



Information about the subject

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: Physics **Type:** Basic Formation

Field of knowledge: Health Science

Department: -

Type of learning: Classroom-based learning

Languages in which it is taught: Spanish

Lecturer/-s:

341A Antonio Peiró Cloquell (**Responsible Lecturer**)

antonio.peiro@ucv.es

341B Antonio Peiró Cloquell (**Responsible Lecturer**)

antonio.peiro@ucv.es



Module organization

Morphology, structure and function of the human body

Subject Matter	ECTS	Subject	ECTS	Year/semester
Morphology and microscopic structure of the human body	6,00	Histology	6,00	2/1
Biology	6,00	Cell Biology	6,00	1/1
Anatomy	27,00	Anatomy II	9,00	2/1
		Anatomy III	6,00	2/2
		Embryology and Anatomy I	12,00	1/2
Biochemistry	9,00	Biochemistry and Molecular Biology	9,00	1/2
Physics	6,00	Biophysics	6,00	1/2
Physiology	12,00	Human Physiology I	6,00	2/1
		Human Physiology II	6,00	2/2

Recommended knowledge

There are no mandatory prerequisites to take this course. Basic prior knowledge of General Physics and Mathematics (numerical analysis and calculation) 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 Cellular communication. Excitable membranes. Cell cycle. Cell differentiation and proliferation.
- R2 Principles of thermodynamics.
- R3 Waves, optics and acoustics.
- R4 Material radiation interaction.



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 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				X
CB2	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				X
CB3	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				X
CB4	Students can pass on information, ideas, problems and solutions to both a specialized and non-specialized audience				X
CB5	Students have developed the learning skills needed to undertake further studies with a high degree of autonomy				X
GENERAL		Weighting			
		1	2	3	4
CG6	Developing professional practice with respect for other health professionals, acquiring teamwork skills			X	
CG7	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			X	
CG11	Understanding and recognizing the effects of growth, development and aging on the individual and their social environment	X			



CG30 Basic knowledge of the National Health System and health legislation

x

TRANSVERSAL

Weighting

1 2 3 4

CT1 Analytical and synthesis capacity

x

CT2 Planification and organization capacity

x

CT6 Manage information capacity

x

CT7 Solving problems

x

CT14 Critical reasoning

x

CT16 Individual learning

x

CT18 Creativity

x

CT25 Autocriticism capacity

x



Assessment system for the acquisition of competencies and grading system

Assessed learning outcomes	Granted percentage	Assessment method
R1, R2, R3, R4	30,00%	Open questions
	70,00%	Tests
	0,00%	Participation in class

Observations

Exam questions about practical assumptions

The multiple choice exam may be extended with practical assumptions that may be presented as open questions or multiple choice questions. Knowledge of theoretical concepts and the student's ability to relate them, integrate them, understand them and express them coherently in written language are fundamentally evaluated. (30.00%)

Observations on learning outcomes:

The following are added to the learning outcomes:

- Dynamics: forces and moments of forces. Work and Energy
- Elasticity (muscles and bones)
- Fluid mechanics. blood rheology.
- Imaging techniques. Physical foundation.
- laser

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 Masterclass
- M2 Problems resolution and practical cases
- M4 Content presentations by teacher
- M5 Knowledges and skills explanation
- M6 Laboratory practices
- M8 Group activities supervised by professor
- M9 Knowledge acquirance through student interaction and activity
- M11 Personalised attention by professor
- M14 Online activity on e-learning
- M15 Personal study
- M19 Group work for searching, discussion and information research



IN-CLASS LEARNING ACTIVITIES

	LEARNING OUTCOMES	HOURS	ECTS
Theory class M1, M2, M4	R1, R2, R3, R4	36,00	1,44
Seminar and group practices M1, M2, M4, M8	R1, R2, R3, R4	9,00	0,36
Practices in small groups M2, M8, M9, M11, M19	R1, R2, R3, R4	4,50	0,18
Tutoring M1, M2, M4, M5	R1, R2, R3, R4	1,50	0,06
Evaluation M2, M9, M11	R1, R2, R3, R4	1,50	0,06
TOTAL		52,50	2,10

LEARNING ACTIVITIES OF AUTONOMOUS WORK

	LEARNING OUTCOMES	HOURS	ECTS
No attendance M9, M14, M15	R1, R2, R3, R4	97,50	3,90
TOTAL		97,50	3,90



Description of the contents

Description of the necessary contents to acquire the learning outcomes.

Theoretical contents:

Content block

Contents

BLOQUE I: Biomecánica

1.- Fundamentos de Biomecánica.

- Leyes de Newton y sus aplicaciones. Conservación de Cantidad de movimiento. Conservación de la Energía.
- Momento de torsión y equilibrio. Fuerzas en músculos y huesos.
- Ejercicios.

2.- Elasticidad.

- Esfuerzo y deformación. Rigidez, elasticidad, ruptura. Estructuras y resistencia.
- Ejercicios.
- Materiales elásticos en Biología. Huesos y músculos.

3.- Fenómenos de superficie.

- Fuerzas de cohesión en líquidos.
- Efectos de superficie. Sistema respiratorio.
- Ejercicios.

4.- Mecánica de Fluidos y Biorreología.

- Mecánica de los fluidos.
- Dinámica de fluidos o hidrodinámica.
- Fluidos en reposo.
- Fluidos en movimiento. Viscosidad. Movimiento laminar y turbulento.
- Fundamentos físicos de la hemodinámica.
- Ejercicios.

5.- Sedimentación en Biomedicina.

- Dinámica de la sedimentación. Velocidad y constante de sedimentación Concepto de velocidad de sedimentación globular (VSG).
- Ultracentrifugación.



BLOQUE II: Termodinámica

6.- Fundamentos de Termodinámica.

- Expansión térmica de sólidos, líquidos y gases.
- Calorimetría. Transferencia de calor. Metabolismo y pérdida de masa.
- Ejercicios.

6.- Fundamentos de Termodinámica.

- Expansión térmica de sólidos, líquidos y gases.
- Calorimetría. Transferencia de calor. Metabolismo y pérdida de masa.
- Ejercicios.

BLOQUE III: Fundamentos físicos de la imagen médica.

7.- Imagen médica.

- Tomografía por Emisión de Positrones (TEP).
- Tomografía Axial Computarizada (TAC).
- Resonancia Magnética Nuclear (RMN).
- Tomografía por ultrasonidos (ecografía).

BLOQUE IV: Fundamentos de Audiología.

8.- Vibraciones y ondas materiales.

- Movimiento vibratorio. Ondas, sonido.
- Oscilaciones y ondas.
- Ejercicios.

9.- Fundamentos de acústica fisiológica.

- Física de la producción y percepción sonora (audición).
- Fenómenos ondulatorios.
- Bioacústica. Aplicaciones del sonido en diagnóstico y terapéutica. Doppler. Ultrasonidos. Resonancia.
- Ejercicios.

BLOQUE V: Electricidad y Magnetismo.

10.- Fundamentos de Electricidad y Magnetismo.

- Fuerza eléctrica y Campo eléctrico.
- Capacitancia
- Circuitos eléctricos resistivos y capacitivos. Circuitos eléctricos equivalentes de las membranas.
- Circuitos eléctricos. Aplicaciones biomédicas.
- Conducción Nerviosa un símil con la corriente continua.
- Riesgo eléctrico.
- Ejercicios.
- Campo magnético y sus fuentes.
- Inducción Magnética. Ley de Faraday.
- Ejercicios.



BLOQUE VI: Óptica.

11.- Fundamentos de Óptica.

- Óptica Geométrica: Índice de refracción, reflexión y refracción, lentes delgadas.
- Defectos visuales.
- Ejercicios.

BLOQUE VII: Radiactividad.

12.- Fundamentos de Radiactividad.

- Radiación ionizante.
- Efecto fotoeléctrico, efecto Compton.
- Semivida de desintegración.
- Dosimetría.
- Efectos y usos de la radiación ionizante.
- Ejercicios.

BLOQUE VIII: Fundamentos del Láser y sus aplicaciones en la Medicina.

13.- LASER.

- Láser y sus aplicaciones en la medicina.
- Ejercicios.



Temporary organization of learning:

Block of content	Number of sessions	Hours
BLOQUE I: Biomecánica	8,00	16,00
BLOQUE II: Termodinámica	3,50	7,00
BLOQUE III: Fundamentos físicos de la imagen médica.	2,00	4,00
BLOQUE IV: Fundamentos de Audiología.	3,00	6,00
BLOQUE V: Electricidad y Magnetismo.	2,00	4,00
BLOQUE VI: Óptica.	3,50	7,00
BLOQUE VII: Radiactividad.	3,50	7,00
BLOQUE VIII: Fundamentos del Láser y sus aplicaciones en la Medicina.	0,75	1,50



References

BIBLIOGRAFÍA FUNDAMENTAL

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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.

BIBLIOGRAFÍA COMPLEMENTARIA

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 Universit ria, Barcelona.

GONZ LEZ IBEAS: Introducci n a la F sica y Biof sica. Editorial: Alambra.

CROMER A.H.: F sica para las ciencias de la vida. Ed. Revert  S.A., Barcelona.

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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:



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: