# Information about the course

**Degree:** Bachelor of Science Degree in Medicine

**Faculty:** Faculty of Medicine and Health Sciences

**Code:** 341104 **Name:** Cell Biology

**Credits**: 6,00 ECTS **Year:** 1 **Semester:** 1

**Module:** Morphology, structure and function of the human body

**Subject Matter:** Biología **Type:** Formación Básica

**Branch of knowledge:** Ciencias de la Salud

**Department:** Pathology

**Type of learning:** Classroom-based learning

**Language/-s in which it is given:** Spanish

**Teachers:**

| | | |
|---|---|---|
| 341A | Jose Antonio Lopez Guerrero **(Profesor responsable)** | ja.lopez@ucv.es |
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## Module organization

### Morphology, structure and function of the human body

| Subject Matter | ECTS | Subject | ECTS | Year/semester |
|---|---|---|---|---|
| Anatomía | 27 | Anatomy II | 9 | 2/1 |
| | | Anatomy III | 6 | 2/2 |
| | | Embryology and Anatomy I | 12 | 1/2 |
| Biología | 6 | Cell Biology | 6 | 1/1 |
| Bioquímica | 9 | Biochemistry and Molecular Biology | 9 | 1/2 |
| Física | 6 | Biophysics | 6 | 1/2 |
| Fisología | 12 | Human Physiology I | 6 | 2/1 |
| | | Human Physiology II | 6 | 2/2 |
| Morfología y estructura microscópica del cuerpo humano | 6 | Histology | 6 | 2/1 |

## Recommended knowledge

Cellular Biology covers knowledge of the structure and functions of the cell as the smallest living unit, both in unicellular and multicellular organisms.
The aim of this subject is to:
·Understand the biological bases of life and its evolution.
·Recognise cellular structure, metabolism and function.
·Delve into cell signalling and the cell cycle in both normal and pathological situations.
·Train students to analyse microscopic structures of cells and tissues.
The aim is to convey not only the facts, but also the excitement and challenges of research in contemporary Cellular Biology.

## Learning outcomes

Al finalizar la asignatura, el estudiante deberá demostrar haber adquirido los siguientes resultados de aprendizaje:

### R1 - Recognize different levels of organization of living beings.

Learning outcomes of the specified title

**Type of AR:** Description

- Handling basic laboratory materials and techniques. Interpreting a normal analysis

**Type of AR:** Description

- Knowing the basic principles of human nutrition. Cellular communication. Excitable membranes. Cell cycle. Cell differentiation and proliferation. Gene information, expression and regulation. Inheritance. Embryonic development and organogenesis

- Knowing the structure and cellular function. Biomolecules. Metabolism. Metabolic regulation and integration

**Type of AR:** Description

- Performing functional tests, determine vital parameters, and interpret them. Basic physical examination

- Students can pass on information, ideas, problems and solutions to both a specialized and non-specialized audience

- Students have demonstrated to possess and understand knowledge in a study area that starts from the base of the general secondary education, and is usually found at a level that, while supported by advanced textbooks, also includes some aspects that involve knowledge from the forefront of their field of study

- Students have developed the learning skills needed to undertake further studies with a high degree of autonomy

- Students have the ability to collect and interpret relevant data (usually within their area of study) to make judgments that include a reflection on relevant social, scientific or ethical topics

- Students know how to apply their knowledge to their job or vocation in a professional way and possess the competences that are usually demonstrated through the elaboration and defense of arguments and the resolution of problems within their area of study

## R2 - Identify cellular structures and organelles.

Learning outcomes of the specified title

**Type of AR:** Description

- Handling basic laboratory materials and techniques. Interpreting a normal analysis

**Type of AR:** Description

- Knowing the basic principles of human nutrition. Cellular communication. Excitable membranes. Cell cycle. Cell differentiation and proliferation. Gene information, expression and regulation. Inheritance. Embryonic development and organogenesis

- Knowing the structure and cellular function. Biomolecules. Metabolism. Metabolic regulation and integration

**Type of AR:** Description

- Performing functional tests, determine vital parameters, and interpret them. Basic physical examination

- Students can pass on information, ideas, problems and solutions to both a specialized and non-specialized audience

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## R3 - Be able to produce documents on cell biology and work as a team.

