



## Information about the subject

**Degree:** Bachelor of Science Degree in Podiatry

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

**Code:** 471105 **Name:** Biophysics and Biochemistry

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

**Module:** BASIC TRAINING

**Subject Matter:** BIOCHEMICALS **Type:** Basic Formation

**Field of knowledge:** Health Sciences

**Department:** -

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

**Languages in which it is taught:** Spanish

### Lecturer/-s:

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## Module organization

### BASIC TRAINING

Subject Matter	ECTS	Subject	ECTS	Year/semester
ANATOMY	12,00	Anatomy	6,00	1/1
		Anatomy of the Lower Extremity	6,00	1/2
BIOLOGY	12,00	Cellular and Tissular Biology	6,00	1/1
		Microbiology	6,00	1/2
PHARMACOLOGY	6,00	Pharmacology	6,00	2/1
MODERN LANGUAGE	6,00	English	6,00	2/2
STATISTICS	6,00	Biostatistics	6,00	1/1
PSYCHOLOGY	6,00	Psychology	6,00	1/2
PHYSIOLOGY	6,00	Physiology	6,00	1/1
BIOCHEMICALS	6,00	Biophysics and Biochemistry	6,00	1/1
ANTHROPOLOGY	6,00	Anthropology	6,00	1/2

## Recommended knowledge

High School Knowledge



## 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 Knows the types and functions of biomolecules.
- R2 Identifies the metabolic pathways and know how to integrate them.
- R3 Knows the applications of biochemical knowledge in the field of Podiatry.
- R4 The student demonstrates knowledge on physical mechanics and elasticity to understand and analyze certain situations and biomechanical processes.
- R5 Searches for bibliographic information from different sources and knows how to analyze it with a critical and constructive spirit.
- R6 Acquires knowledge of thermodynamics describing biological processes of energy and heat transmission.
- R7 The student is acquainted with the main disciplines that make up the physical sciences, their foundations and areas of work.



## 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			

GENERAL		Weighting			
		1	2	3	4
CG2	Students know the structure and function of the human body, especially of the lower limb, semiology, mechanisms, causes and general manifestations of the disease and diagnostic methods of medical and surgical pathological processes, interrelating general pathology with foot pathology.			X	

SPECIFIC		Weighting			
		1	2	3	4
CE26	Students know the subjects of biophysics, physiology and biochemistry related to the human body Immediate principles. Biochemistry and biophysics of membranes, muscles and nerves. Acquire knowledge of the functions and regulation of the different organs and systems of the human body.				X

TRANSVERSAL		Weighting			
		1	2	3	4
CT1	Analytical capabilities			X	



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CT7	Problem solving		x
CT8	Decision making		x
CT14	Critical Reasoning		x
CT15	Ethical commitment		x
CT16	Autonomous learning		x
CT17	Adaptation to new situations		x

Assessed learning outcomes	Granted percentage	Assessment method
R1, R2, R3	5,00%	Open questions
R1, R2, R3, R4	75,00%	Tests
R1, R2, R3, R4	10,00%	Practice (exercises, case studies, problems)
R1, R2, R3, R4	10,00%	Class participation

BIOCHEMICAL PART Test exam (35%), class participation (10%) and practicals (5%).  
BIOPHYSICAL PART  
Final Examination (35%), open questions (5%) and practical (10%)

IMPORTANT: Although the two parts of the subject, Biochemistry and Biophysics, are scored separately, it will be necessary to obtain at least 4 out of 10 points in each discipline to take the average. The grade for the course will be an average of both parts.



## MENTION OF DISTINCTION:

According to Article 22 of the Regulations governing the Evaluation and Qualification of UCV Courses, the mention of "Distinction of Honor" may be awarded by the professor responsible for the course to students who have obtained, at least, the qualification of 9 over 10 ("Sobresaliente"). The number of "Distinction of Honor" mentions that may be awarded may not exceed five percent of the number of students included in the same official record, unless this number is lower than 20, in which case only one "Distinction of Honor" may be awarded.

## Learning activities

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

- M1 Theoretical classes (TC). Training activity preferably oriented to the acquisition of knowledge skills. It is characterised by the fact that students are spoken to. Also called master class or expository class, it refers to the oral exposition made by the teacher, (with the support of a blackboard, computer and cannon for the exposition of texts, graphics, etc.).
- M4 Classroom practice (CPA). Training activity of work in groups that is developed in the classroom. It includes work with documents (e.g.: work with articles or documents, clinical case studies, diagnostic analyses, etc). The size of the group is variable, in a range of 10-20 students.
- M6 Laboratory Practice (CPL). Training activity of work in groups that is developed in the Laboratory. It includes the sessions where students actively and autonomously develop, supervised by the teacher, laboratory experiments. The size of the group is variable, in a range of 10-20 students.
- M7 Tutorials (T). Set of activities carried out by the teacher with personalised attention to the student or in small groups with the aim of reviewing and discussing the materials and topics presented in the classes, seminars, readings, completion of assignments, etc. The aim is to ensure that education is truly a comprehensive training of the student and is not reduced to a transfer of information. It is, therefore, a personalized relationship of help in which the teacher-tutor attends, facilitates and guides one or more students in the formative process.
- M8 Evaluation (Ev). It is the set of processes that try to evaluate the learning results obtained by the students and expressed in terms of acquired knowledge, capacities, developed skills or abilities and manifested attitudes. It covers a wide range of activities that can be developed for students to demonstrate their training (e.g. written, oral and practical tests, projects or assignments,). It also includes Official Calls.



M10 Estudio del alumno: Preparación individual de lecturas, ensayos, resolución de problemas, seminarios

## IN-CLASS LEARNING ACTIVITIES

	LEARNING OUTCOMES	HOURS	ECTS
Theoretical lessons M1	R1, R2, R3, R4	45,00	1,80
Practice lessons M4	R1, R2, R3, R4	6,00	0,24
Office Hours M7	R1, R2, R3, R4	5,00	0,20
Evaluation M8	R1, R2, R3, R4	4,00	0,16
<b>TOTAL</b>		<b>60,00</b>	<b>2,40</b>

## LEARNING ACTIVITIES OF AUTONOMOUS WORK

	LEARNING OUTCOMES	HOURS	ECTS
Autonomous work M10	R1, R2, R3, R4	70,00	2,80
Group work M10	R1, R2, R3, R4	20,00	0,80
<b>TOTAL</b>		<b>90,00</b>	<b>3,60</b>



## Description of the contents

Description of the necessary contents to acquire the learning outcomes.

### Theoretical contents:

Content block	Contents
UNIT 0: REVIEW OF MATHEMATICAL PHYSICS CONCEPTS	Physical quantities and their classification, Order of magnitude, Systems of units Dimensional analysis and laws of scale Significant figures, Scientific notation Scalars and vectors Coordinate systems and components of a vector Vector algebra
UNIT I FUNDAMENTALS OF BIOMECHANICS	Newton's laws and their applications. Energy conservation. Torque and balance. Forces in muscles and bones. Elasticity. Effort and deformation. Elasticity and rupture.
UNIT II FLUID MECHANICS	Fluid mechanics Fluid dynamics or hydrodynamics. Fluids at rest. Fluids in motion. Viscosity. laminar and turbulent motion. Physical foundations of hemodynamics
UNIT III FOUNDATIONS OF THERMODYNAMICS	Thermal expansion of solids, liquids and gases. Calorimetry. Heat transfer. Metabolism and mass loss.
UNIT IV VIBRATIONS AND WAVES	Wave phenomena. Bioacoustics. Applications of sound in diagnosis and therapy. Doppler. ultrasound





## UNIT V STRUCTURAL BIOCHEMISTRY

### Introduction to Biochemistry

#### Water

Amino acids, peptides and proteins. Structure, peptide bond. Function.

Collagen. collagen types. Structure. Synthesis and main pathologies.

Enzymes Coenzymes and cofactors. Kinetic enzyme. mechanisms.

Carbohydrates. Structure and link. Main disaccharides and polysaccharides.

Nucleotides and nucleic acids. Structure and function. Link. DNA and RNA types.

Lipids. Classification. Structure and function. major lipids.

## UNIT VI INTRODUCTION TO METABOLISM AND BIOENERGETICS

Glycolysis. Fermentation. Gluconeogenesis. Pentose phosphate pathway. main enzymes. Glucose and glycogen regulation.

Acetyl-CoA production. Krebs cycle. main enzymes.

#### Regulation

Oxidative phosphorylation. ATP synthesis.

Fatty acid metabolism. Beta oxidation.

protein metabolism. Urea cycle.

Purine catabolism. Gout disease



## Temporary organization of learning:

Block of content	Number of sessions	Hours
UNIT 0: REVIEW OF MATHEMATICAL PHYSICS CONCEPTS	3,00	6,00
UNIT I FUNDAMENTALS OF BIOMECHANICS	3,00	6,00
UNIT II FLUID MECHANICS	3,00	6,00
UNIT III FOUNDATIONS OF THERMODYNAMICS	3,00	6,00
UNIT IV VIBRATIONS AND WAVES	3,00	6,00
UNIT V STRUCTURAL BIOCHEMISTRY	8,00	16,00
UNIT VI INTRODUCTION TO METABOLISM AND BIOENERGETICS	7,00	14,00



## References

1. Parisi, M.: **TEMAS DE BIOFÍSICA**. Ed. McGraw-Hill. Madrid; 2001
2. Buceta, J., Koroutcheva, E., Pastor, J.M. "**TEMAS DE BIOFÍSICA**", Editorial UNED. Colección Cuadernos de la UNED (nº 35275CU01A01); 2006
3. Díez de los Ríos, A **INTRODUCCIÓN A LA BIOFÍSICA Y A LA FÍSICA MÉDICA**. Ed. Universidad de Málaga; 2000
4. Cussó F., López C., Villar Raúl, **FÍSICA DE LOS PROCESOS BIOLÓGICOS**, Ariel (2004)
5. Villar R., Lopez C. y Cussó F. **FUNDAMENTOS FÍSICOS DE LOS PROCESOS BIOLÓGICOS: VOLUMEN I. BIOMECÁNICA Y LEYES DE ESCALA**. ECU (2012)
6. Villar R., Lopez C. y Cussó F. **FUNDAMENTOS FÍSICOS DE LOS PROCESOS BIOLÓGICOS: VOLUMEN III: CALOR Y DINÁMICA DE FLUIDOS EN LOS SERES VIVOS**. ECU(2013)
7. Atkins, P. y De Paula, J.: **PHYSICAL-CHEMISTRY FOR LIFE SCIENCES**. Oxford, 2005.
8. David L. Nelson y M. M. Cox. **PRINCIPIOS DE BIOQUÍMICA**. 6ªEd. Editorial Omega, 2014.
9. Berg J. M., Tymoczko, J.L., Stryer, L. **BIOQUÍMICA**. 7ª Ed., Editorial Reverté, 2015.
10. Berg J. M., Tymoczko, J.L., Stryer, L. **BIOQUÍMICA con aplicaciones clínicas. Volumen II**. 7ª Ed., Editorial Reverté, 2015.
11. Voet, D., Voet, J., Pratt, C.W.. **FUNDAMENTOS DE BIOQUÍMICA**. 4ª Ed Médica Panamericana. 2016
12. Mathews, C.K., Van Holde, K.E., Ahern, G. **BIOQUÍMICA**. 3ª Ed. Pearson, Madrid, 2002
13. Villar R., Lopez C. y Cussó F. **FUNDAMENTOS FÍSICOS DE LOS PROCESOS BIOLÓGICOS: VOLUMEN II: BIOELECTROMAGNETISMO, ONDAS Y RADIACIÓN**. ECU (2013)
14. McDonald, S., Burns. D. **FÍSICA PARA LAS CIENCIAS DE LA VIDA Y DE LA SALUD**, Fondo. Educativo Interamericano. S.A. Bogotá; 1989
15. Díez de los Ríos, A **INTRODUCCIÓN A LA BIOFÍSICA Y A LA FÍSICA MÉDICA**. Ed. Universidad de Málaga; 2000
16. Strother, G.K. **FÍSICA APLICADA A LAS CIENCIAS DE LA SALUD**. Ed. McGraw- Hill



Universidad  
**Católica de  
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San Vicente Mártir

## Course guide

Year 2023/2024

471105 - Biophysics and Biochemistry

latinoamericana; 1981





## 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:

☒ 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:

☒ Microsoft Teams

☐ Kaltura

Explanation about the practical sessions:

No coments



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

### ONSITE WORK

#### Regarding the Assessment Tools:

☒ 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: