywall\\_primary\\_10\\_1007\\_978\\_1\\_4939\\_6412\\_3\\_2](https://ucercatot.uvic-ucc.cat/permalink/34CSUC_UVIC/t1e3js/cdi_unpaywall_primary_10_1007_978_1_4939_6412_3_2)
- Paniagua, Ricardo (2007). *Citología e histología vegetal y animal*. Retrieved from [https://ucercatot.uvic-ucc.cat/permalink/34CSUC\\_UVIC/1nl2ep/alma991001117063206718](https://ucercatot.uvic-ucc.cat/permalink/34CSUC_UVIC/1nl2ep/alma991001117063206718)

— Williams, B. L., y Wilson, K. (1981). *Principios y técnicas de bioquímica experimental*. Retrieved from [https://ucercatot.uvic-ucc.cat/permalink/34CSUC\\_UVIC/1n12ep/alma991000004809706718](https://ucercatot.uvic-ucc.cat/permalink/34CSUC_UVIC/1n12ep/alma991000004809706718)

## Cell and Tissue Biology

**Type:** Basic Training (BT)

**Credits:** 6.0

**Semester:** 1st

| Group                                | Language of instruction | Teachers   |
|--------------------------------------|-------------------------|--|
| G11, classroom instruction, mornings | Catalan                 | Gemma Fuster Orellana<br>Eulalia Bosch Presegue<br>Manuel Joaquin Caudet |

### SUSTAINABLE DEVELOPMENT GOALS (SDG)

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- 5. Gender equality

### OBJECTIVES

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This subject has as its general objective the analysis of cells and their integration into a multicellular organism in the tissue field.

Concepts of basic cell biology, the structure, morphology, composition and function of organelles, important vital dynamic processes such as intercellular and tissue communication, and hierarchical organization are introduced.

Students are trained in theories about the origin, organization, structure and functions of the cellular and extracellular compartments that constitute animal tissues, organs and systems.

### LEARNING OUTCOMES

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- LO1. Know the structure, organization and function of cells.
- LO2. Safely distinguish the main tissues and their function in the different organs.
- LO3. Knows the morphology and structure of tissues at a basic level.
- LO4. Evaluates the learning processes carried out globally in accordance with the plans and objectives set and establishes individual improvement measures through questionnaires, exams and presentations.
- LO5. Understands completely oral and written messages of different types referring to cell and tissue biology expressed in Catalan, Spanish and English.
- LO6. Uses language that is respectful of gender issues in both oral and written or audiovisual productions.
- RA7. Moves with ease in complex situations or those that require the development of new solutions, especially in the resolution of scientific cases.
- LO8. Collects and interprets data and information on which to base their conclusions, which include reflections on social, scientific or ethical issues in the field of biomedicine.
- LO9. Acquires and demonstrates advanced knowledge of theoretical and practical aspects and work methodology in the field of biomedicine.

### COMPETENCIES

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#### General skills

- Formulate hypotheses following the scientific method, with an ability to summarize and analyze information in a critical way in order to be able to solve problems.

#### Specific skills

- Describe the relationship between the biology of the nucleus and the metabolism of the main cell types.
- Recognize the organization, structure and function of cells and their components in different tissues.

#### Basic skills

- Students can apply their knowledge to their work or vocation in a professional manner and have competencies typically demonstrated through drafting and defending arguments and solving problems in their field of study.
- Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.
- Students have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgments that include reflection on relevant social, scientific and ethical issues.

#### Core skills

- Communicate orally, in writing and audiovisually, in one's own language and in foreign languages, with proficiency in form, content and use.
- Reflect critically on knowledge of all kinds, with a commitment to professional rigor and quality.

## CONTENT

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This subject is structured into one day a week of seminars and two days of theoretical classes.

### Program

#### Seminars

1. Transport: Golgi apparatus and secretory pathway
2. Endocytosis, exocytosis and other transport events
3. Organelles: lysosomes, autophagy and endosomal compartment
4. Cytosol and cytoskeleton: intermediate filaments
5. Introduction to multicellular organization: tissues, organs, apparatuses and systems
6. The epithelial tissue
7. The connective tissue
8. Muscle tissue
9. The nervous tissue
10. The blood
11. Tissue integration

#### Theory

1. Introduction to cellular structure and organization and cell membranes
  - 1.1. Concept, structure and compartments
  - 1.2. Cell membranes I: cell membrane lipids and functions
  - 1.3. Cell membranes II: membrane proteins and functions
  - 1.4. Transport through membranes: permeability and types of transport
2. The endomembranous system
  - 2.1. Introduction
  - 2.2. The endoplasmic reticulum
    - 2.2.1. The rough endoplasmic reticulum
    - 2.2.2. The smooth endoplasmic reticulum
3. The energy organelles
  - 3.1. Introduction
  - 3.2. Mitochondria
  - 3.3. Peroxisomes
4. The cytosol and the cytoskeleton
  - 4.1. The cytosol
  - 4.2. The cytoskeleton
  - 4.3. Actin filaments
  - 4.4. Microtubules
5. The nucleus of the cell
  - 5.1. Introduction to the cell cycle
  - 5.2. The interphase nucleus: concept, structure, function and organization
  - 5.3. The nuclear envelope: structure and constitution
  - 5.4. Nuclear pores
  - 5.5. The nucleoplasm: organization, chromatin and nucleolus
6. Extracellular matrix
  - 6.1. Introduction, structure and composition
  - 6.2. Types of extracellular matrix and specializations
7. Adhesion and intercellular junctions
  - 7.1. Introduction
  - 7.2. Cell adhesion proteins
  - 7.3. Cell junctions: concept and types
8. The life cycle of the cell
  - 8.1. Cell cycle: characteristics and phases
  - 8.2. Mitosis
  - 8.3. Cytokinesis
  - 8.4. Meiosis
  - 8.5. Cell death

## EVALUATION

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According to the Academic Regulations for undergraduate studies at UVic-UCC, there is only one official call that includes two different evaluation periods:

- **Ordinary period**, which takes place as part of the training process and during the school period.
- **Complementary evaluation period**, in which the student can be evaluated again for the tasks, activities or tests that he or she has not satisfactorily passed within the framework of the first period.

### Academic or ordinary period

Continuous evaluation of the activities carried out by the student through:

1. **Topic evaluation: 45%**

— **First half** (topics 1-5, including seminars): **22.5%** (recoverable)

**Important:** To be able to average with the other exam, a minimum grade of 4/10 must be obtained. If you obtain less than 4/10, you must retake this part.

— **Second part** (topics 6-9, including seminars): **22.5%** (recoverable)

**Important:** To be able to average with the other exam, you must obtain a minimum grade of 4/10. If you obtain less than 4/10, you must retake this part.

— **Important:** To pass the subject, you must obtain a grade of 5/10 in the average of the two partials of the topic evaluation.

2. **Active participation in classes, seminars and oral presentations** (questions to other groups, peer assessment, assistance): **10%** (not recoverable)

3. **Online exercises and quizzes: 15%** (not recoverable)

4. **Group work: 30%** (non-recoverable) (presentation grade, which includes the individual grade 12.5% + the group grade 12.5%; also includes 5% of tutorials to follow up on the group work)

The final grade for the subject is the result of the weighting of the grades obtained in each of the parts.

### Recovery period

Students who do not pass some of the activities considered retakeable may retake them during this period, as long as the total number of parts of the subject not passed does not represent 50% of the final grade.

### Important

Plagiarism or copying someone else's work is penalized in all universities and, according to the [UVic-UCC coexistence rules](#), constitute serious or very serious faults. Therefore, during the course of this subject, plagiarism or the improper appropriation of texts or ideas from other people (see [What is considered plagiarism?](#)) and the improper or undeclared use of artificial intelligence in an activity automatically result in a suspension or other disciplinary measures.

To cite texts and materials appropriately, you must consult the academic citation guidelines and guidelines available on the UVic Library website.

## METHODOLOGY

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1. Presentation of theoretical content through regular classes and seminars in which videos, participation and information search activities are presented.
2. Carrying out exercises based on the theoretical content presented in class (independent and individual work)
3. Exercise correction tutorials with the class group
4. Carrying out group work with follow-up tutorials in the classroom

## BIBLIOGRAPHY

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### Key references

- Alberts, B. (2015). *Molecular biology of the cell* (6 ed.). Garland Science.
- Alberts, B., Johnson, A., Lewis, J., et al. (2002). *Molecular Biology of the Cell*. Retrieved from <https://www.ncbi.nlm.nih.gov/books/NBK21054/?term=Molecular%20Biology%20of%20the%20Cell>
- Lodish, H., Berk, A., Kaiser, C., Krieger, M., Bretscher, A., Ploegh, H., Martin, K., Yaffe, M., Amon, A. (2021). *Molecular Cell Biology* (9 ed.). Macmillan Press.
- Lodish, H., Berk, A., Kaiser, CA., Kriger, M., Bretscher, A., Ploegh, H., Amon, A., Scott, MA. (2016). *Biología Celular y Molecular* (7 ed.). Editorial Medica Panamericana.

### Further reading

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

## Chemistry

**Type:** Basic Training (BT)

**Credits:** 6.0

**Semester:** 1st

| Group                                | Language of instruction | Teachers                                  |
|--------------------------------------|-------------------------|---|
| G11, classroom instruction, mornings | Catalan                 | Manuel Joaquin Caudet<br>Maria Roca Ayats |

### OBJECTIVES

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The general objective of this subject is to lay a solid foundation in chemistry on which other subjects of the degree and the subsequent exercise of the profession can be based. To achieve this, the basic theoretical aspects of both inorganic and organic chemistry are covered.

### LEARNING OUTCOMES

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- LO1. Knows the fundamental theoretical principles and those of the techniques and methodology in chemistry.
- LO2. Demonstrates skills for critical reflection in processes linked to the exercise of the profession.
- LO3. Analyzes one's own personal and professional capabilities in relation to different areas of professional practice.
- LO4. Acquires and demonstrates advanced knowledge of theoretical and practical aspects and work methodology in the field of biomedicine.

### COMPETENCIES

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#### General skills

- Formulate hypotheses following the scientific method, with an ability to summarize and analyze information in a critical way in order to be able to solve problems.

#### Specific skills

- Apply the principles of chemistry and physics to the interpretation of biological phenomena and in the development of relevant biomedical technology.

#### Basic skills

- Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.

#### Core skills

- Bring to bear values of entrepreneurship and innovation in one's academic and professional careers.
- Reflect critically on knowledge of all kinds, with a commitment to professional rigor and quality.

### CONTENT

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1. Dilutions and concentrations (*2 hours of theory + 1 hour of problems*)
  - 1.1. Basic concepts
  - 1.2. Concentrations
2. Structure of matter (*4 hours of theory + 1 hour of problems*)
  - 2.1. Atom, atomic structure and isotopes
  - 2.2. Chemical elements and bioelements
  - 2.3. Valence layers
3. Compounds and chemical bonding (*4 hours of theory + 1 hour of problems*)
  - 3.1. Chemical bond
  - 3.2. Types of links
  - 3.3. Molecular orbitals in covalent bonds and aromatic compounds
4. Molecular interactions (*2 hours of theory*)
  - 4.1. Non-covalent interactions
  - 4.2. Intermolecular interactions
  - 4.3. Water as a solvent
5. Structure and nomenclature of organic compounds (*4 hours of theory + 1 hour of problems*)
  - 5.1. The chemistry of carbon
  - 5.2. Hydrocarbons
6. Functional groups and reactivity (*4 hours of theory + 1 hour of problems*)
  - 6.1. Characteristics of functional groups

- 6.2. Types of functional groups
- 7. Stereochemistry (*4 hours of theory + 1 hour of problems*)
  - 7.1. Three-dimensional structure
  - 7.2. Angle rotation
  - 7.3. Optical and structural isomerism
- 8. Chemical reactions (*4 hours of theory + 1 hour of problems*)
  - 8.1. Oxidation and reduction
- 9. Chemical equilibrium (*4 hours of theory + 1 hour of problems*)
  - 9.1. Equilibrium constants
  - 9.2. Energy of reactions in equilibrium and alterations of equilibrium
  - 9.3. Acids, bases and the concept of pH. Buffer solutions
- 10. Chemical thermodynamics (*5 hours of theory + 1 hour of problems*)
  - 10.1. Basic concepts
  - 10.2. Enthalpy, entropy and Gibbs free energy
- 11. Chemical kinetics (*3 hours of theory*)
  - 11.1. Activation energy
  - 11.2. Catalysis

## EVALUATION

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According to the Academic Regulations for degrees at UVic-UCC, there is only one official call that includes two different evaluation periods:

- Ordinary period, which takes place as part of the training process and during the school period.
- Complementary evaluation period, in which the student can be evaluated again for the tasks, activities or tests that he/she has not passed satisfactorily within the framework of the first period.

### Ordinary period

Continuous evaluation of the activities carried out by the student through:

- **Evaluation of the topics:** 40%
  - **First part:** 20% (recoverable)
    - Important:** To be able to average with the other exam, a minimum grade of 4/10 must be obtained. If you obtain less than 4/10, you must retake this part.
  - **Second part:** 20% (recoverable)
    - Important:** To be able to average with the other exam, a minimum grade of 4/10 must be obtained. If you obtain less than 4/10, you must retake this part.
- **Online exercises and quizzes:** 25% (non-recoverable)
- **Classroom activities:** 25% (non-recoverable)
- **Group work:** 10% (non-refundable)

**Important note:** To pass the subject, a minimum grade of 5 is required in the total subject evaluation.

The final grade for the subject is the result of the weighting of the grades obtained in each of the parts.

### Complementary evaluation period

Students who do not pass some of the activities considered retakeable may retake them during this period, as long as the total number of parts of the subject not passed does not represent 50% of the final grade.

### Important

Plagiarism or copying someone else's work is penalized in all universities and, according to the [UVic-UCC coexistence rules](#), constitute serious or very serious faults. Therefore, during the course of this subject, plagiarism or the improper appropriation of texts or ideas from other people (see [What is considered plagiarism?](#)) and the improper or undeclared use of artificial intelligence in an activity automatically result in a suspension or other disciplinary measures.

To cite texts and materials appropriately, you must consult the academic citation guidelines and guidelines available on the UVic Library website.

## METHODOLOGY

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- Presentation of content with the class group
- Carrying out exercises based on the theoretical content presented in class (independent and individual work)
- Exercise correction tutorials with the class group
- Development of content expansion work

## BIBLIOGRAPHY

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### Key references

- Bruice, P.Y. (2017). *Organic Chemistry* (8 ed.). Pearson.
- Crowe, J., & Bradshaw, T. (2021). *Chemistry for the Biosciences* (4 ed.). Oxford University Press Academic UK.

— Flowers, P., Theopold, K., Langley, R., & Robinson, W. R. (2022). *Chemistry*. Retrieved from <https://openstax.org/details/books/chemistry-2e>

**Further reading**

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

## Human Genetics

**Type:** Basic Training (BT)

**Credits:** 6.0

**Semester:** 1st

| Group                                | Language of instruction | Teachers               |
|--------------------------------------|-------------------------|------------------------|
| G11, classroom instruction, mornings | Catalan                 | Elisabet Dachs Cabanas |

### SUSTAINABLE DEVELOPMENT GOALS (SDG)

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- 4. Quality education
- 5. Gender equality

### OBJECTIVES

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This subject introduces students to the general concepts of classical genetics and human genetics. It details the genetic alterations that can lead to diseases and introduces students to the basics of genetic counseling. Within this subject, students can analyze and reflect on the relationships between genetics, gender, culture and society.

### LEARNING OUTCOMES

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- LO1. Understands the fundamentals of genetics and nucleic acid biology.
- LO2. Evaluates globally the learning processes carried out in accordance with the plans and objectives set and establishes individual improvement measures.
- LO3. Understands oral and written messages of different types in a complete manner expressed in their own languages and in English.
- LO4. Uses language that is respectful of gender issues in both oral and written or audiovisual productions.
- RA5. Moves with ease in complex situations or those that require the development of new solutions.
- LO6. Collects and interprets data and information on which to base their conclusions, which include reflections on social, scientific or ethical issues in the field of biomedicine.
- LO7. Acquires and demonstrates advanced knowledge of theoretical and practical aspects and work methodology in the field of biomedicine.
- LO8. Apply their knowledge to solve problems in complex or professional and specialized work areas that require the use of creative and innovative ideas.

### COMPETENCIES

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#### General skills

- Formulate hypotheses following the scientific method, with an ability to summarize and analyze information in a critical way in order to be able to solve problems.

#### Specific skills

- Describe the relationship between the biology of the nucleus and the metabolism of the main cell types.
- Recognize the organization, structure and function of cells and their components in different tissues.

#### Basic skills

- Students can apply their knowledge to their work or vocation in a professional manner and have competencies typically demonstrated through drafting and defending arguments and solving problems in their field of study.
- Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.
- Students have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgments that include reflection on relevant social, scientific and ethical issues.

#### Core skills

- Communicate orally, in writing and audiovisually, in one's own language and in foreign languages, with proficiency in form, content and use.
- Reflect critically on knowledge of all kinds, with a commitment to professional rigor and quality.

### CONTENT

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1. History of genetics and impact on medicine
  - Timeline and reflection of what pre-Mendelian and post-Mendelian genetics would be until today
2. Fundamental concepts

- Locus, genes and alleles. Genotype and phenotype. Discrete and continuous characters. Cell cycle. Chromosomes, meiosis and mitosis. Gametogenesis. Parts of chromosomes
- 3. Mendelian inheritance
  - Segregation of hereditary factors. Monozygotic and heterozygous genotypes. Dominant and recessive phenotypes. Random distribution of hereditary factors. Relationship between Mendel's laws and meiosis. Quantitative characters. Sex determination mechanisms. Autosomes and sex chromosomes. Lineages and their analysis. Discrete and continuous characters. Epistasis
- 4. Non-Mendelian inheritance
  - Extrachromosomal or cytoplasmic inheritance. Epigenetics. Partial or incomplete dominance, codominance. Genetic imprinting. Mosaicism. Chimera. Genetic linkage. Sex-linked inheritance. Sex-influenced inheritance. Polygeny. Epistasis
- 5. Inheritance patterns
  - Application of the concepts of topics 3 and 4 in genetic diseases: autosomal dominant, codominant, partial diseases, autosomal recessive diseases, concept of consanguinity, genetic heterogeneity, sex-linked inheritance (X and Y), sex-influenced characters, characters limited to one sex, polygenic inheritance, multifactorial inheritance, genetic imprinting, gene expression and cancer (concepts of proto-oncogene, oncogene and tumor suppressor gene). Congenital metabolic diseases. Developmental genetics or congenital malformations
- 6. Genetic recombination
- 7. Mutations and polymorphism
  - According to the cell, according to the origin, according to the level and according to the effect. Deletions, translocations, inversions, duplications, mosaicism, autopolyploids, allopolyploidies, somatic allopolyploidies. Gametogenesis in case of chromosomal alterations
- 8. Population genetics
  - Hardy-Weinberg law

In addition, students have content related to reflection on social, cultural, economic and gender diversity in the field of human genetics.

## EVALUATION

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The course evaluation consists of two parts, an individual evaluation (65%) and a group evaluation (35%).

### Individual evaluation

- Partial exam 1: 22.5%; recoverable
- Partial exam 2: 22.5%; recoverable
- Individual follow-up activities: 25%; non-recoverable

### Group evaluation

- Cooperative work: 20%; non-refundable
- Group work: 10%; non-recoverable

To pass the subject, the average grade of the 2 exams must be higher than 5 and no exam must be lower than 4.

The average for the entire subject must be equal to or greater than 5.

### Important

Plagiarism or copying someone else's work is penalized in all universities and, according to the [UVic-UCC coexistence rules](#), constitute serious or very serious faults. Therefore, during the course of this subject, plagiarism or the improper appropriation of texts or ideas from other people (see [What is considered plagiarism?](#)) and the improper or undeclared use of artificial intelligence in an activity automatically result in a suspension or other disciplinary measures.

To cite texts and materials appropriately, you must consult the academic citation guidelines and guidelines available on the UVic Library website.

## METHODOLOGY

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The methodology used throughout the course:

- Presentation of content with the class group; students have interactive material: videos made by faculty or external professors, articles, PDFs, etc.
- Use of methodologies that increase student self-learning and autonomy, for example flipped classes, case studies, etc.
- Carrying out exercises based on the theoretical content presented in class or in autonomous, individual and/or group work.
- Exercise correction tutorials (group class)
- Carrying out individual or group extension and synthesis work
- Study of the syllabus (independent and individual work)

## BIBLIOGRAPHY

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### Key references

- Jorde, Lynn B. (2021). *Genética médica*. Retrieved from <https://www-clinicalkey-com.biblioremot.uvic.cat/student/content/toc/3-s2.0-C20190053186>

- Ménsua Fernández, J.L. (2003). *Genética : problemas y ejercicios resueltos* . Retrieved from [https://www-ingebook-com.biblioremot.uvic.cat/ib/NPcd/IB\\_BooksVis?cod\\_primaria=1000187&codigo\\_libro=4653](https://www-ingebook-com.biblioremot.uvic.cat/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=4653)
- Nussbaum, Robert L. (8). *Genética en Medicina*. Retrieved from <https://www-clinicalkey-com.biblioremot.uvic.cat/student/content/toc/3-s2.0-C20150020123>
- Pierce, B. A. (2016). *Genética: Un enfoque conceptual* (5 ed.). Panamericana.
- Turpenny, Peter D. (2022). *Elementos de genética médica y genómica* . Retrieved from <https://www-clinicalkey-com.biblioremot.uvic.cat/student/content/toc/3-s2.0-C20210009603>

#### **Further reading**

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

## Integrated Project I

**Type:** Compulsory (OB)

**Credits:** 6.0

**Semester:** 1st

| Group                                | Language of instruction | Teachers   |
|--------------------------------------|-------------------------|--|
| G11, classroom instruction, mornings | English                 | Meritxell Pujolassos Tanyà<br>Roger Casals Franch<br>Sarah Umbrene Khan<br>Suzanne Tyler |

### SUSTAINABLE DEVELOPMENT GOALS (SDG)

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- 1. No poverty
- 2. Zero hunger
- 3. Good health and well-being
- 4. Quality education
- 5. Gender equality
- 6. Clean water and sanitation
- 7. Affordable and clean energy
- 10. Reduced inequalities
- 11. Sustainable cities and communities
- 16. Peace, justice and strong institutions

### OBJECTIVES

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This subject is the first in the Integrated Project (I-VI) series on the undergraduate programme in Biomedicine. Each semester, from the first to the third year, ends with an Integrated Project. The common objective of this series is to work at a practical level on the knowledge that students have acquired in other subjects during the semester, while facilitating the acquisition of skills related to biomedical research.

In Integrated Project I students improve scientific communication skills in English, both oral and written, and develop data analysis and experimental design skills through a combined PBL (problem-based learning) - SDG (Sustainable Development Goals) methodology. The course is based on a project called *Health Horizons: PBL for sustainable health and well-being* with the following objectives:

- Put into practice knowledge acquired during the first semester.
- Analyse statistical data.
- Learn research skills through PBL methodology in English.
- Apply the key competences for sustainability to ensure sustainable project development.
- Analyse and reflect on the relationship between science and technology, gender, culture and society.

### LEARNING OUTCOMES

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- RA1. Confidently use verb forms, questions, articles and quantifiers, conditionals and prepositions in English.
- RA2. Demonstrate comprehension of spoken and written scientific English.
- RA3. Use specialised sources of information on science and technology in English.
- RA4. Recognise and apply the main guidelines for structuring presentations, projects and publications in scientific communication.
- RA5. Manage databases and apply advanced statistics to analyse data.
- RA6. Resolve problems and situations relevant to professional practice in an innovative and entrepreneurial manner.
- RA7. Critically reflect on processes related to professional practice.
- RA8. Use appropriate spoken language (verbal and non-verbal) to communicate in personal and professional situations in Catalan, Spanish and English.
- RA9. Apply strategies to promote gender equality and justice in the workplace.
- RA10. Prepare reports and written documents (mainly of a technical nature) with correct spelling and grammar in Catalan, Spanish and English.

### COMPETENCIES

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#### General skills

- Show a positive attitude to innovating, creating value and integrating scientific knowledge and improving one's own training.

#### Specific skills

- Analyse biomedical data and biological sequences through the use of statistics and computation.

- Be able to critically interpret the results and conclusions of scientific studies.
- Formulate hypotheses and design experiments in the field of biomedical research.
- Have technical skill in a research laboratory for working on cell and tissue samples, and with experimental animals.
- Recognise the applicability of genetic engineering methods and omics technology in preclinical and clinical research.

### Basic skills

- Students can apply their knowledge to their work or vocation in a professional manner and have competencies typically demonstrated through drafting and defending arguments and solving problems in their field of study.
- Students can communicate information, ideas, problems and solutions to both specialists and non-specialists.
- Students have developed the learning skills necessary to undertake further studies with a high degree of independent learning.

### Core skills

- Develop strategies for promoting gender equality and equity for all.
- Exercise active citizenship and individual responsibility with a commitment to democratic values and sustainable development.
- Reflect critically on knowledge of all kinds, with a commitment to professional rigour and quality.

## CONTENT

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Integrated Project I is based on the project *Health Horizons: PBL for sustainable health and well-being*, which integrates SDGs (SDG3 in particular) and includes the following content:

### Data analysis

*(8x2h whole class content presentation and practice + 2h in-class self study + 1h group presentations or project meetings)\**

1. Tidying data: Data structure and data files
2. Types of variables: categorical variables (proportions, variables + plots; continuous variables (means, medians, variance + plots)

*Online test 1 (30 minutes)\**

1. Surveys and biomedical research (aims and objectives, definition); biomedical research (bias in study design); design of a survey
2. Data visualisation: Graphical representation of data; relationship between two variables (correlation coefficients and relative risk); data over time

*Online test 2 (30 minutes)\**

1. Identification of possible bias and outliers
2. Reproducibility of analysis

*Online test 3 (30 minutes)\**

1. Prepare results for presentation (article and oral presentation format)

### English

*(8x2h whole class content presentation and practice + 2h in-class self study + 1h group presentations or project meetings)\**

1. Introductions, meetings and discussion strategies
2. Global health terminology

*Online test 1 (30 minutes)\**

1. Scientific article structure
2. Scientific article language

*Online test 2 (30 minutes)\**

1. Numbers and figures: Describing data
2. Scientific article drafting

*Online test 3 (30 minutes)\**

1. Presentation skills I
2. Presentation skills II

### Graph interpretation test (1h)\*

### Group project presentations (2h)\*

This subject encourages critical thinking on the social, cultural, and economic impacts, as well as gender diversity, in the field of biomedical science.

\* All hours referenced refer to contact hours, based on approximations provided in the course guide, which may be updated or adjusted over time. A more detailed and regularly updated work plan is available in the virtual classroom. These contact hours represent roughly one-third of the total time students are expected to dedicate to the course. The remaining two-thirds consist of

independent activities, including self-directed study, assignments, projects, and consultations with teaching staff.

## ASSESSMENT

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Students will be assessed in the following way:

1. Short answer tests: 30% (individual assessment); RA1, RA2, RA5, RA6
2. Graph interpretation essay: 10% (individual assessment); RA2, RA3, RA10
3. Scientific presentation: 25% (group, individual and peer assessment); RA3, RA4, RA8
4. Scientific article: 25% (group & peer assessment); RA1, RA2, RA3, RA5, RA10
5. Active participation: 10% (individual and peer assessment); RA6, RA7, RA8, RA9

Activity 1 is assessed quantitatively whereas Activities 2 to 5 are evaluated with specific rubrics provided at the beginning of the course. Students are expected to take part in regular self and peer assessment during the course and attend 80% of the classes.

The minimum pass mark for each of the activities 1, 2, 3 and 4 is a 4.0. The final course mark (average) must be 5.0 or greater to pass the course. Students who obtain less than 5.0 in their final course mark, having completed the course and assessment as outlined above, can retake during the reassessment period. Students who do not attend assessed activities or do not submit assignments cannot retake. The maximum mark in the second sitting is a 5.0.

Work that is plagiarised will not be accepted for assessment and reassessment will not be permitted.

### Important

Plagiarism or copying someone else's work is penalised at all universities and, according to the UVic-UCC Ethical Code ( [in Catalan](#) / [in Spanish](#)), constitutes a very serious offence. Therefore, within this subject, plagiarism or unauthorised appropriation of texts or ideas from others (see [what is considered plagiarism?](#)) and the unauthorised or undisclosed use of artificial intelligence in an activity automatically results in a fail grade or other disciplinary measures.

To facilitate the appropriate citation of texts and materials, consult the guidelines for academic citation available on the UVic Library website.

## METHODOLOGY

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The course is based on Problem-based Learning (PBL) methodology and competences for sustainable development: a combined PBL x SDG approach. Students are given problem scenarios related to SDG3 (Good Health and Well-Being). They then work in groups and identify a problem to study among these scenarios. In line with the PBL x SDG approach, they define their own specific objectives, search for information, select relevant data, organise and analyse data and present findings orally and in writing. During this process they apply individual sustainable competences such as critical thinking, collaboration and problem solving in order to reach a sustainable solution for the problem identified.

As seen from the course content the course covers two strands: Data Analysis and English Skills. These will be taught on alternate days of the week. Each day is divided into 2 hours of class, 2 hours of self-study, and a final tutorial hour. After the initial 2-hour class with the course instructors, students continue with a 2-hour self-study period accompanied by a teaching assistant who monitors progress and end with a final 1-hour tutorial hour with course instructors where they consolidate the day's work.

## BIBLIOGRAPHY

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### Key references

- Daniel Torres-Valladares, Elvira Ballinas-García, Jessica Villarreal-Reyes, Valeria Morales-Álvarez, Carlos Ortiz-del-Ánge (2022). *Research papers 101: The do's and don'ts of scientific writing*. Retrieved from <https://www.sciencedirect-com.biblioremot.uvic.cat/science/article/pii/S2214785320404262?via%3Dihub>
- Hewings, Martin (2013). *Advanced grammar in use with answers: A self-study reference and practice book for advanced learners of English* (3 ed.). Cambridge University Press.
- World Health Organization (2023). *Monitoring health for the SDGs*. Retrieved from <https://www.who.int/data/gho/data/themes/sustainable-development-goals>

### Further reading

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

## Biochemistry

**Type:** Basic Training (BT)

**Credits:** 6.0

**Semester:** 2nd

| Group                                | Language of instruction | Teachers   |
|--------------------------------------|-------------------------|--|
| G11, classroom instruction, mornings | Catalan                 | Joan Casamitjana Vicente<br>Susana Bodoy Salvans |

### SUSTAINABLE DEVELOPMENT GOALS (SDG)

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- 3. Good health and well-being

### OBJECTIVES

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- Contemplate a living being as a cluster of totally coherent, spontaneous processes and understand the internal logic that governs them.
- Introduce students to the molecular mechanisms of life and have them observe how their manifestations have a simple and understandable basis.
- Understand the structure of macromolecules (carbohydrates, lipids and proteins) and the impact on their function.
- Acquire the necessary knowledge to understand the functioning of enzymes.
- Discover how living things obtain and use energy, which molecules are involved and how they are related.
- Allow students to discover or verify for themselves fundamental concepts of biochemistry.

### LEARNING OUTCOMES

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- RA1. Become familiar with the structure of biomolecules.
- LO2. Understands the biochemical organization of the cell and its thermodynamic basis.
- LO3. Evaluates globally the learning processes carried out in accordance with the plans and objectives set and establishes individual improvement measures.
- LO4. Understands oral and written messages of different types in a complete manner expressed in their own languages and in English.
- LO5. Uses language that is respectful of gender issues in both oral and written or audiovisual productions.
- LO6. Moves with ease in complex situations or those that require the development of new solutions.
- LO7. Collects and interprets data and information on which to base their conclusions, which include reflections on social, scientific or ethical issues in the field of biomedicine.
- LO8. Acquires and demonstrates advanced knowledge of theoretical and practical aspects and work methodology in the field of biomedicine.
- LO9. Apply their knowledge to solve problems in complex or professional and specialized work areas that require the use of creative and innovative ideas.

### COMPETENCIES

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#### General skills

- Formulate hypotheses following the scientific method, with an ability to summarize and analyze information in a critical way in order to be able to solve problems.

#### Specific skills

- Describe the relationship between the biology of the nucleus and the metabolism of the main cell types.
- Recognize the organization, structure and function of cells and their components in different tissues.

#### Basic skills

- Students can apply their knowledge to their work or vocation in a professional manner and have competencies typically demonstrated through drafting and defending arguments and solving problems in their field of study.
- Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.
- Students have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgments that include reflection on relevant social, scientific and ethical issues.

#### Core skills

- Communicate orally, in writing and audiovisually, in one's own language and in foreign languages, with proficiency in form, content and use.
- Reflect critically on knowledge of all kinds, with a commitment to professional rigor and quality.

## CONTENT

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### Module 1. Introduction

*(2 h, group class, exhibitions and examples)*

1. Composition of organic matter
2. Introduction to macromolecules

### Module 2. Metabolism

*(2 hours, group class, presentations and examples + 6 hours of exercises and problems)*

1. Introduction to metabolism. Main compounds of metabolism
2. Glycolysis. Overview and crucial reactions
3. Gluconeogenesis. Importance of gluconeogenesis and specific reactions
4. Pyruvate dehydrogenase and Krebs cycle. Importance of obtaining reducing power
5. Respiratory chain. Flow of reducing power and proton gradient

### Module 3. Carbohydrates

*(3 hours, group class, presentations and examples + 2 hours of exercises and problems)*

1. Structure, properties and functions of carbohydrates
2. Carbohydrate metabolism. Catabolism and anabolism

### Module 4. Lipids

*(3 hours, group class, presentations and examples + 2 hours of exercises and problems)*

1. Structure, properties and functions of lipids
2. Lipid metabolism. Catabolism and anabolism

### Partial exam of M1, M2 and M3 (2 h)

### Module 5. Proteins

*(6 hours, group class, presentations and examples + 6 hours of exercises and problems)*

1. Characteristics of amino acids. Structure. Classification. Amino acids present in proteins
2. Peptide bond. Structure and properties
3. Protein folding. Primary, secondary, tertiary and quaternary folding
4. Protein metabolism. Catabolism and anabolism of proteins. Urea cycle

### Module 6. Enzymology

*(6 hours, group class, presentations and examples + 6 hours of exercises and problems)*

1. Introduction to enzymology
2. Enzyme kinetics
3. Michaelis-Menten equation
4. Enzyme inhibition

### Partial exam for M5 and M6 (2 h)

All the hours mentioned correspond to the hours of supervised work, are an approximation and come from the planning of the development of the subject, always subject to changes and adjustments. The detail of the planning is updated periodically in the work plan of the virtual classroom. These hours represent approximately one third of the hours that the student dedicates to the subject. The remaining two thirds are the hours that it is estimated that the student dedicates to unsupervised autonomous work to complete the tasks and assignments, for independent study and for the consultations that he may make to the teaching staff.

## EVALUATION

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The evaluation of the subject is based on continuous monitoring of students' academic work throughout the course.

The final grade for the subject (NF) is the weighted average of the grades for the following assessable activities:

- **Activity 1.** Midterm exams. Weight: 45% (22.5% and 22.5%); retrievable activity; minimum grade: 4; RA evaluated: 1-3, 7-9. The average of the two midterm exams must always be a grade of 5 or higher to be averaged with the rest of the activities.
- **Activity 2.** Exercises. Weight: 25% of NF; non-recoverable activity; RA evaluated: 2, 7
- **Activity 3.** Questionnaires. Weight: 30% of the NF (15% each); activity recoverable during the school period; RA evaluated: 2, 7

The total weight of the assessment activities represents 100% of the final grade for the subject.

Students have the option of retaking the retaken exams. The retake exam is given during the last weeks of the semester, designated for this purpose. If you choose to retake the exam, the final grade is the last, whether lower or higher.

## Important

Plagiarism or copying someone else's work is penalized in all universities and, according to the [UVic-UCC coexistence rules](#), constitute serious or very serious faults. Therefore, during the course of this subject, plagiarism or the improper appropriation of texts or ideas from other people (see [What is considered plagiarism?](#)) and the improper or undeclared use of artificial intelligence in an activity automatically result in a suspension or other disciplinary measures.

To cite texts and materials appropriately, you must consult the academic citation guidelines and guidelines available on the UVic Library website.

## METHODOLOGY

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- The **theoretical sessions** They are carried out by the teachers with the help of the blackboard and an image projector; during these sessions the teachers continuously challenge the students to deduce possible explanations for the experimental facts based on the knowledge taught. Each theoretical session involves, at least, the same dedication of time for personal work during which it is necessary to read chapters of recommended books, do complementary exercises or search for information on the Internet using keywords.
- In the **exercise sessions and quizzes** The teachers propose exercises to be solved individually or collectively and questionnaires that can be evaluated.

## BIBLIOGRAPHY

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### Key references

- Nelson, David L and Cox, Michael M (2017). *Lehninger principles of biochemistry* (7 ed.). New York : W.H. Freeman.
- Richard A. Harvey; Denise R. Ferrier (2010). *Bioquímica*. Retrieved from <https://elibro.net/es/ereader/bibliouvic/124797>
- Stryer, L., Berg, J. M., & Tymoczko, J. L. (2007). *Bioquímica* (6 ed.). Reverté.
- Voet, D., & Voet, J. G. (2006). *Bioquímica* (3 ed.). Médica paramericana.

### Further reading

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

## Biophysics

**Type:** Basic Training (BT)

**Credits:** 6.0

**Semester:** 2nd

| Group                                | Language of instruction | Teachers    |
|--------------------------------------|-------------------------|-------------|
| G11, classroom instruction, mornings | Catalan                 | Carlo Manzo |

### SUSTAINABLE DEVELOPMENT GOALS (SDG)

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- 3. Good health and well-being
- 4. Quality education
- 5. Gender equality

### OBJECTIVES

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The contents of this semester-long subject serve as a foundation for other subjects that are seen throughout the bioscience studies. Concepts necessary to understand basic biological processes are studied and the operation of observation and therapy devices that use state-of-the-art technology is described. In particular, knowledge of thermodynamics, solid and fluid mechanics and electricity is developed: the basic principles that govern energy changes in physical systems are studied. Acoustics, optics and radioactivity are also studied in depth. In each topic, reference is made to biological examples of physical processes.

### LEARNING OUTCOMES

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- RA1. It includes the physics of biological processes: fluid physics, optics, waves and electrophysics.
- LO2. Demonstrates skills for critical reflection in processes linked to the exercise of the profession.
- LO3. Analyzes one's own personal and professional capabilities in relation to different areas of professional practice.
- LO4. Acquires and demonstrates advanced knowledge of theoretical and practical aspects and work methodology in the field of biomedicine.

### COMPETENCIES

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#### General skills

- Formulate hypotheses following the scientific method, with an ability to summarize and analyze information in a critical way in order to be able to solve problems.

#### Specific skills

- Apply the principles of chemistry and physics to the interpretation of biological phenomena and in the development of relevant biomedical technology.

#### Basic skills

- Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.

#### Core skills

- Bring to bear values of entrepreneurship and innovation in one's academic and professional careers.
- Reflect critically on knowledge of all kinds, with a commitment to professional rigor and quality.

### CONTENT

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- Mechanics and biomechanics** (8 h, group class, exhibitions and examples + 2 h, subgroup, experiments and exercises)\*
  - Vectors and vector operations
  - Kinematics: description of movement
  - Dynamics: forces and Newton's laws
  - Biomechanics: application of mechanics to the human body
- Elasticity** (4 h, group class, presentations and examples + 1 h, subgroup, experiments and exercises)\*
  - Tensile, compression and shear forces
  - Applications to biological tissues and structures
- Fluid mechanics** (6 h, group class, presentations and examples + 1 h, subgroup, experiments and exercises)\*
  - Density, pressure, viscosity and surface tension
  - Continuity equation, Bernouille equation and Poiseuille's law
  - Blood flow and biological membranes
  - **Partial exam of topics 1-3 (2 h)\***
- Thermodynamics** (4 h, group class, presentations and examples + 1 h, subgroup, experiments and exercises)\*

- Laws of thermodynamics
- Entropy and microscopic interpretation
- Kinetic theory of gases
- 5. **Oscillations, waves and acoustics** (4 h, group class, presentations and examples + 1 h, subgroup, experiments and exercises)\*
  - Oscillatory movement
  - Wave propagation
  - Doppler effect
- 6. **Electricity and magnetism** (4 h, group class, presentations and examples + 1 h, subgroup, experiments and exercises)\*
  - Coulomb's law and Ohm's law
  - Action potential and bioelectricity
- 7. **Optics** (4 h, group class, presentations and examples + 1 h, subgroup, experiments and exercises)\*
  - Nature and propagation of light
  - Reflection, refraction and geometric optics
  - Optical systems and imaging
  - Interference and diffraction
- 8. **Nuclear physics and radiation** (2 h, group class, presentations and examples + 1 h, subgroup, experiments and exercises)\*
  - Introduction to radioactivity and types of radiation
  - Fission, fusion and applications in nuclear medicine
  - Half-life and principle of radioisotopic dating
  - **Partial exam of topics 4-8 (2 h)\***

\*All the hours mentioned correspond to the hours of supervised work, are an approximation and come from the planning of the development of the subject, always subject to changes and adjustments. The detail of the planning is periodically updated in the work plan of the virtual classroom. These hours represent approximately one third of the hours that the student dedicates to the subject. The remaining two thirds are the hours that it is estimated that the student dedicates to unsupervised autonomous work to complete the tasks and assignments, for independent study and for the consultations that he may make to the teaching staff.

