



## Information about the course

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

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

**Code:** 341103 **Name:** Biophysics

**Credits:** 6,00 ECTS **Year:** 1 **Semester:** 2

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

**Subject Matter:** Física **Type:** Formación Básica

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

**Department:** Biomedical Sciences

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

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

**Teachers:**

341A	<u>Elena Sandri</u> ( <b>Profesor responsable</b> )	elena.sandri@ucv.es
341B	<u>Elena Sandri</u> ( <b>Profesor responsable</b> )	elena.sandri@ucv.es
341C	<u>Elena Sandri</u> ( <b>Profesor responsable</b> )	elena.sandri@ucv.es



## 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
Fisiología	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

There are no mandatory prerequisites to take this course. Basic prior knowledge of General Physics and Mathematics (analysis and numerical calculation) is recommended.



## Learning outcomes

At the end of the course, the student must demonstrate having acquired the following learning outcomes:

### R2 - Principles of thermodynamics.

Learning outcomes of the specified title

---

#### **Type of AR:** Conocimientos o contenidos

- Understanding and recognizing the normal structure and function of the human body, at the molecular, cellular, tissue, organic and systems levels, at the different stages of life and in both sexes

---

#### **Type of AR:** Competencias

- Basic knowledge of the National Health System and health legislation
- Developing professional practice with respect for other health professionals, acquiring teamwork skills
- 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
- Understanding and recognizing the effects of growth, development and aging on the individual and their social environment



### R3 - Waves, optics and acoustics.

Learning outcomes of the specified title

---

**Type of AR:** Competencias

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

### R4 - Material radiation interaction.

Learning outcomes of the specified title

---

**Type of AR:** Competencias

- 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 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

### In-person modality

Assessed learning outcomes	Granted percentage	Assessment tool
R2, R3, R4	25,00%	Open questions
R2, R3, R4	70,00%	Tests
R2, R3, R4	5,00%	Participation in class

### Observations

**The final grade for the course will be composed of two parts:**

**1.OPEN-ENDED QUESTIONS (30%)** This assessment will be conducted continuously throughout the semester and will consist of solving and submitting, via the Virtual Campus, a series of proposed problems, tasks, and exercises related to the topics covered.

All tasks must be submitted before the end of the semester (May 29), and **THERE WILL BE NO OPPORTUNITY TO RETAKE** this part.

**1.MULTIPLE-CHOICE EXAM (70%)** This exam will be held during the official exam period on the date set by the examination board. It will consist of a set of multiple-choice questions. It will include theoretical questions, mini problems, or case studies.

A **minimum score of 4 out of 10** on the final exam is required in order to average it with the open-ended questions.

### **THIS COURSE DOES NOT ALLOW FOR A SINGLE ASSESSMENT.**

Use of AI: Students may not use AI to complete assessable tasks, unless required for a specific activity and indicated by the teacher. If AI is used in any of the activities, students must cite where in the activity it was used, which AI tool was used, and for what purpose.



### 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.

## Training activities

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

- |     |   |
|-----|---|
| M1  | Masterclass   |
| M2  | Problems resolution and practical cases                       |
| M4  | Content presentations by teacher                              |
| M5  | Knowledges and skills explanation                             |
| M8  | Group activities supervised by professor                      |
| M9  | Knowledge acquirance through student interaction and activity |
| M11 | Personalised attention by professor                           |
| M19 | Group work for searching, discussion and information research |

### IN-CLASS TRAINING ACTIVITIES



ACTIVITY	RELATIONSHIP WITH THE COURSE LEARNING OUTCOMES	METHODOLOGY	HOURS	ECTS
Theory class	R2, R3, R4	Masterclass Problems resolution and practical cases Knowledges and skills explanation	36,00	1,44
Seminar and group practices	R2, R3, R4	Masterclass Problems resolution and practical cases Content presentations by teacher Group activities supervised by professor	9,00	0,36
Practices in small groups	R2, R3, R4	Problems resolution and practical cases Group activities supervised by professor Knowledge acquirance through student interaction and activity Personalised attention by professor Group work for searching, discussion and information research	4,50	0,18



Tutoring	R2, R3, R4	Masterclass Problems resolution and practical cases Content presentations by teacher Knowledges and skills explanation	1,50	0,06
Evaluation	R2, R3, R4	Problems resolution and practical cases Knowledge acquirance through student interaction and activity Personalised attention by professor	1,50	0,06
<b>TOTAL</b>			<b>52,50</b>	<b>2,10</b>

## TRAINING ACTIVITIES OF AUTONOMOUS WORK

ACTIVITY	RELATIONSHIP WITH THE COURSE LEARNING OUTCOMES	METHODOLOGY	HOURS	ECTS
No attendance			97,50	3,90
<b>TOTAL</b>			<b>97,50</b>	<b>3,90</b>





## Description of contents

Description of content necessary for the acquisition of learning outcomes.

### Theoretical content:

Block of content	Contents
1.- Fundamentals of Biomechanics.	Newton's laws and their applications. Conservation of momentum. Conservation of energy. Torque and equilibrium. Forces on muscles and bones. Exercises.
2.- Elasticity.	Stress and strain. Rigidity, elasticity, rupture. Structures and resistance. Exercises. Elastic materials in biology. Bones and muscles.
3.- Fluid Mechanics and Bioreology.	Fluid mechanics. Fluid dynamics or hydrodynamics. Fluids at rest. Fluids in motion. Viscosity. Laminar and turbulent motion. Physical fundamentals of haemodynamics.
4.- Fundamentals of Thermodynamics.	Thermal expansion of solids, liquids and gases. Calorimetry. Heat transfer. Metabolism and mass loss. Exercises
5.- Vibrations and material waves.	Vibratory motion. Waves, sound. Oscillations and waves. Exercises.
6.- Ultrasound and Fundamentals of Ultrasound Scanning.	Applications of sound in diagnosis and therapy. Doppler. Ultrasound. Resonance. Ultrasound scanning. Exercises.
7.- Fundamentals of Radioactivity.	Ionising radiation. Photoelectric effect, Compton effect. Half-life of decay. Dosimetry. Effects and uses of ionising radiation. Exercises
8.- Medical imaging.	Positron Emission Tomography (PET). Computed Axial Tomography (CAT). Nuclear Magnetic Resonance (NMR). Ultrasound tomography (ultrasound scan).



### Temporary organization of learning:

Block of content	Sessions	Hours
1.- Fundamentals of Biomechanics.	4	8,00
2.- Elasticity.	3	6,00
3.- Fluid Mechanics and Bioreology.	3	6,00
4.- Fundamentals of Thermodynamics.	3	6,00
5.- Vibrations and material waves.	2	4,00
6.- Ultrasound and Fundamentals of Ultrasound Scanning.	3	6,00
7.- Fundamentals of Radioactivity.	4	8,00
8.- Medical imaging.	4	8,50



## References

### MAIN BIBLIOGRAPHY

JOU, D., LLEBOT, J.E., GARCÍA, C.P.: Física para Ciencias de la Vida. McGraw-Hill Interamericana, Madrid.  
FRUMENTO A.: Biofísica. Ed. Mosby/Doyma Libros, Madrid.  
PARISI M.: Temas de Biofísica. McGraw-Hill Interamericana, Madrid.  
BUCETA, J., KOROUTCHEVA, E. y PASTOR, J. M.: Temas de Biofísica. Editorial UNED. Colección Cuadernos de la UNED. Madrid, 2006.

### ADDITIONAL BIBLIOGRAPHY

DÍEZ DE LOS RÍOS, A: Introducción a la Biofísica y a la Física Médica. Editorial: Universidad de Málaga.  
MC DONALD & BURNS: Física para las ciencias de la vida. Editorial: Fondo educativo interamericano.  
MARTINEZ SANCHO V.: Fonaments de Física (2 vol.). Biblioteca Universitària, Barcelona.  
GONZÁLEZ IBEAS: Introducción a la Física y Biofísica. Editorial: Alambra.  
CROMER A.H.: Física para las ciencias de la vida. Ed. Reverté S.A., Barcelona.  
CAMERON J.L. & SKOFRONIC, J.G.: Medical Physics. Editorial: Wiley Interscience.  
GREMY F.:(ed.) Biophysique. Flammarion Médecine Sciences, Paris  
McDONALD SG, BURNS DM.: Física para las ciencias de la vida. Fondo Educ. Interamericano, Bogotá.  
STROTHER GK.: Física aplicada a las ciencias de la salud. McGraw-Hill, Bogotá.  
KANE JW, STERNHEIM MM.: Física (para estudiantes de biología y medicina). Reverté, Barcelona.  
CATALA J.: Física. Ed. Saber, Valencia.