Learning outcomes of the specified title

**Type of AR:** Description

- Handling basic laboratory materials and techniques. Interpreting a normal analysis

**Type of AR:** Description

- Knowing the basic principles of human nutrition. Cellular communication. Excitable membranes. Cell cycle. Cell differentiation and proliferation. Gene information, expression and regulation. Inheritance. Embryonic development and organogenesis

- Knowing the structure and cellular function. Biomolecules. Metabolism. Metabolic regulation and integration

**Type of AR:** Description

- Students can pass on information, ideas, problems and solutions to both a specialized and non-specialized audience

- Students have demonstrated to possess and understand knowledge in a study area that starts from the base of the general secondary education, and is usually found at a level that, while supported by advanced textbooks, also includes some aspects that involve knowledge from the forefront of their field of study

- Students have developed the learning skills needed to undertake further studies with a high degree of autonomy

- Students have the ability to collect and interpret relevant data (usually within their area of study) to make judgments that include a reflection on relevant social, scientific or ethical topics

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## R4 - Distinguish between normal and pathological cellular processes.

Learning outcomes of the specified title

**Type of AR:** Description

- Handling basic laboratory materials and techniques. Interpreting a normal analysis

**Type of AR:** Description

- Knowing the basic principles of human nutrition. Cellular communication. Excitable membranes. Cell cycle. Cell differentiation and proliferation. Gene information, expression and regulation. Inheritance. Embryonic development and organogenesis

- Knowing the structure and cellular function. Biomolecules. Metabolism. Metabolic regulation and integration

**Type of AR:** Description

- Students have developed the learning skills needed to undertake further studies with a high degree of autonomy

- Students have the ability to collect and interpret relevant data (usually within their area of study) to make judgments that include a reflection on relevant social, scientific or ethical topics

- Students know how to apply their knowledge to their job or vocation in a professional way and possess the competences that are usually demonstrated through the elaboration and defense of arguments and the resolution of problems within their area of study

## R5 - Handle of the basic laboratory material and techniques.

Learning outcomes of the specified title

**Type of AR:** Description

- Handling basic laboratory materials and techniques. Interpreting a normal analysis

**Type of AR:** Description

- Knowing the structure and cellular function. Biomolecules. Metabolism. Metabolic regulation and integration

**Type of AR:** Description

- Performing functional tests, determine vital parameters, and interpret them. Basic physical examination

- Students have the ability to collect and interpret relevant data (usually within their area of study) to make judgments that include a reflection on relevant social, scientific or ethical topics

- Students know how to apply their knowledge to their job or vocation in a professional way and possess the competences that are usually demonstrated through the elaboration and defense of arguments and the resolution of problems within their area of study

## R6 - Handle the optical microscope and recognize with the same different cell types and their basic structural components.

Learning outcomes of the specified title

**Type of AR:** Description

- Handling basic laboratory materials and techniques. Interpreting a normal analysis

**Type of AR:** Description

- Knowing the structure and cellular function. Biomolecules. Metabolism. Metabolic regulation and integration

**Type of AR:** Description

- Performing functional tests, determine vital parameters, and interpret them. Basic physical examination

- Students have the ability to collect and interpret relevant data (usually within their area of study) to make judgments that include a reflection on relevant social, scientific or ethical topics

- Students know how to apply their knowledge to their job or vocation in a professional way and possess the competences that are usually demonstrated through the elaboration and defense of arguments and the resolution of problems within their area of study

## R7 - Recognize and interpret with the optical microscope the different phases of mitosis in rapidly renewing cells and tissues.

