Information about the subject

Degree: Bachelor of Science Degree in Physiotherapy

Faculty: Faculty of Medicine and Health Sciences

Code: 241109 **Name:** Cellular and Molecular Biology

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

Module: MODULE 1: BASIC FORMATION

Subject Matter: Anatomy **Type:** Basic Formation

Field of knowledge: Health Science

Department: Pathology

Type of learning: Classroom-based learning

Languages in which it is taught: English, Spanish

Lecturer/-s:

241A	Elisa Josefa Oltra Garcia **(Responsible Lecturer)**	elisa.oltra@ucv.es
	Belen Estefania Proaño Olmos	be.proano@ucv.es
241Q	Elisa Josefa Oltra Garcia **(Responsible Lecturer)**	elisa.oltra@ucv.es
	Belen Estefania Proaño Olmos	be.proano@ucv.es

Module organization

MODULE 1: BASIC FORMATION

Subject Matter	ECTS	Subject	ECTS	Year/semester
Anatomy	18,00	Anatomy I	6,00	1/1
		Anatomy II	6,00	1/2
		Cellular and Molecular Biology	6,00	1/1
Physiology	18,00	Biomechanics and Applied Physics	6,00	2/1
		Physiology I	6,00	1/2
		Physiology II	6,00	2/1
Applied psychosocial sciences	12,00	Anthropology	6,00	1/2
		Psychology	6,00	1/2
Statistics	6,00	Biostatistics	6,00	1/1
Modern Language	6,00	English	6,00	1/1

Recommended knowledge

Prerequisits: students in the English group must count with a minimum knowledge of the English language equivalent to a B2 level. Basic knowledge of Biology is recommended.

Learning outcomes

At the end of the course, the student must be able to prove that he/she has acquired the following learning outcomes:

R1	Looks for bibliographical information from different sources and knows how to use it with a critical and constructive spirit.
R2	Analyses his work critically.
R3	Finds bibliographic information from different resources and know how to use it with a critical and constructive attitude.
R4	Critically analyses the work.
R5	Distinguishes the different levels of organization of living beings.
R6	Knows how to distinguish the different types of tissue.
R7	Identifies cellular structures and organelles.
R8	Knows how to use different working techniques in the laboratory.
R9	Interprets results obtained in the practices.
R10	The student can elaborate documents on cell biology and work in teams.
R11	Knows the types and functions of biomolecules and is able to transmit this knowledge.
R12	Identifies the metabolic pathways and knows how to integrate them by making outlines and solving questions.
R13	Knows how to use different work techniques in the laboratory following some laboratory protocols.
R14	Interprets the results obtained in the practices after the realization of techniques and solves problems related to the subject.
R15	The student can produce clinical biochemistry papers and work in teams.

Competencies

Depending on the learning outcomes, the competencies to which the subject contributes are (please score from 1 to 4, being 4 the highest score):

BASIC		Weighting			
		1	2	3	4
CB1	Students demonstrate knowledge and understanding in an area of study that is at the core of general secondary education, and is often at a level that, while supported by advanced textbooks, also includes some aspects that involve knowledge from the cutting edge of their field of study.				x
CB2	Students know how to apply their knowledge to their work or vocation in a professional way and possess the skills usually demonstrated by developing and defending arguments and solving problems within their area of study.			x	
CB3	Students have the ability to gather and interpret relevant data (usually within their area of study) to make judgments that include reflection on relevant social, scientific or ethical issues.			x	
CB4	Students can convey information, ideas, problems and solutions to both specialized and non-specialized audiences.			x	
CB5	Students develop those learning skills necessary to undertake further studies with a high degree of autonomy.		x		

SPECIFIC		Weighting			
		1	2	3	4
CE1	Students learn human anatomy and physiology, highlighting the dynamic relations between structure and function, especially of the locomotive system and the nervous and cardio-respiratory systems.		x		
CE3	Students identify the factors that influence human growth and development throughout life.		x		
CE7	Students know the application of ergonomic and anthropometric principles.	x			

CE11	Students identify the factors involved in teamwork and leadership situations.		x		
CE47	Students maintain an attitude of learning and improvement. This includes expressing interest and acting in a constant search for information and professional improvement, committing to contribute to professional development in order to improve practice competence and maintain the status that corresponds to a qualified and regulated profession.			x	
CE51	Show respect, appreciation and sensitivity to the work of others.			x	
CE52	Develop the ability to organize and lead work teams effectively and efficiently.		x		

TRANSVERSAL		Weighting			
		1	2	3	4
CT1	Decision-making		x		
CT2	Problem solving.		x		
CT3	Capacity for organization and planning.			x	
CT4	Analysis and synthesis capacity.			x	
CT5	Oral and written communication in the native language.			x	
CT6	Information management capacity.			x	
CT7	Computer skills related to the field of study.		x		
CT8	Knowledge of a foreign language.			x	
CT9	Ethical commitment.			x	
CT10	Teamwork.			x	
CT11	Interpersonal relationship skills.		x		
CT12	Work in an interdisciplinary team		x		

CT13	Critical Reasoning			x
CT17	Adaptation to new situations.		x	
CT18	Creativity		x	
CT19	Autonomous learning			x
CT20	Initiative and entrepreneurship		x	
CT21	Leadership.		x	
CT22	Knowledge of other cultures and customs	x		
CT23	Sensitivity to environmental issues.	x		

Assessment system for the acquisition of competencies and grading system

Assessed learning outcomes	Granted percentage	Assessment method
R1, R2, R3	20,00%	OPEN QUESTIONS: Written exam in which theoretical knowledge and the student's ability to relate, integrate and express it coherently in written language are evaluated. It allows the following generic or transversal skills to be assessed: 4 Capacity for analysis and synthesis. 3 Capacity for organisation and planning. 5 Oral and written communication in the native language. 8 Knowledge of a foreign language. 2 Problem-solving 19 Autonomous learning.
R1, R2, R3	30,00%	TEST TYPE: Multiple choice test with one correct answer out of five possible ones. It allows the student to know in greater detail the contents acquired by him/her. It allows the following generic or transversal competences to be assessed: 2 Problem solving 1 Decision making 13 Critical thinking
R1, R2, R3	25,00%	PRACTICES: Oral test in which the student is asked to solve practical exercises, clinical cases or problems about the knowledge of the different subjects. It assesses the following generic or transversal competences: 4 Analysis and synthesis capacity. 3 Capacity for organisation and planning. 7 IT Knowledge. 6 Information management skills. 2 Problem-solving 1 Decision-making. 13 Critical thinking. 19 Self-directed learning.

R1, R2, R3	20,00%	WORKS: The student, individually or in a group, elaborates a revision or research topic and presents it, in writing, for the evaluation by the teacher. The following generic or transversal competences are valued: 4 Capacity for analysis and synthesis. 3 Capacity for organisation and planning. 7 Computer skills. 6 Information management skills. 10 Teamwork. 14 Working in an international context. 11 Interpersonal skills. 13 Critical thinking. 19 Autonomous learning. 18 Creativity. 21 Leadership. 20 Initiative and entrepreneurship. 16 Motivation for Quality. 70 Maintaining an attitude of learning and improvement. 72 Knowing one's own skills and limitations.
R1, R2, R3	5,00%	ATTENDANCE AND PARTICIPATION IN CLASS: The teacher evaluates the participation, involvement and progression of the student's acquisition of knowledge and skills during the theoretical and practical classes. It will not exceed 5% of the final grade.

Observations

(1) The written test will be based on the contents received during the theoretical and practical classes of the subject.
(2) The practical contents will be evaluated through attendance at the practical sessions, delivery of a written report and oral presentations.
It is necessary to obtain at least a 5 out of 10 in all the evaluation items to pass the subject.
In case of not passing the exam, the final grade of the subject will be that of the exam itself.
Continuous evaluation: at the end of each thematic block (UNITS-see syllabus) an individual self-assessment test of contents (learning) will be taken. The test will consist of a multiple-choice questionnaire, or similar, to be carried out in the classroom. It will include instructions and response feedback. This evaluation will contribute to the final grade (20%) (WORKS).

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.