## EVALUATION

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Continuous evaluation of the activities carried out by the student through:

- **Evaluation of the topics:** 40%
  - First part (topics 1-3): 20%; recoverable
    - Important:** To be able to average with the other exam, a minimum grade of 4/10 must be obtained. If you obtain less than 4/10, you must retake this part.
  - Second partial (topics 4-7): 20%; recoverable
    - Important:** To be able to average with the other exam, a minimum grade of 4/10 must be obtained. If you obtain less than 4/10, you must retake this part.
- **Active participation in classes, seminars** (questions to other groups, peer assessment, attendance): 5%; non-recoverable
- **Online exercises and quizzes (individual):** 25%; non-recoverable
- **Group work:** 20%; non-recoverable
- **Oral presentation of group work:** 10%; non-recoverable

**Important:** To pass the subject, you must obtain a grade of 5/10 in the average of the two partials of the topic evaluation.

The final grade for the subject is the result of the weighting of the grades obtained in each of the parts.

### Recovery period

Students who do not pass some of the activities considered retakeable may retake them during this period, as long as the total number of parts of the subject not passed does not represent 50% of the final grade.

### Important

Plagiarism or copying someone else's work is penalized in all universities and, according to the [UVic-UCC coexistence rules](#), constitute serious or very serious faults. Therefore, during the course of this subject, plagiarism or the improper appropriation of texts or ideas from other people (see [What is considered plagiarism?](#)) and the improper or undeclared use of artificial intelligence in an activity automatically result in a suspension or other disciplinary measures.

To cite texts and materials appropriately, you must consult the academic citation guidelines and guidelines available on the UVic Library website.

## METHODOLOGY

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- Presentation of theoretical content through regular classes and seminars in which videos, participation and information search activities are presented.
- Carrying out exercises based on the theoretical content presented in class (independent and individual work)
- Exercise correction tutorials with the class group
- Carrying out group work with follow-up tutorials in the classroom

## BIBLIOGRAPHY

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**Key references**

- Jou i Mirabent, Llebot, J. E., & Pérez García, C. (2009). *Física para ciencias de la vida* (2 ed.). McGraw-Hill.
- Nelson, Ph. (2020). *Biological Physics Student Edition: Energy, Information, Life*. Chiliaagon Science.

**Further reading**

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

## Chemistry Laboratory and Instrumental Techniques

**Type:** Basic Training (BT)

**Credits:** 6.0

**Semester:** 1st

| Group                                | Language of instruction | Teachers  |
|--------------------------------------|-------------------------|---|
| G11, classroom instruction, mornings | Catalan                 | Carlo Manzo<br>Oriol Lecina Veciana<br>Sergi Maso Orriols |

### OBJECTIVES

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The objective of this subject is, on the one hand, to complement in a practical way the theoretical knowledge that the student has acquired in the subject of Chemistry, both inorganic and organic. On the other hand, to acquire knowledge of the different instrumental and analytical techniques available to evaluate, determine and quantify certain structures or compounds in a complex sample.

### LEARNING OUTCOMES

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- LO1. Correctly applies theoretical knowledge of chemistry to laboratory practice.
- LO2. Knows and uses routine laboratory instruments to correctly carry out practical work.
- LO3. Apply basic instrumental techniques to the design of experiments: spectroscopy, chromatography, PCR and immunological techniques.
- LO4. Become familiar with the main microscopy techniques.
- LO5. Integrates theoretical concepts with experimental evidence obtained in the laboratory in an argumentative manner.
- LO6. Acts with commitment and responsibility in common situations and those specific to the profession.
- LO7. Resolves problems and situations typical of professional practice with entrepreneurial and innovative attitudes.
- LO8. Analyzes one's own personal and professional capabilities in relation to different areas of professional practice.
- LO9. Acquires and demonstrates advanced knowledge of theoretical and practical aspects and work methodology in the field of biomedicine.
- LO10. Apply their knowledge to solve problems in complex or professional and specialized work areas that require the use of creative and innovative ideas.
- RA11. Moves with ease in complex situations or those that require the development of new solutions.

### COMPETENCIES

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#### General skills

- Carry out professional activities independently with initiative and respect for other health professionals.

#### Specific skills

- Apply the principles of chemistry and physics to the interpretation of biological phenomena and in the development of relevant biomedical technology.
- Have technical skills in a research laboratory for working on cell and tissue samples, and with experimental animals.

#### Basic skills

- Students can apply their knowledge to their work or vocation in a professional manner and have competencies typically demonstrated through drafting and defending arguments and solving problems in their field of study.
- Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.

#### Core skills

- Bring to bear values of entrepreneurship and innovation in one's academic and professional careers.
- Reflect critically on knowledge of all kinds, with a commitment to professional rigor and quality.

### CONTENT

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- Laboratory safety
- Microscopy
- Handling of laboratory material
- Preparation of solutions
- Basic chemistry techniques

### EVALUATION

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- Course monitoring (various activities that take place throughout the different sessions of the course, before, during and after the different practical sessions): 30% of the final grade (NF); non-recoverable; individual
- Laboratory notebook: 30% of the NF; not recoverable; individual
- Final exam: 30% of the NF; recoverable; minimum grade required to pass the subject: 4.5; individual
- Attitude and class participation: 10% of the NF; non-recoverable; this section reflects penalties for lateness.

#### **Attendance is mandatory:**

- Absences are not permitted, but you can miss 1 or 2 sessions for justified reasons. More than 2 unexcused absences will result in failing the entire course.
- Excused absences do not exclude students from doing the work derived from the session they did not attend.

They are considered **excused absences**:

- Hospital admission
- Judicial summons
- Death of a relative of the 1st or 2nd degree of consanguinity or affinity
- Medically diagnosed illness that prevents attendance at the session
- Attendance at a scheduled hospital visit that cannot be postponed and that involves diagnosis, monitoring or medical treatment

In case of a **excused absence**:

- If there is an option, the student must retake the class in another group.
- If the class cannot be made up, the student must do an assignment (proposed by the teacher) that must allow the student to recover, in whole or in part, the content of the session that was missed. The preparation of this assignment is mandatory and failure to submit the assignment implies a penalty equivalent to a 5% reduction in the final grade for the subject.

In the case of **unexcused absence**:

- The class cannot be made up and a penalty equivalent to a 10% reduction in the final grade of the subject is applied for each session missed. (Therefore, one absence means a 10% reduction in the final grade and two, a 20% reduction.)
- Absence from 3 or more sessions implies failing the subject.
- The student may do a recommended assignment to recover, in whole or in part, the content of the session they missed, but it is not mandatory. If they do the assignment satisfactorily, they can recover 5% of the penalty imposed for the absence.

#### **Important**

Plagiarism or copying someone else's work is penalized in all universities and, according to the [UVic-UCC coexistence rules](#), constitute serious or very serious faults. Therefore, during the course of this subject, plagiarism or the improper appropriation of texts or ideas from other people (see [What is considered plagiarism?](#)) and the improper or undeclared use of artificial intelligence in an activity automatically result in a suspension or other disciplinary measures.

To cite texts and materials appropriately, you must consult the academic citation guidelines and guidelines available on the UVic Library website.

## **METHODOLOGY**

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The subject is developed through practical work in the laboratory in small groups.

## **BIBLIOGRAPHY**

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### **Key references**

- Bell, S., Morris, K. (2009). *An introduction to Microscopy*. CRC Press.
- Sánchez Aguilar, J., Alvarado Avellano, M., Pacheco Espejel, M.P. & Laguna Cortés, J.Ó. (2018). *Química Experimental*. Retrieved from [https://ucercatot.uvic-ucc.cat/permalink/34CSUC\\_UVIC/qq5d82/alma991001123555306718](https://ucercatot.uvic-ucc.cat/permalink/34CSUC_UVIC/qq5d82/alma991001123555306718)

### **Further reading**

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

## Integrated Project II

**Type:** Compulsory (OB)

**Credits:** 6.0

**Semester:** 2nd

| Group                                | Language of instruction | Teachers   |
|--------------------------------------|-------------------------|--|
| G11, classroom instruction, mornings | English                 | Mireia Pérez Verdaguer<br>Beatriz Candas Estebanez<br>Indira Bhambi Blanco |

### OBJECTIVES

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This subject belongs to a series of subjects, Integrated Projects I-VI, on the undergraduate programme in Biomedicine which culminate each semester from the first to third year. The common objective of this set of subjects is to work at a practical level on the knowledge that students have acquired in other subjects during the semester, while facilitating the acquisition of skills related to biomedical research. The teaching methodology is problem- or project-based learning.

In particular, Integrated Project II consists of students learning techniques in the separation, measurement and analytical aspects of clinical biochemistry, data analysis and discussion, as well as being introduced to the rules of biosafety, taking into account the handling of biological samples. For this purpose, we strongly recommend that students enrolling in this subject have taken Biochemistry.

### LEARNING OUTCOMES

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- RA1. Identify and use laboratory equipment correctly to carry out experiments.
- RA2. Work with biological material in an appropriate manner, taking into consideration the necessary safety measures whilst handling and disposing of biological waste.
- RA3. Demonstrate comprehension of spoken and written scientific English.
- RA4. Recognise and apply the main guidelines for structuring presentations, projects and publications in scientific communication.
- RA5. Resolve problems and situations relevant to professional practice in an innovative and entrepreneurial manner.
- RA6. Design interventions to meet the needs of the area in a multidisciplinary way.
- RA7. Critically reflect on processes related to professional practice.
- RA8. Use appropriate spoken language (verbal and non-verbal) to communicate in personal and professional situations in Catalan, Spanish and English.
- RA9. Apply strategies to promote gender equality and justice in the workplace.
- RA10. Prepare reports and written documents (mainly of a technical nature) with correct spelling and grammar in Catalan, Spanish and English.

### COMPETENCIES

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#### General skills

- Show a positive attitude to innovating, creating value and integrating scientific knowledge and improving one's own training.

#### Specific skills

- Analyse biomedical data and biological sequences through the use of statistics and computation.
- Be able to critically interpret the results and conclusions of scientific studies.
- Formulate hypotheses and design experiments in the field of biomedical research.
- Have technical skill in a research laboratory for working on cell and tissue samples, and with experimental animals.
- Recognise the applicability of genetic engineering methods and omics technology in preclinical and clinical research.

#### Basic skills

- Students can apply their knowledge to their work or vocation in a professional manner and have competencies typically demonstrated through drafting and defending arguments and solving problems in their field of study.
- Students can communicate information, ideas, problems and solutions to both specialists and non-specialists.
- Students have developed the learning skills necessary to undertake further studies with a high degree of independent learning.

#### Core skills

- Develop strategies for promoting gender equality and equity for all.
- Exercise active citizenship and individual responsibility with a commitment to democratic values and sustainable development.
- Interact in international contexts to transfer knowledge to current and emerging fields of professional development and research.
- Reflect critically on knowledge of all kinds, with a commitment to professional rigour and quality.

### CONTENT

- 
1. Biosafety
  2. Clinical biochemistry techniques focused on:
    - Analysis
    - Separation
    - Measurement
  3. Search protocols information
  4. Tips on writing protocols and reports (including data analysis and discussion)
  5. Work on oral communication skills

## ASSESSMENT

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You will be assessed in the following way:

- Scientific protocol elaboration: 20% (individual assessment: 10% + group assessment: 10%)
- Online tests: 10%
- Skills in following technical protocols: 10%
- Scientific written report: 25% (individual assessment: 12.5% + group assessment: 12.5%)
- Laboratory Scientific presentation: 25% (individual assessment: 12.5% + group assessment: 12.5%)
- Active participation: 10% (participation, attitude, attendance)

Individual evaluations in group work will be carried out through the milestones achieved throughout the project, which will be followed up by the professor.

You are expected to make a qualitative self-assessment during the course and attend 80% of the classes.

Excused absences do not exclude students from doing the work derived from the session they did not attend.

**Excused absences** allowed are:

- Hospital admission
- Court summons
- Death of a family member of 1st or 2nd degree of consanguinity or affinity
- Medically diagnosed illness that makes it impossible to attend the session
- Attendance at a scheduled visit to the hospital, which cannot be postponed and which involves diagnosis, follow-up and/or medical treatment

### In case of a justified absence

If it is not possible to make up the class, the student must do a work (proposed by the teacher) that allows him/her to recover, totally or partially, the content of the session he/she has missed. The elaboration of this work is compulsory and the non-presentation of the work implies a penalty equivalent to the reduction of 5% of the final grade of the course.

### In the case of unexcused absence

- It is not possible to recover the class and a penalty equivalent to the reduction of 10 % of the final grade of the course for each session to which it is missed (therefore, one absence supposes a reduction of 10 % of the final grade and two, one of 20 %).
- Absence from 3 or more sessions means failing the course.
- The student can do a recommended work to recover, totally or partially, the content of the session to which he/she has missed, but it is not obligatory. If the student makes up the work satisfactorily, he/she can recover 5% of the penalty imposed for the absence.

### Important

Plagiarism or copying someone else's work is penalised at all universities and, according to the UVic-UCC Ethical Code ( [in Catalan](#) / [in Spanish](#)), constitutes a very serious offence. Therefore, within this subject, plagiarism or unauthorised appropriation of texts or ideas from others (see [what is considered plagiarism?](#)) and the unauthorised or undisclosed use of artificial intelligence in an activity automatically results in a fail grade or other disciplinary measures.

To facilitate the appropriate citation of texts and materials, consult the guidelines for academic citation available on the UVic Library website.

## METHODOLOGY

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The course is based on problem-based learning (PBL) methodology which involves both individual and group work to respond to a challenge, generate a protocol and execute it in the laboratory and the results analysis, presentation and discussion at written and oral levels.

## BIBLIOGRAPHY

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### Further reading

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

## Molecular Genetics

**Type:** Basic Training (BT)

**Credits:** 6.0

**Semester:** 2nd

| Group                                | Language of instruction | Teachers                                    |
|--------------------------------------|-------------------------|---|
| G11, classroom instruction, mornings | English                 | Alba Casellas Comallonga<br>Neus Roca Ayats |

### OBJECTIVES

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This course introduces students to the basic aspects of molecular genetics and genomics, paying special attention to applications in the human and biomedicine areas.

The main objectives:

- Understand the basic structure of the genome, how it is organised and regulated, and the detailed structure of DNA and RNA.
- Understand the importance of molecular genetics in the field of biomedicine.
- Recognise the close connection between molecular genetics and human health.
- Know the latest advances and discoveries in knowledge and application of molecular genetics concerning biomedicine.
- Understand and identify genome alterations such as mutations, recombinations and gene rearrangement.
- Understand the implication of epigenetics in classical genetics.

### LEARNING OUTCOMES

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- RA1. Demonstrate comprehension of basic genetics and nucleic acid biology.
- RA2. Globally evaluate the learning process following the plans and objectives set out and establish criteria for self-improvement.
- RA3. Demonstrate comprehension of spoken and written messages of different types expressed in the language of instruction and in English.
- RA4. Use gender respectful language in all spoken, written or audio-visual content.
- RA5. Show initiative in complex situations or those which require development of new solutions.
- RA6. Collect and analyse data and information to support conclusions which include reflections on social, ethical and scientific topics in the field of biomedicine.
- RA7. Demonstrate and apply advanced theoretical and practical knowledge learned in the field of biomedicine.
- RA8. Resolve problems in complex professional situations and specialised practice using innovative and creative ideas.

### COMPETENCIES

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#### General skills

- Formulate hypotheses following the scientific method, with an ability to summarise and analyse information in a critical way in order to be able to solve problems.

#### Specific skills

- Describe the relationship between the biology of the nucleus and the metabolism of the main cell types.
- Recognise the organisation, structure and function of cells and their components in different tissues.

#### Basic skills

- Students can apply their knowledge to their work or vocation in a professional manner and have competencies typically demonstrated through drafting and defending arguments and solving problems in their field of study.
- Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.
- Students have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgements that include reflection on relevant social, scientific and ethical issues.

#### Core skills

- Communicate orally, in writing and audiovisually, in one's own language and in foreign languages, with proficiency in form, content and use.
- Reflect critically on knowledge of all kinds, with a commitment to professional rigour and quality.

### CONTENT

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1. **Introduction to genomes** (5h, class group, lecture and examples)
  - Composition
  - Organisation

2. **Nucleic acids as a life molecule** (5h, class group, lecture and examples)
3. **DNA-RNA** (5h, class group, lecture and examples)
  - Processing
  - Replication
  - Transcription
4. **Bases in genome elements** (5h, class group, lecture and examples)
  - Functional (genes, regulatory elements...)
  - Non-functional
- **Midterm exam (1P)**
  - Integration class (1h)
  - 1P exam (units 1-4) (2h)
  - Revision exam (1h)
5. **Gene expression** (5h, class group, lecture and examples)
  - Mechanisms
  - Regulation
6. **Genome reorganisation** (5h, class group, lecture and examples)
  - 2.1. Recombination
  - 2.2. Rearrangement
7. **Genome alterations** (5h, class group, lecture and examples)
  - Mutations
  - Polymorphisms
8. **Epigenetics** (5h, class group, lecture and examples)
  - Mechanisms
  - Imprinting
9. **Introduction to genome analysis (COIL project)** (5h, class group, lecture and examples)
  - Genomic analysis
  - Genomic therapies

## ASSESSMENT

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To pass the course a minimum overall mark of 5.0 is required.

- Participation: 5%
- Follow-up activities: 30% (no resit, individual assessment)
- Specific evaluation: 45% (in each part a 4 or higher is required to calculate the average; the average among two exams must be 5 or higher; each part can be resat)
  - 1st part (E1): 22.5%
  - 2nd part (E2): 22.5%
- Presentation of work: 20% (in pairs, no resit).

### Resits

- Resit exam: if you fail the subject, up to a maximum of 50% of the final grade may be retaken in the resit exam.

### General assessment criteria of Faculty

- During examinations, the possession of cell phones or alike (smartphones, tablets, etc.) is graded zero.
- The absence, or non-delivery of an assignment within the established deadlines, is graded zero. This zero qualification is taken into account when calculating the final marks of the subject.
- The final mark for the subject is obtained from the respective percentages and averages of the different assignments.

### Important

Plagiarism or copying someone else's work is penalised at all universities and, according to the UVic-UCC Ethical Code ( [in Catalan](#) / [in Spanish](#)), constitutes a very serious offence. Therefore, within this subject, plagiarism or unauthorised appropriation of texts or ideas from others (see [what is considered plagiarism?](#)) and the unauthorised or undisclosed use of artificial intelligence in an activity automatically results in a fail grade or other disciplinary measures.

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## METHODOLOGY

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Mainly theory classes, discussion sessions (seminars), and workshops.

The theoretical contents will be based on applied examples.

Some activities will be developed using teamwork.

Collaborative Online International Learning (COIL).

## BIBLIOGRAPHY

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### Key references

- Alberts, Brice (2015). *Molecular biology of the cell* (6 ed.). New York : Garland Science, cop. 2015.
- Berg, J. M., Tymoczko, J. L., Gatto, G. J., & Stryer, L. (2019). *Biochemistry* (9 ed.). WH Freeman.
- Krebs, J. E., Goldstein, E. S., & Kilpatrick, S. T. (2017). *Lewin's Genes* (12 ed.). Jones & Bartlett Learning.
- Lodish, H. (2021). *Molecular Cell Biology* (9 ed.). Macmillan Learning.
- Tubbs, Raymond R., Stoler, Mark H. (2009). *Cell and tissue based molecular pathology*. Retrieved from [https://www.sciencedirect-com.biblioremot.uvic.cat/book/9780443069017/cell-and-tissue-based-molecular-pathology](https://www.sciencedirect.com.biblioremot.uvic.cat/book/9780443069017/cell-and-tissue-based-molecular-pathology)

### Further reading

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

## COMPULSORY SUBJECTS IN THE SECOND YEAR

## Cell Signalling and Gene Regulation

**Type:** Compulsory (OB)

**Credits:** 6.0

**Semester:** 1st

| Group                                | Language of instruction | Teachers             |
|--------------------------------------|-------------------------|----------------------|
| G11, classroom instruction, mornings | Catalan                 | Tomàs Pinós Figueras |

### SUSTAINABLE DEVELOPMENT GOALS (SDG)

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- 5. Gender equality

### OBJECTIVES

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Cell signaling and gene regulation are encompassed within the field of Biochemistry and Molecular and Cellular Biology. Cell signaling is key to cellular behavior but also to regulating the development, organization, physiology and pathology of human tissues and organs and the entire organism.

The general objective of this subject is to understand how cells send, receive and respond to signals from their environment, both in physiological and pathological states. The specific objectives are the following:

- Know the main mechanisms of communication and cell signaling.
- To delve deeper into intracellular transduction pathways and their biochemistry.
- Understand how transcription regulation, mRNA processing and translation work in humans.

### LEARNING OUTCOMES

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- LO1. Understands the molecular mechanisms of regulation and control of metabolism, as well as the molecular bases of intercellular communication and intracellular signaling.
- LO2. Prepares reports and written documents (mainly of a technical nature) with spelling and grammar correction in Catalan, Spanish and English.
- LO3. Evaluates globally the learning processes carried out in accordance with the plans and objectives set and establishes individual improvement measures.
- LO4. Acquires and demonstrates advanced knowledge in the theoretical and practical aspects and working methodology in the field of biomedicine.

### COMPETENCIES

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#### General skills

- Formulate hypotheses following the scientific method, with an ability to summarize and analyze information in a critical way in order to be able to solve problems.

#### Specific skills

- Describe the relationship between the biology of the nucleus and the metabolism of the main cell types.
- Have a systemic vision of the organism, in particular metabolic regulation and control and cell signaling, in order to respond to biomedical challenges.

#### Basic skills

- Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.

#### Core skills

- Communicate orally, in writing and audiovisually, in one's own language and in foreign languages, with proficiency in form, content and use.
- Reflect critically on knowledge of all kinds, with a commitment to professional rigor and quality.

### CONTENT

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The content of the subject is broken down into 4 main points:

#### Intercellular communication (4 hours, group class)

- Types of signals
- Nervous communication
- Signaling molecules

- Signal reception

### **Main signal transduction pathways** (6 hours, group class)

- Biochemical and processing aspects
- Divergence and convergence of paths

### **Cellular response and gene regulation** (5 hours, group class)

- Purpose of signal transduction
- Types, levels, processing and responses to signal transduction

### **Specific signaling pathways** (1 hours, group class)

- G protein-coupled receptor signaling
- Signaling of receptors with enzymatic activity
- Ion channel signaling
- Intracellular receptor signaling
- Integrin signaling

### **Activities, projects and seminars** (8 hours, group class)

### **Midterm exam** (2 hours, group class)

\* All the hours mentioned correspond to the hours of supervised work, are an approximation and come from the planning of the development of the subject, always subject to changes and adjustments. The detail of the planning is periodically updated in the work plan of the virtual classroom. These hours represent approximately 1/3 of the hours that the student dedicates to the subject. The remaining 2/3 are the hours that it is estimated that the student dedicates to unsupervised autonomous work to complete the tasks and assignments, for independent study and for the consultations that he may make to the professor.

## **EVALUATION**

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According to the Academic Regulations for degrees at UVic-UCC, there is only one official call that includes two different evaluation periods:

- Ordinary period, which takes place as part of the training process and during the school period.
- Complementary evaluation period, in which the student can be evaluated again for the tasks, activities or tests that he/she has not passed satisfactorily within the framework of the first period.

Continuous evaluation of the activities carried out by the student through:

- **Evaluation of the topics:** 45%
  - **First part:** 22.5% (recoverable)  
**Important:** To be able to average with the other exam, a minimum grade of 4/10 must be obtained. If you obtain less than 4/10, you must retake this part.
  - **Second part:** 22.5% (recoverable)  
**Important:** To be able to average with the other exam, a minimum grade of 4/10 must be obtained. If you obtain less than 4/10, you must retake this part. The average between the two partials must be 5 or higher to be able to average with the other activities.
- **Active participation in classes, seminars, and in assignments and cases:** 5% (non-recoverable)
- **Continuous assessment activities:** 30% (non-refundable)
- **Group work:** 20% (non-refundable)

The final grade for the subject is the result of the weighting of the grades obtained in each of the parts.

### **Recovery period**

- Students who do not pass some of the activities considered retakeable may retake them during this period, as long as the total number of parts of the subject not passed does not represent 50% of the final grade.

### **Important**

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To cite texts and materials appropriately, you must consult the academic citation guidelines and guidelines available on the UVic Library website.

## **METHODOLOGY**

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- This subject includes theoretical sessions, seminars and/or assignments at the end of each block.
- Practical cases and tasks are presented that students must work on autonomously and independently or in small groups.

- Attendance at seminar sessions, assignments and workshops and at sessions presenting cases and articles is highly recommended, as they will contribute to the integration of the information received in the theoretical sessions.

## BIBLIOGRAPHY

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### Key references

- Alberts, B. (2015). *Molecular biology of the cell* (6 ed.). Garland Science.
- Bradshaw, Ralph A. & Dennis, Edward A. (2009). *Handbook of Cell Signaling*. Retrieved from <https://www-sciencedirect-com.biblioremot.uvic.cat/book/9780123741455/handbook-of-cell-signaling>
- Lodish, H., Berk, A., Kaiser, C., Krieger, M., Bretscher, A., Ploegh, H., Martin, K., Yaffe, M., Amon, A. . (2021). *Molecular Cell Biology* (9 ed.). Macmillan Press.
- Sharma, K. K. (2022). *Vías de señalización celular y molecular*. Saarbrücken: OmniScriptum Publishing.
- Sharma, K. K. (2022). *Vías de señalización celular y molecular*. Scienza Scripts.

### Further reading

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

## Experimental Design, Biostatistics and Epidemiology

**Type:** Compulsory (OB)

**Credits:** 3.0

**Semester:** 1st

| Group                                | Language of instruction | Teachers                   |
|--------------------------------------|-------------------------|----------------------------|
| G11, classroom instruction, mornings | Catalan                 | Meritxell Pujolassos Tanyà |

## SUSTAINABLE DEVELOPMENT GOALS (SDG)

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- 5. Gender equality

## OBJECTIVES

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Experimental design and statistics are essential tools in biomedical studies that allow the design of experiments, the identification of associations between variables and factors linked to human health and epidemiology and the interpretation of results. From this design, analysis and interpretation, patterns in the behavior of a disease and the influence of various factors on this disease can be deduced, among other things. The general objectives of this subject, therefore, are the following:

- Introduce the basic principles of experimental design and statistical methodology applied to scientific research.
- Know the descriptive statistical methods and the concept and methods of statistical inference most used.
- Understand statistics as a tool for epidemiological analysis in both sexes.
- Know and use statistical applications in the field of biomedicine.
- Facilitate the understanding and critical assessment of the results obtained in a statistical study.

## LEARNING OUTCOMES

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- LO1. Analyze biomedical data using descriptive statistics techniques, inference and regression models.
- LO2. Interprets and communicates the results of statistical and bioinformatics analyzes in a rigorous manner.
- LO3. Knows and applies the fundamentals of experimental design and epidemiological studies.
- LO4. Analyze biological sequences in genetic epidemiology studies and gene expression analysis.
- LO5. Demonstrates skills for critical reflection in processes linked to the exercise of the profession.
- LO6. Apply procedures specific to scientific research in the development of training and professional activity.
- LO7. Designs interventions that meet the needs of the field in a multidisciplinary manner.
- LO8. Moves with ease in virtual interaction contexts through the use of ICT.
- LO9. Shows sensitivity to equitable and egalitarian professional practice from a gender perspective.
- LO10. Collects and interprets data and information on which to base their conclusions, which include reflections on social, scientific or ethical issues in the field of biomedicine.

## COMPETENCIES

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### General skills

- Formulate hypotheses following the scientific method, with an ability to summarize and analyze information in a critical way in order to be able to solve problems.

### Specific skills

- Analyze biomedical data and biological sequences through the use of statistics and computation.

- Be able to critically interpret the results and conclusions of scientific studies.
- Formulate hypotheses and design experiments in the field of biomedical research.

### Basic skills

- Students can apply their knowledge to their work or vocation in a professional manner and have competencies typically demonstrated through drafting and defending arguments and solving problems in their field of study.
- Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.
- Students have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgments that include reflection on relevant social, scientific and ethical issues.

### Core skills

- Develop strategies for promoting gender equality and equity for all.
- Interact in international contexts to transfer knowledge to current and emerging fields of professional development and research.
- Make use of professional skills in multidisciplinary, complex, networked environments, whether on-site or online.
- Reflect critically on knowledge of all kinds, with a commitment to professional rigor and quality.
- Take control of one's learning process with a view to personal and professional growth and an all-round education.

## CONTENT

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### 1. Introduction to statistics

*(2 h with the class group, presentations and examples + 2 h with the subgroup, exercises + 4 h with the subgroup, R practice)*

- Practice 0. Introduction to R
- Practice 1. Descriptive analysis of a variable
- Practice 2. Descriptive analysis of two variables
- Practice 3. Descriptive analysis of one and two variables

### 2. Probability

*(2 h with the class group, presentations and examples + 1 h with the subgroup, exercises)*

### 3. Random variables

*(3 h with the class group, presentations and examples + 2 h with the subgroup, exercises)*

### 4. Confidence intervals

*(1 h with the class group, presentations and examples + 2 h with the subgroup, exercises)*

### 5. Hypothesis testing

*(3 h with the class group, presentations and examples + 2 h with the subgroup, exercises + 2 h with the subgroup, R practice)*

- Practice 5. T-test for equality of two means with independent samples
- Practice 6. T-test for equality of two means with paired data and test for equality of two proportions
- Practice 7. Chi-square test of independence of two factors

### 6. Experimental design and basic concepts of epidemiology

*(2 hours with the class group, exhibitions and examples + 1 hour with the class group, guest presentation)*

## EVALUATION

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Continuous evaluation of the activities carried out by the student through:

- **Evaluation of the topics:** 50%
  - **First part:** 25% (recoverable)
 

**Important:** To be able to average with the other exam, a minimum grade of 4/10 must be obtained. If you obtain less than 4/10, you must retake this part.
  - **Second part:** 25% (recoverable)
 

**Important:** To be able to average with the other exam, a minimum grade of 4/10 must be obtained. If you obtain less than 4/10, you must retake this part.
- **Active participation in classes, seminars** (attendance, active participation and optional online exercises): 5% (non-recoverable)
- **Online or in-person exercises and quizzes** (individual): 25% (non-refundable)
- **Group work:** 20% (non-recoverable) (individual grade 7.5%, group grade 7.5%, follow-up tutorials group work 5%)

**Important:** To pass the subject, you must obtain a grade of 5/10 in the average of the two partials of the topic evaluation.

The final grade for the subject is the result of the weighting of the grades obtained in each of the parts.

### Recovery period

- Students who do not pass some of the activities considered retakeable may retake them during this period, as long as the total number of parts of the subject not passed does not represent 50% of the final grade.

### Important

Plagiarism or copying someone else's work is penalized in all universities and, according to the [UVic-UCC coexistence rules](#), constitute serious or very serious faults. Therefore, during the course of this subject, plagiarism or the improper appropriation of texts or ideas from other people (see [What is considered plagiarism?](#)) and the improper or undeclared use of artificial intelligence in an activity automatically result in a suspension or other disciplinary measures.

To cite texts and materials appropriately, you must consult the academic citation guidelines and guidelines available on the UVic Library website.

## **METHODOLOGY**

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- Presentation of theoretical content through regular classes and seminars
- Carrying out exercises based on the theoretical content presented in class (independent and individual work)
- Data analysis with R
- Exercise correction tutorials with the class group
- Carrying out group work with follow-up tutorials in the classroom

## **BIBLIOGRAPHY**

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### **Key references**

- Daniel, W.W., Cross, Ch.L. (2013). *Biostatistics: Basic concepts and methodology for the health sciences* (10 ed.). Wiley.
- Henquin, R. (2013). *Epidemiología y estadística para principiantes*. Retrieved from [https://elibro.net/ca/lc/bibliouvic/titulos/76940?fs\\_q=Epidemiologia\\_y\\_estad%C3%ADstica\\_\\_&prev=fs](https://elibro.net/ca/lc/bibliouvic/titulos/76940?fs_q=Epidemiologia_y_estad%C3%ADstica__&prev=fs)
- Milton, S. (2007). *Estadística para biología y ciencias de la salud*. McGraw-Hill / Interamericana de España.
- Zaiats, V.; Calle, M.L. (2001). *Probabilitat i estadística: Exercicis II*. Edicions UAB.
- Zaiats, V.; Calle, M.L.; Presas, R. (2001). *Probabilitat i estadística: Exercicis I* (2 ed.). Edicions UAB.

### **Further reading**

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

## Human Physiology and Anatomy I

**Type:** Basic Training (BT)

**Credits:** 6.0

**Semester:** 1st

| Group                                | Language of instruction | Teachers   |
|--------------------------------------|-------------------------|--|
| G11, classroom instruction, mornings | Catalan                 | Juan Tony Da Sousa Valente<br>Esther Jorge Vizquete<br>Manuel Joaquin Caudet |

### SUSTAINABLE DEVELOPMENT GOALS (SDG)

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- 3. Good health and well-being
- 4. Quality education
- 5. Gender equality

### OBJECTIVES

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This subject and the subject Human Physiology II together form the subject of Physiology and Anatomy. Through these subjects, knowledge is provided about the structures of the organism and its functionality, from the cellular and tissue perspective that make up the different systems. Finally, all this knowledge is integrated into different physiological and pathological situations or aging.

The main objectives of the Human Physiology I subject are for students to acquire:

- General knowledge of the structure and functioning of the human body
- Knowledge of physiology and pathophysiology of the human body
- Knowledge of the different parts of human anatomy
- Basic knowledge of human histology and embryology
- Analysis and reflection on the relationships between human physiology and anatomy, gender, culture and society.

### LEARNING OUTCOMES

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- LO1. Understands the fundamentals of general physiology and all organs, systems and organs.
- LO2. It explains the physiology of organs and systems in an integrated way.
- LO3. Analyze the function of organs, tissues and cell types in humans.
- LO4. Relates the general homeostasis of the human body, as well as the integration of the operating systems that compose it.
- LO5. Uses dissection material correctly.
- LO6. Acts with commitment and responsibility in common situations and those specific to the profession.
- LO7. Uses oral language (verbal and non-verbal) appropriately in personal and professional interaction in Catalan, Spanish and English.
- LO8. Acquires and demonstrates advanced knowledge of theoretical and practical aspects and work methodology in the field of biomedicine.
- LO9. Apply their knowledge to solving problems in complex work areas and in professional and specialized areas that require the use of creative and innovative ideas.

### COMPETENCIES

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#### General skills

- Formulate hypotheses following the scientific method, with an ability to summarize and analyze information in a critical way in order to be able to solve problems.

#### Specific skills

- Have a systemic vision of the organism, in particular metabolic regulation and control and cell signaling, in order to respond to biomedical challenges.
- Make integrated assessments of the functioning of organs and apparatus, and their role in homeostasis.
- Recognize the organization, structure and function of cells and their components in different tissues.
- Use key analytical and imaging techniques, and basic technological instruments, following customary preclinical research laboratory protocols.

#### Basic skills

- Students can apply their knowledge to their work or vocation in a professional manner and have competencies typically demonstrated through drafting and defending arguments and solving problems in their field of study.
- Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.

## Core skills

- Communicate orally, in writing and audiovisually, in one's own language and in foreign languages, with proficiency in form, content and use.
- Reflect critically on knowledge of all kinds, with a commitment to professional rigor and quality.

## CONTENT

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### Block 1. Introduction

(4 hours, group class)

- Definition of anatomy and physiology
- Levels of organization: chemical, cellular, tissue
- Homeostasis

### Block 2. Nervous system

(9.5 hours, group class)

- Structure of the nervous system
- Function of the nervous system: cells of the nervous system (the neuron and functions of the glia), ion channels and formation of the action potential. Synapse and neurotransmission
- Neuroplasticity
- Circuits: autonomic, sensory and motor. Sympathetic and parasympathetic system. Sensory receptors and pain. Senses. Motor control
- Cognitive neuroscience

### Block 3. Pathological anatomy

(2 hours, group class)

- Definition of pathological anatomy
- Pathologies of cellular and tissue development and aging

### Block 4. Integumentary system

(3.5 h, group class)

- Structure of the integumentary system
- Skin function, sensory receptors and vascular regulation
- Skin pathologies, burns...

### Block 5. Endocrine system

(6 hours, group class)

- Structure and function of the endocrine system. Characteristics and regulation of the *feedback* positive and of *feedback* negative
- Hormones: characteristics, types and functions
- Hypothalamic-pituitary system
- Main glands: thyroid, adrenal gland, endocrine pancreas, gonads
- Regulation of homeostasis
- Endocrine pathologies: hypo- and hyperthyroidism, growth hormone deficiency

### Block 6. Reproductive system

(5.5 hours, group class)

- Female reproductive system: anatomical generalities. Oogenesis and female reproductive cycle (this part is seen in more or less depth in the endocrine system part). Mammary glands
- Male reproductive system: anatomical generalities. Spermatogenesis and male hormonal regulation

### Block 7. Blood

(4 hours, group class)

- Functions and characteristics of blood. Blood composition
- Hematopoiesis, erythrocytes and hemoglobin
- Leukocytes and platelets
- Hemostasis: concept, mechanisms of hemostasis. Platelet plug. Coagulation: extrinsic pathway, intrinsic pathway and common pathway
- Pathologies related to coagulation

### Block 8. Immune system

(3.5 h, group class)

- Key concepts: immunity, immune system and immune response
- Types of immunity and cells involved in innate and adaptive immunity
- Innate immunity: first line of defense and second line of defense. Innate immunity mechanisms (inflammation, fever)
- Adaptive immunity: clonal selection. Humoral adaptive immunity. Cellular adaptive immunity
- Pathologies related to the immune system

### Internships

- Nerve Sim computer program (2 hours, subgroup)
- Histology: sample staining and observation (4 hours, subgroup)
- Macroscopic observations at UMedicina (2 hours, subgroup)
- Observation of blood smear and determination of blood groups (2 hours, subgroup)

### Activities

Histology dossiers to familiarize themselves with tissue, both anatomically and pathologically. In addition, students have the opportunity to reflect on social, cultural, economic and gender diversity in the field of human physiology and anatomy.

### Clinical cases

(2 hours, group class)

Different clinical cases are worked on to apply the different knowledge gained throughout the course and solve problems that require the use of creative and innovative ideas.

**Examination and follow-up questionnaires** (4 h group class)

## EVALUATION

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The evaluation of the subject is based on continuous monitoring of the student's academic work throughout the course.

The final grade for the subject (NF) is the weighted average of the grades for the following assessable activities:

- Questionnaires and work monitoring: 15% of the NF; non-recoverable activity
- Internships: 20% of the NF; non-recoverable activity \*
- Activities, assignments and presentations: 20% of the NF; non-recoverable activity \*
- Exams: 45%
  - Partial I: 22.5% of the NF, blocks 1,2,3 and 4. Recoverable activity
  - Partial II: 22.5% of the NF, blocks 5,6,7 and 8. Recoverable activity
  - Minimum grade for each of the partial exams to make an average: 4. The average between the two exams must be 5 to be able to make an average with the rest of the activities.

\* These activities assess Sustainable Development Goals 3 and 5.

### Subject-specific criteria

Attendance at internship sessions is mandatory. Therefore, unexcused absence from more than one internship session or justified absence from more than 30% of internship sessions will result in suspension of the internship.

### General evaluation criteria

Possession of mobile phones or similar (*smartphones*, tablets, etc.) during the taking of the recoverable tests will result in a zero on the test.

Failure to appear or submit within the established deadlines for any of the assessment activities will result in a grade of zero for that activity. This grade is taken into account when calculating the final grade for the subject.

The student has the option of retaking failed make-up tests. Make-up tests are held during the last weeks of the semester, designated for this purpose.

No more than 50% of the subject can be recovered.

If you decline to take the retake test, the grade achieved in the first instance will be maintained.

In non-recoverable activities, no minimum grades are required to calculate the final grade for the subject.

### Important

Plagiarism or copying someone else's work is penalized in all universities and, according to the [UVic-UCC coexistence rules](#), constitute serious or very serious faults. Therefore, during the course of this subject, plagiarism or the improper appropriation of texts or ideas from other people (see [What is considered plagiarism?](#)) and the improper or undeclared use of artificial intelligence in an activity automatically result in a suspension or other disciplinary measures.

To cite texts and materials appropriately, you must consult the academic citation guidelines and guidelines available on the UVic Library website.

## METHODOLOGY

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- In this subject, theoretical sessions, workshops or assignments are held at the end of each block to integrate the knowledge acquired.
- Regarding personal work, students must follow the theoretical aspects of the subject and actively participate in discussions, assignments and workshops in the classroom.
- Cases and tasks are also presented that students must work on autonomously and independently or in small groups.
- Attendance at seminar sessions, assignments and workshops and at case and article presentation sessions is highly recommended, as they are interactive classes with assessable activities and participation.
- Practical sessions are held to familiarize students with the histology laboratory and the observation of tissues, both at the microscopic and macroscopic levels.

## BIBLIOGRAPHY

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### Key references

- Marieb, E. N., Keller, S. M. (2017). *Fisiología Humana: Fisiología Humana* (12 ed.). Madrid: Pearson.
- Martini, F.H., Tallitsch, R.B, Nath, J.L. (2017). *Anatomía Humana: Anatomía Humana* (9 ed.). Madrid: Pearson.
- Thibodeau, Gary A. (2008). *Estructura del cuerpo humano*. Amsterdam; Barcelona: Elsevier.
- Tortora, G.J. , Derrickson, B. (2018). *Principios de Anatomía y Fisiología: Principios de Anatomía y Fisiología* (15 ed.). Buenos Aires: Médica Panamericana.
- Young, B., O'Dowd, G., Woodford, P. (2014). *Wheater Histología Funcional: Texto y Atlas en Color* (6 ed.). Barcelona: Elsevier España SL.

### Further reading

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

## Integrated Project III

**Type:** Compulsory (OB)

**Credits:** 6.0

**Semester:** 1st

| Group                                | Language of instruction | Teachers   |
|--------------------------------------|-------------------------|--|
| G11, classroom instruction, mornings | English                 | Albert Espona Noguera<br>Magí Passols Manzano<br>Neus Roca Ayats |

### OBJECTIVES

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This subject belongs to a series of subjects, Integrated Projects I-VI, on the undergraduate programme in Biomedicine which culminate each semester from the first to third year. The common objective of this set of subjects is to work at a practical level on the knowledge that students have acquired in other subjects during the semester, while facilitating the acquisition of skills related to biomedical research. The teaching methodology is problem- or project-based learning.

In particular, Integrated Project III aims that students will learn experimental design, techniques of molecular biology, metabolic biochemistry and statistical analysis: isolation and amplification of a cDNA, electrophoresis in agarose gel, cloning of the cDNA in an expression vector, transformation in bacteria and analysis of biological activity on lipolysis. Finally, some statistical data analysis and global discussion of the data will be carried out.

For this purpose, we strongly recommend that students enrolling in this subject have taken [Biochemistry](#), [Microbiology](#), [Cell signaling and Gene Regulation](#), and [Experimental Design, Biostatistics and Epidemiology](#).

### LEARNING OUTCOMES

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- RA1. Identify and use laboratory equipment correctly to carry out experiments.
- RA2. Work with biological material in an appropriate manner, taking into consideration the necessary safety measures whilst handling and disposing of biological waste.
- RA3. Demonstrate comprehension of spoken and written scientific English.
- RA4. Recognise and apply the main guidelines for structuring presentations, projects and publications in scientific communication.
- RA5. Resolve problems and situations relevant to professional practice in an innovative and entrepreneurial manner.
- RA6. Design interventions to meet the needs of the area in a multidisciplinary way.
- RA7. Critically reflect on processes related to professional practice.
- RA8. Use appropriate spoken language (verbal and non-verbal) to communicate in personal and professional situations in Catalan, Spanish and English.
- RA9. Apply strategies to promote gender equality and justice in the workplace.
- RA10. Prepare reports and written documents (mainly of a technical nature) with correct spelling and grammar in Catalan, Spanish and English.

### COMPETENCIES

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#### General skills

- Show a positive attitude to innovating, creating value and integrating scientific knowledge and improving one's own training.

#### Specific skills

- Analyse biomedical data and biological sequences through the use of statistics and computation.
- Be able to critically interpret the results and conclusions of scientific studies.
- Formulate hypotheses and design experiments in the field of biomedical research.
- Have technical skill in a research laboratory for working on cell and tissue samples, and with experimental animals.
- Recognise the applicability of genetic engineering methods and omics technology in preclinical and clinical research.

#### Basic skills

- Students can apply their knowledge to their work or vocation in a professional manner and have competencies typically demonstrated through drafting and defending arguments and solving problems in their field of study.
- Students can communicate information, ideas, problems and solutions to both specialists and non-specialists.
- Students have developed the learning skills necessary to undertake further studies with a high degree of independent learning.

#### Core skills

- Develop strategies for promoting gender equality and equity for all.
- Exercise active citizenship and individual responsibility with a commitment to democratic values and sustainable development.
- Interact in international contexts to transfer knowledge to current and emerging fields of professional development and research.

— Reflect critically on knowledge of all kinds, with a commitment to professional rigour and quality.

## CONTENT

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1. Experimental design
2. Gene expression techniques
3. Restriction enzyme activity
4. Information retrieval and protocol writing
5. Statistical data analysis
6. Scientific workshop

## ASSESSMENT

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The course will be evaluated through:

- Online evaluation: 10%
- Elaboration of scientific protocols: 20% (individual assessment: 10% + group assessment: 10%)
- Competences in following technical protocols: 10%
- Evaluation of results and discussion: 30% (individual evaluation: 15% + group evaluation: 15%)
- Scientific workshop: 20% (individual evaluation: 10% + group evaluation: 10%)
- Active participation: 10% (participation, attitude, attendance)

**Attendance is compulsory.** Absences are not allowed, but it is possible to miss 1 or 2 sessions for justified reasons. More than 2 unexcused absences mean failing the whole course.

Excused absences do not exclude students from doing the work derived from the session they did not attend.

Excused absences allowed are:

- Hospital admission
- Court summons
- Death of a family member of 1st or 2nd degree of consanguinity or affinity
- Medically diagnosed illness that makes it impossible to attend the session
- Attendance at a scheduled visit to the hospital, which cannot be postponed and which involves diagnosis, follow-up and/or medical treatment

### In case of a justified absence

- If it is not possible to make up the class, the student must do a work (proposed by the teacher) that allows him/her to recover, totally or partially, the content of the session he/she has missed. The elaboration of this work is compulsory and the non-presentation of the work implies a penalty equivalent to the reduction of 5% of the final grade of the course.

### In the case of unexcused absence

- It is not possible to recover the class and a penalty equivalent to the reduction of 10 % of the final grade of the course for each session to which it is missed (therefore, one absence supposes a reduction of 10 % of the final grade and two, one of 20 %).
- Absence from 3 or more sessions means failing the course.
- The student can do a recommended work to recover, totally or partially, the content of the session to which he/she has missed, but it is not obligatory. If the student makes up the work satisfactorily, he/she can recover 5% of the penalty imposed for the absence.

### Important

Plagiarism or copying someone else's work is penalised at all universities and, according to the UVic-UCC Ethical Code ( [in Catalan](#) / [in Spanish](#)), constitutes a very serious offence. Therefore, within this subject, plagiarism or unauthorised appropriation of texts or ideas from others (see [what is considered plagiarism?](#)) and the unauthorised or undisclosed use of artificial intelligence in an activity automatically results in a fail grade or other disciplinary measures.

To facilitate the appropriate citation of texts and materials, consult the guidelines for academic citation available on the UVic Library website.

## METHODOLOGY

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This course is based on the problem-based learning (PBL) methodology, which involves individual and group work to respond to a challenge, generate a protocol and execute it in the laboratory, and analyse, present, and discuss the results in writing and orally.

## BIBLIOGRAPHY

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### Further reading

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

## Microbiology

**Type:** Basic Training (BT)

**Credits:** 6.0

**Semester:** 1st

| Group                                | Language of instruction | Teachers                                   |
|--------------------------------------|-------------------------|--|
| G11, classroom instruction, mornings | Catalan                 | Marc Llíros Dupré<br>Anna González Tendero |

### OBJECTIVES

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Microorganisms play a central role in biological systems, are very diverse and have a strong impact, both in the ecological field and in their relationship with health. Microbiology has provided most of the experimental models that have allowed the development of modern biochemistry and molecular biology. Microbiological knowledge has allowed us to understand how nature works and to develop the main resources for biotechnology.

The objectives are:

- Recognize the importance that microbiology has in the chosen professional field and, therefore, highlight the implications of the microorganism as a living entity, the extensive world of microbes and the figure of the microbiologist within human activities related to life.
- Learn in depth about bacterial cytology, physiology and genetics.
- Acquire general training in the basic techniques of microbiological work, both in the theoretical approach and in practical activity.
- Understand the ecological role of different types of microorganisms and what their controlled use in the biomedical field represents technologically.
- Learn about the basic structure of viruses and their importance within the world of living beings.
- Perceive the range of possibilities that microbiology currently has and those it may have in the future in its application within the different fields of biosciences and especially in biomedicine.

### LEARNING OUTCOMES

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- LO1. Identify the main groups of microorganisms and their relationship with pathologies.
- LO2. Understands oral and written messages of different types in a complete manner expressed in Catalan, Spanish and English.
- LO3. Uses language that is respectful of gender issues in both oral and written or audiovisual productions.
- LO4. Moves with ease in complex situations or those that require the development of new solutions.
- LO5. Collects and interprets data and information on which to base their conclusions, which include reflections on social, scientific or ethical issues in the field of biomedicine.
- LO6. Acquires and demonstrates advanced knowledge of theoretical and practical aspects and work methodology in the field of biomedicine.

### COMPETENCIES

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#### General skills

- Formulate hypotheses following the scientific method, with an ability to summarize and analyze information in a critical way in order to be able to solve problems.

#### Specific skills

- Describe the relationship between the biology of the nucleus and the metabolism of the main cell types.
- Recognize the organization, structure and function of cells and their components in different tissues.

#### Basic skills

- Students can apply their knowledge to their work or vocation in a professional manner and have competencies typically demonstrated through drafting and defending arguments and solving problems in their field of study.
- Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.
- Students have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgments that include reflection on relevant social, scientific and ethical issues.

#### Core skills

- Communicate orally, in writing and audiovisually, in one's own language and in foreign languages, with proficiency in form, content and use.
- Reflect critically on knowledge of all kinds, with a commitment to professional rigor and quality.

## CONTENT

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### Theory

1. Introduction to microbiology  
(2 h with the class group + 0.5 h of independent work)
    - Theory
    - Problems
  2. Basic methodologies in microbiology  
(2 hours with the class group + 2.5 hours of independent work + 15 hours of practical work)
    - Theory
    - Problems
    - Practices 1, 2, 3, 4 and 5
  3. Bacterial cytology  
(8 hours with the class group + 2.5 hours of independent work + 15 hours of practical work)
    - Theory: generalities, envelope, appendages and reproductive/differential structures
    - Problems
    - Practices 2, 4 and 5
- Exam: 1st part (topics 1-3)
4. Bacterial metabolism  
(4 h with the class group + 2.5 h of independent work + 15 h of practical work)
    - Theory: typology, fermentation, aerobic respiration, anaerobic respiration, phototrophy and chemotrophy
    - Problems
    - Practices 1 and 4
  5. Bacterial genetics  
(4 hours with the class group + 2.5 hours of independent work)
    - Theory: genome, regulation, transformation, conjugation and transduction
    - Problems
    - Projection: *The invisible extinction*
  6. Clinical microbiology  
(2 h with the class group + 2.5 h of independent work + 15 h of practical work)
    - Theory: typology, classification and transduction
    - Problems
    - Practices 2 and 4
  7. Biosecurity  
(2 hours with the class group + 2.5 hours of independent work)
    - Theory
  8. Diagnostic methods: classic and molecular  
(2 hours with the class group + 2.5 hours of independent work + 15 hours of practical work)
    - Theory
    - Practices 1, 4, 5, 6 and 7
  9. Pathogenic microorganisms: gram-positive and gram-negative cocci  
(2 hours with the class group + 2.5 hours of independent work + 15 hours of practical work)
    - Theory
    - Practices 1, 4 and 5
  10. Pathogenic microorganisms: gram-positive and gram-negative bacilli  
(2 hours with the class group + 2.5 hours of independent work + 15 hours of practical work)
    - Theory
    - Practices 1, 4 and 5
  11. Pathogenic microorganisms: mycoplasmas and fungi  
(2 hours with the class group + 2.5 hours of independent work + 15 hours of practical work)
    - Theory
    - Practices 1, 4 and 5
  12. Antimicrobial agents and bacterial resistance mechanisms  
(2 hours with the class group + 2.5 hours of independent work + 15 hours of practical work)
    - Theory
    - Practices 1, 4 and 7
- Exam: 2nd term (subjects 4-12)

### Practice

1. Culture media
2. Aseptic technique and seeding
3. Microbial concentration
4. Insulation
5. Metabolism and biochemical tests
6. Macro- and microscopic observation
7. Antimicrobial resistance

## EVALUATION

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The evaluation of the subject is based on continuous monitoring of the student's academic work throughout the course.

The final grade for the subject (NF) is the weighted average of the grades for the following assessable activities:

### — Activity 1. Theory

- Questionnaires. Weight: 10% of the NF; non-recoverable activity
- Partial 1. Weight: 22.5% of the NF; recoverable activity  
You must get at least a 4 to be able to average with the other parts of activity 1.
- Partial 2. Weight: 22.5% of the NF; recoverable activity  
You must get at least a 4 to be able to average with the other parts of activity 1.  
You must get at least a 5 from activity 1 (theory; weighted average between the quizzes and midterms) to be able to average the rest of the grades.

### — Activity 2. Practises

- Practical exam. Weight: 20% of the NF; retrievable activity
- Clinical case presentation. Weight: 20% of NF; non-recoverable activity
- Attitude, attendance and participation. Weight: 5% of the NF; non-recoverable  
You must get at least a 4 on the practical exam to be able to average the rest of your grades.

### Subject-specific criteria

To pass the subject, you must obtain a final grade in which the weighted average of all items is equal to or greater than 5.0. You must obtain at least a 4 from activity 1 to be able to average the rest of the grades.

**Attendance at the practical sessions is mandatory to pass the subject.**

**Unjustified absence from more than two practice sessions implies failure of the entire subject.**

**Excused absences from more than 50% of practical activities will result in a zero grade for the practicals.**

The subject cannot be passed if the practical section is not passed with a grade equal to or greater than 5.

To pass the subject, the weighted average of all items must be equal to or greater than 5.

### General evaluation criteria

The use of mobile phones or other digital devices (smartphones, tablets, etc.) during retrievable tests results in a grade of 0 on the exam.

Failure to attend any of the assessment activities or to submit the work within the established deadlines will result in a grade of 0 for the activity in question. This grade is taken into account when calculating the final grade for the subject.

The final grade for the subject is obtained by weighting, with the respective percentages, the arithmetic averages of the different activities.

The student has the option of retaking failed make-up tests. Make-up tests are held during the last weeks of the semester, designated for this purpose, and no more than 50% of the subject can be retaken.

If you refuse to take the retake test, the grade achieved in the first instance will be maintained.

In non-recoverable activities, no minimum grades are required to calculate the final grade for the subject.

The subject is only graded "Not presented" if no assessable test has been taken or a grade has been obtained in any of the subject's activities.

### Important

Plagiarism or copying someone else's work is penalized in all universities and, according to the [UVic-UCC coexistence rules](#), constitute serious or very serious faults. Therefore, during the course of this subject, plagiarism or the improper appropriation of texts or ideas from other people (see [What is considered plagiarism?](#)) and the improper or undeclared use of artificial intelligence in an activity automatically result in a suspension or other disciplinary measures.

To cite texts and materials appropriately, you must consult the academic citation guidelines and guidelines available on the UVic Library website.

## METHODOLOGY

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Microbiology presents a series of theoretical contents that are taught regularly throughout the course in classroom sessions and that are accompanied by the support of audiovisual resources, written documentation and bibliographical references and are evaluated through written exams.

As can be seen in the content program, the subject also has an eminently practical aspect. For this reason, theoretical sessions are combined with theoretical-practical sessions in the classroom itself and practical sessions in the microbiological laboratory. The goal

pursued is the achievement of a generic and comprehensive training of the student.

Therefore, the learning process is carried out with a combination of theoretical and practical sessions accompanied by weekly tutorials at the students' free disposal. In addition, the student must carry out a set of activities that help them in the development of autonomous work.

## **BIBLIOGRAPHY**

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### **Key references**

- 3. Willey, J., Sherwood, L.M., Woolverton, C.J. (2009). *Microbiología: de Prescott, Harley y Klein* (7 ed.). McGraw-Hill Interamericana de España S.L.
- Madigan, M.T., Bender, K.S., Buckley, D.H., Sattley, W.M., Stahl, D.A. (2017). *Brock Biology of microorganisms* (15 ed.). Pearson.
- Madigan, MT., Bender, KS., Buckley, DH., Sattley, WM., Stahl, DA. (2019). *Brock-Biology of Microorganisms: Global Edition, 15E*. Retrieved from [https://www.pearson.com/nl/en\\_NL/higher-education/subject-catalogue/biology/Brock-Biology-of-Microorganisms-Madigan.html](https://www.pearson.com/nl/en_NL/higher-education/subject-catalogue/biology/Brock-Biology-of-Microorganisms-Madigan.html)
- Willey, J., Sherwood, L.M., Woolverton, C.J. (2017). *Prescott's Microbiology* (10 ed.). McGraw Hill.

### **Further reading**

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

## Omics Technologies

**Type:** Compulsory (OB)

**Credits:** 3.0

**Semester:** 1st

| Group                                | Language of instruction | Teachers               |
|--------------------------------------|-------------------------|------------------------|
| G11, classroom instruction, mornings | English                 | Aleix Noguera Castells |

### SUSTAINABLE DEVELOPMENT GOALS (SDG)

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- 3. Good health and well-being

### OBJECTIVES

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The rapid evolution of omics technologies is changing the knowledge we have about human health and diseases and the way in which the research of diseases is being considered. The revolution of large-scale molecular analysis (such as genomics, epigenomics, proteomics, transcriptomics and metabolomics) has expanded our knowledge about the processes related to the human health, at structural, mechanistic and functional levels playing at this moment a leading role in scientific discoveries.

The aim of this course is to be introduced in the omics technologies and their applications for biomedicine studies including DNA sequencing, transcriptome analysis and proteome analysis among others.

### LEARNING OUTCOMES

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- LO1. Acquire and demonstrate advanced knowledge of the theoretical and practical aspects and work methodology in the field of Biomedicine.
- LO2. Understand the basic concepts of genetic engineering and genomics with clinical application.
- LO3. Know the different omics technologies (DNA sequencing, transcriptome analysis and proteome analysis) and their applications to biomedicine.

### COMPETENCIES

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#### General skills

- Carry out professional activities independently with initiative and respect for other health professionals.
- Formulate hypotheses following the scientific method, with an ability to summarise and analyse information in a critical way in order to be able to solve problems.

#### Specific skills

- Apply the principles of chemistry and physics to the interpretation of biological phenomena and in the development of relevant biomedical technology.
- Combine knowledge of the molecular, cellular, genetic and epigenetic principles of the most prevalent diseases.
- Evaluate technological advances for the diagnosis, prognosis and treatment of disease.
- Have technical skill in a research laboratory for working on cell and tissue samples, and with experimental animals.
- Recognise the applicability of genetic engineering methods and omics technology in preclinical and clinical research.
- Use key analytical and imaging techniques, and basic technological instruments, following customary preclinical research laboratory protocols.

#### Basic skills

- Students can apply their knowledge to their work or vocation in a professional manner and have competencies typically demonstrated through drafting and defending arguments and solving problems in their field of study.
- Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.
- Students have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgements that include reflection on relevant social, scientific and ethical issues.

#### Core skills

- Bring to bear values of entrepreneurship and innovation in one's academic and professional careers.
- Exercise active citizenship and individual responsibility with a commitment to democratic values and sustainable development.
- Make use of professional skills in multidisciplinary, complex, networked environments, whether on-site or online.
- Reflect critically on knowledge of all kinds, with a commitment to professional rigour and quality.

### CONTENT

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1. Generalities of omics technologies (1h)

- a. 1.1. Introduction
- b. 1.2. Applications
2. Genomics technologies (7h)
  - 2.1. Introduction to genomics
  - 2.2. Non-omics DNA techniques
  - 2.3. SANGER DNA sequencing
  - 2.4. Next-generation sequencing (NGS)
  - 2.5. Whole genome sequencing (WGS)
  - 2.6. Whole exome sequencing (WES)
  - 2.7. Other genomics technologies
  - 2.8. Basics of genomic bioinformatic analysis
3. Transcriptomics technologies (3h)
  - 3.1. Introduction to transcriptomics
  - 3.2. Non-omics RNA techniques
  - 3.3. Transcriptome analysis by NGS
  - 3.4. Basics of transcriptomics bioinformatic analysis
4. Proteomics technologies (3h)
  - 4.1. Introduction to proteomics
  - 4.2. Non-omics protein techniques
  - 4.3. Proteome analysis by mass spectrometry
  - 4.4. Basics of transcriptomics bioinformatic analysis
5. Epigenomics (3h)
  - 5.1. Introduction to epigenomics
  - 5.2. Omics analysis of the DNA methylome
  - 5.3. Omics analysis of histone modifications
  - 5.4. Omics analysis of histone occupancy
  - 5.5. Omics analysis of chromatin interactions
  - 5.6. Omics analysis of non-coding RNAs
6. Microbiomics (3h)
  - 6.1. Introduction to microbiomics
  - 6.2. 16S rRNA gene sequencing
  - 6.3. Shotgun metagenomic sequencing
7. Other omics and cutting-edge omics technologies (3h)

## ASSESSMENT

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The evaluation of the subject will consider the acquisition of the skills and learning outcomes.

It is based on the continuous monitoring of student work, which will be assessed throughout the course with different classroom activities, conducting written tests and a group project.

The final grade for the course will be an average of the evaluation of the following items:

- **Student work monitoring:** 20% of the final grade (FG). The student will be assessed individually or in groups their understanding of the subject in in-class activities. This activity is **non-recoverable**.
- **Project:** Students will work in groups to research a specific omics technology, becoming experts on its principles, applications, and limitations. Through a multi-stage process, they will apply this knowledge collaboratively to solve an experimental biological problem. The project grade is based on both group work (22.5% of the FG) and an individual assessment (7.5% of the FG). **This activity is non-recoverable.**
- **Exams:** 50% of the FG. There will be two written exams, each one accounting for 25% of the FG. Minimum mark to pass the exam is 4/10. However, to pass the subject you need a minimum score of 5 averaging both exams. This activity **is recoverable**. If the student just failed one of the exam (first or second), he/she will have the possibility to recover just the failed exam. If the student have failed both, he/she will have the possibility to recover both exams. If the student doesn't have an average of 5 in both exams, but they passed both, he/she could decide which exam wants to recover.

Attendance to theoretical classes or seminars is non-mandatory. However, some evaluable activities will be during the theory/seminars hours, if the student is not at class will count as a 0 for the specific activity. Unjustified absence for the Research Center visit will result with a reduction of 10% of the subject FG.

Justified absences include: hospital admission, court summons, death of a family member of 1st or 2nd degree of consanguinity or affinity, medically diagnosed illness that makes it impossible to attend the session, attendance at a scheduled visit to the hospital, which cannot be postponed and which involves diagnosis, follow-up and/or medical treatment.

### Important

Plagiarism or copying someone else's work is penalised at all universities and, according to the UVic-UCC Ethical Code ( [in Catalan](#) / [in Spanish](#)), constitutes a very serious offence. Therefore, within this subject, plagiarism or unauthorised appropriation of texts or ideas from others (see [what is considered plagiarism?](#)) and the unauthorised or undisclosed use of artificial intelligence in an activity automatically results in a fail grade or other disciplinary measures.

To facilitate the appropriate citation of texts and materials, consult the guidelines for academic citation available on the UVic Library website.

## **METHODOLOGY**

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The Omics Technologies course presents a series of theoretical contents that will be taught regularly throughout the course in class sessions and seminars. That will be accompanied by the support of audiovisual resources, written documentation and bibliographical references and will be evaluated through written exams.

## **BIBLIOGRAPHY**

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### **Key references**

— Arivaradarajan, P., Gauri, M. (2018). *Omics Approaches, Technologies and Applications*. Springer.

### **Further reading**

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

## Regulation of Metabolism

**Type:** Compulsory (OB)

**Credits:** 6.0

**Semester:** 1st

| Group                                | Language of instruction | Teachers             |
|--------------------------------------|-------------------------|----------------------|
| G11, classroom instruction, mornings | Catalan                 | Susana Bodoy Salvans |

### SUSTAINABLE DEVELOPMENT GOALS (SDG)

— 3. Good health and well-being

### OBJECTIVES

The subject Regulation of Metabolism addresses the regulation and intercommunication between the different metabolic pathways of carbohydrates, lipids and proteins. The different types of regulations are studied and emphasis is placed on signal transduction through hormones and the different regulation depending on the tissue. Finally, all this knowledge is integrated into different physiological and pathological situations.

The main objectives of the subject are:

1. Understand the role of signal transduction in mediating hormonal action and in the integration of physiological processes.
2. Understand the control mechanisms of enzymes involved in the regulation of the most important metabolic pathways.
3. Understand the differences in control mechanisms depending on the tissue location of the pathways.
4. Understand the regulation of the flow of metabolites within and between organs in health and disease.
5. Integrate the control of different metabolic pathways into the general homeostasis of the organism (with special emphasis on the case of humans).
6. Understand the causes of the main metabolic diseases.

### LEARNING OUTCOMES

- LO1. Understands the molecular mechanisms of regulation and control of metabolism, as well as the molecular bases of intercellular communication and intracellular signaling.
- LO2. Prepares reports and written documents (mainly of a technical nature) with spelling and grammar correction in Catalan, Spanish and English.
- LO3. Evaluates globally the learning processes carried out in accordance with the plans and objectives set and establishes individual improvement measures.
- LO4. Acquires and demonstrates advanced knowledge of the theoretical and practical aspects of work methodology in the field of biomedicine.

### COMPETENCIES

#### General skills

- Formulate hypotheses following the scientific method, with an ability to summarize and analyze information in a critical way in order to be able to solve problems.

#### Specific skills

- Describe the relationship between the biology of the nucleus and the metabolism of the main cell types.
- Have a systemic vision of the organism, in particular metabolic regulation and control and cell signaling, in order to respond to biomedical challenges.

#### Basic skills

- Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.

#### Core skills

- Communicate orally, in writing and audiovisually, in one's own language and in foreign languages, with proficiency in form, content and use.
- Reflect critically on knowledge of all kinds, with a commitment to professional rigor and quality.

### CONTENT

#### Block 1. Introduction. Hormones and intermediary metabolism

1. Introduction to the regulation of metabolic pathways: energy balance, regulation of enzymatic activities and membrane

- transporters
2. Structure and function of organs and tissues
  3. Function of hormones (insulin, glucagon, catecholamines...)
  4. Regulation of central pathways of intermediary metabolism: Krebs cycle

### Block 2. Carbohydrate metabolism

1. Regulation of intestinal absorption of monosaccharides and glucose transport across cell membranes
2. Glucose utilization pathways
3. Regulation of gluconeogenesis
4. Regulation of glycogen metabolism

### Block 3. Lipid metabolism

1. Digestion, intestinal absorption and lipid transport
2. Lipoprotein metabolism
3. Regulation of lipogenesis and synthesis of triacylglycerols
4. Regulation of lipolysis and fatty acid oxidation

### Block 4. Protein metabolism

1. Protein intake. Transport of peptides and amino acids
2. Protein turnover and amino acid catabolism

## EVALUATION

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The evaluation of the subject is based on continuous monitoring of students' academic work throughout the course.

The final grade for the subject (NF) is the weighted average of the grades for the following assessable activities:

- **Assessable activity 1.** Questionnaires: 30% of the NF; non-recoverable activity
- **Assessable activity 2.** Partial test 1: 25% of the NF; retrievable activity; minimum grade to make an average: 4
- **Assessable activity 3.** Partial test 2: 25% of the NF; retrievable activity; minimum grade to make an average: 4
- **Assessable activity 4.** Assessable exercises: 20% of the NF; non-recoverable activity

The total weight of the assessment activities represents 100% of the final grade for the subject. To average all the assessable activities, the average of assessable activities 2 and 3 must be equal to or greater than 5.

### Important

Plagiarism or copying someone else's work is penalized in all universities and, according to the [UVic-UCC coexistence rules](#), constitute serious or very serious faults. Therefore, during the course of this subject, plagiarism or the improper appropriation of texts or ideas from other people (see [What is considered plagiarism?](#)) and the improper or undeclared use of artificial intelligence in an activity automatically result in a suspension or other disciplinary measures.

To cite texts and materials appropriately, you must consult the academic citation guidelines and guidelines available on the UVic Library website.

## METHODOLOGY

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- In this subject, theoretical sessions, workshops or assignments are held at the end of each block to integrate the knowledge acquired.
- Regarding personal work, students must follow the theoretical aspects of the subject and actively participate in discussions, assignments and workshops in the classroom.
- Cases and tasks are also presented that students must work on autonomously and independently or in small groups.
- Attendance at seminar sessions, assignments and workshops and at case and article presentation sessions is highly recommended, as they are interactive classes with assessable activities and participation.

## BIBLIOGRAPHY

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### Key references

- Bender, D. A. (2014). *Introduction to nutrition and metabolism* (5 ed.). CRC Press, Taylor & Francis Group.
- Blanco Gaitán, María Dolores (2017). *Fundamentos de bioquímica metabólica* (4 ed.). Retrieved from <https://elibro.net/es/lc/bibliouvic/titulos/51989>
- Frayn, K. N. (2010). *Metabolic regulation: A human perspective* (3 ed.). Wiley-Blackwell.
- Newsholme, E. A., Leech, T. R. (2010). *Functional biochemistry in health and disease*. Wiley.
- Storey, K. B. (2004). *Functional metabolism: Regulation and adaptation*. Wiley.

### Further reading

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

## Cell Culture and Tissue Engineering

**Type:** Compulsory (OB)

**Credits:** 6.0

**Semester:** 2nd

| Group                                | Language of instruction | Teachers   |
|--------------------------------------|-------------------------|--|
| G11, classroom instruction, mornings | Catalan                 | Albert Espona Noguera<br>Cristina Bancells Bau<br>Patricia Fernandez Nogueira<br>Santiago Roura Ferrer |

### OBJECTIVES

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Classically, the production of vaccines, recombinant proteins and monoclonal antibodies has been conditioned by the ability to grow eukaryotic cells in culture media in the laboratory. On the other hand, the use of cell cultures has allowed to open new perspectives in the knowledge of molecular mechanisms and in the treatment of pathologies such as cancer, cardiovascular diseases and neurodegenerative diseases, main causes of morbidity and mortality in developed societies. Likewise, current and future medical needs require the ability to replace dysfunctional tissues of the human body, which leads to an important development of tissue bioengineering techniques for the creation and manipulation of tissues in the laboratory.

This subject aims to introduce students to the basic techniques of manipulating cell cultures and the possible applications of cell cultures in the biomedical field. Therefore, four basic objectives are set:

- Know the equipment, facilities, materials and techniques necessary for the manipulation of cell cultures and biological materials under sterile conditions.
- To introduce students to the manipulation of eukaryotic cell cultures.
- Introduce students to the principles and techniques of tissue engineering.
- Learn about the possible applications of the use of cell cultures and tissue engineering through the analysis of scientific publications.

### LEARNING OUTCOMES

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- LO1. Knows the techniques of 2D and 3D culture and analysis of cells and tissues.
- LO2. Performs monolayer cultures of continuous cell lines correctly and safely, following good laboratory practices, and knows the main tissue engineering methods.
- LO3. Identify imaging techniques for the analysis of cellular and tissue organization levels.
- LO4. Evaluates globally the learning processes carried out in accordance with the plans and objectives set and establishes individual improvement measures.
- LO5. Understands oral and written messages of different types in a complete way expressed in Catalan, Spanish and English.
- LO6. Acquires and demonstrates advanced knowledge of technical and practical aspects in the field of cell cultures and tissue engineering.
- RA7. Moves with ease in complex situations or those that require the development of new solutions in experimentation in the field of cell cultures and tissue engineering.
- LO8. Collects and interprets data and information on which to base their conclusions, which include reflections on social, scientific or ethical issues in the field of cell cultures and cell tissue engineering.

### COMPETENCIES

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#### General skills

- Formulate hypotheses following the scientific method, with an ability to summarize and analyze information in a critical way in order to be able to solve problems.

#### Specific skills

- Describe the relationship between the biology of the nucleus and the metabolism of the main cell types.
- Have technical skills in a research laboratory for working on cell and tissue samples, and with experimental animals.
- Promote, respect and apply the principles of bioethics in professional activity.
- Recognize the organization, structure and function of cells and their components in different tissues.
- Use key analytical and imaging techniques, and basic technological instruments, following customary preclinical research laboratory protocols.

#### Basic skills

- Students can apply their knowledge to their work or vocation in a professional manner and have competencies typically demonstrated through drafting and defending arguments and solving problems in their field of study.

- Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.
- Students have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgments that include reflection on relevant social, scientific and ethical issues.

### Core skills

- Communicate orally, in writing and audiovisually, in one's own language and in foreign languages, with proficiency in form, content and use.
- Reflect critically on knowledge of all kinds, with a commitment to professional rigor and quality.

## CONTENT

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The subject is structured into theory sessions, guided work sessions and practical sessions.

In the **theoretical sessions** The course contents are taught organized into four blocks:

- Part I. Introduction to cell cultures (basic concepts, cell culture laboratory, types of cultures, contaminations, etc.)
- Part II. Cell culture techniques (nutritional requirements, culture methods, biology of cells in culture, cryopreservation, primary cultures, etc.)
- Part III. Cell culture study techniques (flow cytometry, microscopy, etc.) and cell culture applications (cell therapy, etc.)
- Part IV. Tissue bioengineering (principles and techniques)

In the **guided work sessions** The following content blocks are explored in depth:

- Regulations for the manipulation of cell cultures in the biotechnology and research field (biosafety regulations, individual and collective protection equipment, waste treatment, work regulations according to GLP, etc.)
- Ethical aspects related to the manipulation of cell cultures (data protection legislation, regulations and codes of good research practice, patient consent, etc.)
- Applications of cell cultures (biotechnological uses of cell cultures, cell therapy, etc.)
- Tissue engineering applications (biomaterials, organ decellularization, 3D bioprinting, etc.)

In the **practice sessions** is working:

- Introduction to sample handling under sterile conditions
- Initiation and expansion of a monolayer culture of a continuous cell line
- Cell proliferation and viability studies
- Cell culture monitoring and analysis techniques

## EVALUATION

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The evaluation of the subject is based on continuous monitoring of the student's academic work throughout the course.

The total weight of the assessment activities represents 100% of the final grade of the subject (NF). The NF is the weighted average of the grades of the following assessable activities:

- **Specific evaluation test** (retrievable individual activity; minimum exam grade to make an average: 4.5)
  - Summary exam (theoretical + practical problems): 50% of the NF
- **Carrying out work** (guided group work activities)
  - Seminars: 22.5% of the NF; non-recoverable activities
  - Problem-solving workshop: 10%; non-returnable activity
- **Internship monitoring:** 10%
  - Pre-practice questionnaire: 2.5% of the NF; non-recoverable activity
  - Practice notebook: 7.5% of the final grade; non-retrievable activity
- **Attitude and participation:** 7.5% (in the classroom: 2.5%; in the laboratory: 5%); non-retrievable activity

### Subject-specific criteria

- Seminar activities for analyzing scientific articles and practicals are mandatory.
- To pass the subject, you must obtain a final grade in which the weighted average of all items is equal to or greater than 5.0.
- Attendance and work attitude in the practicals: the practicals begin at the scheduled time. Lack of punctuality harms the development of the practicals and, therefore, is scored negatively and is reflected in the attendance grade. The overall attitude in the laboratory is evaluated: involvement in the development of the experimental work, having the appropriate experimental protocols, a sewn laboratory notebook, a calculator, a laboratory coat and dressing appropriately under the coat to avoid accidents, etc. Coordination, planning and teamwork are taken into account for the smooth functioning of the experimental work.

### General evaluation criteria

- Possession of mobile phones or similar (*smartphones*, tablets, etc.) during the taking of the recoverable tests will result in a zero on the test.
- Failure to appear or present within the established deadlines for any of the assessment activities will result in a grade of zero for that activity. This grade is taken into account when calculating the final grade for the subject.

- The final grade for the subject is obtained by weighting, with the respective percentages, the arithmetic averages of the different activities.
- The student has the option of retaking failed make-up tests. Make-up tests are held during the last weeks of the semester, designated for this purpose, and no more than 50% of the subject can be retaken.
- If you refuse to take the retake test, the grade achieved in the first instance will be maintained.
- In non-recoverable activities, no minimum grades are required to calculate the final grade for the subject.
- The subject is only graded as "Not presented" if no assessable test has been taken or a grade has been obtained in any of the subject's activities.

### Important

Plagiarism or copying someone else's work is penalized in all universities and, according to the [UVic-UCC coexistence rules](#), constitute serious or very serious faults. Therefore, during the course of this subject, plagiarism or the improper appropriation of texts or ideas from other people (see [What is considered plagiarism?](#)) and the improper or undeclared use of artificial intelligence in an activity automatically result in a suspension or other disciplinary measures.

To cite texts and materials appropriately, you must consult the academic citation guidelines and guidelines available on the UVic Library website.

## METHODOLOGY

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### Theoretical contents

The theoretical content is taught using the methodologies listed below, depending on the needs derived from each topic:

- Master classes
- Seminars with problem-based learning (PBL) methodology
- Seminars with cooperative learning methodology in the guided reading of scientific articles

### Practical skills

Practical skills are worked on through experimental work in the laboratory in small groups.

## BIBLIOGRAPHY

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### Key references

- Doyle, A., Griffiths, J.B. (1998). *Cell and Tissue Culture: Laboratory procedures in biotechnology*. John Wiley & Sons.
- Freshney, R.I. (2010). *Culture of animal cells a manual of basic technique and specialized applications*. Retrieved from <https://onlinelibrary-wiley-com.biblioremot.uvic.cat/doi/book/10.1002/9780470649367>
- Lanza, R., Langer, R., Vacanti, J. (2007). *Principles of Tissue Engineering* (3 ed.). Elsevier Academic Press.
- Ormerod, M.G. (2008). *Flow Cytometry: A Basic Introduction*. Retrieved from <https://flowbook.denovosoftware.com/>
- Sigma-Aldrich. Lab & Production Materials (2018). *Fundamental Techniques in Cell Culture Laboratory Handbook: 4th Edition*. Retrieved from <https://www.sigmaaldrich.com/life-science/cell-culture/learning-center/ecacc-handbook.html>

### Further reading

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

## Human Physiology and Anatomy II

**Type:** Basic Training (BT)

**Credits:** 6.0

**Semester:** 2nd

| Group                                | Language of instruction | Teachers   |
|--------------------------------------|-------------------------|--|
| G11, classroom instruction, mornings | Catalan                 | Maria Dolors Puigoriol Illamola<br>Albert Espona Noguera |

### OTHER TEACHERS

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— Manuel Joaquin Caudet

### SUSTAINABLE DEVELOPMENT GOALS (SDG)

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- 3. Good health and well-being
- 4. Quality education
- 5. Gender equality

### OBJECTIVES

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This subject and the subject Human Physiology and Anatomy I together form the subject of Physiology and Anatomy. Through these subjects, knowledge is provided about the structures of the organism and its functionality, from the cellular and tissue perspective that make up the different systems. Finally, all this knowledge is integrated into different physiological and pathological situations or aging.

The main objectives of the subject Human Physiology and Anatomy II are for students to acquire:

- General knowledge of the structure and anatomy of the human body
- Knowledge of physiology and pathophysiology of the human body
- Basic knowledge of human histology and embryology
- Analysis and reflection on the relationships between human physiology and anatomy, gender, culture and society.

### LEARNING OUTCOMES

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- LO1. Understands the fundamentals of general physiology and all organs, systems and organs.
- LO2. It explains the physiology of organs and systems in an integrated way.
- LO3. Analyze the function of organs, tissues and cell types in humans.
- LO4. Relates the general homeostasis of the human body, as well as the integration of the operating systems that compose it.
- LO5. Uses dissection material correctly.
- LO6. Acts with commitment and responsibility in common situations and those specific to the profession.
- LO7. Uses oral language (verbal and non-verbal) appropriately in personal and professional interaction in Catalan, Spanish and English.
- LO8. Acquires and demonstrates advanced knowledge of theoretical and practical aspects and work methodology in the field of biomedicine.
- LO9. Apply their knowledge to solving problems in complex work areas and in professional and specialized areas that require the use of creative and innovative ideas.

### COMPETENCIES

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#### General skills

- Formulate hypotheses following the scientific method, with an ability to summarize and analyze information in a critical way in order to be able to solve problems.

#### Specific skills

- Have a systemic vision of the organism, in particular metabolic regulation and control and cell signaling, in order to respond to biomedical challenges.
- Make integrated assessments of the functioning of organs and apparatus, and their role in homeostasis.
- Recognize the organization, structure and function of cells and their components in different tissues.
- Use key analytical and imaging techniques, and basic technological instruments, following customary preclinical research laboratory protocols.

#### Basic skills

- Students can apply their knowledge to their work or vocation in a professional manner and have competencies typically demonstrated through drafting and defending arguments and solving problems in their field of study.

- Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.

### Core skills

- Communicate orally, in writing and audiovisually, in one's own language and in foreign languages, with proficiency in form, content and use.
- Reflect critically on knowledge of all kinds, with a commitment to professional rigor and quality.

## CONTENT

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### Block 1. Introduction (2 hours, group class)

- Definition of physiology
- Levels of organization: chemical, cellular and tissue
- Tissue repair

### Block 2. Cardiovascular system (8 hours, group class)

- Anatomy: heart muscle and heart valves
- Types of heart cells
- Action potential (generation and transmission)
- Muscle contraction
- Electrocardiogram
- Cardiac cycle
- Blood vessels: arteries and veins. blood flow
- Blood pressure. Venous return. Capillary microcirculation.
- Diffusion, transcytosis and mass flow: filtration and absorption
- Special circulations: pulmonary circulation. Fetal circulation
- Neural regulation, heart and blood vessels
- Development-related pathologies of the cardiovascular system, pathologies related to aging

### Block 3. Digestive system (8 hours, group class)

- Anatomy of the digestive system. Primary and secondary organs. Types of musculature. Chemical and physical digestion
- Oropharyngeal and esophageal physiology: mastication and swallowing. Motility of the mouth and esophagus. Salivary digestion
- Stomach. Gastric physiology: gastric motility, secretion and absorption
- Hepatobiliary and pancreatic physiology
- Physiology of the small intestine. Digestion and absorption of nutrients
- Physiology of the large intestine
- Phases of digestion and regulation
- Metabolism: utilization of nutrients. Main metabolic pathways
- Related pathologies in the digestive system. Ulcers, swallowing problems, food intolerances and celiac disease

### Block 4. Respiratory system (5.5 h, group class)

- Anatomy: structure of the lungs and structural characteristics. Importance of pulmonary surfactant
- Gas exchange: external respiration and internal respiration
- Transport of oxygen and transport of carbon dioxide
- Breathing mechanics: pulmonary ventilation. Ventilation and perfusion
- Pulmonary blood flow
- Breathing control
- Respiratory pathologies: differences between obstructive and restrictive pathologies

### Block 5. Renal system (4 hours, group class)

- Anatomy of the renal system. In the macroscopic and microscopic field. The nephron
- Kidney functions. Osmotic and homeostatic activity
- Filtration, reabsorption and secretion mechanisms in urine formation
- Hormonal regulation. Formation of concentrated and diluted urine
- Urination
- Kidney functions in acid-base balance
- Pathologies of the renal system and kidney stones. Problems in the formation of glomerular filtration

### Block 6. Locomotor system (9.5 hours, group class)

- Anatomy of the musculoskeletal system. Main bones and muscles
- Bone tissue. Histology and differences between compact and spongy bone tissue. Bone formation and fracture
- Muscle tissue. Contraction and relaxation of muscle fibers. Differences between skeletal muscle, cardiac muscle and smooth muscle. Control of muscle tension. Muscle metabolism
- Joints. Types of joints. Characteristics and limitations of joint movements.
- Muscle tissue regeneration
- Locomotor system and exercise

— Pathologies associated with aging, osteoporosis, sarcopenia and cartilage wear

#### **Internships** (6.5 hours, small group)

- Macroscopic observations
- Study of cardiorespiratory function: spirometry and calorimetry

#### **Clinical cases** (8 hours, group class)

Different clinical cases are worked on to apply the knowledge gained throughout the course to solving problems that require the use of creative and innovative ideas. In addition, students have the opportunity to reflect on social, cultural, economic and gender diversity in the field of human physiology and anatomy.

#### **Midterm exam and follow-up questionnaires** (2.5 hours)

### **EVALUATION**

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The evaluation of the subject is based on continuous monitoring of the student's academic work throughout the course.

The final grade for the subject (NF) is the weighted average of the grades for the following assessable activities:

- Questionnaires and work monitoring: 15% of the NF; non-recoverable activity
  - Internships: 20% of the NF; non-recoverable activity \*
  - Activities, assignments and presentations: 20% of the NF; non-recoverable activity \*
  - Exams: 45%
    - Partial I: 22.5% of the NF; blocks 1, 2 and 3; recoverable activity
    - Partial II: 22.5% of the NF; blocks 4, 5 and 6; recoverable activity
- Minimum grade for each of the partial exams to make an average: 4. The average between the two exams must be 5 to be able to make an average with the rest of the activities.

\* This activity specifically works on Sustainable Development Goals 3 and 5.

#### **Subject-specific criteria**

Attendance at internship sessions is mandatory. Therefore, unexcused absence from more than one internship session or justified absence from more than 30% of internship sessions will result in suspension of the internship.

To pass the subject, you must obtain a final grade in which the weighted average of all activities is equal to or greater than 5.0.

#### **General evaluation criteria**

Possession of mobile phones or similar (*smartphones*, tablets, etc.) during the taking of the recoverable tests will result in a zero on the test.

Failure to appear or present within the established deadlines for any of the assessment activities will result in a grade of zero for that activity. This grade is taken into account when calculating the final grade for the subject.

The student has the option of retaking failed make-up tests. Make-up tests are held during the last weeks of the semester, designated for this purpose.

No more than 50% of the subject can be recovered.

If you decline to take the retake test, the grade achieved in the first instance will be maintained.

In non-recoverable activities, no minimum grades are required to calculate the final grade for the subject.

#### **Important**

Plagiarism or copying someone else's work is penalized in all universities and, according to the [UVic-UCC coexistence rules](#), constitute serious or very serious faults. Therefore, during the course of this subject, plagiarism or the improper appropriation of texts or ideas from other people (see [What is considered plagiarism?](#)) and the improper or undeclared use of artificial intelligence in an activity automatically result in a suspension or other disciplinary measures.

To cite texts and materials appropriately, you must consult the academic citation guidelines and guidelines available on the UVic Library website.

### **METHODOLOGY**

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In this subject, theoretical sessions, workshops or assignments are held at the end of each block to integrate the knowledge acquired.

Regarding personal work, students must follow the theoretical aspects of the subject and actively participate in discussions, assignments and workshops in the classroom.

Cases and tasks are also presented that students must work on autonomously and independently or in small groups.

Attendance at seminar sessions, assignments and workshops and at case and article presentation sessions is highly recommended,

as they are interactive classes with assessable activities and participation.

Practical sessions are held to familiarize students with the assessment of cardiorespiratory function and the observation of tissues on a macroscopic scale.

## **BIBLIOGRAPHY**

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### **Key references**

- Gilroy, Anne M. (2008). *Prometheus: Atlas de anatomía*. Buenos Aires: Médica Panamericana.
- Marieb, E. N., Keller, S. M. (2017). *Fisiología Humana: Fisiología Humana* (12 ed.). Madrid: Pearson.
- Martini, F.H., Tallitsch, R.B, Nath, J.L. (2017). *Anatomía Humana: Anatomía Humana* (9 ed.). Madrid: Pearson.
- Tortora, G.J. , Derrickson, B. (2018). *Principios de Anatomía y Fisiología : Principios de Anatomía y Fisiología* (15 ed.). Buenos Aires: Médica Panamericana.
- Young, B., O'Dowd, G., Woodford, P. (2014). *Wheater Histología Funcional: Texto y Atlas en Color* (6 ed.). Barcelona: Elsevier España SL.

### **Further reading**

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

## Immunology

**Type:** Compulsory (OB)

**Credits:** 6.0

**Semester:** 2nd

| Group                                | Language of instruction | Teachers                       |
|--------------------------------------|-------------------------|--------------------------------|
| G11, classroom instruction, mornings | Catalan                 | Alexandre Olvera Van Der Stoep |
| G12, classroom instruction, mornings | Catalan                 | Ferran Tarrés Freixas          |

### OBJECTIVES

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Within the degree in Biomedicine, the subject Immunology aims to teach students how the immune system and the immune response work. This knowledge should allow them to understand the importance of the immune system in the control of infectious diseases and cancer, and also in pathologies caused by a malfunction of this system, mainly autoimmunities or immunodeficiencies. Finally, the student sees how, from the study of the immune system, tools have been developed that are revolutionizing the field of biotechnology (especially antibodies, vaccines and CAR-T).

From here, three specific objectives are defined:

1. Know the structure, function and interrelationship of the components of the immune system.
2. Learn about the molecular basis of different pathologies related to the immune system.
3. Learn about therapeutic applications developed from (antibodies) or using components (vaccines and CART) of the immune system.

### LEARNING OUTCOMES

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- LO1. Understands the general concepts of organism defense.
- LO2. Know the cellular and molecular bases of immunological processes and the effector mechanisms of the immune response.
- LO3. Relate the responses of the immune system to the onset of the disease.
- LO4. Prepares reports and written documents (mainly of a technical nature) with spelling and grammar correction in Catalan, Spanish and English.
- LO5. Evaluates the learning processes carried out globally in accordance with the plans and objectives set and establishes individual improvement measures.
- LO6. Know the main immune therapeutic strategies against diseases.
- LO7. Acquires and demonstrates advanced knowledge of theoretical and practical aspects and work methodology in the field of biomedicine.

### COMPETENCIES

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#### General skills

- Formulate hypotheses following the scientific method, with an ability to summarize and analyze information in a critical way in order to be able to solve problems.

#### Specific skills

- Have a systemic vision of the organism, in particular metabolic regulation and control and cell signaling, in order to respond to biomedical challenges.

#### Basic skills

- Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.

#### Core skills

- Communicate orally, in writing and audiovisually, in one's own language and in foreign languages, with proficiency in form, content and use.
- Reflect critically on knowledge of all kinds, with a commitment to professional rigor and quality.

### CONTENT

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The contents of this subject are divided into the following blocks:

- Block I. Basic immunology
- Block II. Pathologies associated with the immune system
- Block III. Immunotherapies

## Block I. Basic immunology

1. Introduction to immunology (3 hours with the class group)
  - 1.1. Basic concepts
  - 1.2. Types of immune response, innate and adaptive
  - 1.3. Cells and organs of the immune response
  - 1.4. General characteristics of the immune response (innate and adaptive)
2. Innate immune response (4 h with the class group + 0.5 h of independent work)
  - 2.1. Barriers to infection
  - 2.2. Activation of the innate immune system
  - 2.3. Cellular components: phagocytes and NK
  - 2.4. Soluble components: the complement
  - 2.5. The inflammatory response
  - 2.6. Activation of the adaptive immune response
3. The humoral adaptive immune response (4 h with the class group + 0.5 h of independent work)
  - 3.1. Antigens
  - 3.2. Antibodies: structure, immunoglobulin classes and B cell receptor ( B-cell receptor(BCR)
  - 3.3. Antigen-antibody reactions
  - 3.4. Functions of antibodies: neutralization, opsonization and phagocytosis, antibody-dependent cytotoxic activity, complement activation
4. The cellular adaptive immune response (4 h with the class group + 0.5 h of independent work)
  - 4.1. MHC: antigen presentation and antigen-presenting cells (APCs)
  - 4.2. Composition and biosynthesis of MHC class I and class II
  - 4.3. Functions of the MHC
  - 4.4. HLA and tissue compatibility
  - 4.5. T cell receptor (TCR): accessory molecules and intracellular signaling in T lymphocyte activation
5. Lymphocyte development (4 h with the class group + 0.5 h of independent work)
  - 5.1. Lymphocyte development
  - 5.2. Generation of antigen receptor diversity and antibody maturation
  - 5.3. Somatic recombination: generation of functional genes for antigen receptors and isotype switching
  - 5.4. Formation of B lymphocytes
  - 5.5. Formation of T lymphocytes
  - 5.6. Lymphocyte migration and secondary lymphatic organs
6. Effector mechanisms of the immune response (3 h with the class group + 0.5 h of independent work)
  - 6.1. Activation of T lymphocytes
  - 6.2. Helper T lymphocyte subpopulations (T-helper)
  - 6.3. Macrophage activation
  - 6.4. Interactions between T and B lymphocytes for the improvement of antibodies
7. Tolerance (2 h with the class group + 0.5 h of independent work)
  - 7.1. Central and peripheral tolerance
  - 7.2. Tolerance mechanisms
  - 7.3. Regulatory T lymphocytes

## Block II. Pathologies associated with the immune system

8. Autoimmune diseases (7 hours with the class group + 1 hour of independent work)
  - 1.1. Autoimmunity
  - 1.2. Cases
9. Immunodeficiencies (7 hours with the class group + 1 hour of independent work)
  - 2.1. Primary immunodeficiencies
  - 2.2. Secondary immunodeficiencies
  - 2.3. Cases

## Block III. Using the immune system to develop biological therapies

10. Immunotherapies (10 hours with the class group + 2 hours of independent work)
  - 1.1. Monoclonal antibody therapies
  - 1.2. Application to the detection of molecules (WB, immunofluorescence, ELISA, flow cytometry)
  - 1.3. CAR-T cell therapies
  - 1.4. Vaccines
  - 1.5. Critical reading club (Journal Club)

## EVALUATION

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The subject continuously evaluates the student's academic work throughout the course. The final grade for the subject (NF) is the weighted average of the grades of the following assessable activities:

- Assessable activity 1. Compulsory attendance at seminars: 5%
- Assessable activity 2. Quick tests at the end of topics 2 to 10: together they are 15% of the NF, 1.7% each.
- Assessable activity 3. Case studies (group work): together they are 20% of the NF, 3.33% each
- Assessable activity 4. Critical reading club (journal club) (group work): 10% of the NF

- Assessable activity 5. Partial written test I (topics 1-5): 25% of the NF; retrievable activity; minimum grade to be able to make an average: 4.0
- Assessable activity 6. Partial written test II (topics 5-10): 25% of the NF; retrievable activity; minimum grade to be able to make an average: 4.0
- The average grade between activity 5 and 6 must be 5 or higher to be able to average with the other activities.

### Important

Plagiarism or copying someone else's work is penalized in all universities and, according to the [UVic-UCC coexistence rules](#), constitute serious or very serious faults. Therefore, during the course of this subject, plagiarism or the improper appropriation of texts or ideas from other people (see [What is considered plagiarism?](#)) and the improper or undeclared use of artificial intelligence in an activity automatically result in a suspension or other disciplinary measures.

To cite texts and materials appropriately, you must consult the academic citation guidelines and guidelines available on the UVic Library website.

## METHODOLOGY

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The theoretical sessions are taught by the teacher with the help of a blackboard, a projector and a computer with which presentations are made. They are complemented by case studies and a critical reading club (*journal club*). During these sessions, the teacher continuously challenges the students to deduce possible explanations for the experimental facts based on the knowledge taught.

Regarding personal work, the student must follow the theoretical aspects of the subject. Each theoretical session involves, at least, the same amount of time for personal work. The work consists of preparing tests, case studies, the critical reading club (*journal club*), read chapters of recommended books or search for information on the Internet using keywords.

## BIBLIOGRAPHY

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### Key references

- (2017). *Microbiology and immunology on-line*. Retrieved from [www.microbiologybook.org/book/welcome.htm](http://www.microbiologybook.org/book/welcome.htm)
- (2019). *Immunopaedia*. Retrieved from [www.immunopaedia.org.za/](http://www.immunopaedia.org.za/)
- Abul K. Abbas, Andrew H. Lichtman, Shiv Pillai, David L. Baker (2022). *Inmunología celular y molecular*. Retrieved from [www-clinicalkey-com.biblioremot.uvic.cat/student/content/toc/3-s2.0-C20210015248](http://www-clinicalkey-com.biblioremot.uvic.cat/student/content/toc/3-s2.0-C20210015248)
- Roitt, I., Brostoff, J., Male, D. (2012). *Immunology* (8 ed.). Elsevier.

### Further reading

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

## Integrated Project IV

**Type:** Compulsory (OB)

**Credits:** 6.0

**Semester:** 2nd

| Group                                | Language of instruction | Teachers                   |
|--------------------------------------|-------------------------|----------------------------|
| G11, classroom instruction, mornings | English                 | Meritxell Pujolassos Tanyà |

### SUSTAINABLE DEVELOPMENT GOALS (SDG)

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- 3. Good health and well-being
- 5. Gender equality

### OBJECTIVES

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This subject belongs to a series of subjects, Integrated Projects I-VI, of the undergraduate program in Biomedicine which culminate each semester from the first to third year. The common objective of this set of subjects is to work at a practical level on the knowledge that students have acquired in other subjects during the semester, while facilitating the acquisition of skills related to biomedical research. The teaching methodology is problem- or project-based learning.

Specifically, Integrated Project IV is a research workshop related to the subjects of Omics Data and Bioinformatics I and Cell Signalling and Gene Regulation. For this reason, we strongly recommend that students enrolling in this subject have taken [Immunology](#), [Omics Data and Bioinformatics I](#) and [Cell Signalling and Gene Regulation](#).

### LEARNING OUTCOMES

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- RA1. Use specialised information sources in science and technology in English.
- RA2. Manages databases and applies advanced statistical methods to analyse these data.
- RA3. Demonstrate comprehension of spoken and written scientific English.
- RA4. Recognise and apply the main guidelines for structuring presentations, projects and publications in scientific communication.
- RA5. Resolve problems and situations relevant to professional practice in an innovative and entrepreneurial manner.
- RA6. Design interventions to meet the needs of the area in a multidisciplinary way.
- RA7. Critically reflect on processes related to professional practice.
- RA8. Use appropriate spoken language (verbal and non-verbal) to communicate in personal and professional situations in Catalan, Spanish and English.
- RA9. Apply strategies to promote gender equality and justice in the workplace.
- RA10. Prepare reports and written documents (mainly of a technical nature) with correct spelling and grammar in Catalan, Spanish and English.

### COMPETENCIES

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#### General skills

- Show a positive attitude to innovating, creating value and integrating scientific knowledge and improving one's own training.

#### Specific skills

- Analyse biomedical data and biological sequences through the use of statistics and computation.
- Be able to critically interpret the results and conclusions of scientific studies.
- Formulate hypotheses and design experiments in the field of biomedical research.
- Have technical skill in a research laboratory for working on cell and tissue samples, and with experimental animals.
- Recognise the applicability of genetic engineering methods and omics technology in preclinical and clinical research.

#### Basic skills

- Students can apply their knowledge to their work or vocation in a professional manner and have competencies typically demonstrated through drafting and defending arguments and solving problems in their field of study.
- Students can communicate information, ideas, problems and solutions to both specialists and non-specialists.
- Students have developed the learning skills necessary to undertake further studies with a high degree of independent learning.

#### Core skills

- Develop strategies for promoting gender equality and equity for all.
- Exercise active citizenship and individual responsibility with a commitment to democratic values and sustainable development.
- Interact in international contexts to transfer knowledge to current and emerging fields of professional development and research.
- Reflect critically on knowledge of all kinds, with a commitment to professional rigour and quality.

### CONTENT

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## Block 1. Biological databases and comparative sequence analysis

(6h subgroup, exposition + 7.5h subgroup, practice)

- Extraction of information throughout the central dogma of biology (from DNA to protein): NCBI, Ensembl, Uniprot, PDB - Similarity, homology and orthology: BLAST
- Phylogenetics: multiple sequence alignments and phylogenetic trees: MAFFT

## Block 2. Gene expression

(10h subgroup, exposition + 12.5h subgroup, practice)

- Transcriptomics data analysis: Galaxy and R
- Treatment of different biological formats: Bash
- Design of results validation: Primer-BLAST

## Block 3. Genes, structures, functions and variation

(6h subgroup, exposition + 7.5h subgroup, practice)

- What are genes and their structures: UCSC, ORFfinder and Biomart
- Functionality and protein domains: GeneOntology, KEGG, Reactome and Uniprot
- Variation: Ensembl, dbSNP and PDB

*Doubt resolution sessions (3 sessions)*

*Project presentation session (1 session)*

## ASSESSMENT

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You will be assessed in the following way:

- Online tests: 30%
- Complementary activities: 10%
- Scientific presentation: 25%
- Scientific article: 25%
- Active participation: 10% (participation, attitude, attendance)

**Attendance is compulsory.** Absences are not allowed, but it is possible to miss 1 or 2 sessions for justified reasons. More than 2 unexcused absences mean failing the whole course.

Excused absences do not exclude students from doing the work derived from the session they did not attend.

Excused absences allowed are:

- Hospital admission
- Court summons
- Death of a family member of 1st or 2nd degree of consanguinity or affinity
- Medically diagnosed illness that makes it impossible to attend the session
- Attendance at a scheduled visit to the hospital, which cannot be postponed and which involves diagnosis, follow-up and/or medical treatment

### In case of a justified absence

- If it is not possible to make up the class, the student must do a work (proposed by the teacher) that allows him/her to recover, totally or partially, the content of the session he/she has missed. The elaboration of this work is compulsory and the non-presentation of the work implies a penalty equivalent to the reduction of 5% of the final grade of the course.

### In the case of unexcused absence

- It is not possible to recover the class and a penalty equivalent to the reduction of 10% of the final grade of the course for each session to which it is missed (therefore, one absence supposes a reduction of 10% of the final grade and two, one of 20%).
- Absence from 3 or more sessions means failing the course.
- The student can do a recommended work to recover, totally or partially, the content of the session to which he/she has missed, but it is not obligatory. If the student makes up the work satisfactorily, he/she can recover 5% of the penalty imposed for the absence.

### Important

Plagiarism or copying someone else's work is penalised at all universities and, according to the UVic-UCC Ethical Code ( [in Catalan](#) / [in Spanish](#)), constitutes a very serious offence. Therefore, within this subject, plagiarism or unauthorised appropriation of texts or ideas from others (see [what is considered plagiarism?](#)) and the unauthorised or undisclosed use of artificial intelligence in an activity automatically results in a fail grade or other disciplinary measures.

To facilitate the appropriate citation of texts and materials, consult the guidelines for academic citation available on the UVic Library website.

## **METHODOLOGY**

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The course is based on problem-based learning (PBL) methodology, which involves both individual and group work in response to a challenge, analysing the data related to it and being able to propose a feasible solution.

## **BIBLIOGRAPHY**

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### **Further reading**

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

## Omics Data and Bioinformatics I

**Type:** Compulsory (OB)

**Credits:** 3.0

**Semester:** 2nd

| Group                                | Language of instruction | Teachers                   |
|--------------------------------------|-------------------------|----------------------------|
| G11, classroom instruction, mornings | Catalan                 | Meritxell Pujolassos Tanyà |

### SUSTAINABLE DEVELOPMENT GOALS (SDG)

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— 5. Gender equality

### OBJECTIVES

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One of the most profound revolutions that humanity has experienced in the last 50 years is the digitalization of information. This process, which has allowed the development of computing and telecommunications, has also profoundly affected the biosciences and, in a very special way, biomedicine, a discipline in which large amounts of digitalized information are available. The fields of genomics, transcriptomics, epigenomics and proteomics and, in general, the so-called omic technologies, previously introduced in the subject Omics Technologies, are a source of this type of information that must be known, explored and learned to exploit.

In this subject we focus especially on the analysis of transcriptomics data. Transcriptomics is the study of the complete set of RNA transcripts produced by a genome under a specific condition and allows us to understand how genes are expressed and regulated in different biological situations.

We also study basic workflows in transcriptomics. We focus on the various bioinformatics analysis methodologies and emphasize the statistical analysis of this data. We learn to analyze this type of data and make decisions from a statistical point of view to solve specific research objectives at each time.

Finally, we discuss some of the biomedical uses of genomics and explore some of the most commonly used biological databases in bioinformatics. We see how this data is generated and how we can easily exploit it to obtain valuable information for research.

### LEARNING OUTCOMES

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- RA1. Interprets and communicates the results of statistical and bioinformatics analyzes rigorously.
- LO2. Uses computing, biological databases and bioinformatics tools to obtain biological information.
- LO3. Demonstrates skills for critical reflection in processes linked to the exercise of the profession.
- LO4. Analyses knowledge specific to the field and its contextualisation in national and international environments.
- LO5. Apply procedures specific to scientific research in the development of training and professional activity.
- LO6. Designs interventions that meet the needs of the field in a multidisciplinary manner.
- LO7. Moves with ease in virtual interaction contexts through the use of ICT.
- LO8. Moves with ease in the general use of ICT and, especially, in technological environments specific to the professional field.
- LO9. Shows sensitivity to equitable and egalitarian professional practice from a gender perspective.
- RA10. Moves with ease in complex situations or those that require the development of new solutions.

### COMPETENCIES

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#### General skills

- Formulate hypotheses following the scientific method, with an ability to summarize and analyze information in a critical way in order to be able to solve problems.

#### Specific skills

- Analyze biomedical data and biological sequences through the use of statistics and computation.
- Be able to critically interpret the results and conclusions of scientific studies.
- Formulate hypotheses and design experiments in the field of biomedical research.

#### Basic skills

- Students can apply their knowledge to their work or vocation in a professional manner and have competencies typically demonstrated through drafting and defending arguments and solving problems in their field of study.
- Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.
- Students have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgments that include reflection on relevant social, scientific and ethical issues.

#### Core skills

- Develop strategies for promoting gender equality and equity for all.

- Interact in international contexts to transfer knowledge to current and emerging fields of professional development and research.
- Make use of professional skills in multidisciplinary, complex, networked environments, whether on-site or online.
- Reflect critically on knowledge of all kinds, with a commitment to professional rigor and quality.
- Take control of one's learning process with a view to personal and professional growth and an all-round education.

## CONTENT

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### Block I. The world of omics

1. Introduction to the world of omics data  
(1 hour with the whole group, exhibition)
2. Omics databases and bioinformatics tools  
(4 hours with the entire subgroup, computer practice)
  - Practice 1. The taste for bioinformatics
  - Practice 2. Obtaining RNA-seq data for analysis

### Block II. Biostatistics for omic data (transcriptomics and genomics)

3. Analysis of Variance (ANOVA)  
(2 h with the whole group, exposure + 2 h with the subgroup, R practice)
  - Practice 3. Analysis of gene expression in patients with tuberculosis (part I)
4. Non-parametric statistics  
(2 h with the whole group, exposure + 4 h with the subgroup, R practice)
  - Practice 4. Analysis of gene expression in patients with tuberculosis (part II)
  - Practice 5. Longitudinal analysis of gene expression in patients with tuberculosis
5. Linear and logistic regression models  
(4 h with the whole group, exposure + 8 h with the subgroup, R practice)
  - Practice 6. Prediction of infection levels based on gene expression (part I)
  - Practice 7. Prediction of infection levels based on gene expression (part II)
  - Practice 8. Predicting response to tuberculosis treatment (part I)
  - Practice 9. Predicting response to tuberculosis treatment (part II)
6. Applications in biomedicine  
(1 h with the whole group, exposure + 2 h with the subgroup, R practice)
  - Practice 10. Visualization and interpretation of sequencing results

## EVALUATION

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The assessment of the subject is continuous and is carried out through 4 elements:

- **Participation and attitude in the classroom:** 10% (non-refundable). Multiple-choice questions for each topic on the content covered during class.
- **Tracking RNA-seq data analysis and visualization practices with R:** 15% (non-refundable). Questionnaires and small deliveries.
- **Data analysis project for RNA-seq experiments:** 25% (recoverable). Recovery is done during the school period.
- **Final exam:** 50% (repeatable). To pass the subject, you must obtain a grade of 4.5/10 in this test.

The retake tests that a student takes cannot exceed 50% of the subject grade.

### Important

Plagiarism or copying someone else's work is penalized in all universities and, according to the [UVic-UCC coexistence rules](#), constitute serious or very serious faults. Therefore, during the course of this subject, plagiarism or the improper appropriation of texts or ideas from other people (see [What is considered plagiarism?](#)) and the improper or undeclared use of artificial intelligence in an activity automatically result in a suspension or other disciplinary measures.

To cite texts and materials appropriately, you must consult the academic citation guidelines and guidelines available on the UVic Library website.

## METHODOLOGY

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Classes are taught in a face-to-face format. Most sessions consist of a theoretical part and a practical part, in which exercises on omics data analysis with R or other programs are also carried out.

## BIBLIOGRAPHY

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### Key references

- Arivaradarajan, P., Gauri, M. (2018). *Omics Approaches, Technologies and Applications*. Springer.
- Braun, W. John, Duncan J. Murdoch (2016). *A first course in statistical programming with R*. Cambridge University Press.
- Gerner, C. & Hill, M. (2021). *Integrative Multi-Omics in Biomedical Research: Multidimensional omics*. Retrieved from <https://directory.doabooks.org/handle/20.500.12854/77086>
- González, JR., Cáceres, A. (2019). *Omic Association Studies with R and Bioconductor*. CRC Press.
- Wang, Xinkun (2016). *Next-generation sequencing data analysis*. CRC Press.

**Further reading**

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

## Virology

**Type:** Compulsory (OB)

**Credits:** 3.0

**Semester:** 2nd

| Group                                | Language of instruction | Teachers                       |
|--------------------------------------|-------------------------|--------------------------------|
| G11, classroom instruction, mornings | Catalan                 | Alexandre Olvera Van Der Stoep |

### SUSTAINABLE DEVELOPMENT GOALS (SDG)

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- 3. Good health and well-being

### OBJECTIVES

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The Virology subject of the Biomedicine degree at UVic-UCC aims to provide students with basic and fundamental knowledge of the biology, structure, genetics and evolution of viruses within the framework of their pathogenesis and therapeutic and research possibilities. Emphasis is placed on the emerging applications of viruses in biotechnology and nanotechnology, and on the need for constant updating of information through bibliographic databases.

The objectives of the subject are:

- Recognize the importance that virology has in the chosen professional field.
- Learn about the basic structure of virions and their importance within the world of living beings.
- Acquire general training in the basic techniques of working with viruses.
- To perceive the range of possibilities that virology currently has and those that it may have in the future in its application within the different fields of biosciences and, especially, in biomedicine.
- Understand the ecological role of different types of microorganisms and what their controlled use in the biomedical field represents technologically.

### LEARNING OUTCOMES

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- LO1. Recognizes the structural characteristics, morphology, composition and functional aspects of viruses.
- LO2. Demonstrates skills for critical reflection in processes linked to the exercise of the profession.
- LO3. Evaluates globally the learning processes carried out in accordance with the plans and objectives set and establishes individual improvement measures.
- LO4. Analyses knowledge specific to the field and its contextualisation in national and international environments.
- LO5. Apply procedures specific to scientific research in the development of training and professional activity.
- LO6. Shows an attitude of motivation and commitment to personal and professional improvement.
- LO7. Shows sensitivity to equitable and egalitarian professional practice from a gender perspective.
- LO8. Acquires and demonstrates advanced knowledge of theoretical and practical aspects and work methodology in the field of biomedicine.

### COMPETENCIES

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#### General skills

- Formulate hypotheses following the scientific method, with an ability to summarize and analyze information in a critical way in order to be able to solve problems.

#### Specific skills

- Combine knowledge of the molecular, cellular, genetic and epigenetic principles of the most prevalent diseases.
- Formulate hypotheses and design experiments in the field of biomedical research.
- Have a systemic vision of the organism, in particular metabolic regulation and control and cell signaling, in order to respond to biomedical challenges.
- Identify the mechanisms of action of infectious agents, drugs and toxins, and their effects on the body.
- Make integrated assessments of the functioning of organs and apparatus, and their role in homeostasis.
- Promote, respect and apply the principles of bioethics in professional activity.

#### Basic skills

- Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.
- Students have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgments that include reflection on relevant social, scientific and ethical issues.

#### Core skills

- Develop strategies for promoting gender equality and equity for all.
- Exercise active citizenship and individual responsibility with a commitment to democratic values and sustainable development.
- Interact in international contexts to transfer knowledge to current and emerging fields of professional development and research.
- Reflect critically on knowledge of all kinds, with a commitment to professional rigor and quality.
- Take control of one's learning process with a view to personal and professional growth and an all-round education.

## CONTENT

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1. Introduction to virology (3 hours, group class)
2. The viral particle (2 hours, group class)
3. Viral genomes (3 hours, group class)
4. The infectious cycle of the virus (3 hours, group class)
5. The evolution of viruses (3 hours, group class)
6. How do we classify viruses? (3 hours, group class)
7. Pathogenesis of viral infections (4 hours, group class)
8. The control of viral infections (3 hours, group class)
9. Emerging viral diseases (3 hours, group class)
10. Technological applications of viruses (3 hours, group class)

## EVALUATION

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The evaluation of the subject is based on continuous monitoring of the student's academic work throughout the course.

The final grade for the subject (NF) is the weighted average of the grades for the following assessable activities:

### Final note

- **Questionnaires.** Weight: 15% of NF; recoverable activity
- **Theory.** Weight: 45% of the NF
  - Partial 1. Weight: 50% of the theory grade; recoverable activity
  - Partial 2. Weight: 50% of the theory grade; make-up activity
 You must get at least a 5 from the theory to be able to average the theory, and a 4 from each of the partials to be able to average the rest of the grades.
- **Group work.** Weight: 35% of the NF
  - Commentary/seminar on a scientific article. Weight: 50% of the group work grade; non-returnable activity
  - Resolution of a clinical case. Weight: 50% of the group work grade; non-returnable activity
- **Attitude and participation.** Weight: 5% of the NF

### Subject-specific criteria

- To pass the subject, you must obtain a final grade in which the weighted average of all items is equal to or greater than 5.0. You must obtain a minimum of 5 in theory to be able to average the rest of the grades.

### General evaluation criteria

- Possession of mobile phones or similar (*smartphones*, tablets, etc.) during the taking of the recoverable tests will result in a zero on the test.
- Failure to appear or present within the established deadlines for any of the assessment activities will result in a grade of zero for that activity. This grade is taken into account when calculating the final grade for the subject.
- The final grade for the subject is obtained by weighting, with the respective percentages, the arithmetic averages of the different activities.
- The student has the option of retaking failed make-up tests. Make-up tests are held during the last weeks of the semester, designated for this purpose, and no more than 50% of the subject can be retaken.
- If you refuse to take the retake test, the grade achieved in the first instance will be maintained.
- In non-recoverable activities, no minimum grades are required to calculate the final grade for the subject.
- The subject is only graded as "Not presented" if no assessable test has been taken or a grade has been obtained in any of the subject's activities.

### Important

Plagiarism or copying someone else's work is penalized in all universities and, according to the [UVic-UCC coexistence rules](#), constitute serious or very serious faults. Therefore, during the course of this subject, plagiarism or the improper appropriation of texts or ideas from other people (see [What is considered plagiarism?](#)) and the improper or undeclared use of artificial intelligence in an activity automatically result in a suspension or other disciplinary measures.

To cite texts and materials appropriately, you must consult the academic citation guidelines and guidelines available on the UVic Library website.

## METHODOLOGY

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The course consists of theoretical classes and active learning activities (scientific problems and clinical case simulation) so that students acquire the necessary skills to carry out bibliographic searches, propose experimental approaches and design problem-

solving strategies in the field of virology. Oral presentations of active learning activities encourage teamwork, coordination of activities and rational presentation of work plans and results. Active learning activities focus on methodological, biomedical, pharmaceutical, biotechnological and nanotechnological applications of viruses, as well as derived viral structures.

*Virology* It presents a series of theoretical contents that are taught regularly throughout the course in classroom sessions and that are accompanied by the support of audiovisual resources, written documentation and bibliographical references and are evaluated through written exams.

As can be seen in the content program, the subject does not include practical activities, but theoretical sessions are combined with seminar sessions to deepen the extensive knowledge of virions. The goal pursued is the achievement of a generic and comprehensive training of the student in the world of virology.

Therefore, the learning process is carried out with a combination of theoretical and practical sessions accompanied by weekly tutorials available to students (by appointment). In addition, the student must complete a series of activities that help them in the development of autonomous work.

## **BIBLIOGRAPHY**

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### **Key references**

- Andrew M.Q. King Michael J. Adams Eric B. Carstens Elliot J. Lefkowitz (2011). *Virus Taxonomy: Ninth Report of the International Committee on Taxonomy of Viruses*. Retrieved from <https://www-sciencedirect-com.biblioremot.uvic.cat/book/9780123846846/virus-taxonomy>
- Cann (2015). *Principles of molecular virology* (6 ed.). Elsevier Academic Press.
- Christopher J. Burrell, Colin R. Howard, Frederick A. Murphy (2016). *Fenner and White's Medical Virology*. Retrieved from <https://www-sciencedirect-com.biblioremot.uvic.cat/book/9780123751560/fenner-and-whites-medical-virology#book-description>
- Flint, Jane, Racaniello, Vincent, Rall, Glenn, Hatzioannou, Theodora, Skalka, Anne Marie (2020). *Principles of virology* (5 ed.). American Society for Microbiology; John Wiley, 2020.
- Michael G. Katze, Marcus J. Korth, G. Lynn Law, Neal Nathanson (2016). *Viral Pathogenesis: From Basics to Systems Biology*. Retrieved from <https://www-sciencedirect-com.biblioremot.uvic.cat/book/9780128009642/viral-pathogenesis>

### **Further reading**

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

## COMPULSORY SUBJECTS IN THE THIRD YEAR

### Cell Culture and Tissue Engineering Laboratory

**Type:** Compulsory (OB)

**Credits:** 6.0

**Semester:** 1st

| Group                                | Language of instruction | Teachers   |
|--------------------------------------|-------------------------|--|
| G11, classroom instruction, mornings | Catalan                 | Albert Espona Noguera<br>Patricia Fernandez Nogueira |

#### OTHER TEACHERS

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- Joan Casamitjana Vicente
- Milica Zivanic

#### OBJECTIVES

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The Cell Culture and Tissue Engineering Laboratory subject, with a high practical component, introduces students to 3D cultures and shows them some basic steps of tissue engineering, such as 3D printing of artificial matrices or decellularization as a model for generating natural matrices. In addition, students are also introduced to tissue regeneration / tissue engineering through the completion of a project. This subject is the natural continuation of the second year subject of the degree in Biomedicine, [Cell Cultures and Tissue Engineering](#), in which students have already become familiar with the theoretical concepts of this discipline and have also completed a practical introduction to cell cultures.

#### LEARNING OUTCOMES

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- LO1. Knows cell and tissue culture techniques.
- LO2. Correctly carries out monolayer cultures of continuous cell lines and knows the main methods of tissue engineering.
- LO3. It applies imaging techniques to the analysis of the functioning of the organism at different hierarchical levels.
- LO4. Evaluates globally the learning processes carried out in accordance with the plans and objectives set and establishes individual improvement measures.
- LO5. Understands completely oral and written messages of different types expressed in Catalan, Spanish and English.
- LO6. Acquires and demonstrates advanced knowledge of the theoretical and practical aspects and working methodology of the field of biomedicine.
- RA7. Moves with ease in complex situations or those that require the development of new solutions.
- LO8. Collects and interprets data and information on which to base their conclusions, which include reflections on social, scientific or ethical issues in the field of biomedicine.

#### COMPETENCIES

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##### General skills

- Formulate hypotheses following the scientific method, with an ability to summarize and analyze information in a critical way in order to be able to solve problems.

##### Specific skills

- Promote, respect and apply the principles of bioethics in professional activity.
- Recognize the organization, structure and function of cells and their components in different tissues.
- Use key analytical and imaging techniques, and basic technological instruments, following customary preclinical research laboratory protocols.

##### Basic skills

- Students can apply their knowledge to their work or vocation in a professional manner and have competencies typically demonstrated through drafting and defending arguments and solving problems in their field of study.
- Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.
- Students have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgments that include reflection on relevant social, scientific and ethical issues.

##### Core skills

- Communicate orally, in writing and audiovisually, in one's own language and in foreign languages, with proficiency in form, content and use.
- Reflect critically on knowledge of all kinds, with a commitment to professional rigor and quality.

## CONTENT

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In this subject, students once again create 2D cell cultures to generate and track 3D cell cultures.

In the field of tissue engineering, 3D printing is introduced to generate matrices or *scaffolding* artificial, and also in the decellularization of animal tissue for the generation of matrices or *scaffolding* natural.

In addition, students participate in a team project or work to find the solution for the regeneration of different tissues.

## EVALUATION

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- Observation of participation, attitude and attendance: 10%
- Specific assessment tests related to the practices: 40%. To be able to average with the rest of the activities, the minimum grade must reach 4.5.
- Completion of the work or project: 35%
- Monitoring of the work carried out (students must complete the different phases of achieving the project indicated by the teacher): 15%

### Attendance at internships is mandatory:

- Absences are not permitted, but you can be absent for justified reasons. More than 2 unexcused absences will result in failing the entire subject.
- Excused absences do not exclude students from doing the work derived from the session they did not attend.

They are considered **excused absences**:

- Hospital admission
- Judicial summons
- Death of a relative of the 1st or 2nd degree of consanguinity or affinity
- Medically diagnosed illness that prevents attendance at the session
- Attendance at a scheduled hospital visit that cannot be postponed and that involves diagnosis, monitoring or medical treatment

In case of a **excused absence**:

- If there is an option, the student must retake the class in another group.
- If the class cannot be made up, the student must do an assignment (proposed by the professor) that allows them to recover, in whole or in part, the content of the session they missed. The preparation of this assignment is mandatory and failure to submit the assignment will result in a penalty equivalent to a 5% reduction in the final grade for the subject.

In the case of **unexcused absence**:

- The class cannot be made up and a penalty equivalent to a 10% reduction in the final grade of the subject will be applied for each session missed. (Therefore, one absence means a 10% reduction in the final grade, and two, a 20% reduction.)
- Absence from 3 or more sessions implies failing the subject.
- The student may do a recommended assignment to recover, in whole or in part, the content of the session they missed, but it is not mandatory. If they do the assignment satisfactorily, they can recover 5% of the penalty imposed for the absence.

### Important

Plagiarism or copying someone else's work is penalized in all universities and, according to the [UVic-UCC coexistence rules](#), constitute serious or very serious faults. Therefore, during the course of this subject, plagiarism or the improper appropriation of texts or ideas from other people (see [What is considered plagiarism?](#)) and the improper or undeclared use of artificial intelligence in an activity automatically result in a suspension or other disciplinary measures.

To cite texts and materials appropriately, you must consult the academic citation guidelines and guidelines available on the UVic Library website.

## METHODOLOGY

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The methodology used in this subject combines:

- Teamwork in the laboratory
- Carrying out a team project

## BIBLIOGRAPHY

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### Key references

- Panagiotis, M. (2019). *Stem Cell and Biologic Scaffold Engineering*. Retrieved from <https://directory.doabooks.org/handle/20.500.12854/60016>
- Radwa, A.M. (2019). *Cell Culture*. Retrieved from <https://directory.doabooks.org/handle/20.500.12854/130722>
- Xianquan, Z. (2022). *Cell Culture: Advanced Technology and Applications in Medical and Life Sciences*. Retrieved from <https://directory.doabooks.org/handle/20.500.12854/90341>

### Further reading

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

## Developmental Biology

**Type:** Compulsory (OB)

**Credits:** 3.0

**Semester:** 1st

| Group                                | Language of instruction | Teachers                 |
|--------------------------------------|-------------------------|--------------------------|
| G11, classroom instruction, mornings | Catalan                 | Albert Carbonell Sanromà |

### OBJECTIVES

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The main objective of this subject is for students to acquire the basic concepts and processes in human development, mainly in the embryonic stage. Students become familiar with the stages of embryonic and postembryonic development, as well as with morphogenesis and organogenesis, and with the biological and therapeutic aspects of stem cells, among others.

### LEARNING OUTCOMES

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- LO1. Knows the embryonic, organogenic, growth, maturation, adaptation to the environment and aging processes of organs and systems.
- LO2. Prepares reports and written documents (mainly of a technical nature) with spelling and grammar correction in Catalan, Spanish and English.
- LO3. Evaluates globally the learning processes carried out in accordance with the plans and objectives set and establishes individual improvement measures.
- LO4. Acquires and demonstrates advanced knowledge of theoretical and practical aspects and work methodology in the field of biomedicine.

### COMPETENCIES

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#### General skills

- Formulate hypotheses following the scientific method, with an ability to summarize and analyze information in a critical way in order to be able to solve problems.

#### Specific skills

- Have a systemic vision of the organism, in particular metabolic regulation and control and cell signaling, in order to respond to biomedical challenges.

#### Basic skills

- Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.

#### Core skills

- Communicate orally, in writing and audiovisually, in one's own language and in foreign languages, with proficiency in form, content and use.
- Reflect critically on knowledge of all kinds, with a commitment to professional rigor and quality.

### CONTENT

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This subject is structured around the following topics:

1. Human embryonic development: basic concepts and basic processes of development
2. Genetics and molecular signaling, and developmental cellular communication
3. Morphogenesis and organogenesis
4. Stem cells: current and future therapeutic applications in regeneration and biomedical research
5. Aging

### EVALUATION

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According to the Academic Regulations for undergraduate studies at UVic-UCC, there is only one official call that provides for two different evaluation periods:

- Ordinary period, which takes place as part of the training process and during the school period.
- Complementary evaluation period, in which the student can be evaluated again for the tasks, activities or tests that he/she has not passed satisfactorily within the framework of the first period.

#### Academic or ordinary period

Continuous evaluation of the activities carried out by the student through:

— Evaluation of the topics (single test): 40%

**Important:** To pass the subject, you must obtain a grade of 4.5/10 in the topic evaluation.

— Active participation in classes, seminars and oral presentations (questions to other groups, peer assessment, attendance and behavior in teamwork): 5% (non-recoverable)

— Online or in-person exercises and quizzes: 30% (non-recoverable)

— Group work and/or critical reading club (*journal club*): 25% (non-recoverable). This is the grade for the presentation, which includes the individual grade (12.5%) + the group grade (12.5%).

The final grade for the subject is the result of the weighting of the grades obtained in each of the parts.

### Recovery period

Students who do not pass some of the activities considered retakeable may retake them during this period, as long as the total number of parts of the subject not passed does not represent 50% of the final grade.

### Important

Plagiarism or copying someone else's work is penalized in all universities and, according to the [UVic-UCC coexistence rules](#), constitute serious or very serious faults. Therefore, during the course of this subject, plagiarism or the improper appropriation of texts or ideas from other people (see [What is considered plagiarism?](#)) and the improper or undeclared use of artificial intelligence in an activity automatically result in a suspension or other disciplinary measures.

To cite texts and materials appropriately, you must consult the academic citation guidelines and guidelines available on the UVic Library website.

**There are some mandatory attendance sessions that the teaching staff indicates in the work plan. The reason for non-attendance must be included among the justifiable reasons provided and must be duly communicated to the teaching staff.**

## METHODOLOGY

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The contents of this subject are taught using the methodologies listed below, depending on the needs of the contents to be worked on:

— Master classes

— Cooperative work for the analysis of scientific articles

## BIBLIOGRAPHY

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### Key references

— Felipe, A.E. (2009). *Mecanismos biológicos del desarrollo*. Retrieved from [https://elibro.net/es/lc/bibliouvic/titulos/28460?as\\_all=biolog%C3%ADa\\_del\\_desarrollo&as\\_all\\_op=unaccent\\_\\_icontains&prev=as](https://elibro.net/es/lc/bibliouvic/titulos/28460?as_all=biolog%C3%ADa_del_desarrollo&as_all_op=unaccent__icontains&prev=as)

— Moore, K.L. (2020). *Embriología Clínica*. Retrieved from <https://www-clinicalkey-com.biblioremot.uvic.cat/student/content/toc/3-s2.0-C20190007285>

### Further reading

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

## Genetic Engineering

**Type:** Compulsory (OB)

**Credits:** 6.0

**Semester:** 1st

| Group                                | Language of instruction | Teachers        |
|--------------------------------------|-------------------------|-----------------|
| G11, classroom instruction, mornings | Catalan                 | Neus Roca Ayats |

### OBJECTIVES

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The objectives of this subject are for students to acquire and understand the fundamentals and essential techniques for the characterization and manipulation of genetic material, as well as their applications in basic and applied research in biomedicine. In order to achieve these objectives, students delve into:

- The basic concepts of genetic engineering
- Gene isolation and cloning techniques and their manipulation
- The latest generation technology in genetic engineering and its applications in biomedicine, especially in therapy

### LEARNING OUTCOMES

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- LO1. Acquires and demonstrates advanced knowledge of theoretical and practical aspects and work methodology in the field of biomedicine.
- LO2. Uses methodologies and technologies for the cloning of nucleic acids and applies them correctly to the design of experiments.
- LO3. Master the basic concepts of genetic engineering and genomics with clinical application.
- LO4. Understand the basic principles of gene and cell therapy.

### COMPETENCIES

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#### General skills

- Carry out professional activities independently with initiative and respect for other health professionals.
- Formulate hypotheses following the scientific method, with an ability to summarize and analyze information in a critical way in order to be able to solve problems.

#### Specific skills

- Evaluate technological advances for the diagnosis, prognosis and treatment of disease.
- Recognize the applicability of genetic engineering methods and omics technology in preclinical and clinical research.

#### Basic skills

- Students can apply their knowledge to their work or vocation in a professional manner and have competencies typically demonstrated through drafting and defending arguments and solving problems in their field of study.
- Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.
- Students have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgments that include reflection on relevant social, scientific and ethical issues.

#### Core skills

- Bring to bear values of entrepreneurship and innovation in one's academic and professional careers.
- Exercise active citizenship and individual responsibility with a commitment to democratic values and sustainable development.
- Make use of professional skills in multidisciplinary, complex, networked environments, whether on-site or online.
- Reflect critically on knowledge of all kinds, with a commitment to professional rigor and quality.

### CONTENT

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1. Basic concepts
2. DNA recombination *in vitro*
3. Polymerase chain reaction (PCR)
4. Cloning strategies and types of vectors
5. Eukaryotic vector-host systems
6. Gene libraries
7. Gene expression study
8. Recombinant proteins
9. Transgenic animals as models for studying human pathophysiology
10. Basics of gene therapy

## EVALUATION

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According to the Academic Regulations for undergraduate studies at UVic-UCC, there is only one official call that provides for two different evaluation periods:

- Ordinary period, which takes place as part of the training process and during the school period.
- Complementary evaluation period, in which the student can be evaluated again for the tasks, activities or tests that he/she has not passed satisfactorily within the framework of the first period.

### Academic or ordinary period

Continuous evaluation of the activities carried out by the student through:

- Topic evaluation: 50%
  - First partial: 25% (refundable)  
**Important:** to be able to average with the other exam you must obtain **a minimum rating of 4/10** If you get less than 4/10 you must retake this part.
  - Second partial: 25% (recoverable)  
**Important:** to be able to average with the other exam you must obtain **a minimum rating of 4/10** If you get less than 4/10 you must retake this part.
- **Important:** To pass the subject you must obtain a **grade of 5/10 in the average of the two midterms** of the evaluation of topics.
- Active participation in classes, seminars and oral presentations (questions to other groups, peer assessment, attendance and behavior in teamwork): 5% (non-recoverable)
- Online or in-person exercises and quizzes: 20% (non-recoverable)
- Required problems and assignments: 25% (non-recoverable). If it is a team project, the grade is broken down as follows: presentation grade, which includes the individual grade (12.5%) + group grade (12.5%). If they are problems, they are assessed individually.

The final grade for the subject is the result of the weighting of the grades obtained in each of the parts.

### Recovery period

Students who do not pass some of the activities considered retakeable may retake them during this period, as long as the total number of parts of the subject not passed does not represent 50% of the final grade.

### Important

Plagiarism or copying someone else's work is penalized in all universities and, according to the [UVic-UCC coexistence rules](#), constitute serious or very serious faults. Therefore, during the course of this subject, plagiarism or the improper appropriation of texts or ideas from other people (see [What is considered plagiarism?](#)) and the improper or undeclared use of artificial intelligence in an activity automatically result in a suspension or other disciplinary measures.

To cite texts and materials appropriately, you must consult the academic citation guidelines and guidelines available on the UVic Library website.

**There are some mandatory attendance sessions that the teaching staff indicates in the work plan. The reason for non-attendance must be included among the justifiable reasons provided and must be duly communicated to the teaching staff.**

## METHODOLOGY

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The contents of this subject are taught using the methodologies listed below, depending on the needs of the contents to be worked on:

- Master classes
- Practical cases
- Classroom exercises

## BIBLIOGRAPHY

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### Key references

- Brown, T. A. (2021). *Gene cloning and DNA analysis : an introduction*. Hoboken, NJ : Wiley Blackwell.
- Herráez, A. (2012). *Texto ilustrado e interactivo de biología molecular e ingeniería genética*. Retrieved from <https://www-clinicalkey-com.biblioremot.uvic.cat/student/content/toc/3-s2.0-C20110096783>
- Izquierdo, M. (2014). *Curso de genética molecular e ingeniería genética*. Pirámide.
- Primrose, S.B., & Twyman, R. M. (2006). *Principles of gene manipulation and genomics* (7 ed.). Blackwell.
- Watson, J. D., Caudy, A. A., Myers, R. M., & Witkowski, J. A. (2007). *Recombinant DNA*. Freeman & Co-CSHL Press.

### Further reading

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

## Integrated Project V

**Type:** Compulsory (OB)

**Credits:** 6.0

**Semester:** 1st

| Group                                | Language of instruction | Teachers   |
|--------------------------------------|-------------------------|--|
| G11, classroom instruction, mornings | English                 | Esther Dalfo Capella<br>Aleix Noguera Castells<br>Nura Lutfi Royo<br>Oskar Marin Bejar |

### OBJECTIVES

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This subject belongs to a series of subjects, Integrated Projects I-VI, on the undergraduate programme in Biomedicine which culminate each semester from the first to third year. The common objective of this set of subjects is to work at a practical level on the knowledge that students have acquired in other subjects during the semester, while facilitating the acquisition of skills related to biomedical research. The teaching methodology is problem- or project-based learning.

In particular, Integrated Project V aims to introduce students to the use of animal models to study human physiology and pathology. To do this, they will make use of experimental design, molecular and cell biology techniques, they will learn how to handle different animal models in biomedicine research and finally, they will statistically analyse the results of the experiments and discuss them.

For this purpose, we strongly recommend that students enrolling in this subject have taken [Experimental Design](#), [Biostatistics and Epidemiology](#), [Molecular and Cellular Basis of Disease](#), [Developmental Biology](#), [Genetic Engineering](#), and [Cell Culture and Tissue Engineering Laboratory](#).

### LEARNING OUTCOMES

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- LO1. Works appropriately in a laboratory with biological material, taking into account safety measures, handling and elimination of biological waste, as well as the recording of activities.
- LO2. Uses sources of specialised information on science and technology in English.
- LO3. Knows and applies the main guidelines for structuring presentations, projects and publications in the field of scientific communication.
- LO4. Manages databases and applies advanced statistical methods to analyse these data.
- LO5. Solves problems and situations typical of professional practice with an enterprising and innovative attitude.
- LO6. Designs interventions that address needs in the field in a multidisciplinary manner.
- LO7. Shows skills for critical thoughts in the processes linked to the exercise of the profession.
- LO8. Prepares reports and written documents (mainly of a technical nature) with spelling and grammatical accuracy in Catalan, Spanish and English.
- LO9. Communicates clearly and precisely knowledge, methodology, ideas, problems and solutions to all types of audiences (specialised and non-specialised).
- LO10. Can identify his/her own learning needs and is able to organise his/her own learning with a high degree of autonomy in all types of contexts (structured or not).

### COMPETENCIES

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#### General skills

- Show a positive attitude to innovating, creating value and integrating scientific knowledge and improving one's own training.

#### Specific skills

- Analyse biomedical data and biological sequences through the use of statistics and computation.
- Be able to critically interpret the results and conclusions of scientific studies.
- Formulate hypotheses and design experiments in the field of biomedical research.
- Have technical skill in a research laboratory for working on cell and tissue samples, and with experimental animals.
- Recognise the applicability of genetic engineering methods and omics technology in preclinical and clinical research.

#### Basic skills

- Students can apply their knowledge to their work or vocation in a professional manner and have competencies typically demonstrated through drafting and defending arguments and solving problems in their field of study.
- Students can communicate information, ideas, problems and solutions to both specialists and non-specialists.
- Students have developed the learning skills necessary to undertake further studies with a high degree of independent learning.

#### Core skills

- Develop strategies for promoting gender equality and equity for all.
- Exercise active citizenship and individual responsibility with a commitment to democratic values and sustainable development.
- Interact in international contexts to transfer knowledge to current and emerging fields of professional development and research.
- Reflect critically on knowledge of all kinds, with a commitment to professional rigour and quality.

## CONTENT

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- Problem-based learning
  - Model organisms of human diseases
  - Invertebrate and vertebrate models
  - Ethical concerns regarding animal experimentation
  - Experimental design applied to animal models
  - Biostatistics
- Experimental part
  - Analysis of murine model samples
  - *Caenorhabditis elegans* model organism
  - Chorioallantoic membrane model (CAM) of the chicken embryo
    - Embryonic development
    - Tumour growth in a CAM model

## ASSESSMENT

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The course will be evaluated through:

- Active participation during all the course (10%)
- Student work monitoring (30%): The student will be evaluated during the experimental part of the subject with specific individual problems regarding the animal model in which the student have been working on.
- Individual exam (10%): At the end of the subject, each student will do an exam to evaluate all the knowledge acquired during the practical and the problem-solving lessons of the course.
- Project (50%): In groups, the students will focus on a specific disease and try to find the most suitable animal model for experimentation. The project will be presented in a written memory and defended with a scientific presentation. This part will be evaluated as a group, but also individually (25% individual work and 25% group work).

All items **are not recoverable**. To pass the subject, the student must have a mark equal or higher than 5.0. In case that a student has a final mark of the subject equal or higher than 4.5, but lower than 5.0, he/she will have the possibility to increase 0.5 the final mark of the subject by doing a written or oral exam, in this case the maximum final mark of the subject will be 5.0. Final subject marks lower than 4.5 results in failing the subject.

### Course attendance

Attendance is compulsory at problem-based sessions and practical sessions. Practical sessions are divided in two time frames within a day, unjustified absence from one of the two timeframes will also account as an unjustified absence. Even though absences are not allowed, but it is possible to miss 1 or 2 sessions for justified reasons. More than 2 unexcused absences mean failing the whole course. Excused absences do not exclude students from doing the work derived from the session they did not attend.

Excused absences allowed are:

- Hospital admission
- Court summons
- Death of a family member of 1st or 2nd degree of consanguinity or affinity
- Medically diagnosed illness that makes it impossible to attend the session
- Attendance at a scheduled visit to the hospital, which cannot be postponed and which involves diagnosis, follow-up and/or medical treatment.

### In the case of unexcused absence

It is not possible to recover the class and a penalty equivalent to the reduction of 10% of the final grade of the course for each session to which it is missed (therefore, one absence supposes a reduction of 10% of the final grade and two, one of 20%). Absence from 3 or more sessions means failing the course.

### Important

Plagiarism or copying someone else's work is penalised at all universities and, according to the UVic-UCC Ethical Code ( [in Catalan](#) / [in Spanish](#)), constitutes a very serious offence. Therefore, within this subject, plagiarism or unauthorised appropriation of texts or ideas from others (see [what is considered plagiarism?](#)) and the unauthorised or undisclosed use of artificial intelligence in an activity automatically results in a fail grade or other disciplinary measures.

To facilitate the appropriate citation of texts and materials, consult the guidelines for academic citation available on the UVic Library website.

## METHODOLOGY

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The course is based on Problem Based Learning (PBL) methodology, which involves both individual and group work to respond to a

challenge and produce a scientific document. In parallel, it also involves carrying out animal model experiments in the laboratory and analysing the results. All of this must be presented and discussed both orally and in writing.

## **BIBLIOGRAPHY**

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### **Key references**

- Ibeh, B. (2018). *Experimental Animal Models of Human Diseases: An Effective Therapeutic Strategy*. Retrieved from <https://directory.doabooks.org/handle/20.500.12854/130333>
- Mahmut, K., Volkan, G., & Abdulsamed, K. (2023). *Animal Models and Experimental Research in Medicine*. Retrieved from <https://directory.doabooks.org/handle/20.500.12854/113307>

### **Further reading**

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

## Molecular and Cellular Basis of Disease

**Type:** Compulsory (OB)

**Credits:** 6.0

**Semester:** 1st

| Group                                | Language of instruction | Teachers               |
|--------------------------------------|-------------------------|------------------------|
| G11, classroom instruction, mornings | Catalan                 | Raquel Guillamat Prats |

### OBJECTIVES

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In this subject, the student acquires knowledge about the cellular, molecular, genetic and biochemical mechanisms that take place in different pathologies. At the same time, they can be introduced to diagnostic, monitoring and therapeutic systems based on these molecular and cellular bases of diseases.

### LEARNING OUTCOMES

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- LO1. Know the main pathologies of the respiratory, cardiovascular, digestive, endocrine, immune, nervous, metabolic, kidney and urinary tract, musculoskeletal and blood systems.
- LO2. Analyzes current lines of biomedical research in relation to the major current pathologies of the different systems of the human body.
- LO3. Demonstrates skills for critical reflection in processes linked to the exercise of the profession.
- LO4. Evaluates globally the learning processes carried out in accordance with the plans and objectives set and establishes individual improvement measures.
- LO5. Apply procedures specific to scientific research to the development of training and professional activity.
- LO6. Ethically analyze situations of injustice and inequality and propose compensation measures.
- LO7. Shows sensitivity to equitable and egalitarian professional practice from a gender perspective.
- LO8. Acquires and demonstrates advanced knowledge of theoretical and practical aspects and work methodology in the field of biomedicine.
- LO9. Collects and interprets data and information on which to base their conclusions, which include reflections on social, scientific or ethical issues in the field of biomedicine.

### COMPETENCIES

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#### General skills

- Formulate hypotheses following the scientific method, with an ability to summarize and analyze information in a critical way in order to be able to solve problems.

#### Specific skills

- Combine knowledge of the molecular, cellular, genetic and epigenetic principles of the most prevalent diseases.
- Formulate hypotheses and design experiments in the field of biomedical research.
- Have a systemic vision of the organism, in particular metabolic regulation and control and cell signaling, in order to respond to biomedical challenges.
- Identify the mechanisms of action of infectious agents, drugs and toxins, and their effects on the body.
- Make integrated assessments of the functioning of organs and apparatus, and their role in homeostasis.
- Promote, respect and apply the principles of bioethics in professional activity.
- Recognize endogenous and exogenous agents involved in the main groups of pathologies.

#### Basic skills

- Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.
- Students have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgments that include reflection on relevant social, scientific and ethical issues.

#### Core skills

- Develop strategies for promoting gender equality and equity for all.
- Exercise active citizenship and individual responsibility with a commitment to democratic values and sustainable development.
- Interact in international contexts to transfer knowledge to current and emerging fields of professional development and research.
- Reflect critically on knowledge of all kinds, with a commitment to professional rigor and quality.
- Take control of one's learning process with a view to personal and professional growth and an all-round education.

### CONTENT

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This subject is structured around the following topics:

- General introduction to the genetic, biochemical and molecular mechanisms of human diseases
- Main molecular processes that lead to the development and progression of diseases and aging in humans (apoptosis, autophagy and senescence, among others)
  - Cellular and molecular mechanisms of genetic diseases
  - Introduction to the cellular and molecular mechanisms of the main non-genetic diseases

## EVALUATION

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According to the Academic Regulations for undergraduate studies at UVic-UCC, there is only one official call that provides for two different evaluation periods:

- Ordinary period, which takes place as part of the training process and during the school period.
- Complementary evaluation period, in which the student can be evaluated again for the tasks, activities or tests that he/she has not passed satisfactorily within the framework of the first period.

### Academic or ordinary period

Continuous evaluation of the activities carried out by the student through:

- Topic evaluation: 60%
  - First partial: 30% (refundable)
 

**Important:** to be able to average with the other exam **a minimum grade of 4/10 must be obtained** If you get less than 4/10 you must retake this part.
  - Second partial: 30% (recoverable)
 

**Important:** to be able to average with the other exam **a minimum grade of 4/10 must be obtained** If you get less than 4/10 you must retake this part.

**Important:** To pass the subject you must obtain a **grade of 5/10 in the average of the two midterms** of the evaluation of topics.
- Active participation in classes, seminars and oral presentations (questions to other groups, peer assessment, attendance and behavior in teamwork): 5% (non-recoverable)
- Face-to-face questionnaires: 10% (non-refundable)
- Group work: 25% (non-recoverable). This is the grade for the presentation, which includes the individual grade (15%) + the group grade (15%).

**The final grade for the subject is the result of the weighting of the grades obtained in each of the parts.**

### Recovery period

Students who do not pass some of the activities considered retakeable may retake them during this period, as long as the total number of parts of the subject not passed does not represent 50% of the final grade.

### Important

Plagiarism or copying someone else's work is penalized in all universities and, according to the [UVic-UCC coexistence rules](#), constitute serious or very serious faults. Therefore, during the course of this subject, plagiarism or the improper appropriation of texts or ideas from other people (see [What is considered plagiarism?](#)) and the improper or undeclared use of artificial intelligence in an activity automatically result in a suspension or other disciplinary measures.

To cite texts and materials appropriately, you must consult the academic citation guidelines and guidelines available on the UVic Library website.

**There are some mandatory attendance sessions that the teaching staff indicates in the work plan. The reason for non-attendance must be included among the justifiable reasons provided and must be duly communicated to the teaching staff.**

## METHODOLOGY

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The contents of this subject are taught using the methodologies listed below, depending on the needs of the contents to be worked on:

- Master classes
- Practical cases
- Cooperative work for the analysis of scientific articles
- Group work

## BIBLIOGRAPHY

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### Key references

- Ferreras Valentí P, Rozman C (2020). *Medicina interna*. Retrieved from <https://www-clinicalkey-com.biblioremot.uvic.cat/student/content/toc/3-s2.0-C20181055389>
- González, A. (2019). *Principios de bioquímica clínica y patología molecular*. Retrieved from <https://www-clinicalkey-com.biblioremot.uvic.cat/student/content/toc/3-s2.0-C20180005599>
- Scriver, C. R., Beaudet, A. L., Sly, W. S., Valle, D., Childs, B., Kinzler, K. W., and Vogelstein, B (2002). *The Metabolic and Molecular Bases of Inherited Disease*. Retrieved from <https://link-springer-com.biblioremot.uvic.cat/article/10.1023/A:1017418800320>

— Wood, E. J. (2009). *Marks' basic medical biochemistry: A clinical approach*. Retrieved from <https://iubmb-onlinelibrary-wiley-com.biblioremot.uvic.ca/doi/full/10.1002/bmb.2006.494034052660>

### **Further reading**

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

## Omics Data and Bioinformatics II

**Type:** Compulsory (OB)

**Credits:** 3.0

**Semester:** 1st

| Group                                | Language of instruction | Teachers               |
|--------------------------------------|-------------------------|------------------------|
| G11, classroom instruction, mornings | Catalan                 | Tomas Montserrat Ayuso |

### OBJECTIVES

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In recent decades, the digitization of information has profoundly transformed our society and has driven significant advances in numerous scientific fields. One of the most benefited has been the field of biomedicine, in which the accumulation and analysis of large volumes of data has allowed for a deeper understanding of biological processes.

In this second introductory bioinformatics course, we focus on two fundamental pillars of omics data: genomics and transcriptomics. Genomics studies the complete set of genetic material of an organism, while transcriptomics analyzes gene expression, that is, the levels of messenger RNA produced from genes under different biological conditions.

Advances in these areas have been made possible by next-generation sequencing (NGS) technologies, which have revolutionized the way we obtain and analyze biological data. In the course, we explore how this data is generated, how it is processed, and how it can be analyzed using bioinformatics tools to answer relevant questions in biomedical research.

We begin with an introduction to genomic data, focusing on the detection of genomic variants, which are changes in the DNA sequence with respect to a reference. We also study basic bioinformatics analysis methodologies applied to genomics.

We then delve into the field of transcriptomics, in which we analyze data derived from RNA sequencing (RNA-seq). We learn how to quantify gene expression and identify genes differentially expressed between conditions. We also address techniques such as principal component analysis (PCA), data normalization, and functional interpretation through gene enrichment analysis.

This subject provides the necessary foundations to understand and use omics technologies in biomedical research and prepares students to face the challenges and opportunities offered by bioinformatics in the study of genomics and transcriptomics.

### LEARNING OUTCOMES

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- RA1. Interprets and communicates the results of statistical and bioinformatics analyzes in a rigorous manner.
- LO2. Uses computing, biological databases and bioinformatics tools to obtain biological information.
- LO3. Demonstrates the capacity for critical reflection in the processes linked to the exercise of the profession.
- LO4. Analyzes one's own knowledge of the field and its contextualization in national and international environments.
- LO5. Apply scientific research procedures in the development of training and professional activity.
- LO6. Designs interventions that address the needs of the field in a multidisciplinary manner.
- LO7. Demonstrate skills in virtual interaction contexts through the use of ICT.
- LO8. Moves with ease in the general use of ICT, especially in technological environments specific to the professional field.
- LO9. Shows sensitivity to equitable and egalitarian professional practice from a gender perspective.
- RA10. Shows an attitude of motivation and commitment to personal and professional improvement.
- LO11. Acquires and demonstrates advanced knowledge of theoretical and practical aspects and work methodology in the field of biomedicine.
- RA12. Moves with ease in complex situations or those that require the development of new solutions.
- LO13. Acquires and demonstrates advanced knowledge of theoretical and practical aspects and work methodology in the field of biomedicine.

### COMPETENCIES

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#### General skills

- Formulate hypotheses following the scientific method, with an ability to summarize and analyze information in a critical way in order to be able to solve problems.

#### Specific skills

- Analyze biomedical data and biological sequences through the use of statistics and computation.
- Be able to critically interpret the results and conclusions of scientific studies.
- Formulate hypotheses and design experiments in the field of biomedical research.

#### Basic skills

- Students can apply their knowledge to their work or vocation in a professional manner and have competencies typically demonstrated through drafting and defending arguments and solving problems in their field of study.

- Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.
- Students have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgments that include reflection on relevant social, scientific and ethical issues.

### Core skills

- Develop strategies for promoting gender equality and equity for all.
- Interact in international contexts to transfer knowledge to current and emerging fields of professional development and research.
- Make use of professional skills in multidisciplinary, complex, networked environments, whether on-site or online.
- Reflect critically on knowledge of all kinds, with a commitment to professional rigor and quality.
- Take control of one's learning process with a view to personal and professional growth and an all-round education.

## CONTENT

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The course is structured in two major blocks focused on the most fundamental omics in current biomedical research: genomics and transcriptomics. Each of these blocks combines theoretical sessions with practical and participatory activities oriented towards the analysis of real data using accessible bioinformatics tools.

### Block 1. Genomics

*(5 hours of theory with the whole class group + 10 hours of practice with the small group)*

This block introduces the conceptual and computational foundations for the analysis of genomic data obtained by massive sequencing (NGS) techniques. Students work with real genomic data and learn to interpret genetic variants in biomedical contexts.

#### Contents

- Fundamentals of molecular biology and functional genomics
- Next-generation sequencing (NGS) technologies
- Quality control, alignment and file formats (FASTQ, BAM, VCF)
- Detection and interpretation of genetic variants
- Clinical applications and ethical considerations

#### Activities

- Visualization of genomic data with UCSC Genome Browser, case resolution and discussions on personalized genomics and sequencing technologies

### Block 2. Transcriptomics (RNA-seq)

*(5 hours of theory with the whole class group + 10 hours of practice with the small group)*

This block focuses on the study of the transcriptome using RNA-seq data. Students learn to process and analyze gene expression data to identify relevant changes under different biological conditions.

#### Contents

- Introduction to transcriptomics and RNA-seq experiments
- Gene expression alignment, quantification and normalization
- Visualization and exploration of expression patterns (PCA and *heatmap*)
- Detection of differentially expressed genes
- Functional analysis and biological interpretation of the results

#### Featured activities

- Practices with Galaxy, exploration of transcriptomic signatures and debate on differential expression in diseases

### Estimated total directed hours\*

- 10 hours of theory in the group-class: introductory sessions to contextualize the contents, present the analysis tools and debates.
- 20 hours of practices and activities: guided work with real genomics and transcriptomics data, collaborative activities and solving exercises with teaching support.

\*All the hours mentioned refer to the supervised work of the subject and are calculated based on the initial teaching plan. These hours represent approximately one third of the total time planned for a subject of 3 ECTS credits. The remaining two thirds correspond to the autonomous work that the student must carry out to complete the activities, prepare the practices and debates, delve into the contents and study for the assessment. The specific distribution of hours is subject to minor adjustments and can be updated, if necessary, in the virtual classroom work plan throughout the course.

## EVALUATION

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The assessment of the subject is continuous and is carried out through 4 elements:

- Participation and attitude in the classroom: 10% (non-recoverable). Classroom attitude, participation in debates and attendance at mandatory activities.
- Monitoring of genomic and transcriptomic data analysis and visualization practices: 30% (non-recoverable). Questionnaires and small assignments.
- Genomics and transcriptomics data analysis project: 20% (non-refundable)
- Final exam: 40% (repeatable). To pass the subject, you must obtain a grade of 4.5/10 in this test.

The make-up tests that a student takes cannot exceed 50% of the subject grade.

### **Important**

Plagiarism or copying someone else's work is penalized in all universities and, according to the [UVic-UCC coexistence rules](#), constitute serious or very serious faults. Therefore, during the course of this subject, plagiarism or the improper appropriation of texts or ideas from other people (see [What is considered plagiarism?](#)) and the improper or undeclared use of artificial intelligence in an activity automatically result in a suspension or other disciplinary measures.

To cite texts and materials appropriately, you must consult the academic citation guidelines and guidelines available on the UVic Library website.

### **METHODOLOGY**

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The subject is based on a practical and active approach, and combines the exposition of concepts, the analysis of real data, guided exercises *hands-on*, collaborative work and participatory activities. Critical thinking and autonomy are encouraged when using bioinformatics tools to interpret omics data in biomedical contexts.

### **BIBLIOGRAPHY**

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#### **Further reading**

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

## Clinical Genomics

**Type:** Compulsory (OB)

**Credits:** 3.0

**Semester:** 2nd

| Group                                | Language of instruction | Teachers                 |
|--------------------------------------|-------------------------|--------------------------|
| G11, classroom instruction, mornings | English                 | Alba Casellas Comallonga |

### OBJECTIVES

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Once the students have a good knowledge of the mechanisms involved in the functioning of nucleic acids in the cell ([Molecular Genetics](#) subject) and have become familiar with analysis techniques ([Omics Technologies](#), and [Omics Data and Bioinformatics I](#) subjects), Clinical Genomics completes the training in this field, with particular emphasis on clinical applications.

The main objectives are:

- To understand the fundamental aspects of genomics (composition, structure, organisation of the genome).
- To know the methodology and tools of clinical genome analysis.
- To understand the importance of molecular genetics in biomedicine.
- To recognise and interpret genomic diagnostic tests.
- To understand clinical applications of genomics.
- To understand the regulatory, legal and ethical aspects of clinical genomics.

### LEARNING OUTCOMES

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Students will:

- RA1. Acquire and demonstrate advanced knowledge of the theoretical and practical aspects and work methodology in the field of biomedicine.
- RA2. Use the methodologies and technologies for the cloning and characterisation of nucleic acids and apply them correctly in the design of experiments.
- RA3. Employ the basic concepts of genetic engineering and genomics, including their clinical application.
- RA4. Recognise the different omics technologies (DNA sequencing, transcriptome analysis and proteome analysis) and their applications to biomedicine.
- RA5. Organise the storage and custody of omics data.
- RA6. Apply the main research methods used in forensic medicine.

### COMPETENCIES

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#### General skills

- Carry out professional activities independently with initiative and respect for other health professionals.
- Formulate hypotheses following the scientific method, with an ability to summarise and analyse information in a critical way in order to be able to solve problems.

#### Specific skills

- Combine knowledge of the molecular, cellular, genetic and epigenetic principles of the most prevalent diseases.
- Evaluate technological advances for the diagnosis, prognosis and treatment of disease.
- Recognise the applicability of genetic engineering methods and omics technology in preclinical and clinical research.
- Use key analytical and imaging techniques, and basic technological instruments, following customary preclinical research laboratory protocols.

#### Basic skills

- Students can apply their knowledge to their work or vocation in a professional manner and have competencies typically demonstrated through drafting and defending arguments and solving problems in their field of study.
- Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.
- Students have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgements that include reflection on relevant social, scientific and ethical issues.

#### Core skills

- Bring to bear values of entrepreneurship and innovation in one's academic and professional careers.
- Exercise active citizenship and individual responsibility with a commitment to democratic values and sustainable development.
- Make use of professional skills in multidisciplinary, complex, networked environments, whether on-site or online.
- Reflect critically on knowledge of all kinds, with a commitment to professional rigour and quality.

## CONTENT

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The course content is divided into 4 parts:

1. Fundamental aspects of genomics (6h, group class, lectures and examples)
2. Methodology, tools for clinical analysis of the genome (12h, group class, lectures and examples)
3. Clinical applications of genomic diagnosis and interpretation (9h, group class, lectures and examples)
4. Regulation, legal and ethical aspects of clinical genomics (3h, group class, lectures and examples)

## ASSESSMENT

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- Continual assessment: 20%
- Assignments, activities: 32%
- Final exam: 48% (may be retaken). Minimum pass mark 4.5

### Reassessment

- Make-up exam: In the case of failure, a maximum of 50% of the final mark may be retaken in the make-up exam.

### General evaluation criteria of the Faculty

- Possession of mobile phones or similar devices (smartphones, tablets, etc.) during exams will result in a 0 on the test.
- Absence or failure to complete an assignment within the established deadlines will result in a gr 0. This qualification is taken into account when calculating the final course grade.
- The final course grade is calculated from the weighted average of all assignments.

### Important

Plagiarism or copying someone else's work is penalised at all universities and, according to the UVic-UCC Ethical Code ( [in Catalan](#) / [in Spanish](#)), constitutes a very serious offence. Therefore, within this subject, plagiarism or unauthorised appropriation of texts or ideas from others (see [what is considered plagiarism?](#)) and the unauthorised or undisclosed use of artificial intelligence in an activity automatically results in a fail grade or other disciplinary measures.

To facilitate the appropriate citation of texts and materials, consult the guidelines for academic citation available on the UVic Library website.

## METHODOLOGY

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- Mainly theoretical lectures, discussions (seminars) and workshops.
- Theoretical content is based on applied examples.
- Some activities are developed through teamwork.

## BIBLIOGRAPHY

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### Key references

- Kovács, D (2023). *Clinical Pharmacology and Pharmacy of Antimicrobial Agents*. Retrieved from <https://directory.doabooks.org/handle/20.500.12854/128823>
- Kulkarni S & Pfeifer J (2015). *Clinical Genomics*. Elsevier Inc.
- Kumar, D. & Antonarakis, S. (2015). *Medical and Health Genomics*. Retrieved from <https://www-sciencedirect-com.biblioremot.uvic.cat/book/9780124201965/medical-and-health-genomics>
- Samadikuchaksaraei, A., Seif, M (2019). *Bioinformatics Tools for Detection and Clinical Interpretation of Genomic Variations*. Retrieved from <https://directory.doabooks.org/handle/20.500.12854/66994>

### Further reading

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

## Diagnostic Imaging Techniques

**Type:** Compulsory (OB)

**Credits:** 3.0

**Semester:** 2nd

| Group                                | Language of instruction | Teachers               |
|--------------------------------------|-------------------------|------------------------|
| G11, classroom instruction, mornings | Catalan                 | Lorena Casanova Lozano |

### SUSTAINABLE DEVELOPMENT GOALS (SDG)

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- 3. Good health and well-being
- 4. Quality education

### OBJECTIVES

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The main objective of this course is to provide students with an understanding of the main medical imaging techniques used in clinical diagnosis.

Through theoretical classes, students learn the physical foundations, associated risks, clinical applications and technological advances in the field of diagnostic imaging.

The objectives are:

- Understand the history and evolution of medical imaging techniques.
- Know the physical foundations of diagnostic imaging techniques.
- Analyze clinical cases using different imaging techniques:
  - Projection radiography
  - Computed tomography
  - Nuclear medicine
  - Ultrasound imaging
  - Magnetic resonance imaging
  - Multimodality imaging
  - Others
- Evaluate the associated risks.
- Understand the basic principles of computer vision in the application of diagnostic imaging.
- Getting into the applications of the *machine learning* and *deep learning* in imaging diagnosis.

### LEARNING OUTCOMES

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- LO1. Acquires and demonstrates advanced knowledge of theoretical and practical aspects and work methodology in the field of biomedicine.
- LO2. Correctly recognize the morphology and structure of tissue, organs and systems using imaging techniques.
- LO3. Know the main research methods used in forensic medicine.
- LO4. It applies imaging techniques to the analysis of the functioning of the organism at different hierarchical levels.

### COMPETENCIES

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#### General skills

- Carry out professional activities independently with initiative and respect for other health professionals.
- Formulate hypotheses following the scientific method, with an ability to summarize and analyze information in a critical way in order to be able to solve problems.

#### Specific skills

- Apply the principles of chemistry and physics to the interpretation of biological phenomena and in the development of relevant biomedical technology.
- Evaluate technological advances for the diagnosis, prognosis and treatment of disease.
- Use key analytical and imaging techniques, and basic technological instruments, following customary preclinical research laboratory protocols.

#### Basic skills

- Students can apply their knowledge to their work or vocation in a professional manner and have competencies typically demonstrated through drafting and defending arguments and solving problems in their field of study.
- Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.

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

### Core skills

- Bring to bear values of entrepreneurship and innovation in one's academic and professional careers.
- Exercise active citizenship and individual responsibility with a commitment to democratic values and sustainable development.
- Make use of professional skills in multidisciplinary, complex, networked environments, whether on-site or online.
- Reflect critically on knowledge of all kinds, with a commitment to professional rigor and quality.

### CONTENT

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The course is designed to offer a complete and detailed overview of the most important medical imaging techniques used in clinical diagnosis. The main contents covered throughout the course are presented below:

- History and evolution of medical imaging techniques
  - Historical development of medical imaging techniques
  - Impact of technological innovations on clinical diagnosis
- Physical foundations of diagnostic imaging techniques
  - Basic physical principles of the different techniques
  - Interaction of radiation with biological matter
- Imaging techniques and their clinical applications
  - Projection radiography
    - Operating principles
    - Clinical applications
  - Computerized tomography (CT)
    - Fundamentals of CT
    - Clinical use and case examples
  - Nuclear medicine
    - Use of radioisotopes
    - Diagnostic and therapeutic applications
  - Ultrasound imaging
    - Ultrasound generation and detection
    - Clinical applications and advantages
  - Magnetic resonance imaging (MRI)
    - Fundamentals of MRI
    - Clinical applications and examples
  - Multimodality imaging
    - Integration of various imaging techniques
    - Benefits in diagnosis and treatment
- Assessment of associated risks
  - Risks of exposure to ionizing radiation
  - Safety measures and protocols to minimize risks
- Basic principles of computer vision
  - Introduction to computer vision
  - Applications in imaging diagnostics
- Applications of the *machine learning* and *deep learning*
  - Fundamentals of *machine learning* and *deep learning*
  - Applications in imaging diagnostics
  - Practical examples of implementation and results

### EVALUATION

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The evaluation criteria are:

- Participation observation: 5%
- Monitoring of work carried out: 15%
- Work completion: 30%
- Specific assessment tests: 50% (divided into a midterm exam and a final exam in equal parts (25% each); make-up activity)

All activities must exceed the **4.0** to be able to make the weighted average. And, in the case of specific assessment tests or exams, the average of each of them must be 5 or higher.

In the recovery phase, the student can access the retrievable activities as long as they do not exceed 50% of the subject.

### Important

Plagiarism or copying someone else's work is penalized in all universities and, according to the [UVic-UCC coexistence rules](#), constitute serious or very serious faults. Therefore, during the course of this subject, plagiarism or the improper appropriation of texts or ideas from other people (see [What is considered plagiarism?](#)) and the improper or undeclared use of artificial intelligence in an activity automatically result in a suspension or other disciplinary measures.

To cite texts and materials appropriately, you must consult the academic citation guidelines and guidelines available on the UVic Library website.

## **METHODOLOGY**

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The teacher gives theoretical and problem-based classes. The student must do problems and exercises for each topic and must prepare some of the exercises that are done in class in advance. The student can have explanatory modules, which can be obtained through the Virtual Campus, in a format closer to class notes than to a textbook.

During the practicals/exercises, the necessary material is provided to be able to do them. It is advisable for the student to be able to use a personal computer. In addition to the face-to-face component of the practicals, they must be accompanied by a report.

## **BIBLIOGRAPHY**

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### **Key references**

- Bankman, I. N. (Isaac N.) (200). *Handbook of medical imaging processing and analysis* . Retrieved from [https://ucercatot.uvic-ucc.cat/permalink/34CSUC\\_UVIC/qq5d82/alma991001156533006718](https://ucercatot.uvic-ucc.cat/permalink/34CSUC_UVIC/qq5d82/alma991001156533006718)
- Meyer-Bäse, Anke. (2004). *Pattern recognition in medical imaging* . Retrieved from [https://ucercatot.uvic-ucc.cat/permalink/34CSUC\\_UVIC/qq5d82/alma991000995375806718](https://ucercatot.uvic-ucc.cat/permalink/34CSUC_UVIC/qq5d82/alma991000995375806718)
- Nadeski, Mark. Future of medical imaging (2014). *Medical imaging : technology and applications* . Retrieved from [https://ucercatot.uvic-ucc.cat/permalink/34CSUC\\_UVIC/qq5d82/alma991000855709706718](https://ucercatot.uvic-ucc.cat/permalink/34CSUC_UVIC/qq5d82/alma991000855709706718)

### **Further reading**

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

## Endocrine System Diseases

**Type:** Compulsory (OB)

**Credits:** 3.0

**Semester:** 2nd

| Group                                | Language of instruction | Teachers              |
|--------------------------------------|-------------------------|-----------------------|
| G11, classroom instruction, mornings | Catalan                 | Jessica Latorre Luque |

### OBJECTIVES

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The subject Diseases of the Endocrine System aims to provide the necessary knowledge for the study of diseases of the endocrine system, including etiopathogenesis, pathophysiology, diagnosis, prognosis and treatment. Through this subject, and taking as a basis the subjects of [Human Physiology and Anatomy](#) and [Cell Signaling and Gene Regulation](#), tools are acquired for the recognition and treatment of pathologies of the endocrine system, metabolism and nutrition.

The main objectives of the subject Diseases of the Endocrine System are for students to acquire:

- General knowledge of the functioning of the endocrine system
- Knowledge about the main endocrinometabolic problems
- General knowledge about the etiopathogenesis of endocrine and metabolic pathologies
- General knowledge about the pathophysiology of endocrine and metabolic pathologies
- General knowledge about diagnosis, prognosis and treatment of endocrine and metabolic pathologies

### LEARNING OUTCOMES

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- LO1. Know the main pathologies of the respiratory, cardiovascular, digestive, endocrine, immune, nervous, metabolic, kidney and urinary tract, musculoskeletal and blood systems.
- LO2. Demonstrates skills for critical reflection in processes linked to the exercise of the profession.
- LO3. Evaluates globally the learning processes carried out in accordance with the plans and objectives set and establishes individual improvement measures.
- LO4. Analyses knowledge specific to the field and contextualisation in national and international environments.
- LO5. Apply procedures specific to scientific research to the development of training and professional activity.
- LO6. Ethically analyze situations of injustice and inequality and propose compensation measures.
- LO7. Shows an attitude of motivation and commitment to personal and professional improvement.
- LO8. Shows sensitivity to equitable and egalitarian professional practice from a gender perspective.
- LO9. Acquires and demonstrates advanced knowledge of theoretical and practical aspects and work methodology in the field of biomedicine.
- LO10. Collects and interprets data and information on which to base their conclusions, which include reflections on social, scientific or ethical issues in the field of biomedicine.

### COMPETENCIES

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#### General skills

- Formulate hypotheses following the scientific method, with an ability to summarize and analyze information in a critical way in order to be able to solve problems.

#### Specific skills

- Formulate hypotheses and design experiments in the field of biomedical research.
- Have a systemic vision of the organism, in particular metabolic regulation and control and cell signaling, in order to respond to biomedical challenges.
- Make integrated assessments of the functioning of organs and apparatus, and their role in homeostasis.
- Promote, respect and apply the principles of bioethics in professional activity.

#### Basic skills

- Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.
- Students have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgments that include reflection on relevant social, scientific and ethical issues.

#### Core skills

- Develop strategies for promoting gender equality and equity for all.
- Exercise active citizenship and individual responsibility with a commitment to democratic values and sustainable development.
- Interact in international contexts to transfer knowledge to current and emerging fields of professional development and research.
- Reflect critically on knowledge of all kinds, with a commitment to professional rigor and quality.

– Take control of one's learning process with a view to personal and professional growth and an all-round education.

## **CONTENT**

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### **Block 1. Introduction to endocrinology**

*(2 hours with the class group)*

- General principles of hormonal action
- Hormonal resistance
- Biochemical determination of hormonal action and diagnostic methods for endocrine pathologies
- Genetics in endocrinology

### **Block 2. Hypothalamic-pituitary regulatory system**

*(5.5 hours with the class group)*

- Disorders of the anterior pituitary or adenohypophysis
- Disorders of the posterior pituitary or neurohypophysis
- Diagnostic criteria for pathologies

### **Block 3. Hypothalamic-pituitary-thyroid axis**

*(3 hours with the class group)*

- Thyroid function assessment
- Thyroiditis
- Hypothyroidism and hyperthyroidism
- Tumor pathology and congenital disorders of the thyroid gland
- Calcitonin hormone disorders: hypocalcemia and hypercalcemia
- Diagnostic criteria for pathologies

### **Block 4. Hypothalamic-pituitary-adrenal axis**

*(2 hours with the class group)*

- Adrenal cortex and mineralocorticoid hypertension
- Adrenal hyperfunction: Cushing's syndrome
- Acute and chronic adrenal insufficiency
- Tumor pathology and congenital disorders of the adrenal gland
- Diagnostic criteria for pathologies

### **Block 5. Hypothalamic-pituitary-gonadal axis**

*(2 hours with the class group)*

- Disorders of the male reproductive system in adult men
- Disorders of the female reproductive system in adult women
- Precocious, early and delayed puberty
- Infertility and contraception
- Diagnostic criteria for pathologies

### **Block 6. Endocrine pancreas**

*(2.5 hours with the class group)*

- Hormonal regulation of energy metabolism
- Tumor pathology of the pancreas: insulinoma
- Diagnostic criteria for pancreatic pathology

### **Clinical cases**

*(11 am with the subgroup)*

Different clinical cases are worked on to apply the different knowledge gained throughout the course, which allows solving problems that require the use of creative and innovative ideas.

### **Examination and follow-up questionnaires**

*(5 hours with the class group)*

## **EVALUATION**

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The evaluation of the subject is based on continuous monitoring of the student's academic work throughout the course.

The final grade for the subject (NF) is the weighted average of the grades for the following assessable activities:

- **Assessable activity 1.** Participation in group tasks: 5% of the NF; non-recoverable activity
- **Assessable activity 2.** Questionnaires and work monitoring: 20% of the NF; non-recoverable activity
- **Assessable activity 3.** Exams: 45% of the NF
  - Partial I: 22.5% of the NF; blocks 1, 2 and 3; recoverable activity
  - Partial II: 22.5% of the NF; blocks 4, 5 and 6; recoverable activity
 Minimum grade for each of the partial exams to be averaged: 4. The average grade between the two exams to be averaged with the other activities must be 5 or higher.
- **Assessable activity 4.** Exercises based on clinical cases: 30% of the NF; non-recoverable activity

### Subject-specific criteria

The **Attendance at clinical case sessions is mandatory.** Therefore, unjustified absence from more than 20% of clinical case sessions implies suspension of the assessable activity 4.

To pass the subject, you must obtain a grade equal to or greater than 4.5 in both exams and a final grade in which the weighted average is equal to or greater than 5.0.

### General evaluation criteria

Possession of mobile phones or similar devices (smartphones, tablets, etc.) during the taking of recoverable tests will result in a zero on the test.

Failure to appear or present within the established deadlines for any of the assessment activities will result in a grade of zero for that activity. This grade is taken into account when calculating the final grade for the subject.

The student has the option of retaking failed make-up tests. Make-up tests are held during the last weeks of the semester, designated for this purpose.

No more than 50% of the subject can be recovered.

If you decline to take the retake test, the grade achieved in the first instance will be maintained.

In non-recoverable activities, no minimum grades are required to calculate the final grade for the subject.

### Important

Plagiarism or copying someone else's work is penalized in all universities and, according to the [UVic-UCC coexistence rules](#), constitute serious or very serious faults. Therefore, during the course of this subject, plagiarism or the improper appropriation of texts or ideas from other people (see [What is considered plagiarism?](#)) and the improper or undeclared use of artificial intelligence in an activity automatically result in a suspension or other disciplinary measures.

To cite texts and materials appropriately, you must consult the academic citation guidelines and guidelines available on the UVic Library website.

## METHODOLOGY

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In this subject, theoretical sessions, seminars or tasks in the form of clinical cases are carried out to integrate the knowledge acquired.

- Regarding personal work, students must follow the theoretical aspects of the subject and actively participate in debates, assignments and workshops in the classroom.
- Cases and tasks are also presented that students must work on autonomously and independently or in small groups.
- Attendance at seminar sessions is highly recommended, as they are interactive classes with assessable activities/participation.

## BIBLIOGRAPHY

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### Key references

- Bender, D. A. (2014). *Introduction to nutrition and metabolism* (5 ed.). CRC Press, Taylor & Francis Group.
- Farreras Valentí P, Rozman C (2020). *Medicina interna*. Retrieved from <https://www-clinicalkey-com.biblioremot.uvic.cat/student/content/toc/3-s2.0-C20181055389>
- Henry M. Kronenberg, Wiliams (2021). *Tratado de endocrinología*. Retrieved from <https://www-clinicalkey-com.biblioremot.uvic.cat/student/content/toc/3-s2.0-C20200013265>
- Larry Jameson J, Fauci AS, Kasper DL (2019). *Harrison. Principios de Medicina Interna* (20 ed.). Ciudad de México: McGraw-Hill Interamericana.
- Lavin N (2010). *Manual de endocrinología y metabolismo* (4 ed.). Barcelona: Wolters Kluwer Health.

### Further reading

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

## Immunology

**Type:** Compulsory (OB)

**Credits:** 6.0

**Semester:** 2nd

| Group                                | Language of instruction | Teachers                       |
|--------------------------------------|-------------------------|--------------------------------|
| G11, classroom instruction, mornings | Catalan                 | Alexandre Olvera Van Der Stoep |
| G12, classroom instruction, mornings | Catalan                 | Ferran Tarrés Freixas          |

### OBJECTIVES

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Within the degree in Biomedicine, the subject Immunology aims to teach students how the immune system and the immune response work. This knowledge should allow them to understand the importance of the immune system in the control of infectious diseases and cancer, and also in pathologies caused by a malfunction of this system, mainly autoimmunities or immunodeficiencies. Finally, the student sees how, from the study of the immune system, tools have been developed that are revolutionizing the field of biotechnology (especially antibodies, vaccines and CAR-T).

From here, three specific objectives are defined:

1. Know the structure, function and interrelationship of the components of the immune system.
2. Learn about the molecular basis of different pathologies related to the immune system.
3. Learn about therapeutic applications developed from (antibodies) or using components (vaccines and CART) of the immune system.

### LEARNING OUTCOMES

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- LO1. Understands the general concepts of organism defense.
- LO2. Know the cellular and molecular bases of immunological processes and the effector mechanisms of the immune response.
- LO3. Relate the responses of the immune system to the onset of the disease.
- LO4. Prepares reports and written documents (mainly of a technical nature) with spelling and grammar correction in Catalan, Spanish and English.
- LO5. Evaluates the learning processes carried out globally in accordance with the plans and objectives set and establishes individual improvement measures.
- LO6. Know the main immune therapeutic strategies against diseases.
- LO7. Acquires and demonstrates advanced knowledge of theoretical and practical aspects and work methodology in the field of biomedicine.

### COMPETENCIES

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#### General skills

- Formulate hypotheses following the scientific method, with an ability to summarize and analyze information in a critical way in order to be able to solve problems.

#### Specific skills

- Have a systemic vision of the organism, in particular metabolic regulation and control and cell signaling, in order to respond to biomedical challenges.

#### Basic skills

- Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.

#### Core skills

- Communicate orally, in writing and audiovisually, in one's own language and in foreign languages, with proficiency in form, content and use.
- Reflect critically on knowledge of all kinds, with a commitment to professional rigor and quality.

### CONTENT

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The contents of this subject are divided into the following blocks:

- Block I. Basic immunology
- Block II. Pathologies associated with the immune system
- Block III. Immunotherapies

## Block I. Basic immunology

1. Introduction to immunology (3 hours with the class group)
  - 1.1. Basic concepts
  - 1.2. Types of immune response, innate and adaptive
  - 1.3. Cells and organs of the immune response
  - 1.4. General characteristics of the immune response (innate and adaptive)
2. Innate immune response (4 h with the class group + 0.5 h of independent work)
  - 2.1. Barriers to infection
  - 2.2. Activation of the innate immune system
  - 2.3. Cellular components: phagocytes and NK
  - 2.4. Soluble components: the complement
  - 2.5. The inflammatory response
  - 2.6. Activation of the adaptive immune response
3. The humoral adaptive immune response (4 h with the class group + 0.5 h of independent work)
  - 3.1. Antigens
  - 3.2. Antibodies: structure, immunoglobulin classes and B cell receptor ( B-cell receptor(BCR)
  - 3.3. Antigen-antibody reactions
  - 3.4. Functions of antibodies: neutralization, opsonization and phagocytosis, antibody-dependent cytotoxic activity, complement activation
4. The cellular adaptive immune response (4 h with the class group + 0.5 h of independent work)
  - 4.1. MHC: antigen presentation and antigen-presenting cells (APCs)
  - 4.2. Composition and biosynthesis of MHC class I and class II
  - 4.3. Functions of the MHC
  - 4.4. HLA and tissue compatibility
  - 4.5. T cell receptor (TCR): accessory molecules and intracellular signaling in T lymphocyte activation
5. Lymphocyte development (4 h with the class group + 0.5 h of independent work)
  - 5.1. Lymphocyte development
  - 5.2. Generation of antigen receptor diversity and antibody maturation
  - 5.3. Somatic recombination: generation of functional genes for antigen receptors and isotype switching
  - 5.4. Formation of B lymphocytes
  - 5.5. Formation of T lymphocytes
  - 5.6. Lymphocyte migration and secondary lymphatic organs
6. Effector mechanisms of the immune response (3 h with the class group + 0.5 h of independent work)
  - 6.1. Activation of T lymphocytes
  - 6.2. Helper T lymphocyte subpopulations (T-helper)
  - 6.3. Macrophage activation
  - 6.4. Interactions between T and B lymphocytes for the improvement of antibodies
7. Tolerance (2 h with the class group + 0.5 h of independent work)
  - 7.1. Central and peripheral tolerance
  - 7.2. Tolerance mechanisms
  - 7.3. Regulatory T lymphocytes

## Block II. Pathologies associated with the immune system

8. Autoimmune diseases (7 hours with the class group + 1 hour of independent work)
  - 1.1. Autoimmunity
  - 1.2. Cases
9. Immunodeficiencies (7 hours with the class group + 1 hour of independent work)
  - 2.1. Primary immunodeficiencies
  - 2.2. Secondary immunodeficiencies
  - 2.3. Cases

## Block III. Using the immune system to develop biological therapies

10. Immunotherapies (10 hours with the class group + 2 hours of independent work)
  - 1.1. Monoclonal antibody therapies
  - 1.2. Application to the detection of molecules (WB, immunofluorescence, ELISA, flow cytometry)
  - 1.3. CAR-T cell therapies
  - 1.4. Vaccines
  - 1.5. Critical reading club (Journal Club)

## EVALUATION

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The subject continuously evaluates the student's academic work throughout the course. The final grade for the subject (NF) is the weighted average of the grades of the following assessable activities:

- Assessable activity 1. Compulsory attendance at seminars: 5%
- Assessable activity 2. Quick tests at the end of topics 2 to 10: together they are 15% of the NF, 1.7% each.
- Assessable activity 3. Case studies (group work): together they are 20% of the NF, 3.33% each
- Assessable activity 4. Critical reading club (*journal club*) (group work): 10% of the NF

- Assessable activity 5. Partial written test I (topics 1-5): 25% of the NF; retrievable activity; minimum grade to be able to make an average: 4.0
- Assessable activity 6. Partial written test II (topics 5-10): 25% of the NF; retrievable activity; minimum grade to be able to make an average: 4.0
- The average grade between activity 5 and 6 must be 5 or higher to be able to average with the other activities.

### Important

Plagiarism or copying someone else's work is penalized in all universities and, according to the [UVic-UCC coexistence rules](#), constitute serious or very serious faults. Therefore, during the course of this subject, plagiarism or the improper appropriation of texts or ideas from other people (see [What is considered plagiarism?](#)) and the improper or undeclared use of artificial intelligence in an activity automatically result in a suspension or other disciplinary measures.

To cite texts and materials appropriately, you must consult the academic citation guidelines and guidelines available on the UVic Library website.

## METHODOLOGY

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The theoretical sessions are taught by the teacher with the help of a blackboard, a projector and a computer with which presentations are made. They are complemented by case studies and a critical reading club (*journal club*). During these sessions, the teacher continuously challenges the students to deduce possible explanations for the experimental facts based on the knowledge taught.

Regarding personal work, the student must follow the theoretical aspects of the subject. Each theoretical session involves, at least, the same amount of time for personal work. The work consists of preparing tests, case studies, the critical reading club (*journal club*), read chapters of recommended books or search for information on the Internet using keywords.

## BIBLIOGRAPHY

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### Key references

- (2017). *Microbiology and immunology on-line*. Retrieved from [www.microbiologybook.org/book/welcome.htm](http://www.microbiologybook.org/book/welcome.htm)
- (2019). *Immunopaedia*. Retrieved from [www.immunopaedia.org.za/](http://www.immunopaedia.org.za/)
- Abul K. Abbas, Andrew H. Lichtman, Shiv Pillai, David L. Baker (2022). *Inmunología celular y molecular*. Retrieved from [www-clinicalkey-com.biblioremot.uvic.cat/student/content/toc/3-s2.0-C20210015248](http://www-clinicalkey-com.biblioremot.uvic.cat/student/content/toc/3-s2.0-C20210015248)
- Roitt, I., Brostoff, J., Male, D. (2012). *Immunology* (8 ed.). Elsevier.

### Further reading

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

## Integrated Project VI

**Type:** Compulsory (OB)

**Credits:** 6.0

**Semester:** 2nd

| Group                                | Language of instruction | Teachers                                 |
|--------------------------------------|-------------------------|--|
| G11, classroom instruction, mornings | English                 | Albert Espona Noguera<br>Neus Roca Ayats |

### OBJECTIVES

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This subject belongs to a series of subjects, Integrated Projects I-VI, on the undergraduate programme in Biomedicine which culminate each semester from the first to third year. The common objective of this set of subjects is to work at a practical level on the knowledge that students have acquired in other subjects during the semester, while facilitating the acquisition of skills related to biomedical research. The teaching methodology is problem- or project-based learning.

In particular, Integrated Project VI aims to respond to a challenge and produce a scientific document to apply for a fictitious scientific grant. The course also involves the preparation of protocols and laboratory experiments, analysis of results and discussion, all of which are incorporated into the scientific proposal. Finally, statistical data analysis and discussion of the data will be carried out.

For this purpose, we strongly recommend that students enrolling in this subject have taken [Experimental Design, Biostatistics and Epidemiology](#), [Genetic Engineering](#), [Cell Culture and Tissue Engineering Laboratory](#), [Pharmacology and Toxicology](#), [Clinical Genomics](#) and [Diagnostic Imaging Techniques](#).

### LEARNING OUTCOMES

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- LO1. Work appropriately in a laboratory with biological material, taking into account safety measures, handling and disposing of biological waste, as well as recording activities.
- LO2. Use specialised science and technology information sources in English.
- LO3. Know and apply the main guidelines for structuring presentations, projects and publications in the field of scientific communication.
- LO4. Manages data bases and applies advanced statistical methods to analyse this data.
- LO5. Applies their knowledge to solve problems in complex or specialised professional and work environments that require the use of creative and innovative ideas.
- LO6. Design interventions that meet the needs of the field in a multidisciplinary way.
- LO7. Show skills for critical reflection in the processes linked to the exercise of the profession.
- LO8. Prepares reports and written documents (mainly technical) and corrects spelling and grammar in Catalan, Spanish and English.
- LO9. Communicates to all types of audiences (specialised or not) in a clear and precise manner about knowledge, methodology, ideas, problems and solutions.
- LO10. Identifies own training needs and is able to organise own learning with a high degree of autonomy in all types of contexts (structured or not).

### COMPETENCIES

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#### General skills

- Show a positive attitude to innovating, creating value and integrating scientific knowledge and improving one's own training.

#### Specific skills

- Analyse biomedical data and biological sequences through the use of statistics and computation.
- Be able to critically interpret the results and conclusions of scientific studies.
- Formulate hypotheses and design experiments in the field of biomedical research.
- Have technical skill in a research laboratory for working on cell and tissue samples, and with experimental animals.
- Recognise the applicability of genetic engineering methods and omics technology in preclinical and clinical research.

#### Basic skills

- Students can apply their knowledge to their work or vocation in a professional manner and have competencies typically demonstrated through drafting and defending arguments and solving problems in their field of study.
- Students can communicate information, ideas, problems and solutions to both specialists and non-specialists.
- Students have developed the learning skills necessary to undertake further studies with a high degree of independent learning.

#### Core skills

- Develop strategies for promoting gender equality and equity for all.

- Exercise active citizenship and individual responsibility with a commitment to democratic values and sustainable development.
- Interact in international contexts to transfer knowledge to current and emerging fields of professional development and research.
- Reflect critically on knowledge of all kinds, with a commitment to professional rigour and quality.

## CONTENT

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- Accurate analysis of the scientific background of a given topic
- Elaboration of protocols for the realisation of concrete laboratory experiments
- Application of molecular biology (genetic engineering) and cell culture techniques
- Experimental design and statistical data analysis
- Team development of an application for a scientific call for proposals with preliminary results from different working subgroups
- Inclusion of results obtained from image databases of the pathologies addressed

## ASSESSMENT

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The course will be evaluated through:

### – Active participation during all the course:

- Participation, attitude, and attendance: 10%  
Attendance is compulsory. Absences are not allowed, but it is possible to miss 1 or 2 sessions for justified reasons. More than 2 unexcused absences mean failing the whole course.

### – In laboratory:

- Global practical evaluation: 20%
- Laboratory competences: 20%

### – In class:

- Scientific written grant: 25% (individual assessment: 10% + group assessment: 15%)
- Scientific presentation: 25% (individual evaluation: 12,5% + group evaluation: 12,5%)  
Excused absences do not exclude students from doing the work derived from the session they did not attend.

Excused absences allowed are:

- Hospital admission
- Court summons
- Death of a family member of 1st or 2nd degree of consanguinity or affinity
- Medically diagnosed illness that makes it impossible to attend the session
- Attendance at a scheduled visit to the hospital, which cannot be postponed and which involves diagnosis, follow-up and/or medical treatment.

### In case of a justified absence

If it is not possible to make up the class, the student must do a work (proposed by the teacher) that allows him/her to recover, totally or partially, the content of the session he/she has missed. The elaboration of this work is compulsory, and the non-presentation of the work implies a penalty equivalent to the reduction of 5% of the final grade of the course.

### In the case of unexcused absence

It is not possible to recover the class and a penalty equivalent to the reduction of 10 % of the final grade of the course for each session to which it is missed (therefore, one absence supposes a reduction of 10 % of the final grade and two, one of 20%).

Absence from 3 or more sessions means failing the course.

The student can do a recommended work to recover, totally or partially, the content of the session to which he/she has missed, but it is not obligatory. If the student makes up the work satisfactorily, he/she can recover 5% of the penalty imposed for the absence.

### Important

Plagiarism or copying someone else's work is penalised at all universities and, according to the UVic-UCC Ethical Code ( [in Catalan](#) / [in Spanish](#)), constitutes a very serious offence. Therefore, within this subject, plagiarism or unauthorised appropriation of texts or ideas from others (see [what is considered plagiarism?](#)) and the unauthorised or undisclosed use of artificial intelligence in an activity automatically results in a fail grade or other disciplinary measures.

To facilitate the appropriate citation of texts and materials, consult the guidelines for academic citation available on the UVic Library website.

## METHODOLOGY

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The course is based on the problem based learning (PBL) methodology, which involves both individual and group work to respond to a challenge and produce a scientific document to apply for a fictitious scientific grant. The course also involves the preparation of protocols and laboratory experiments, analysis of results and discussion, all of which are incorporated into the scientific proposal.

## BIBLIOGRAPHY

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### Further reading

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

## Neurobiology and Diseases of the Central Nervous System

**Type:** Compulsory (OB)

**Credits:** 3.0

**Semester:** 2nd

| Group                                | Language of instruction | Teachers                   |
|--------------------------------------|-------------------------|----------------------------|
| G11, classroom instruction, mornings | Catalan                 | Lluís Pujadas Puigdomènech |

### OBJECTIVES

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The subject Neurobiology and Diseases of the Central Nervous System is part of the subject Basis of Pathologies, included within the Cellular and Molecular Biology module, corresponding to the Compulsory Training of the degree in Biomedicine. The general objectives of this subject are:

- Understand the basic aspects of the physiological functioning of the central nervous system.
- Study the molecular and cellular bases of pathologies that affect the central nervous system.
- Learn about techniques used in the field of neuroscience and their application in the study of diseases that affect the central nervous system.
- Integrate basic knowledge of cellular and molecular biology into biomedical research on pathologies of the central nervous system.

### LEARNING OUTCOMES

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- LO1. Describe the bases of neurobiology and the molecular and cellular mechanisms of pathologies of the central and peripheral nervous system.
- LO2. Demonstrates skills for critical reflection in processes linked to the exercise of the profession.
- LO3. Evaluates globally the learning processes carried out in accordance with the plans and objectives set and establishes individual improvement measures.
- LO4. Analyses knowledge specific to the field and contextualisation in national and international environments.
- LO5. Apply procedures specific to scientific research to the development of training and professional activity.
- LO6. Ethically analyze situations of injustice and inequality and propose compensation measures.
- LO7. Shows an attitude of motivation and commitment to personal and professional improvement.
- LO8. Shows sensitivity for equitable and egalitarian professional practice from a gender perspective.
- LO9. Acquires and demonstrates advanced knowledge of theoretical and practical aspects and work methodology in the field of biomedicine.
- LO10. Collects and interprets data and information on which to base their conclusions, which include reflections on social, scientific or ethical issues in the field of biomedicine.

### COMPETENCIES

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#### General skills

- Formulate hypotheses following the scientific method, with an ability to summarize and analyze information in a critical way in order to be able to solve problems.

#### Specific skills

- Have a systemic vision of the organism, in particular metabolic regulation and control and cell signaling, in order to respond to biomedical challenges.
- Make integrated assessments of the functioning of organs and apparatus, and their role in homeostasis.
- Promote, respect and apply the principles of bioethics in professional activity.
- Recognize endogenous and exogenous agents involved in the main groups of pathologies.

#### Basic skills

- Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.
- Students have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgments that include reflection on relevant social, scientific and ethical issues.

#### Core skills

- Develop strategies for promoting gender equality and equity for all.
- Interact in international contexts to transfer knowledge to current and emerging fields of professional development and research.
- Reflect critically on knowledge of all kinds, with a commitment to professional rigor and quality.
- Take control of one's learning process with a view to personal and professional growth and an all-round education.

### CONTENT

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1. **Introduction to the central nervous system (CNS)** (2 hours of theory with the class group + 2 hours of activities with the subgroup)
  - 1.1. Generalities of the nervous system
  - 1.2. Histology of the nervous system
  - 1.3. Anatomy of the human CNS
2. **Neural development** (2 hours of theory with the class group + 1 hour of activities with the subgroup)
  - 2.1. Neurogenesis and migration
  - 2.2. Axonal guidance and synaptogenesis
  - 2.3. Neurodevelopmental diseases
3. **Cellular and molecular biology of the neuron** (4 hours of theory with the class group + 2 hours of activities with the subgroup)
  - 3.1. Neuronal morphology
  - 3.2. Neurophysiology
  - 3.3. Neurotransmission
  - 3.4. Alterations in neurotransmission
4. **Vascularization and neuroimmunology** (2 hours of theory with the class group + 1 hour of activities with the subgroup)
  - 4.1. Vascularization of the CNS and related diseases
  - 4.2. Neuroimmunology, neuroinflammation and autoimmunity
5. **Perception and cognition** (4 hours of theory with the class group + 3 hours of activities with the subgroup)
  - 5.1. Complex mental circuits and functions
  - 5.2. Senses
6. **Neural plasticity, aging and neurodegeneration** (6 hours of theory with the class group + 3 hours of activities with the subgroup)
  - 6.1. Synaptic plasticity and neurogenesis
  - 6.2. Neurodegenerative diseases

## EVALUATION

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According to the Academic Regulations for undergraduate studies at UVic-UCC, there is only one official call that provides for two different evaluation periods:

### Ordinary period

It takes place as part of the training process and within the school period. During this period, continuous evaluation of the activities carried out by the student is carried out through:

- Partial exam 1: 25% of the final grade of the subject; recoverable
- Partial exam 2: 25% of the final grade of the subject; recoverable
- Completion of assignments, reports and questionnaires: 30% of the final grade for the subject; non-retrievable
- Monitoring of the work carried out: 15% of the final grade for the subject; non-recoverable
- Classroom attitude and participation: 5% of the final grade for the subject; non-retrievable

The final grade for the subject is the result of the weighting of the grades obtained in each of the parts. The subject is passed if a grade  $\geq 5$  is obtained. The average grade of the exams must be higher than 5 and no exam must have a grade lower than 4. Likewise, in order to make the weighted average, it is essential that the retrievable activities have a minimum grade of 5. All exams and evaluation questionnaires are face-to-face.

### Complementary evaluation period

The student may be assessed again for the remedial activities that he/she has not satisfactorily completed within the first period.

The final grade for this period is obtained by taking the weighted average of the grades obtained during the ordinary period and the grades from the complementary assessment, if some activities have been made up. The minimum grades required for each activity remain the same as in the ordinary period. The subject is passed if a final weighted grade  $\geq 5$  is obtained.

### Important

Plagiarism or copying someone else's work is penalized in all universities and, according to the [UVic-UCC coexistence rules](#), constitute serious or very serious faults. Therefore, during the course of this subject, plagiarism or the improper appropriation of texts or ideas from other people (see [What is considered plagiarism?](#)) and the improper or undeclared use of artificial intelligence in an activity automatically result in a suspension or other disciplinary measures.

To cite texts and materials appropriately, you must consult the academic citation guidelines and guidelines available on the UVic Library website.

## METHODOLOGY

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The subject is organized through:

- Masterclass sessions with the whole class
- Guided work sessions with small groups: case resolution, analysis of scientific articles...
- Seminars with external professionals who are experts in the field

## BIBLIOGRAPHY

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### Key references

- Haines D.E i Mihailoff G.A. (2019). *Principios de neurociencia. Aplicaciones básicas y clínicas* . Retrieved from <https://www-clinicalkey-com.biblioremot.uvic.cat/student/content/toc/3-s2.0-C20170037795>
- Kandel E. (2012). *Principles of Neural Science* (4 ed.). McGraw-Hill.
- Purves D. (2016). *Neurociencia* (5 ed.). Medica Panamericana.
- Purves D., Augustine G.J., Groh J.M, Huettel S.A., LaMantia A-S. and White L.E. (2026). *Neurociencia* (7 ed.). Editorial Medica Panamericana. Retrieved from [https://ucercatot.uvic-ucc.cat/permalink/34CSUC\\_UVIC/qq5d82/alma991001278848106718](https://ucercatot.uvic-ucc.cat/permalink/34CSUC_UVIC/qq5d82/alma991001278848106718)

### Further reading

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

## Pharmacology and Toxicology

**Type:** Compulsory (OB)

**Credits:** 6.0

**Semester:** 2nd

| Group                                | Language of instruction | Teachers   |
|--------------------------------------|-------------------------|--|
| G11, classroom instruction, mornings | Catalan                 | Maria Dolors Puigoriol Illamola<br>Mireia Bachiller Garcia |

### OBJECTIVES

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By taking this subject, in addition to developing transversal skills, students are able to know the fundamental aspects of the properties and mechanisms of action of drugs from various pharmacological groups on which rational drug therapy is based, as well as their interactions and adverse reactions. They also learn to search for bibliography related to toxicological and pharmacological data of various chemical and biological compounds, and their application in drug development. Finally, students acquire the skills to evaluate the pharmacological efficacy and toxicity of certain drugs.

### LEARNING OUTCOMES

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- LO1. Know the main toxic compounds and their mechanism of action.
- LO2. Demonstrates skills for critical reflection in processes linked to the exercise of the profession.
- LO3. Evaluates globally the learning processes carried out in accordance with the plans and objectives set and establishes individual improvement measures.
- LO4. Analyses knowledge specific to the field and contextualisation in national and international environments.
- LO5. Apply procedures specific to scientific research to the development of training and professional activity.
- LO6. Ethically analyze situations of injustice and inequality and propose compensation measures.
- LO7. Shows an attitude of motivation and commitment to personal and professional improvement.
- LO8. Shows sensitivity for equitable and egalitarian professional practice from a gender perspective.
- LO9. Acquires and demonstrates advanced knowledge of theoretical and practical aspects and work methodology in the field of biomedicine.
- LO10. Collects and interprets data and information on which to base their conclusions, which include reflections on social, scientific or ethical issues in the field of biomedicine.

### COMPETENCIES

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#### General skills

- Formulate hypotheses following the scientific method, with an ability to summarize and analyze information in a critical way in order to be able to solve problems.

#### Specific skills

- Formulate hypotheses and design experiments in the field of biomedical research.
- Have a systemic vision of the organism, in particular metabolic regulation and control and cell signaling, in order to respond to biomedical challenges.
- Identify the mechanisms of action of infectious agents, drugs and toxins, and their effects on the body.
- Promote, respect and apply the principles of bioethics in professional activity.
- Recognize endogenous and exogenous agents involved in the main groups of pathologies.

#### Basic skills

- Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.
- Students have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgments that include reflection on relevant social, scientific and ethical issues.

#### Core skills

- Develop strategies for promoting gender equality and equity for all.
- Interact in international contexts to transfer knowledge to current and emerging fields of professional development and research.
- Reflect critically on knowledge of all kinds, with a commitment to professional rigor and quality.
- Take control of one's learning process with a view to personal and professional growth and an all-round education.

### CONTENT

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1. Basic principles of pharmacology (7 am, group class)
  - 1.1. Introduction to pharmacology and drug development

- 1.2. Pharmacokinetics
- 1.3. Pharmacodynamics
2. Basic principles of experimental pharmacology (4.5 hours, group class)
  - 2.1. Introduction to current legislation (guarantees required for the authorization of medicines)
  - 2.2. Anesthesia
  - 2.3. Pharmacogenomics and personalized medicine
3. Pharmaceutical industry (4 hours, group class)
  - 3.1. Search and validation of new pharmacological targets: presentation of different strategies: chemical libraries, natural products and rational drug design
  - 3.2. Drug design: modeling and structure-activity (SAR) studies (structure and geometry of protein targets)
  - 3.3. Pharmacological screening (selection phases until obtaining the lead/candidate)
  - 3.4. Tools to evaluate pharmacological activity and efficacy
  - 3.5. Tools to evaluate pharmacokinetics and toxicokinetics: models *in vitro* to predict ADME, *in vivo* and PK-PD studies
  - 3.6. Tools for assessing toxicity: exploratory, mechanistic and regulatory studies
  - 3.7. Evaluation of safety margins in different phases of drug development. Calculation of the first dose to be administered in humans
4. Pharmacology of the nervous system (6 hours, group class)
  - 4.1. Pharmacology of the autonomic nervous system
    - 4.1.1. Adrenergic receptor
    - 4.1.2. Cholinergic receptor (effects mediated by nicotinic receptors)
    - 4.1.3. Histamine receptor
    - 4.1.4. Dopaminergic receptor
  - 4.2. Pharmacology of the central nervous system
    - 4.2.1. Anxiolytics and hypnotics
    - 4.2.2. Antidepressants
    - 4.2.3. Antiepileptics
    - 4.2.4. Antiparkinsonians
    - 4.2.5. Antipsychotics
    - 4.2.6. Drugs for Alzheimer's disease
5. Pharmacology of the respiratory system (2 hours, group class)
6. Pharmacology of pain and inflammation (2 hours, group class)
  - 6.1. Analgesics and opiate pain relievers, antipyretics and anti-inflammatories
7. Cardiovascular pharmacology (4 hours, group class)
  - 7.1. Diuretics
  - 7.2. Pharmacology of vascular tone (antihypertensives)
  - 7.3. Lipid-lowering agents
  - 7.4. Pharmacological regulation of cardiac function (antiarrhythmics, heart failure and antianginals)
8. Hypoglycemic and digestive pharmacology (3.5 h, group class)
  - 8.1. Insulin and non-insulin oral hypoglycemic drugs
  - 8.2. Antiemetic drugs
  - 8.3. Drugs that modulate intestinal motility
9. Endocrine pharmacology (2 hours, group class)
  - 9.1. Contraceptives
  - 9.2. Corticosteroids
10. Anti-infective pharmacology (4 hours, group class)
  - 10.1. Antibiotic resistance

**The exams and assessable activities or tests involve a total of 3 hours of group class time and the practicals are 12 hours in a small group.**

\* All the hours mentioned correspond to the hours of supervised work, are an approximation and come from the planning of the development of the subject, always subject to changes and adjustments. The detail of the planning is periodically updated in the work plan of the virtual classroom. These hours represent approximately 1/3 of the hours that the student dedicates to the subject. The remaining 2/3 are the hours that it is estimated that the student dedicates to unsupervised autonomous work to complete the tasks and assignments, for independent study and for the consultations that he may make to the professor.

## EVALUATION

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- Exams: 50%
  - Partial exam 1: 25%; minimum grade of 4/10
  - Partial exam 2: 25%; minimum grade of 4/10
  - Important: you must obtain an average of 5 between the two exam tests to be able to average with the rest of the activities.
- Monitoring of the work carried out: 30%
  - Assessable activity 1. Experimental pharmacology: 15%
  - Questionnaire 2. Pharmacology of pain and inflammation, cardiovascular pharmacology and blood pharmacology: 15%
- Internships: 20%
  - Organ bath: 5%
  - PyMOL: 5%
  - Toxicological tests: 10%

## Important

Plagiarism or copying someone else's work is penalized in all universities and, according to the [UVic-UCC coexistence rules](#), constitute serious or very serious faults. Therefore, during the course of this subject, plagiarism or the improper appropriation of texts or ideas from other people (see [What is considered plagiarism?](#)) and the improper or undeclared use of artificial intelligence in an activity automatically result in a suspension or other disciplinary measures.

To cite texts and materials appropriately, you must consult the academic citation guidelines and guidelines available on the UVic Library website.

## METHODOLOGY

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In this subject, theoretical sessions, workshops or assignments are held at the end of the blocks to integrate and put into practice the knowledge acquired. Likewise, practical sessions are also held to familiarize students with the preclinical research stages of drug development, whether in the evaluation of the structure-activity relationship, or in the efficacy testing of drugs in animal models. Attendance at the practical sessions is mandatory, while it is recommended to actively follow the theory of the subject and participate actively in the discussions, assignments and workshops within the classroom.

## BIBLIOGRAPHY

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### Key references

- Ahmad, U. & Catala, A. (2020). *Molecular pharmacology*. Retrieved from <https://directory.doabooks.org/handle/20.500.12854/67790>
- Bernal, A. (2020). *Good Research Practice in Non-Clinical Pharmacology and Biomedicine*. Retrieved from <https://link.springer.com/book/10.1007/978-3-030-33656->
- Florez, J., Armijo, J.A., i Mediavilla, A. (2014). *Farmacología humana* (6 ed.). Barcelona: Elsevier.
- Harvey, R. A., Whalen, K. (2016). *Farmacología* (6 ed.). Madrid: Wolters Kluwer.
- Katzung, B.G. (2019). *Farmacología: básica y clínica* (14 ed.). Madrid: McGraw-Hil.

### Further reading

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

# COMPULSORY SUBJECTS IN THE FOURTH YEAR

## Bioethics

**Type:** Compulsory (OB)

**Credits:** 3.0

**Semester:** 1st

| Group                                | Language of instruction | Teachers                     |
|--------------------------------------|-------------------------|------------------------------|
| G11, classroom instruction, mornings | Catalan                 | Haizea Arrizabalaga Ezquieta |

## SUSTAINABLE DEVELOPMENT GOALS (SDG)

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- 4. Quality education
- 5. Gender equality

## OBJECTIVES

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The main objectives of this subject are:

- **Raise student awareness** on the diversity of ethical issues that arise in the field of biomedicine, especially those related to professional practice and the treatment of people and samples derived from human beings, and also animals within the framework of current scientific advances.
- **Provide students with conceptual tools and encourage a critical and reflective attitude** that allows them to analyze and face moral dilemmas in an autonomous and well-founded way, going beyond intuitive reactions.
- **Promote the practical application of ethical knowledge in real or simulated situations** with the aim of developing the ability to make responsible, respectful decisions based on the current legal framework, in various contexts of biomedical practice.

## LEARNING OUTCOMES

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- LO1. Acquires and demonstrates advanced knowledge of theoretical and practical aspects and work methodology in the field of biomedicine.
- LO2. Uses methodologies and technologies for the cloning and characterization of nucleic acids and applies them correctly in the design of experiments.
- LO3. Master the basic concepts of genetic engineering and genomics with clinical application.
- LO4. Become familiar with the storage and custody of omics data.

## COMPETENCIES

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### General skills

- Carry out professional activities independently with initiative and respect for other health professionals.

### Specific skills

- Recognize the applicability of genetic engineering methods and omics technology in preclinical and clinical research.

### Basic skills

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

### Core skills

- Bring to bear values of entrepreneurship and innovation in one's academic and professional careers.
- Exercise active citizenship and individual responsibility with a commitment to democratic values and sustainable development.
- Reflect critically on knowledge of all kinds, with a commitment to professional rigor and quality.

## CONTENT

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1. Fundamentals of bioethics and ethical analysis
  - Origin and evolution of bioethics
  - Basic principles of bioethics
  - How to identify an ethical dilemma
  - Ethical analysis and decision-making models
2. Ethics in biomedical research
  - Informed consent
  - Treatment of human biological samples
  - Biobanks and privacy

- Research with experimental animals
- Publication and scientific integrity
- 3. Bioethics and new technologies
  - Gene editing (CRISPR, gene therapy...)
  - Artificial intelligence and *big data* in sciences
  - Advanced biotechnology

## EVALUATION

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The evaluation of the subject takes into account the acquisition of skills and learning outcomes.

It is based on the continuous monitoring of the student's work, which is evaluated throughout the course, as well as active attendance at face-to-face sessions, the completion of a written test on theory, active participation in class activities and exhibitions, and the resolution of cases.

The final grade for the subject is the weighted average of the following activities:

- Activity 1. A written test: 50% of the final grade (NF). A minimum score of 5/10 is required to pass the subject (repeatable activity). In the event of a failure, the failed part can be recovered during the reassessment period.
- Activity 2. Resolution of ethical cases or problems: overall 20% of the NF; non-recoverable and mandatory activity.
- Activity 3. Active participation: 10% of the NF; non-recoverable activity.
- Activity 4. Oral presentation: 20% of the NF; non-returnable activity. Attendance at the oral presentation sessions is mandatory.

### Important

Plagiarism or copying someone else's work is penalized in all universities and, according to the [UVic-UCC coexistence rules](#), constitute serious or very serious faults. Therefore, during the course of this subject, plagiarism or the improper appropriation of texts or ideas from other people (see [What is considered plagiarism?](#)) and the improper or undeclared use of artificial intelligence in an activity automatically result in a suspension or other disciplinary measures.

To cite texts and materials appropriately, you must consult the academic citation guidelines and guidelines available on the UVic Library website.

## METHODOLOGY

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The subject combines theoretical classes, discussions (seminars), analysis of specific texts, in groups and individually, and case studies.

## BIBLIOGRAPHY

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### Key references

- Beauchamp, T. L., & Childress, J. F. (2023). *Principios de ética biomédica*. Colección Cátedra de Bioética.
- Sánchez González, M. A. (2021). *Bioética en Ciencias de la Salud*. Retrieved from <https://www-clinicalkey-com.biblioremot.uvic.cat/student/content/toc/3-s2.0-C20190054520>

### Further reading

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

## Cancer Biology

**Type:** Compulsory (OB)

**Credits:** 6.0

**Semester:** 1st

| Group                                | Language of instruction | Teachers  |
|--------------------------------------|-------------------------|---|
| G11, classroom instruction, mornings | English                 | Gemma Fuster Orellana<br>Aleix Noguera Castells<br>Gerardo Ferrer Aguilar |

### SUSTAINABLE DEVELOPMENT GOALS (SDG)

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- 3. Good health and well-being

### OBJECTIVES

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The Cancer Biology course aims to provide a comprehensive understanding of the molecular and cellular mechanisms involved in cancer development and progression. The course covers key topics such as carcinogenesis, cell signaling, tumor microenvironment, metastasis, and current therapeutic strategies. It also introduces concepts of drug resistance, translational oncology, and emerging diagnostic tools.

### LEARNING OUTCOMES

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- RA1. Understands the basic concepts of tumour diseases and knows the main treatments.
- RA2. Analyses current biomedical research lines related to major current pathologies of different human body systems.
- RA3. Communicates correctly with the scientific community, demonstrating proficiency in English within the biomedical field.
- RA4. Demonstrates the ability to critically reflect on processes related to professional practice.
- RA5. Applies scientific research procedures to the development of educational and professional activities.
- RA6. Demonstrates motivation and commitment to personal and professional development.
- RA7. Demonstrates sensitivity to fair and equitable professional practice from a gender perspective.

### COMPETENCIES

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#### General skills

- Formulate hypotheses following the scientific method, with an ability to summarise and analyse information in a critical way in order to be able to solve problems.

#### Specific skills

- Combine knowledge of the molecular, cellular, genetic and epigenetic principles of the most prevalent diseases.
- Formulate hypotheses and design experiments in the field of biomedical research.
- Have a systemic vision of the organism, in particular metabolic regulation and control and cell signalling, in order to respond to biomedical challenges.
- Promote, respect and apply the principles of bioethics in professional activity.
- Recognise endogenous and exogenous agents involved in the main groups of pathologies.

#### Basic skills

- Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.
- Students have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgements that include reflection on relevant social, scientific and ethical issues.

#### Core skills

- Develop strategies for promoting gender equality and equity for all.
- Exercise active citizenship and individual responsibility with a commitment to democratic values and sustainable development.
- Interact in international contexts to transfer knowledge to current and emerging fields of professional development and research.
- Reflect critically on knowledge of all kinds, with a commitment to professional rigour and quality.
- Take control of one's learning process with a view to personal and professional growth and an all-round education.

### CONTENT

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#### THEORY

##### Part I. Cancer biology basis (17h)

- Topic 1. Introduction to cancer (2h)
- Topic 2. Carcinogenesis: Genetic and epigenetic alterations in cancer + student's cases related to ODS3 (4h)
- Topic 3. Oncogenes and tumour suppressor genes (3h)
- Topic 4. Dysregulated cell signaling in cancer + case study (6h)

### Exam lessons 1-6 (2h)

#### Part II. Tumour and stromal cell behaviour and characteristics (9h)

- Topic 5. Cell cycle and apoptosis deregulation and genome instability (2h)
- Topic 6. Metabolic reprogramming in cancer (2h)
- Topic 7. Tumor microenvironment (0,5h)
- Topic 8. Tumor angiogenesis (0,5h)
- Topic 9. Invasion and metastasis (2h)
- Visit to VHIO (2h)

#### Part III. Cancer diagnosis and therapy (12h)

- Topic 10. Cancer diagnostics and biomarkers (3h)
- Topic 11. Cancer therapies: Past, present, and future (4h)
- Topic 12. Mechanisms of drug resistance (2h)
- Topic 13. Introduction to cancer research and translational oncology (1h)
- Case study (2h)

### Exam lessons 7-13 (2h)

#### PRACTICALS (15h)

- Teamwork in the laboratory (15 hours): Students will work in teams to carry out practical activities focused on the treatment of cancer cells, functional analysis, and molecular and phenotypic characterization of cancer cells.

#### Important note

All the hours mentioned refer to guided learning hours. They are approximate and based on the planned development of the course, which is always subject to changes and adjustments. The detailed planning will be updated periodically in the work plan section of the virtual classroom.

These hours represent approximately one third of the total time the student is expected to dedicate to the course. The remaining two thirds correspond to independent work, which includes completing assignments and projects, self-study, and any consultations with the teaching staff.

## ASSESSMENT

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#### Specific considerations for Cancer Biology

The evaluation of the subject will consider the acquisition of the skills and learning outcomes. It is based on the continuous monitoring of student work, which will be assessed throughout the course conducting written tests on the theory, the assistance and active participation in seminars, the practical written report, the completion of assignments proposed in class, and the resolution of case reports. The final grade for the course will be calculated as a weighted combination of the following items:

#### Theory contents (75%)

- **Activity 1. Two written tests:** 45% of the final grade (FG); minimum score to pass the subject: 5 points (mean of two exams); recoverable
  - First exam: accounts for 22.5% of activity 1; possibility to recover it; minimum grade of 4/10 to pass
  - Second exam: accounts for 22.5% of activity 1; possibility to recover it; minimum grade of 4/10 to pass
 If you fail one of the exams (first or second) or both, you will be able to retake the failed part in the recovery period exam.
- **Activity 2:** 30% of the FG in three activities; non-recoverable and mandatory
  - SDG 3 presentation about your specific cancer: team activity; 5% of FG
  - Podcast (10-12 min) about specific cancer project (related to topics 1-9 from theory classes): team activity; 10% of the FG
  - Case study related to your specific cancer: 12% of the FG (6% individual activity + 6% team activity)
  - Mandatory assistance and active participation in the seminars: 3% of the FG

#### Practicals content (25%)

The attendance to practice classes is mandatory at least at 50%; minimum score to pass the subject: 5 points; non-recoverable.

- **Activity 3. Skills in technical protocols:** 5% of the FG
- **Activity 4. Written report:** 20% of the FG; non-recoverable task (delays in delivery term penalise 50%)

#### Important

Plagiarism or copying someone else's work is penalised at all universities and, according to the UVic-UCC Ethical Code ( [in Catalan](#) / [in Spanish](#)), constitutes a very serious offence. Therefore, within this subject, plagiarism or unauthorised appropriation of texts or ideas from others (see [what is considered plagiarism?](#)) and the unauthorised or undisclosed use of artificial intelligence in an activity

automatically results in a fail grade or other disciplinary measures.

To facilitate the appropriate citation of texts and materials, consult the guidelines for academic citation available on the UVic Library website.

## **METHODOLOGY**

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The course is based on continuous assessment through a combination of theoretical and practical activities, including written exams, teamwork, and individual assignments. Active participation in seminars, journal clubs, and laboratory sessions is essential to foster the acquisition of competencies and learning outcomes.

## **BIBLIOGRAPHY**

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### **Key references**

- Alberts, B., Johnson, A., Lewis, J., et al. (2002). *Molecular Biology of the Cell*. Retrieved from <https://www.ncbi.nlm.nih.gov/books/NBK21054/?term=Molecular%20Biology%20of%20the%20Cell>
- Weinberg, R. A. (2008). *Molecular Biology of the cell* (5 ed.). New York : Garland Science.
- Weinberg, R. A. (2014). *The biology of cancer*. Garland Science.

### **Further reading**

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

## Cardiovascular and Respiratory System Diseases

**Type:** Compulsory (OB)

**Credits:** 3.0

**Semester:** 1st

| Group                                | Language of instruction | Teachers   |
|--------------------------------------|-------------------------|--|
| G11, classroom instruction, mornings | Catalan                 | Anna Camps Vilaró<br>Eder Fredy Mateus Medina<br>Javier Hernando Redondo |

### SUSTAINABLE DEVELOPMENT GOALS (SDG)

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- 5. Gender equality

### OBJECTIVES

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This subject aims to deepen the knowledge of cardiovascular and respiratory diseases from a molecular and cellular perspective. It focuses on analyzing the mechanisms involved in their pathophysiology and response to treatments, based on the knowledge acquired in the subjects [Molecular and Cellular Basis of Diseases](#) and [Human Physiology and Anatomy I](#). Specifically, alterations in signaling pathways and key cellular processes are addressed, as well as the effects of drugs on specific molecular targets. Biomarkers and diagnostic strategies are reviewed. Finally, an integrative vision of translational research applied to these pathologies is promoted.

### LEARNING OUTCOMES

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- LO1. Know the main pathologies of the respiratory, cardiovascular and digestive systems, the endocrine, immune and nervous systems, metabolism, kidneys and urinary tract, the musculoskeletal system and the blood.
- LO2. Analyzes current lines of biomedical research in relation to the major current pathologies of the different systems of the human body.
- LO3. Demonstrates skills for critical reflection in processes linked to the exercise of the profession.
- LO4. Analyses knowledge specific to the field and its contextualisation in national and international environments.
- LO5. Acquires and demonstrates advanced knowledge of theoretical and practical aspects and work methodology in the field of biomedicine.
- LO6. Collects and interprets data and information on which to base their conclusions, which include reflections on social, scientific or ethical issues in the field of biomedicine.

### COMPETENCIES

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#### General skills

- Formulate hypotheses following the scientific method, with an ability to summarize and analyze information in a critical way in order to be able to solve problems.

#### Specific skills

- Combine knowledge of the molecular, cellular, genetic and epigenetic principles of the most prevalent diseases.
- Formulate hypotheses and design experiments in the field of biomedical research.
- Have a systemic vision of the organism, in particular metabolic regulation and control and cell signaling, in order to respond to biomedical challenges.
- Identify the mechanisms of action of infectious agents, drugs and toxins, and their effects on the body.
- Make integrated assessments of the functioning of organs and apparatus, and their role in homeostasis.
- Recognize endogenous and exogenous agents involved in the main groups of pathologies.

#### Basic skills

- Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.
- Students have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgments that include reflection on relevant social, scientific and ethical issues.

#### Core skills

- Develop strategies for promoting gender equality and equity for all.
- Exercise active citizenship and individual responsibility with a commitment to democratic values and sustainable development.
- Interact in international contexts to transfer knowledge to current and emerging fields of professional development and research.
- Reflect critically on knowledge of all kinds, with a commitment to professional rigor and quality.
- Take control of one's learning process with a view to personal and professional growth and an all-round education.

## CONTENT

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### Block I. Cardiovascular system

1. Main cardiovascular diseases
2. Inflammation and cardiovascular disease
3. Arrhythmias
4. Metabolic disorders and cardiovascular pathology
5. Cardiovascular system and immune response
6. Cardiovascular aspects in women
7. Translational aspects: medical devices and transplants
8. Experimental models in cardiovascular research

### Block II. Respiratory system

9. Respiratory infectious diseases
10. Bronchiectasis and cystic fibrosis
11. Pulmonary vascular diseases
12. Occupational, environmental and pollution diseases
13. Sleep breathing disorders
14. Asthma and chronic obstructive pulmonary disease (COPD)
15. Allergic respiratory diseases
16. Surgical pathology: tracheal diseases and lung resection, thoracic and rib wall trauma
17. Functional tests and experimental models in respiratory system research

## EVALUATION

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The evaluation of the subject is based on continuous monitoring of the student's academic work throughout the course.

The final grade for the subject (NF) is the weighted average of the grades for the following assessable activities:

- Assessable activity 1. Participation in group tasks: 5% of the NF; non-recoverable activity
- Assessable activity 2. Questionnaires and work monitoring: 20% of the NF; non-recoverable activity
- Assessable activity 3. Exams: 45% of the NF
  - Partial I: 22.5% of the NF; blocks 1, 2 and 3; recoverable activity
  - Partial II: 22.5% of the NF; blocks 4, 5 and 6; recoverable activityMinimum grade for each of the partial exams to be averaged: 4. The average grade between the two exams to be averaged with the other activities must be 5 or higher.
- Assessable activity 4. Exercises based on clinical cases: 30% of the NF; non-recoverable activity

### Subject-specific criteria

Attendance at clinical case sessions is mandatory. Therefore, unexcused absence from more than 20% of clinical case sessions will result in suspension of assessable activity 4.

To pass the subject, you must obtain a grade equal to or greater than 4.5 in both exams and a final grade in which the weighted average is equal to or greater than 5.0.

### General evaluation criteria

- Possession of mobile phones or similar devices (smartphones, tablets, etc.) during the taking of recoverable tests will result in a zero on the test.
- Failure to appear or present within the established deadlines for any of the assessment activities will result in a grade of zero for that activity. This grade is taken into account when calculating the final grade for the subject.
- The student has the option of retaking failed make-up tests. Make-up tests are held during the last weeks of the semester, designated for this purpose.
- No more than 50% of the subject can be recovered.
- If you decline to take the retake test, the grade achieved in the first instance will be maintained.
- In non-recoverable activities, no minimum grades are required to calculate the final grade for the subject.

### Important

Plagiarism or copying someone else's work is penalized in all universities and, according to the [UVic-UCC coexistence rules](#), constitute serious or very serious faults. Therefore, during the course of this subject, plagiarism or the improper appropriation of texts or ideas from other people (see [What is considered plagiarism?](#)) and the improper or undeclared use of artificial intelligence in an activity automatically result in a suspension or other disciplinary measures.

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## METHODOLOGY

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In this subject, theoretical sessions, seminars or tasks in the form of clinical cases are carried out to integrate the knowledge acquired.

Regarding personal work, students must follow the theoretical aspects of the subject and actively participate in debates, assignments and workshops in the classroom.

Cases and tasks are also presented that students must work on autonomously and independently or in small groups.

Attendance at seminar sessions is highly recommended, as they are interactive classes with assessable activities/participation.

## **BIBLIOGRAPHY**

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### **Key references**

- Álvarez-Sala Walther, J. L. (2017). *Neumología clínica, 2.ª Edición*. Retrieved from <https://www-clinicalkey-com.biblioremot.uvic.cat/student/content/toc/3-s2.0-C20130139657>
- Fuster V, Harrington RA, Narula J, Eapen ZJ, (2022). *Fuster and Hurst's The Heart* (15 ed.). ed. New York: McGraw-Hill Education.
- Goldman, Lee, MD, MPH (2025). *Goldman-Cecil: Tratado de medicina interna, 27.ª Edición* . Retrieved from <https://www-clinicalkey-com.biblioremot.uvic.cat/student/content/toc/3-s2.0-C20230523754>
- J. Larry Jameson, Anthony S. Fauci, and Dennis L. Kasper (2019). *Harrison: Principios de Medicina interna. Vol. 1 y 2 (20a. ed.)*. Retrieved from <https://ebookcentral-proquest-com.biblioremot.uvic.cat/lib/uvicsp/detail.action?pq-origsite=primo&docID=5758836#>
- Libby, P. (2023). *Braunwald. Tratado de cardiología, 12.ª edición*. Retrieved from <https://www-clinicalkey-com.biblioremot.uvic.cat/student/content/toc/3-s2.0-C20221011941>

### **Further reading**

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

## External Practicums

**Type:** External Academic Practicum (PAE)

**Credits:** 6.0

**Semester:** 1st or 2nd

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### COORDINATION

— Anna Maria Dalmau Roda

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### OBJECTIVES

The subject External Internships I (PCI) aims for the student to:

1. Learn more about the organizational structure of a company or external entity.
2. Make the tasks of a biomedical professional your own.
3. Apply knowledge to your professional practice.
4. Deepen and relate scientific and technological concepts from various subjects of the degree.
5. Participate and reflect on situations specific to a professional activity.

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### LEARNING OUTCOMES

- Works appropriately in a laboratory with biological material, taking into account safety measures, handling and disposal of biological waste, as well as recording activities.
- Manages databases and applies advanced statistical methods to analyze this data.
- Apply the main guidelines for structuring presentations, projects and publications in the field of scientific communications.
- It relates the legal and ethical bases involved in the development and application of biomedicine.
- It applies procedures specific to scientific research in the development of training and professional activity.
- Define your own learning objectives and design development processes that are coherent and realistic with these objectives and the time available.
- Shows an attitude of motivation and commitment to personal and professional improvement.
- Communicates knowledge, methodology, ideas, problems and solutions to all types of audiences (specialized or not) clearly and precisely.
- Assumes different responsibilities in individual or collaborative work and evaluates the results obtained.
- Moves with ease in the general use of ICT and, especially, in the technological environments specific to the professional field.
- It applies strategies to promote gender equality and equity between people in the professional field.

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### COMPETENCIES

#### General skills

- Carry out professional activities independently with initiative and respect for other health professionals.
- Show a positive attitude to innovating, creating value and integrating scientific knowledge and improving one's own training.

#### Specific skills

- Be able to critically interpret the results and conclusions of scientific studies.
- Formulate hypotheses and design experiments in the field of biomedical research.
- Have technical skills in a research laboratory for working on cell and tissue samples, and with experimental animals.
- Promote, respect and apply the principles of bioethics in professional activity.

#### Basic skills

- Students can apply their knowledge to their work or vocation in a professional manner and have competencies typically demonstrated through drafting and defending arguments and solving problems in their field of study.
- Students can communicate information, ideas, problems and solutions to both specialists and non-specialists.
- Students have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgments that include reflection on relevant social, scientific and ethical issues.

#### Core skills

- Develop strategies for promoting gender equality and equity for all.
- Exercise active citizenship and individual responsibility with a commitment to democratic values and sustainable development.
- Interact in international contexts to transfer knowledge to current and emerging fields of professional development and research.
- Make use of professional skills in multidisciplinary, complex, networked environments, whether on-site or online.
- Take control of one's learning process with a view to personal and professional growth and an all-round education.

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### CONTENT

- Organizational aspects of a company or external entity
- Functions of a biomedical engineer and their professional environment
- Methodologies for working in interdisciplinary teams of professionals

- Research methodologies, data analysis and report writing
- Processes developed in the company or external entity
- Communication with professionals from the same or different discipline

## EVALUATION

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The Annex to the agreement specifies the tutors associated with the student in this internship subject, both from the company or external entity and from the University.

The external entity tutor is the person designated by the company who maintains constant contact with the student and accompanies him/her throughout the internship period. The external entity tutor must complete the evaluation form provided by the UVic-UCC academic tutor, which evaluates:

- General aspects of student activity
- Achievement of learning outcomes associated with competencies
- Development of tasks entrusted to the external entity
- Overall assessment of the student's activity during the internship
- Strong points to highlight and aspects to improve
- The academic tutor at UVic-UCC ensures compliance with the internship program, monitors it and requests an assessment of the internships carried out by the student from the company or external entity. In addition, he or she is the person responsible for correcting and evaluating the report.

The academic tutor at UVic-UCC gives the final grade for the internships taking into account the following items:

- External tutor rating: 60%
- Practical report: 20%
- Academic tutor's assessment: 20%

They are reasons for "failure" of curricular practices:

- Failure to comply with the hours corresponding to the internship stay at the company or institution
- Failure to submit the internship report within the deadlines and with the established requirements
- Failure to complete the tasks assigned to the student (within the framework of the internship) at the company or external entity
- Lack of discipline, breach of the code of ethics or breach of confidentiality

## METHODOLOGY

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In the year you wish to do an internship, you must register for it together with the other subjects of the course on the July registration date.

Once the internship coordinator knows which students want to do an internship that year, mandatory orientation and training sessions are planned to help the student develop the *curriculum vitae*, cover letters and learning how to conduct an interview.

The internship coordination and the Professional Careers Service (SCP) accompany the student in their search for an internship.

### Application for internship agreement

When the student has already contacted an external company or entity and they have accepted him, he must fill out the "Internship Agreement Application" form, which is located in the center classroom, in the internship section.

If the student responds to a call made by the SCP, they must send a copy of their ID and CV by email to [scp.practiques.fcte@uvic.cat](mailto:scp.practiques.fcte@uvic.cat) so that the SCP sends it to the external entity in question and the interview can take place.

It is important to note that there are specific deadlines for requesting the annex to the agreement for each internship period that are specified in the center's classroom.

### Signing of the annex to the agreement

Once the agreement request form has been completed, the Careers Service prepares the annex to the agreement for the student in question. The agreement between the company or entity and UVic-UCC must already be signed (if not, it is signed at that time).

This annex to the agreement is sent to the company or entity and to the student and the UVic tutor for signature. This way, all parties involved have all the information associated with this internship position (the UVic-UCC tutor, the external entity tutor, the internship period, etc.).

### Carrying out the internships

It is essential that the agreement and annex have been signed before starting the internship to ensure that insurance coverage is in effect (compulsory school insurance, accident insurance and civil liability insurance).

When starting the internship, the student must contact the UVic-UCC tutor to establish how the follow-up will be done, to find out how it will be evaluated and what the report should be like.

You cannot be at the company after the final date stated in the annex to the agreement.

## **Delivery of the report**

Once the internship period has ended, a report on the internship must be submitted to the corresponding space in the internship room within a maximum period of 10 days after it has ended. For internships that end at the end of January, at the beginning of June or at the end of August, the report must be prepared during the internship and must be submitted no later than the day the internship ends. This way, the internship can be evaluated before the closing of the proceedings.

It is important to remember that each internship subject has an associated report, even if the subjects are taken consecutively and at the same company or external entity. Each report must be uploaded to the Moodle classroom of the corresponding internship subject.

## **Evaluation**

Based on the monitoring of the student, the internship report received and the report made by the external tutor, the UVic tutor evaluates the internship.

## **Others**

The agreement is the document that regulates the collaboration between the company or entity and the University. The annex to the agreement is the specific document for a particular student in which all the details of the internship are specified (student details, tutors, period, tasks, skills, etc.).

It should be noted that carrying out an internship in an external company or entity does not entail any employment relationship (Royal Decree 1791/2010, of December 30).

No annex may be submitted after September 14, the official end date of the academic year. Furthermore, to facilitate the evaluation of internships, it is recommended that agreements be made only until August 15.

If either party, student or external entity, wishes to end the internship before the established deadline, they must notify the UVic-UCC tutor and complete the termination form in the annex.

## **Extracurricular internships (PEC)**

If you want to do extracurricular internships, the student must contact the external entity where you want to do the internship and fill out the "Agreement Application Form" with all the details. You can find it in the center classroom. Once sent, the Careers Service prepares the documentation to be able to sign the agreement between the University and the company or external entity and to be able to assign a tutor to the student. From here on, the procedure is the same as for curricular internships.

On UAcadèmic (accessible from the main page of the UVic Virtual Campus) you can consult the PEC offers that the University has for this degree.

The evaluation of PECs follows the same procedure as curricular internships (PC): based on the monitoring of the student, the internship report and the report made by the external tutor, the tutor from UVic-UCC evaluates the internships. Since they are not curricular internships, the grade can only be pass or fail.

## Final Year Project

**Type:** Final Year Project (TFG)

**Credits:** 12.0

**Semester:** 1st or 2nd

### COORDINATION

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— Anna Maria Dalmau Roda

### SUSTAINABLE DEVELOPMENT GOALS (SDG)

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— 3. Good health and well-being

### OBJECTIVES

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The Final Degree Project (TFG) is a subject in the last year of undergraduate studies, essential to obtain a bachelor's degree in any specialty.

The objective of the TFG subject is for the student to:

1. Develop an academic paper.
2. Consolidate scientific and technological knowledge received throughout the curriculum.
3. Participate in situations specific to a professional activity.

### LEARNING OUTCOMES

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- LO1. Manages databases and applies advanced statistical methods to analyze this data.
- LO2. Designs and develops a work plan based on the expert's prior instructions.
- LO3. Knows and uses routine laboratory instruments to correctly carry out practical work.
- LO4. Works appropriately in a laboratory with biological material, taking into account safety measures, handling and elimination of biological waste, as well as recording activities.
- LO5. Critically analyze the results obtained in the experiments and the problems that appear throughout the work.
- LO6. Consolidates and interrelates scientific concepts from various subjects.
- LO7. Apply procedures specific to scientific research to the development of training and professional activity.
- LO8. Defines own learning objectives and designs development processes that are coherent and realistic with these objectives and the time available.
- LO9. Shows sensitivity to equitable and egalitarian professional practice from a gender perspective.
- LO10. Collects and interprets data and information on which to base their conclusions, which include reflections on social, scientific or ethical issues in the field of biomedical sciences.

### COMPETENCIES

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#### General skills

- Formulate hypotheses following the scientific method, with an ability to summarize and analyze information in a critical way in order to be able to solve problems.

#### Specific skills

- Analyze biomedical data and biological sequences through the use of statistics and computation.
- Be able to critically interpret the results and conclusions of scientific studies.
- Formulate hypotheses and design experiments in the field of biomedical research.
- Have technical skills in a research laboratory for working on cell and tissue samples, and with experimental animals.
- Promote, respect and apply the principles of bioethics in professional activity.

#### Basic skills

- Students can communicate information, ideas, problems and solutions to both specialists and non-specialists.
- Students have developed the learning skills necessary to undertake further studies with a high degree of independent learning.
- Students have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgments that include reflection on relevant social, scientific and ethical issues.

#### Core skills

- Communicate orally, in writing and audiovisually, in one's own language and in foreign languages, with proficiency in form, content and use.
- Develop strategies for promoting gender equality and equity for all.
- Interact in international contexts to transfer knowledge to current and emerging fields of professional development and research.
- Take control of one's learning process with a view to personal and professional growth and an all-round education.

### CONTENT

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The final degree project (TFG) is a synthesis of everything learned during the degree studies.

In the TFG, the student must integrate and apply —with professional, creative and innovative criteria— the learning outcomes acquired throughout the degree, especially those that specifically help them to provide efficient solutions to the problems arising from the TFG itself (autonomy, initiative, planning, organization, capacity for analysis and synthesis, communication, etc.).

Some of the knowledge received throughout the degree and that must be applied in the development of the TFG are:

- Research methods oriented towards the design of experiments or projects applied to the field of biomedicine
- Problem solving, data analysis and decision making
- Information search: tools, storage, citations...
- Writing reports and preparing presentations
- Defense and communication of projects

At the same time, complementary training is carried out in aspects of:

- Writing the report
- Sources of information and resources for the TFG
- Sustainability applied to the biomedical field

## **EVALUATION**

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The evaluation of the TFG is individual, even if different students work on the work together.

The evaluation is based on different evaluation elements, the weighting of which is described below:

- Monitoring of the work carried out: 20%
- Written report or project: 50%
- Public defense: 30%

Submitting the report and completing the defense are essential to pass the subject.

The monitoring is graded by the UVic-UCC tutor and the external tutor (if any). The report or project and the defense are graded by consensus among the members of the committee.

## **METHODOLOGY**

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This subject is special. To be able to enrol in it, you must meet certain prerequisites of approved or enrolled credits (see regulations) and have a proposal made and accepted.

The student is responsible for choosing the topic of their final degree project (TFG). However, the topic can come from the student's initiative or from proposals suggested by professors from the University's departments or from external entities.

There are 5 types of TFG:

- Experimental GFA
- Development TFG
- Multimedia thesis
- INNOVA TFG
- Bibliographic review thesis

All TFGs must have an academic tutor who teaches at UVic-UCC, who guides the process of preparation, presentation and defense. They may also have, if deemed necessary, an external tutor.

The criteria for assigning tutors to assignments are based on the academic coherence between the student's work proposal, the teacher's specialty and their availability.

TFGs can be developed jointly by several students, if the proposal so requires. In this case, the students complement each other to carry out the project. These teams can be interdisciplinary or not, and are formed with students from one or several degrees at the University.

Thesis projects can also be completed on a mobile basis.

### **Process to follow**

#### **a. Proposal for the final degree project**

Formally, it is the first step in the process of preparing a TFG. Before registering for the TFG, you must enter the specific TFG computer application (Virtual Campus » TFG » My proposals » + New proposal) and fill out the form with the information about the project you want to develop. The proposal must include:

- title
- short description
- work objectives
- methodology

— ...

If different students do the TFG together, each student must fill out their own proposal.

If the TFG is done at an external entity, the student must request an agreement from the Professional Careers Service (SCP) by filling out the agreement request form that is in the center classroom, in the TFG section.

The degree coordinator makes the decision on the TFG proposal. Once the proposal is accepted, the student can enroll.

#### **b. Tutor / work director**

The tutor/director of the work is a teacher, researcher or professional who has the responsibility of guiding the student, supporting them and monitoring them throughout the process of developing the work, until it is defended before a specially constituted tribunal.

In the event that the tutor/director of the thesis is a person external to the university, the student is also assigned an academic tutor for the thesis to guide the student in all the more academic aspects of preparing the proposal, the report and the defense.

The functions of tutors/directors are:

- Establish a work and tutoring plan together with the student.
- Provide support and monitoring to the student within the planned deadlines individually or in groups.
- Accompany the student in the preparation of the presentation and defense of the work before the court.
- Participate in the evaluation of the TFG.
- Provide proposals for improving the TFGs.

#### **c. Development of the work and preparation of the report**

To facilitate the preparation of the report, the FCTE has developed templates that give the student guidelines on what the format should be, the main sections that should be included, and what content each section should have. These templates can be found in the Moodle classroom of the TFG subject.

The report can be written in any of the official languages of Catalonia and in English. The report cannot exceed 50 pages (with the exception of the TFG innova modality).

To help prepare the report, there are partial submissions of drafts of the report throughout the semester, in the TFG Moodle classroom, which the thesis tutor reviews and from which he or she gives instructions to the student so that he or she can improve the report.

The report must be submitted within the deadlines established in the TFG calendar. The calendar can be consulted in the center classroom, TFG section or in the Moodle classroom of the TFG subject.

The report must be submitted in the specific TFG computer application (Virtual Campus » TFG » My proposals » Click on the proposal).

#### **d. Defense of work**

The student must defend their work before the tribunal in a public event (or behind closed doors, if there are specific confidentiality commitments).

The student has 20 minutes to make the presentation without interruption. In the case of a demonstration, the student has an extra 10 minutes in which the members of the jury can ask for clarification. The members of the jury then have 20 minutes to ask the student questions. Once they have finished, the president asks the student and the audience to leave so that the jury can deliberate. The jury has a maximum of 15 minutes to make a decision.

The student and the audience are then invited to find out the grade of the work.

## **BIBLIOGRAPHY**

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### **Key references**

- Coromina, E; Casacuberta, X; Quintana, D (2000). *El treball de recerca : Procés d'elaboració, memòria escrita, exposició oral i recursos*. Eumo Editorial.
- Ferrer, V; Carmona, M; Sòria, V (2012). *El trabajo de Fin de Grado : Guia para estudiantes, docentes y agentes colaboradores*. Mc Graw Hill.
- Rigo, A; Genescà, G (2000). *Tesis i treballs: Aspectes formals*. Eumo Editorial.
- Sancho, J (2014). *Com escriure i presentar EL MILLOR TREBALL ACADÈMIC: Guia pràctica per estudiants i professors*. Eumo Editorial.

## OPTIONAL SUBJECTS

### Advanced Pharmacology and Toxicology

**Type:** Optional (OP)

**Credits:** 6.0

| Group                                | Language of instruction | Teachers   |
|--------------------------------------|-------------------------|--|
| G11, classroom instruction, mornings | Catalan                 | Goizane Ros Bernaola<br>Beltran Alvarez Perez<br>Mireia Bachiller Garcia |

#### OBJECTIVES

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This course aims to provide an overview of the fundamental principles of pharmacology and toxicology, including the dynamics and kinetics of drugs, their interactions and clinical implications. The course also introduces, among other things, aspects related to regulation, drugs of abuse and patents.

To take this subject it is highly recommended to have passed the subject [Pharmacology and Toxicology](#).

#### LEARNING OUTCOMES

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- LO1. Understand the regulatory aspects of the pharmaceutical industry.
- LO2. Uses resources to communicate to the general public innovations related to biomedicine and the risks they have associated with them.
- LO3. Apply management and quality improvement tools.
- LO4. It explains the main techniques of epigenetic modification, nanomedicine and artificial intelligence.
- LO5. Acts with commitment and responsibility in common situations and those specific to the profession.
- LO6. Assumes different responsibilities in individual and collaborative work and evaluates the results obtained.
- LO7. Understands oral and written messages of different types in a complete manner expressed in Catalan, Spanish and English.
- RA8. Moves with ease in complex situations or those that require the development of new solutions.

#### COMPETENCIES

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##### General skills

- Formulate hypotheses following the scientific method, with an ability to summarize and analyze information in a critical way in order to be able to solve problems.

##### Specific skills

- Evaluate technological advances for the diagnosis, prognosis and treatment of disease.
- Identify the mechanisms of action of infectious agents, drugs and toxins, and their effects on the body.
- Promote, respect and apply the principles of bioethics in professional activity.

##### Basic skills

- Students can apply their knowledge to their work or vocation in a professional manner and have competencies typically demonstrated through drafting and defending arguments and solving problems in their field of study.
- Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.

##### Core skills

- Interact in international contexts to transfer knowledge to current and emerging fields of professional development and research.
- Make use of professional skills in multidisciplinary, complex, networked environments, whether on-site or online.
- Reflect critically on knowledge of all kinds, with a commitment to professional rigor and quality.
- Take control of one's learning process with a view to personal and professional growth and an all-round education.

#### CONTENT

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The following topics are developed:

1. Pharmacokinetics and pharmacodynamics. Compartmental and non-compartmental pharmacokinetic models
2. Drug interactions
3. Clinical impact of pharmacokinetics
4. Pharmacology and toxicology in biological therapies and biomedical engineering (nanotechnology)
5. Toxicology by systems

6. Toxicokinetics
7. Toxic agents and drugs of abuse. Clinical implications
8. Patents

## EVALUATION

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**Exams:**50%

- Partial exam 1: 25%; minimum grade of 4/10
- Partial exam 2: 25%; minimum grade of 4/10

**Important:** You must obtain an average of 5 between the two exam tests to be able to average with the rest of the activities.

**Evaluable monitoring activities:** 30%; non-recoverable

**Seminar/teamwork:** 20%; non-recoverable

### Important

Plagiarism or copying someone else's work is penalized in all universities and, according to the [UVic-UCC coexistence rules](#), constitute serious or very serious faults. Therefore, during the course of this subject, plagiarism or the improper appropriation of texts or ideas from other people (see [What is considered plagiarism?](#)) and the improper or undeclared use of artificial intelligence in an activity automatically result in a suspension or other disciplinary measures.

To cite texts and materials appropriately, you must consult the academic citation guidelines and guidelines available on the UVic Library website.

## METHODOLOGY

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This subject includes theoretical sessions and tasks related to the blocks to integrate and put into practice the knowledge acquired. Case studies are also carried out to familiarize students with the most relevant aspects of pharmacokinetics and pharmacodynamics or toxicology and their clinical implications. Attendance at the seminar/task sessions indicated by the professor is mandatory, while it is recommended to actively follow the theory of the subject and participate actively in the discussions, tasks and workshops within the classroom.

## BIBLIOGRAPHY

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### Key references

- Katzung, B.G. (2019). *Farmacología: básica y clínica* (14 ed.). Madrid: McGraw-Hill.
- Montiel Falcón, H. & Ron Aguirre, A. (2018). *El ABC de la toxicología*. Retrieved from <https://elibro.net/es/ereader/bibliouvic/117511>
- Rosenfeld, G.C. (2015). *Farmacología*. Retrieved from <https://elibro.net/es/ereader/bibliouvic/125320>
- Vasarhelyi, B. & Karvaly, G. B. (2024). *Therapeutic Drug Monitoring and Pharmacokinetics-Based Individualization of Drug Therapy*. Retrieved from <https://directory.doabooks.org/handle/20.500.12854/143737>

### Further reading

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

## Bioengineering and Medical Devices

**Type:** Optional (OP)

**Credits:** 6.0

| Group                                | Language of instruction | Teachers            |
|--------------------------------------|-------------------------|---------------------|
| G11, classroom instruction, mornings | Catalan                 | David Reifs Jiménez |

### OBJECTIVES

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This subject aims to provide students with comprehensive training in the field of bioengineering, with special attention to biomaterials, biomechanics, bioinstrumentation and biological signal processing. The subject includes the study of emerging technologies such as rehabilitation robotics, telemedicine and artificial intelligence, as well as the ethical, regulatory and management aspects related to the development, clinical evaluation and commercialization of medical devices.

It is recommended to have passed the subjects of [Tissue Culture and Engineering Laboratory](#) and of [Imaging Diagnostic Techniques](#).

### LEARNING OUTCOMES

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- LO1. Understand the regulatory aspects of the pharmaceutical industry.
- LO2. Uses resources to communicate to the general public innovations related to biomedicine and the risks associated with them.
- LO3. Apply management and quality improvement tools.
- LO4. It explains the main techniques of epigenetic modification, nanomedicine and artificial intelligence.
- LO5. Defines own learning objectives and designs development processes that are coherent and realistic with these objectives and with the time available.
- LO6. Moves with ease in the general use of ICT and, especially, in technological environments specific to the professional field.
- LO7. Moves with ease in virtual interaction contexts through the use of ICT.
- RA8. Moves with ease in complex situations or those that require the development of new solutions.

### COMPETENCIES

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#### General skills

- Formulate hypotheses following the scientific method, with an ability to summarize and analyze information in a critical way in order to be able to solve problems.

#### Specific skills

- Combine knowledge of the molecular, cellular, genetic and epigenetic principles of the most prevalent diseases.
- Evaluate technological advances for the diagnosis, prognosis and treatment of disease.
- Identify the mechanisms of action of infectious agents, drugs and toxins, and their effects on the body.
- Make integrated assessments of the functioning of organs and apparatus, and their role in homeostasis.
- Promote, respect and apply the principles of bioethics in professional activity.
- Recognize endogenous and exogenous agents involved in the main groups of pathologies.

#### Basic skills

- Students can apply their knowledge to their work or vocation in a professional manner and have competencies typically demonstrated through drafting and defending arguments and solving problems in their field of study.
- Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.

#### Core skills

- Interact in international contexts to transfer knowledge to current and emerging fields of professional development and research.
- Make use of professional skills in multidisciplinary, complex, networked environments, whether on-site or online.
- Reflect critically on knowledge of all kinds, with a commitment to professional rigor and quality.

### CONTENT

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The following topics are developed:

1. Biomaterials and biocompatibility
  - Types of biomaterials and physicochemical properties
  - Immune response, tissue integration, toxicity and biofilm formation
2. Biomechanics and bioinstrumentation. Application to the musculoskeletal, cardiovascular, respiratory systems, including assessments of system function and methods for evaluating these functions. Robotics and rehabilitation engineering

- Biomechanics
  - Study of forces, moments and movements applied to the human body
  - Modeling the musculoskeletal system
  - Simulation of the functioning of the heart and lungs
  - Gait and posture analysis
- Bioinstrumentation
  - Principles of physiological sensors (electrocardiogram (ECG), electromyogram (EMG), spirometer, etc.)
  - Monitoring of vital functions and integration with computer systems
- Rehabilitation engineering
  - Mobility assistance devices (exoskeletons and orthoses)
  - Robotic systems for physiotherapy
  - 3D printing of customized prostheses
- 3. Biological signal processing. Telemedicine. Artificial intelligence tools.
  - Signal processing
    - Basic fundamentals of signal analysis
    - Biomedical signal analysis
  - Telemedicine
    - Remote monitoring systems
    - Mobile applications and patient tracking platforms
  - Artificial intelligence
    - Classification and prediction algorithms applied to images and medical data
    - Clinical decision support systems
  - Case studies: Biomedical signal analysis with Python/MATLAB, real use cases of AI in medical diagnosis
- 4. Regulatory and ethical aspects of medical device development
  - Regulatory framework
    - European and international regulations (MDR, ISO 13485 and CE)
    - Stages of regulatory development: design, verification and validation
  - Ethical aspects
    - Informed consent and use of personal data
    - Ethical risks in medical software
  - Case studies: Devices withdrawn from the market and ethical dilemmas in medical robotics
- 5. Clinical trials, entrepreneurship and commercialization, and post-market surveillance
  - Clinical trials
    - Testing phases and requirements for medical devices
    - Experimental design, recruitment and monitoring
  - Entrepreneurship
    - Development of *spin-offs* and *start-ups* in bioengineering
    - Business plan for a new device
    - Financing strategies: *venture capital* and public aid
  - Commercialization
    - Marketing strategies, market research
    - Cost-effectiveness studies and access to the healthcare market
    - Post-market surveillance
- 6. Biological signal processing. Telemedicine. Artificial intelligence tools.
- 7. Regulatory and ethical aspects of medical device development
- 8. Clinical trials, entrepreneurship and commercialization, and post-market surveillance

## EVALUATION

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The evaluation of the subject is based on continuous monitoring of the student's academic work throughout the course.

The total weight of the assessment activities represents 100% of the final grade of the subject (NF). The NF is the weighted average of the grades of the following assessable activities:

- Specific assessment tests (individual and recoverable activities): 50% of the NF
  - Important:** The average grade for this activity must be 5 to pass the subject and to be averaged with the other activities.
  - Summary exam I: 25% of the NF; minimum grade to make an average: 4
  - Synthesis exam II: 25% of the NF; minimum grade to make an average: 4
- Problems and/or case studies: 20% of the NF
- Completion of assignments (guided group work activities) and/or seminars: 20% of the NF; non-recoverable activities
- Attitude and participation: 10%; non-recoverable

### Subject-specific criteria

- Seminar activities for the analysis of scientific articles, case studies and practicals are mandatory.
- To pass the subject, you must obtain a final grade in which the weighted average of all items is equal to or greater than 5.0.

### General evaluation criteria

- Possession of mobile phones or similar (*smartphones*, tablets, etc.) during the taking of the recoverable tests will result in a zero on the test.
- Failure to attend any of the assessment activities or to submit them within the established deadlines will result in a grade of zero for that activity. This grade is taken into account when calculating the final grade for the subject.
- The final grade for the subject is obtained by weighting, with the respective percentages, the arithmetic averages of the different activities.
- The student has the option of retaking failed make-up tests. Make-up tests are held during the last weeks of the semester, designated for this purpose, and no more than 50% of the subject can be retaken.
- If you refuse to take the retake test, the grade achieved in the first instance will be maintained.
- In non-recoverable activities, no minimum grades are required to calculate the final grade for the subject.
- The subject is only graded as "Not presented" if no assessable test has been taken or a grade has been obtained in any of the subject's activities.

### **Important**

Plagiarism or copying someone else's work is penalized in all universities and, according to the [UVic-UCC coexistence rules](#), constitute serious or very serious faults. Therefore, during the course of this subject, plagiarism or the improper appropriation of texts or ideas from other people (see [What is considered plagiarism?](#)) and the improper or undeclared use of artificial intelligence in an activity automatically result in a suspension or other disciplinary measures.

To cite texts and materials appropriately, you must consult the academic citation guidelines and guidelines available on the UVic Library website.

### **METHODOLOGY**

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The contents of this subject are taught through theoretical classes and practical cases. The student must work cooperatively and/or in groups to solve problems and exercises for each topic, with the possibility of having to previously prepare some of the practical cases that are done in class.

During the practicals/exercises, the necessary material is provided to be able to do them. It is preferable that the student has a personal computer.

### **BIBLIOGRAPHY**

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#### **Key references**

- Enderle, J. D., and Bronzino, J. D. (2011). *Introduction to biomedical engineering*. Retrieved from [https://ucrcatot.uvic-ucc.cat/permalink/34CSUC\\_UVIC/qq5d82/alma991001156767206718](https://ucrcatot.uvic-ucc.cat/permalink/34CSUC_UVIC/qq5d82/alma991001156767206718)
- Najarian, K., & Splinter, R. (2012). *Biomedical signal and image processing*. Retrieved from <https://doi.org/10.1201/b11978>

#### **Further reading**

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

## Clinical Biochemistry

**Type:** Optional (OP)

**Credits:** 6.0

| Group                                | Language of instruction | Teachers   |
|--------------------------------------|-------------------------|--|
| G11, classroom instruction, mornings | English                 | Beatriz Candas Estebanez<br>Indira Bhambi Blanco |

### OBJECTIVES

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The objective of this subject is to introduce students to Clinical Biochemistry, addressing all phases of the analytical process, including sample management and the interpretation of results. Students will also study the main biomarkers related to specific systems and pathologies, as well as methods of quality control and specialised diagnostic techniques. Legal and regulatory aspects applicable to clinical laboratory practice are also examined.

### LEARNING OUTCOMES

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- RA1. Apply leadership and people management skills, manage time effectively, work collaboratively in teams, participate actively, resolve interpersonal conflicts, and demonstrate understanding of organisational ethics.
- RA2. Apply quality management and improvement tools.
- RA3. Identify the main infectious diseases affecting different organs and systems.
- RA4. Define personal learning objectives and design coherent and realistic development processes aligned with those objectives in the available timeframe.
- RA5. Act in routine and profession-specific situations with commitment and responsibility.
- RA6. Demonstrate comprehension of spoken and written messages of different types expressed in the language of instruction and in English.
- RA7. Demonstrate and apply advanced theoretical and practical knowledge of the methodology learned in the field of biomedicine.

### COMPETENCIES

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#### General skills

- Formulate hypotheses following the scientific method, with an ability to summarise and analyse information in a critical way in order to be able to solve problems.

#### Specific skills

- Combine knowledge of the molecular, cellular, genetic and epigenetic principles of the most prevalent diseases.
- Evaluate technological advances for the diagnosis, prognosis and treatment of disease.
- Make integrated assessments of the functioning of organs and apparatus, and their role in homeostasis.
- Promote, respect and apply the principles of bioethics in professional activity.
- Recognise endogenous and exogenous agents involved in the main groups of pathologies.

#### Basic skills

- Students can apply their knowledge to their work or vocation in a professional manner and have competencies typically demonstrated through drafting and defending arguments and solving problems in their field of study.
- Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.

#### Core skills

- Interact in international contexts to transfer knowledge to current and emerging fields of professional development and research.
- Make use of professional skills in multidisciplinary, complex, networked environments, whether on-site or online.
- Reflect critically on knowledge of all kinds, with a commitment to professional rigour and quality.
- Take control of one's learning process with a view to personal and professional growth and an all-round education.

### CONTENT

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In this subject, the following topics are introduced and developed:

1. The clinical biochemistry laboratory: Laboratory types and complexity levels. Types of specimens. Pre-analytical and analytical phases. Sample collection and processing. Sources of variability. Regulations for each specimen type. Legal Aspects
2. Quality control Six Sigma and control rules
3. Analytical phase: Analysis and validation of results: Analytical methods. Post-analytical phase: Interpretation of results in the clinical laboratory. Diagnostic sensitivity and specificity
4. Biomarkers related to systems and organs (cardiovascular system, renal system, fluid and electrolyte balance, blood pressure,

- endocrine disorders, functional tests, hepatic and gastrointestinal disorders, and phosphocalcic metabolism biochemistry)
5. Biomarkers related to other metabolic alterations (carbohydrate and lipid metabolism)
  6. Hematology laboratory (blood count, coagulation tests, anemias and oncohematological diseases)
  7. Cancer-related processes (tumor markers, liquid biopsy, and other factors associated with cancer)
  8. Biomarkers related to metabolism. Rare diseases and neonatal metabolic pathologies
  9. Specialised clinical analyses and diagnostics (pregnancy, prenatal and neonatal diagnosis, intolerances, and genetic disease diagnosis, among others.)

## ASSESSMENT

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### Exams: 50%

- Partial exam 1: 25%; minimum pass mark of 4/10
- Partial exam 2: 25%; minimum pass mark of 4/10

**Important:** Students must obtain an average of at least 5/10 across the two partial exams in order for these to be included in the calculation of the overall mark, together with other assessed continuous activities.

**Assessed continuous activities:** 30%; may not be retaken. Case study analysis and resolution

**Participation in case study resolution and/or debates:** 10%; may not be retaken

**Team-based problem-solving in clinical biochemistry:** 10%; may not be retaken

### Important

Plagiarism or copying someone else's work is penalised at all universities and, according to the UVic-UCC Ethical Code ( [in Catalan](#) / [in Spanish](#)), constitutes a very serious offence. Therefore, within this subject, plagiarism or unauthorised appropriation of texts or ideas from others (see [what is considered plagiarism?](#)) and the unauthorised or undisclosed use of artificial intelligence in an activity automatically results in a fail grade or other disciplinary measures.

To cite texts and materials appropriately, students should consult the academic citation guidelines available on the UVic Library website.

## METHODOLOGY

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This subject is taught through lectures, case studies, problem-solving exercises, and practical case-based sessions. Students will also take part in seminars and/or group based activities.

## BIBLIOGRAPHY

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### Key references

- Fuentes i Arderiu, Xavier (1999). *Bioquímica Clínica*. eumo.
- Michael J Murphy (2024). *Bioquímica clínica : texto y atlas en color* (7 ed.). Elsevier.

## Human Reproduction

**Type:** Optional (OP)

**Credits:** 6.0

| Group                                | Language of instruction | Teachers          |
|--------------------------------------|-------------------------|-------------------|
| G11, classroom instruction, mornings | Catalan                 | Mireia Solé Canal |

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### OBJECTIVES

The objective of the subject is to offer students an integrated view of the biological, physiological and genetic processes related to human reproduction, both in normal and pathological conditions. The subject addresses gametogenesis, hormonal regulation, fertility and assisted reproduction techniques. The social, ethical and legal aspects linked to reproductive health are also covered.

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### LEARNING OUTCOMES

- LO1. Understand the basic aspects of the physiology of reproduction and sex hormones.
- LO2. Know the different assisted reproduction and fertilization techniques, as well as the legal and ethical aspects related to them.
- LO3. Acts with commitment and responsibility in common situations and those specific to the profession.
- LO4. Understands oral and written messages of different types in a complete manner expressed in Catalan, Spanish and English.
- RA5. Moves with ease in complex situations or those that require the development of new solutions.
- LO6. Acquires and demonstrates advanced knowledge of theoretical and practical aspects and work methodology in the field of biomedicine.

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### COMPETENCIES

#### General skills

- Formulate hypotheses following the scientific method, with an ability to summarize and analyze information in a critical way in order to be able to solve problems.

#### Specific skills

- Combine knowledge of the molecular, cellular, genetic and epigenetic principles of the most prevalent diseases.
- Evaluate technological advances for the diagnosis, prognosis and treatment of disease.
- Make integrated assessments of the functioning of organs and apparatus, and their role in homeostasis.
- Promote, respect and apply the principles of bioethics in professional activity.

#### Basic skills

- Students can apply their knowledge to their work or vocation in a professional manner and have competencies typically demonstrated through drafting and defending arguments and solving problems in their field of study.
- Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.

#### Core skills

- Interact in international contexts to transfer knowledge to current and emerging fields of professional development and research.
- Make use of professional skills in multidisciplinary, complex, networked environments, whether on-site or online.
- Reflect critically on knowledge of all kinds, with a commitment to professional rigor and quality.
- Take control of one's learning process with a view to personal and professional growth and an all-round education.

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### CONTENT

The following topics are developed:

1. Review of cell biology, genetics, and physiology concepts related to human reproduction: cell division, human genetics, and endocrine and central nervous system aspects
2. Gametogenesis, oogenesis, spermatogenesis and hormonal regulation of gametogenesis
3. Pregnancy, menstrual cycle and conception
4. Control and pathology of reproduction, and contraception
5. Fertility and sterility, seminogram and sperm selection techniques, sperm and egg banking and related ethical aspects, folliculogenesis and controlled ovarian stimulation, drugs, endometrial receptivity, ovarian reserve and ovarian aging, ovarian rejuvenation and treatments
6. Assisted reproduction protocols
7. Related social and ethical aspects

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### EVALUATION

**Exams:** 50%

- Partial exam 1: 25%; minimum grade of 4/10
- Partial exam 2: 25%; minimum grade of 4/10

**Important:** To be able to average with the rest of the activities, you must obtain an average of 5 between the two exam tests.

**Evaluable monitoring activities:** 30%; non-recoverable

**Participation in seminars and/or debates:** 10%; non-recoverable

**Seminar/teamwork on problems related to human reproduction:** 10%; non-recoverable

**Important**

Plagiarism or copying someone else's work is penalized in all universities and, according to the [UVic-UCC coexistence rules](#), constitute serious or very serious faults. Therefore, during the course of this subject, plagiarism or the improper appropriation of texts or ideas from other people (see [What is considered plagiarism?](#)) and the improper or undeclared use of artificial intelligence in an activity automatically result in a suspension or other disciplinary measures.

To cite texts and materials appropriately, you must consult the academic citation guidelines and guidelines available on the UVic Library website.

**METHODOLOGY**

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This subject is taught through lectures, case studies, problems or practical cases. Seminars and group work are also held.

**BIBLIOGRAPHY**

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**Key references**

- Jones, Richard E. (2006). *Human reproductive biology*. Retrieved from <https://www-sciencedirect-com.biblioremot.uvic.cat/book/9780120884650/human-reproductive-biology>

**Further reading**

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

## Nutritional Biochemistry

**Type:** Optional (OP)

**Credits:** 6.0

| Group                                | Language of instruction | Teachers |
|--------------------------------------|-------------------------|----------|
| G11, classroom instruction, mornings | Catalan                 |          |

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### OBJECTIVES

This course introduces the biochemical foundations of nutrition and analyzes the relationship between nutrients (with special emphasis on micronutrients), genes, and health. It covers concepts such as nutrigenetics, nutriepigenetics, and the role of the microbiome in metabolism. It also studies the molecular basis of deficiencies and toxicities, and nutrition as a preventive tool in health.

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### LEARNING OUTCOMES

- LO1. Uses resources to communicate to the general public innovations related to biomedicine and the risks they have associated with them.
- LO2. Identify the nutritional and feeding needs of the different stages of the life cycle.
- LO3. Relate the main manifestations of disease and nutrition.
- LO4. Assumes different responsibilities in individual and collaborative work and evaluates the results obtained.
- LO5. Understands oral and written messages of different types in a complete manner expressed in Catalan, Spanish and English.
- LO6. Acquires and demonstrates advanced knowledge of theoretical and practical aspects and work methodology in the field of biomedicine.

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### COMPETENCIES

#### General skills

- Formulate hypotheses following the scientific method, with an ability to summarize and analyze information in a critical way in order to be able to solve problems.

#### Specific skills

- Evaluate technological advances for the diagnosis, prognosis and treatment of disease.
- Identify the mechanisms of action of infectious agents, drugs and toxins, and their effects on the body.
- Make integrated assessments of the functioning of organs and apparatus, and their role in homeostasis.
- Promote, respect and apply the principles of bioethics in professional activity.

#### Basic skills

- Students can apply their knowledge to their work or vocation in a professional manner and have competencies typically demonstrated through drafting and defending arguments and solving problems in their field of study.
- Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.

#### Core skills

- Interact in international contexts to transfer knowledge to current and emerging fields of professional development and research.
- Make use of professional skills in multidisciplinary, complex, networked environments, whether on-site or online.
- Reflect critically on knowledge of all kinds, with a commitment to professional rigor and quality.
- Take control of one's learning process with a view to personal and professional growth and an all-round education.

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### CONTENT

The contents of the subject deal with the concept of the biochemistry of nutrition. Specifically:

1. Principles of nutritional biochemistry. Biochemistry of vitamins and minerals
2. Nutrigenetics and nutrigenomics. Nutrition-gene interaction
3. Nutriepigenetics. Nutrition-epigenetic interaction
4. Impact of the microbiome on nutrient metabolism in health and disease
5. Molecular basis of nutrient deficiencies and toxicities
6. Integrating nutrition into disease prevention

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### EVALUATION

**Exams:** 50%

- Partial exam 1: 25%; minimum grade of 4/10

— Partial exam 2: 25%; minimum grade of 4/10

**Important:** You must obtain an average of 5 between the two exam tests to be able to average with the rest of the activities.

**Evaluable monitoring activities:** 30%; non-recoverable. Case presentation and resolutions

**Teamwork on problems related to the biochemistry of nutrition:** 20%; non-recoverable

### Important

Plagiarism or copying someone else's work is penalized in all universities and, according to the [UVic-UCC coexistence rules](#), constitute serious or very serious faults. Therefore, during the course of this subject, plagiarism or the improper appropriation of texts or ideas from other people (see [What is considered plagiarism?](#)) and the improper or undeclared use of artificial intelligence in an activity automatically result in a suspension or other disciplinary measures.

To cite texts and materials appropriately, you must consult the academic citation guidelines and guidelines available on the UVic Library website.

## METHODOLOGY

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This subject is taught through lectures, case studies, problems or practical cases. Seminars and/or group work are also held.

## BIBLIOGRAPHY

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### Key references

- Baynes, John W (2024). *Bioquímica médica*. Retrieved from <https://www-clinicalkey-com.biblioremot.uvic.cat/student/content/toc/3-s2.0-C20230005672>
- Blanco Gaitán, M D (2017). *Fundamentos de bioquímica metabólica*. Retrieved from [https://elibro.net/ca/lc/bibliouvic/titulos/51989?fs\\_q=bioqu%C3%ADmica\\_del\\_metabolismo&prev=fs](https://elibro.net/ca/lc/bibliouvic/titulos/51989?fs_q=bioqu%C3%ADmica_del_metabolismo&prev=fs)
- Salas-Salvadó, Jordi (2025). *Nutrición y dietética clínica*. Retrieved from <https://www-clinicalkey-com.biblioremot.uvic.cat/student/content/toc/3-s2.0-C20230523717>

## Optional External Practicum

**Type:** Optional (OP)

**Credits:** 6.0

### COORDINATION

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— Anna Maria Dalmau Roda

### OBJECTIVES

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Optional External Internships (PCII) is a subject designed primarily to improve the application of knowledge to professional practice. It allows for a longer internship or to delve deeper into other topics by changing external entities with respect to the mandatory internships.

The Elective External Internship (PCII) subject has the following objectives:

- Learn more about the organizational structure of a company or entity.
- Assume the tasks of a biomedical engineer.
- Apply knowledge to professional practice.
- Deepen and relate scientific and technological concepts from various subjects of the degree.
- Participate and reflect on situations typical of a professional activity.

### LEARNING OUTCOMES

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- LO1. Apply management and quality improvement tools.
- LO2. Defines own learning objectives and designs development processes that are coherent and realistic with these objectives and with the time available.
- LO3. Uses routine laboratory instruments to carry out practical work correctly.
- LO4. Acts with commitment and responsibility in common situations and those specific to the profession.
- LO5. Assumes different responsibilities in individual collaborative work and evaluates the results obtained.
- LO6. Moves with ease in virtual interaction contexts through the use of ICT.
- LO7. Moves with ease in the general use of ICT and, especially, in technological environments specific to the professional field.
- LO8. Understands oral and written messages of different types in a complete form expressed in Catalan, Spanish and English.
- RA9. Moves with ease in complex situations or those that require the development of new solutions.
- LO10. Acquires and demonstrates advanced knowledge of theoretical and practical aspects and work methodology in the field of biomedicine.

### COMPETENCIES

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#### General skills

- Formulate hypotheses following the scientific method, with an ability to summarize and analyze information in a critical way in order to be able to solve problems.

#### Specific skills

- Promote, respect and apply the principles of bioethics in professional activity.

#### Basic skills

- Students can apply their knowledge to their work or vocation in a professional manner and have competencies typically demonstrated through drafting and defending arguments and solving problems in their field of study.
- Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.

#### Core skills

- Interact in international contexts to transfer knowledge to current and emerging fields of professional development and research.
- Make use of professional skills in multidisciplinary, complex, networked environments, whether on-site or online.
- Reflect critically on knowledge of all kinds, with a commitment to professional rigor and quality.
- Take control of one's learning process with a view to personal and professional growth and an all-round education.

### CONTENT

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- Organizational aspects of a company or external entity
- Functions of a biomedical engineer and their professional environment
- Methodologies for working in teams of interdisciplinary professionals
- Research methodologies, data analysis and report writing
- Processes developed in the company or external entity
- Communication with professionals from the same or different discipline

### EVALUATION

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The Annex to the agreement specifies the tutors associated with the student in this internship subject, both from the company or external entity and from the University.

The external entity tutor is the person designated by the company who maintains constant contact with the student and accompanies him/her throughout the internship period. The external entity tutor must complete the evaluation form provided by the UVic-UCC academic tutor, which evaluates:

- General aspects of student activity
- Achievement of learning outcomes associated with competencies
- Development of tasks entrusted to the external entity
- Overall assessment of the student's activity during the internship
- Strong points to highlight and aspects to improve
- The academic tutor at UVic-UCC ensures compliance with the internship program, monitors it and requests an assessment of the internships carried out by the student from the company or external entity. In addition, he or she is the person responsible for correcting and evaluating the report.

The academic tutor at UVic-UCC gives the final grade for the internships taking into account the following items:

- External tutor rating: 60%
- Practical report: 20%
- Academic tutor's assessment: 20%

They are reasons for "failure" of curricular practices:

- Failure to comply with the hours corresponding to the internship at the company or external entity
- Failure to submit the internship report within the deadlines and with the established requirements
- Failure to complete the tasks assigned to the student (within the framework of the internship) at the company or external entity
- Lack of discipline, breach of the code of ethics or breach of confidentiality

## **METHODOLOGY**

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### **Registration for the optional internship subject**

In the year you wish to do an internship, you must register for it together with the other subjects of the course on the July registration date.

Once the internship coordinator knows which students want to do an internship that year, mandatory orientation and training sessions are planned to help the student develop the *curriculum vitae*, cover letters and learning how to conduct an interview.

The internship coordination and the Professional Careers Service (SCP) accompany the student in their search for an internship.

### **Application for internship agreement**

When the student has already contacted an external company or entity and they have accepted him, he must fill out the "Internship Agreement Application" form, which is located in the center classroom, in the internship section.

If the student responds to a call made by the SCP, they must send a copy of their ID and CV by email to [scp.practiques.fcte@uvic.cat](mailto:scp.practiques.fcte@uvic.cat) so that the SCP sends it to the external entity in question and the interview can take place.

It is important to note that there are specific deadlines for requesting the annex to the agreement for each internship period that are specified in the center's classroom.

### **Signing of the annex to the agreement**

Once the agreement request form has been completed, the Careers Service prepares the annex to the agreement for the student in question. The agreement between the company or entity and UVic-UCC must already be signed (if not, it is signed at that time).

This annex to the agreement is sent to the company or entity and to the student and the UVic tutor for signature. This way, all parties involved have all the information associated with this internship position (the UVic-UCC tutor, the external entity tutor, the internship period, etc.).

### **Carrying out the internships**

It is essential that the agreement and annex have been signed before starting the internship, in order to have valid insurance coverage (compulsory school insurance, accident insurance and civil liability insurance).

When starting the internship, the student must contact the UVic-UCC tutor to establish how the follow-up will be done, to find out how it will be evaluated and what the report should be like.

You cannot be at the company after the final date stated in the annex to the agreement.

### **Delivery of the report**

Once the internship period has ended, a report on the internship must be submitted to the corresponding space in the internship room within a maximum period of 10 days after it has ended. For internships that end at the end of January, at the beginning of June or at the end of August, the report must be prepared during the internship and must be submitted no later than the day the

internship ends. This way, the internship can be evaluated before the closing of the proceedings.

It is important to remember that each internship subject has an associated report, even if the subjects are taken consecutively and at the same company or external entity. Each report must be uploaded to the Moodle classroom of the corresponding internship subject.

### **Evaluation**

Based on the monitoring of the student, the internship report received and the report made by the external tutor, the UVic tutor evaluates the internship.

### **Others**

The agreement is the document that regulates the collaboration between the company or entity and the University. The annex to the agreement is the specific document for a particular student in which all the details of the internship are specified (student details, tutors, period, tasks, skills, etc.).

It should be noted that carrying out an internship in an external company or entity does not entail any employment relationship (Royal Decree 1791/2010, of December 30).

No annex may be submitted after September 14, the official end date of the academic year. Furthermore, to facilitate the evaluation of internships, it is recommended that agreements be made only until August 15.

If either party, student or external entity, wishes to end the internship before the established deadline, they must notify the UVic-UCC tutor and complete the termination form in the annex.

### **Extracurricular internships (PEC)**

Students wishing to undertake extracurricular internships must contact the external organization where they intend to do their placement and complete the "Internship Agreement Request Form" with all the required information. This form is available in the Virtual Classroom. Once submitted, Career Services will prepare the necessary documentation to sign the agreement between the University and the company or external entity, and to assign a tutor to the student. From this point forward, the procedure is identical to that of curricular internships.

On UAcadèmic (accessible from the main page of the UVic Virtual Campus) you can consult the PEC offers that the University has for this degree.

The evaluation of extracurricular internships (PEC) follows the same procedure as curricular internships (PC): the UVic-UCC tutor carries out the assessment based on the student's monitoring, the internship report, and the report provided by the external supervisor. Given that these are not curricular internships, the final grade can only be "Pass" or "Fail."

## Proteomics

**Type:** Optional (OP)

**Credits:** 6.0

| Group                                | Language of instruction | Teachers                                      |
|--------------------------------------|-------------------------|---|
| G11, classroom instruction, mornings | Catalan                 | Francesc Canals Surís<br>Josep Roma Castanyer |

### OBJECTIVES

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The study of proteins, their function, and the interactions that are established between them and the rest of the biological components are at the heart of the functioning of cells and organisms. Modernly, the whole is considered as a system called proteome. Advances in the understanding of these phenomena have given rise to a new discipline, proteomics. It is, therefore, a discipline with a systemic approach for the understanding of which two basic elements are proposed:

1. Knowledge of the techniques directly involved in obtaining information about the proteome
2. The analysis of the most relevant applications in this field

### LEARNING OUTCOMES

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- LO1. Apply management and quality improvement tools.
- LO2. Know the proteomic analysis techniques.
- LO3. Defines own learning objectives and designs development processes that are coherent and realistic with these objectives and with the time available.
- LO4. Acts with commitment and responsibility in common situations and those specific to the profession.
- LO5. Assumes different responsibilities in individual and collaborative work and evaluates the results obtained.
- LO6. Moves with ease in the general use of ICT and, especially, in technological environments specific to the professional field.
- LO7. Understands oral and written messages of different types in a complete manner expressed in Catalan, Spanish and English.
- RA8. Moves with ease in complex situations or those that require the development of new solutions.

### COMPETENCIES

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#### General skills

- Formulate hypotheses following the scientific method, with an ability to summarize and analyze information in a critical way in order to be able to solve problems.

#### Specific skills

- Combine knowledge of the molecular, cellular, genetic and epigenetic principles of the most prevalent diseases.
- Evaluate technological advances for the diagnosis, prognosis and treatment of disease.
- Promote, respect and apply the principles of bioethics in professional activity.

#### Basic skills

- Students can apply their knowledge to their work or vocation in a professional manner and have competencies typically demonstrated through drafting and defending arguments and solving problems in their field of study.
- Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.

#### Core skills

- Interact in international contexts to transfer knowledge to current and emerging fields of professional development and research.
- Make use of professional skills in multidisciplinary, complex, networked environments, whether on-site or online.
- Reflect critically on knowledge of all kinds, with a commitment to professional rigor and quality.
- Take control of one's learning process with a view to personal and professional growth and an all-round education.

### CONTENT

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#### 1. Proteomic analysis techniques

- 1.1. **Introduction to proteomics.** Basic concepts and techniques
- 1.2. **Mass spectrometry**
  - MALDI and ESI ionization
  - Types of analyzers, instruments and basic concepts of EM
  - MS-MS tandem mass spectrometry
  - Identification and characterization of proteins by MS
  - Protein identification by peptide fingerprinting method
  - Protein identification from MSMS spectra

- De Novo Sequencing. Database Search Engines
- Characterization of post-translational modifications
- 1.3. **Proteomic analysis by two-dimensional electrophoresis**
  - Two-dimensional protein electrophoresis
  - SAY.
- 1.4. **Proteomic analysis by liquid chromatography coupled to MS**
  - Nano-LC-EM coupling
  - Label-free quantitative proteomics
  - Quantitative proteomics based on isotopic labeling. SILAC and iTRAQ
  - Targeted quantitative analysis. SRM
- 1.5. **Clinical proteomics**
  - Biomarker search and validation
  - Identification of microorganisms by MALDI-TOF MS
  - MALDI imaging
- 1.6. **Antibody-based proteomic analysis techniques**
  - Arrays of proteins. Arrays analytical, functional and reverse phase. Arrays of spheres
  - Arrays based on other affinity reagents
- 1.7. **Other proteomic analysis strategies**
  - Top-down proteomics
  - Single-cell proteomics
- 2. **Applications of proteomics**
  - 2.1. Differential gene expression. Introduction to cancer and techniques for studying differential gene expression. Applications of 2D-DIGE and *isotope coded affinity tags* Examples in publications
  - 2.2. Study of protein interactions
    - In vitro methods: co-immunoprecipitation, *cross-linking*, *far western*, *transfer label*, *arrays of proteins* and *pull-down* Examples in recent publications
    - In vivo methods: *tandem affinity purification* (TAP), *yeast double hybrid* (*yeast two-hybrid*), *double reverse hybrid*, *yeast tribrid*, *mammalian two-hybrid*, *phage display*, *arrays of protein*. Examples in publications
  - 2.3. Study of post-translational modifications
    - Review of the main post-translational modifications
    - Proteomic methods for the analysis of post-translational modifications
    - Phosphorylation: mapping of phosphorylations using mass spectrometry, enrichment strategies for phosphorylated peptides, specific phosphoprotein staining and DIGE. Examples in publications
  - 2.4. Oral presentations by students: oral presentations of recent articles are given in groups of about 3 people, lasting about 20 minutes per group.

## Internships

Bioinformatics analysis practices are carried out using real examples of chromatography coupled to mass spectrometry data. Data from three different types of differential quantitative proteomic analysis experiments are analyzed: without isotopic labeling, with SILAC metabolic labeling and with TMT isobaric labeling. In each case, raw data processing, protein identification, relative quantification and differential statistical analysis are carried out.

## EVALUATION

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The evaluation of this subject is based on the following items:

1. Monitoring of the work carried out: 20% of the final grade; non-recoverable
  - Exercises carried out throughout the course
2. Specific evaluation tests
  - Theoretical exam: 35% of the final grade; retaken. There are 2 exams during the course. Both can be retaken in the January exam.
  - Application examination: 15% of the final mark; recoverable
3. Carrying out required work or projects
  - Practicals: 20% of the final grade; non-returnable
  - Seminars: 10% of the final mark; non recoverable

In the theory and applications exam, you must obtain a grade equal to or greater than 4.0 to be able to count the final grade with the rest of the grades.

The total weight of the assessment activities represents 100% of the final grade for the subject.

### General evaluation criteria

The use of mobile or similar devices (phones, tablets, etc.) during the retrievable tests will result in a zero on the test.

Failure to attend any of the assessment activities or to submit them within the established deadlines will result in a grade of zero for that activity. This grade is taken into account when calculating the final grade for the subject.

The final grade for the subject is obtained by adding the arithmetic averages of the different activities.

The student has the option of retaking failed make-up tests. Make-up tests are held during the last weeks of the semester, designated for this purpose, and no more than 50% of the subject can be retaken.

If you refuse to take the retake test, the grade achieved in the first instance will be maintained.

In non-recoverable activities, no minimum grades are required to calculate the final grade for the subject.

The subject is only graded as "Not presented" if no assessable test has been taken or a grade has been obtained in any of the subject's activities.

## **METHODOLOGY**

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This subject includes theoretical sessions and discussions of scientific articles in the classroom. On the other hand, there is a set of guided practical sessions of bioinformatics work in which all tasks are done individually.

In the area of personal work, the student must follow the theoretical aspects of the subject and complete the practicals.

Attendance at practical sessions is mandatory.

## **BIBLIOGRAPHY**

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### **Key references**

- (2014). *Manual de proteómica*. Retrieved from [http://www.seprot.es/wp-content/uploads/2016/05/Indice\\_manual\\_prot.pdf](http://www.seprot.es/wp-content/uploads/2016/05/Indice_manual_prot.pdf) (<https://payhip.com/b/FNt7>)
- (2014). *Manual de proteómica*. Ejemplar de edición gratuita - 23 pares Ilustraciones Científicas S.L.
- Broad Institute (2025). *Tutorials and workshops*. Retrieved from <https://www.broadinstitute.org/proteomics/tutorials-and-workshops>
- Thermofisher (2025). *Overview of Mass Spectrometry for Protein Analysis*. Retrieved from <https://www.thermofisher.com/es/es/home/life-science/protein-biology/protein-biology-learning-center/protein-biology-resource-library/pierce-protein-methods/overview-mass-spectrometry.html>

### **Further reading**

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.