Learning outcomes of the specified title

**Type of AR:** Description

- Handling basic laboratory materials and techniques. Interpreting a normal analysis

**Type of AR:** Description

- Knowing the structure and cellular function. Biomolecules. Metabolism. Metabolic regulation and integration

**Type of AR:** Description

- Performing functional tests, determine vital parameters, and interpret them. Basic physical examination

- Students have the ability to collect and interpret relevant data (usually within their area of study) to make judgments that include a reflection on relevant social, scientific or ethical topics

- Students know how to apply their knowledge to their job or vocation in a professional way and possess the competences that are usually demonstrated through the elaboration and defense of arguments and the resolution of problems within their area of study

## R8 - Recognize and interpret at the ultrastructural level the cell membrane, organelles and cytoskeleton components.

Learning outcomes of the specified title

**Type of AR:** Description

- Handling basic laboratory materials and techniques. Interpreting a normal analysis

**Type of AR:** Description

- Knowing the structure and cellular function. Biomolecules. Metabolism. Metabolic regulation and integration

**Type of AR:** Description

- Performing functional tests, determine vital parameters, and interpret them. Basic physical examination

- Students have the ability to collect and interpret relevant data (usually within their area of study) to make judgments that include a reflection on relevant social, scientific or ethical topics

- Students know how to apply their knowledge to their job or vocation in a professional way and possess the competences that are usually demonstrated through the elaboration and defense of arguments and the resolution of problems within their area of study

## Assessment system

**Modalidad presencial**

| Assessed learning outcomes | Granted percentage | Assessment tool |
|---|---|---|
| R1, R2, R3, R4, R8 | 70,00% | Tests |
| R1, R2, R3, R5, R6, R7 | 30,00% | Practices |
| R3 | 0,00% | Participation in class |

**Observations**

**Notes on the assessment system:**The maximum grade for the course will be 10.0 points. To pass the course, a grade of at least 5.0 points must be achieved. The total points for the course will be counted by the sum of the points obtained in each of the assessment instruments mentioned above, provided that at least 50% is obtained in the final exam, which will be a multiple choice test and whose maximum grade is 4 points. The rest of the points will be obtained from: group work (3 points) and laboratory practices (3 points).
**Minimum requirements:**No subject in module 3 (Human Clinical Training) can be taken without having passed all the subjects in module 1 (Morphology, Structure and Function of the Human Body).
**Criteria for granting honours:**Honours may be awarded to the best students, who must have obtained a minimum grade of 9.If circumstances require it, a special test may be established to determine those students deserving of honours, taking into account the 5% limit of enrolled students.In second and subsequent calls, only the honours that may remain after the first call may be awarded.
**DEVELOPMENT of the subject in second and subsequent registrations:**There will be a specific group for students who are not in their first registration if it exceeds the classroom

occupancy limit and a teacher in charge of said group.The teacher in charge of this group will carry out 6 monitoring and tutoring sessions of 2 hours each. The skills to acquire the abilities and skills of the subject will be carried out through all the practices planned for the subject. In each session, the subject will be developed in such a way that the work on the skills that each student needs to be able to pass the subject will be reinforced.The evaluation of content and skills will be carried out in the exam set in the official calendar for this subject.

**CRITERIA FOR THE AWARD OF A MATRICULA DE HONOR:**According to article 22 of the Regulations Governing the Evaluation and Grading of Subjects at the UCV, the mention of "Matrícula de Honor" may be awarded by the professor responsible for the subject to students who have obtained the grade of "Outstanding". The number of mentions of "Matrícula de Honor" that may be awarded may not exceed five percent of the students included in the same official record , unless this is less than 20, in which case only one "Matrícula de Honor" may be awarded.

**MENTION OF DISTINCTION:**

In accordance with the regulations governing the assessment and grading of subjects in force at UCV, the distinction of "Matrícula de Honor" (Honours with Distinction) may be awarded to students who have achieved a grade of 9.0 or higher. The number of "Matrículas de Honor" (Honours with Distinction) may not exceed five percent of the students enrolled in the group for the corresponding academic year, unless the number of enrolled students is fewer than 20, in which case a single "Matrícula de Honor" (Honours with Distinction) may be awarded. Exceptionally, these distinctions may be assigned globally across different groups of the same subject. Nevertheless, the total number of distinctions awarded will be the same as if they were assigned by group, but they may be distributed among all students based on a common criterion, regardless of the group to which they belong. The criteria for awarding "Matrícula de Honor" (Honours with Distinction) will be determined according to the guidelines stipulated by the professor responsible for the course, as detailed in the "Observations" section of the evaluation system in the course guide.

## Actividades formativas

The methodologies to be used so that the students reach the expected learning outcomes will be the following:

| | |
|---|---|
| M1 | Masterclass |
| M4 | Content presentations by teacher |
| M5 | Knowledges and skills explanation |
| M6 | Laboratory practices |
| M9 | Knowledge acquirance through student interaction and activity |

M11 Personalised attention by professor

M12 Tests to understand the level of knowledge acquirance and skills

M13 Written work

M14 Online activity on e-learning

M15 Personal study

M16 Information research

M18 Work in team

**IN-CLASS TRAINING ACTIVITIES**

| ACTVITY | RELATIONSHIP WITH THE COURSE LEARNING OUTCOMES | METHODOLOGY | HOURS | ECTS |
|---|---|---|---|---|
| Theory class | R1, R2, R4, R8 | Masterclass<br>Content presentations by teacher<br>Knowledges and skills explanation | 36,00 | 1,44 |
| Seminar and group practices | R3, R4, R5 | Knowledges and skills explanation<br>Knowledge acquirance through student interaction and activity<br>Written work<br>Personal study<br>Information research<br>Work in team | 9,00 | 0,36 |

| | | | | |
|---|---|---|---|---|
| Practices in small groups | R1, R2, R3, R5, R6, R7, R8 | Content presentations by teacher<br>Knowledges and skills explanation<br>Laboratory practices<br>Knowledge acquirance through student interaction and activity<br>Personalised attention by professor<br>Written work<br>Information research | 4,50 | 0,18 |
| Tutoring | R1, R2, R5, R6, R8 | Personalised attention by professor<br>Personal study<br>Information research<br>Work in team | 1,50 | 0,06 |
| Evaluation | R1, R2, R3, R4, R5, R6, R7, R8 | Laboratory practices<br>Knowledge acquirance through student interaction and activity<br>Tests to understand the level of knowledge acquirance and skills<br>Written work<br>Information research<br>Work in team | 1,50 | 0,06 |
| **TOTAL** | | | **52,50** | **2,10** |

## TRAINING ACTIVITIES OF AUTONOMOUS WORK

| ACTVITY | RELATIONSHIP WITH THE COURSE LEARNING OUTCOMES | METHODOLOGY | HOURS | ECTS |
|---|---|---|---|---|
| No attendance | R1, R2, R3, R4, R6, R7, R8 | Knowledge acquirance through student interaction and activity<br>Written work<br>Online activity on e-learning<br>Personal study<br>Information research<br>Work in team | 97,50 | 3,90 |
| **TOTAL** | | | **97,50** | **3,90** |

## Description of contents

Descripción de contenidos necesarios para la adquisición de los resultados de aprendizaje.

### Theoretical content:

| Block of content | Contents |
|---|---|
| Block I. INTRODUCTION | **Teaching Unit 1. Overview of the cell and cell research.**<br>1.Origin and evolution of cells.<br>2.Cells as experimental models.<br>3.Instruments of Cell Biology.<br>4.Units of measurement and dimensions of cells and their components.<br><br>**Teaching Unit 2. Composition of cells.**<br>1.Cell molecules. Cell membranes.<br>2.Proteomics: large-scale analysis of cellular proteins.<br><br>**Teaching Unit 3. Cell metabolism.**<br>1.Central role of enzymes as biological catalysts.<br>2.Metabolic energy. Biosynthesis of cellular components. |

| | |
|---|---|
| Block II. STRUCTURE AND FUNCTION OF CELLS | **Teaching Unit 4. Nucleus.**<br>1.Nuclear envelope and traffic between the nucleus and the cytoplasm.<br>2.Internal organization of the nucleus. Nucleolus. Processing of rRNA.<br>**Teaching Unit 5. Distribution and transport of proteins: endoplasmic reticulum, Golgi apparatus and lysosomes.**<br>1.Endoplasmic reticulum.<br>2.Golgi apparatus.<br>3.Mechanism of vesicle transport.<br>4.Lysosomes.<br>**Teaching Unit 6. Bioenergetics and metabolism: mitochondria and peroxisomes.**<br>1.Mitochondria.<br>2.Peroxisomes.<br>**Teaching Unit 7. Cytoskeleton and cell movement.**<br>1.Structure and organization of actin filaments.<br>2.Actin, myosin and cell movement.<br>3.Intermediate filaments.<br>4.Microtubules.<br>5.Microtubular motors and movements.<br>**Teaching Unit 8. Plasma membrane.**<br>1.Structure of the plasma membrane.<br>2.Transport of small molecules.<br>3.Endocytosis.<br>**Teaching Unit 9. Cell walls, extracellular matrix and cell interactions.**<br>1.Cell walls.<br>2.The extracellular matrix and cell-matrix interactions.<br>3.Cell-cell interactions. |

| | |
|---|---|
| Block III. CEL REGULATION | **Teaching Unit 10. Cell signaling.**<br>1.Signaling molecules and their receptors.<br>2.Functions of cell surface receptors.<br>3.Intracellular signal transduction pathways.<br>**Teaching Unit 11. Cell cycle.**<br>1.Eukaryotic cell cycle.<br>2.Regulators of cell cycle progression.<br>3.M phase events.<br>4.Meiosis and fertilization.<br>**Teaching Unit 12. Cell death and renewal.**<br>1.Programmed cell death.<br>2.Stem cells and the maintenance of adult tissues.<br>3.Regenerative medicine: embryonic stem cells and therapeutic cloning.<br>**Teaching Unit 13. Cancer.**<br>1.Development and causes of cancer.<br>2.Tumor viruses.<br>3.Oncogenes.<br>4.Tumor suppressor genes. |
| LABORATORY. PRACTICES | **Practices 1 and 2.**<br>1.Structure and handling of the optical microscope.<br>2.Preparation and observation of cells and cellular processes (mitosis). |

## Temporary organization of learning:

| Block of content | Sessions | Hours |
|---|---|---|
| Block I. INTRODUCTION | 5 | 10,50 |
| Block II. STRUCTURE AND FUNCTION OF CELLS | 13 | 25,00 |
| Block III. CEL REGULATION | 6 | 11,00 |
| LABORATORY. PRACTICES | 3 | 6,00 |

## References

**FUNDAMENTAL REFERENCES**COOPER GM y HAUSMAN RE. “La célula”. 6ª Ed. Marbán 2014 (O ediciones anteriores). ISBN:9788471019479. Secciones utilizadas en la asignatura: I–Introducción (excepto el capítulo 4), III–Estructura y Función de las Células, IV–Regulación Celular. Animaciones, videos, e imágenes deeste libro (en inglés) en http://sites.sinauer.com/cooper6e/BRUCE ALBERTS, ALEXANDER JOHNSON, JULIAN LEWIS, DAVID MORGAN, MARTINRAFF, KEITH ROBERTS, PETER WALTER. Molecular Biology of the Cell, 6th edition, GarlandScience, November 2014 (O ediciones anteriores en ingles y castellano).ISBN:9780815344322; 9780815344643. Secciones IV y V. Texto completo en inglés mediantebúsquedas para la 4ª edición en: http://www.ncbi.nlm.nih.gov/books/NBK21054/COOPER GM y HAUSMAN RE. "La célula" 7ªEdición. Ed Marban (2017).ISBN:978-84-16042-63-0COOPER GM y HAUSMAN RE. "La célula" 8ªEdición. Ed Marban (2021).ISBN:978-84-18068-58-4

**COMPLEMENTARY REFERENCES**BECKER WM, KLEINSMITH LJ, HARDIN J. “El mundo de la célula”. 6ª Edición. EditorialPearson. 2007.Capítulos 1 a 17 y 24. BRUCE ALBERTS, DENNIS BRAY, KAREN HOPKIN, ALEXANDER JOHNSON, JULIANLEWIS, MARTIN RAFF, KEITH ROBERTS, PETER WALTER. Introducción a la Biología Celular.3º Edición. Editorial Médica Panamericana. 2010. Capítulos 1 a 4, 11 a 18 y 20.13