Learning activities

The following methodologies will be used so that the students can achieve the learning outcomes of the subject:

M1	Master class Problem solving Exposition of contents by the teacher. Explanation of knowledge and skills
M2	Case resolution: Analysis of sample realities - real or simulated - that allow the student to connect theory with practice, to learn from models of reality or to reflect on the processes used in the cases presented.
M5	Set of tests carried out to know the degree of acquisition of knowledge and skills of the student.
M6	Problem solving and case studies Written work Online activity in the e-learning platform Personal study. Search of information and documentation.
M12	Group work: Group work sessions supervised by the teacher. Knowledge construction through student interaction and activity.
M14	Group work to search, discuss and filter information about the subjects
M15	Seminar, supervised monographic sessions with shared participation
M16	Student's study: Individual preparation of readings, essays, problem solving, seminars.

IN-CLASS LEARNING ACTIVITIES

	LEARNING OUTCOMES	HOURS	ECTS
Theoretical lessons M1, M5	R1, R2, R3	35,00	1,40
Practice lessons M2, M5, M12	R1, R2, R3	12,00	0,48
Seminar M1, M5	R1, R2, R3	4,00	0,16
Office Hours M1	R1	6,00	0,24
Assessment M5	R2	3,00	0,12
TOTAL		**60,00**	**2,40**

LEARNING ACTIVITIES OF AUTONOMOUS WORK

	LEARNING OUTCOMES	HOURS	ECTS
Autonomous work M2, M5	R1, R2, R3	50,00	2,00
Group work M2, M5, M12	R1, R2, R3	40,00	1,60
TOTAL		**90,00**	**3,60**

Description of the contents

Description of the necessary contents to acquire the learning outcomes.

Theoretical contents:

Content block	Contents
UNIT I.- INTRODUCTION TO CELL BIOLOGY	**Chapter 1.** Origin and evolution of first cells. Cell theory. Prokaryotic and eukaryotic cells.
UNIT II.- THE PLASMA MEMBRANE AND ENDOMEMBRANE SYSTEMS	**Chapter 2.** Structure and function of the plasma membrane. Permeability and transport through the membrane. Endocytosis and exocytosis. **Chapter 3.** The endomembrane system. Mitochondria. Endoplasmic reticulum. Golgi apparatus. Lysosomes and autophagy.
UNIT III.- THE CYTOSKELETON	**Chapter 4.** Structure and functions of the cytoskeleton.Microtubules, microfilaments and intermediate filaments.
UNIT IV.- THE NUCLEUS	**Chapter 5.** Nuclear components. Genes. & DNA packaging. Human cytogenetics: the karyotype. **Chapter 6.** The flow of genetic information. **Chapter 7.** The cell cycle: mitosis and meiosis. Apoptosis.

UNIT V.- HISTOLOGY	**Chapter 8.** ADIPOSE TISSUE: White fat and brown fat. Characteristics and main differences. Distribution in the human organism. CONNECTIVE TISSUE: Loose connective tissue. Compact connective tissue. **Chapter 9.** CARTILAGE: Characteristics. Hyaline cartilage. Articular cartilage. Elastic cartilage. Fibrocartilage. BONE: Cell types. Structure of the compact and spongy bone. **Chapter 10.** MUSCLE: Striated skeletal muscle. Cardiac muscle. Smooth muscle. **Chapter 11.** NERVES: Nervous tissue in the central and peripheral nervous system.
UNIT VI.- PRINCIPLES IN BIOENERGETICS. INTRODUCTION TO METABOLISM	**Chapter 12.** Introduction to the chemistry of life: carbohydrates, lipids, proteins and nucleic acids. **Chapter 13.** Anabolism and Catabolism. Enzymes.
UNIT VII.- METABOLISM OF GLUCIDS, LIPIDS AND AMINO ACIDS	**Chapter 14.** Sugar & lipid metabolism **Chapter 15.** Amino acid & nucleotide metabolism.
UNIT VIII.- PRACTICAL CONTENTS	**Chapter 16.** Structure and operation of the optical microscope. Types of microscopy. **Chapter 17.** Molecular Biology Techniques: Microarrays, PCR (Polymerase Chain Reaction), RT-PCR (Retrotranscription followed by PCR) and qRT-PCR (quantitative RT-PCR). Electrophoresis of nucleic acids. **Chapter 18.** Reading of scientific articles and exhibition of contents in "Journal Club" format, to be done in small groups.

Temporary organization of learning:

Block of content	Number of sessions	Hours
UNIT I.- INTRODUCTION TO CELL BIOLOGY	2,00	4,00
UNIT II.- THE PLASMA MEMBRANE AND ENDOMEMBRANE SYSTEMS	2,00	4,00
UNIT III.- THE CYTOSKELETON	1,00	2,00
UNIT IV.- THE NUCLEUS	5,00	10,00
UNIT V.- HISTOLOGY	5,00	10,00
UNIT VI.- PRINCIPLES IN BIOENERGETICS. INTRODUCTION TO METABOLISM	2,00	4,00
UNIT VII.- METABOLISM OF GLUCIDS, LIPIDS AND AMINO ACIDS	5,00	10,00
UNIT VIII.- PRACTICAL CONTENTS	8,00	16,00

References

Alberts B., Bray D., Johnson A., Lewis J., Raff M., Roberts K., Walter P. **MOLECULAR BIOLOGY OF THE CELL** 5th Edition; 2012

Lodish H., Berk A., Matsudaira P., Kaiser CA., Krieger M., Scott MP., Zipursky L., Darnell J. **MOLECULAR CELL BIOLOGY** 7ªEd. WH Freeman; 2012

Biorom 2008, a compendium of learning aid material in Biochemistry, Molecular Biology and Biotechnology. Web site: http://sebbm.bq.ub.es/BioROM/indices/index.html

DNA learning center in http://www.dnai.org/index.htm, which includes valuable teaching material on everything related to DNA discovery, recombinant DNA technology, interviews with scientists, etc.

Series of **informative videos** of the American public network PBS on the genomic revolution entitled **"Cracking the code of life**" en http://www.pbs.org/wgbh/nova/genome/program.html

Library of macromolecules of biological interest in "**Jena Library of Biological Macromolecules**": http://www.fli-leibniz.de/IMAGE.html

Pubmed in https://www.ncbi.nlm.nih.gov/pubmed

Clinical Trials in https://clinicaltrials.gov/

Addendum to the Course Guide of the Subject

Due to the exceptional situation caused by the health crisis of the COVID-19 and taking into account the security measures related to the development of the educational activity in the Higher Education Institution teaching area, the following changes have been made in the guide of the subject to ensure that Students achieve their learning outcomes of the Subject.

Situation 1: Teaching without limited capacity (when the number of enrolled students is lower than the allowed capacity in classroom, according to the security measures taken).

In this case, no changes are made in the guide of the subject.

Situation 2: Teaching with limited capacity (when the number of enrolled students is higher than the allowed capacity in classroom, according to the security measures taken).

In this case, the following changes are made:

1. Educational Activities of Onsite Work:

All the foreseen activities to be developed in the classroom as indicated in this field of the guide of the subject will be made through a simultaneous teaching method combining onsite teaching in the classroom and synchronous online teaching. Students will be able to attend classes onsite or to attend them online through the telematic tools provided by the university (videoconferences). In any case, students who attend classes onsite and who attend them by videoconference will rotate periodically.

In the particular case of this subject, these videoconferences will be made through:

[X] Microsoft Teams

[ ] Kaltura

Situation 3: Confinement due to a new State of Alarm.

In this case, the following changes are made:

1. Educational Activities of Onsite Work:

All the foreseen activities to be developed in the classroom as indicated in this field of the guide of the subject, as well as the group and personalized tutoring, will be done with the telematic tools provided by the University, through:

X	Microsoft Teams
	Kaltura

Explanation about the practical sessions:

2. System for Assessing the Acquisition of the competences and Assessment System

ONSITE WORK

Regarding the Assessment Tools:

[X] The Assessment Tools will not be modified. If onsite assessment is not possible, it will be done online through the UCVnet Campus.

[ ] The following changes will be made to adapt the subject's assessment to the online teaching.

Course guide		Adaptation	
Assessment tool	Allocated percentage	Description of the suggested changes	Platform to be used

The other Assessment Tools will not be modified with regards to what is indicated in the Course Guide.

Comments to the Assessment System: