1. BASIC INFORMATION

Subject	Biophysics
Degree	Physiotherapy
School/Faculty	Physical Activity and Sport Sciences
Course	First
ECTS	6 ECTS
Character	Basic
Language/s	Spanish, English and French
Modality	On-site
Semester	First
Academic year	2024/2025
Coordinating teacher	Julia Simón Martín and Luis C Fernández

2. ABOUT THE SUBJECT

"Biophysics" is a basic subject of the Degree in Physiotherapy with a value of 6 ECTS.

This subject provides the physical knowledge that will allow the student to study phenomena of physiological interest in depth, as well as to understand the bases of physical medicine and its applications in physiotherapy.

On the other hand, a series of essential principles for the understanding of the physical and instrumental bases of diagnosis and therapy will also be studied. Given the instrumentation used today in physiotherapeutic practice, it is essential to understand and analyse the effects that physical agents have on the organism and matter.

3. COMPETENCES AND LEARNING OUTCOMES

Core competences:

- CB1: Students have demonstrated knowledge and understanding in an area of study that builds on the foundation of general secondary education, and is usually at a level that, while relying on advanced textbooks, also includes some aspects that involve knowledge from the cutting edge of their field of study.

- CB2: That students know how to apply their knowledge to their work or vocation in a professional manner and possess the competences that are usually demonstrated through the elaboration and defence of arguments and problem solving within their area of study.
- CB4: Students are able to convey information, ideas, problems and solutions to both specialist and non-specialist audiences.
- CB5: Students have developed those learning skills necessary to undertake further studies with a high degree of autonomy.

Transversal competences:

- TC 2: Problem solving.
- TC 3: Organisational and planning skills
- TC 4: Capacity for analysis and synthesis
- TC 13: Critical reasoning.

Specific competences:

- CE 74: Be able to synthesise relevant information from simple scientific articles.
- CE 75: Understand and know the principles and theories of physics applied to physiotherapy.
- CE 76: Know and analyse the principles of the different physical agents of interest in physiotherapy.
- CE 77: Relate the different physical agents with the effects they have on the organism.

Learning outcomes:

- RA1: Understanding of fundamental concepts related to the contents of the subject.
- RA2: Ability to describe the theoretical principles that define the different physical agents.
- RA3: Comprehension and synthesis of texts related to the subject.

The table below shows the relationship between the competences developed in the subject and the learning outcomes pursued:

Competences	Learning outcomes
CB1, CB4, CT2, CT13, CE75, CE76, CE77	RA1. Understanding of fundamental concepts related to the contents of the subject.
CB2, CT3, CE75	RA2. Ability to describe the theoretical principles that define the different physical agents.
CB5, CT4, CT13, CE74	RA3: Comprehension and synthesis Texts related to the subject.

4. CONTENTS

The subject is organised into six blocks (learning units), which are divided into units or chapters:

Block 0. INTRODUCTION
Chapter 0. Physics in health sciences. Concept and content of the subject.

Block I. THERMOLOGY AND THERMODYNAMICS

Chapter 1. Heat and cold in Health Sciences. Basic concepts of heat and temperature. Thermometric scales. Heat transmission. Physical methods of heat propagation: conduction, convection and radiation. Temperature regulation.

Chapter 2. Thermodynamics and its principles. First Law of Thermodynamics. Second Law of Thermodynamics. Human metabolism.

Block II. WAVE MOTION
Chapter 3. Waves and wave phenomena. Description of wave motion. Wave speed. Wave interference. Doppler effect. Measurement of flows by means of the Doppler effect.

Chapter 4. Sound and ultrasound. Wave motion. Sound waves. Sound-matter interaction. Nature and production of ultrasound. Physical and biophysical effects. Physical basis of ultrasound application.

Chapter 5. Light in health CC. Wave nature of light. Speed. Index of refraction. Reflection. Refraction. Total internal reflection. Diffraction. Polarisation of light

Chapter 6. Non-ionising radiation. Corpuscule-wave duality. Spectrum of electromagnetic radiation. Thermography. Absorption of radiation. Exposure to radiation.

Block III. FLUIDS

Chapters 7-9. The mechanics of ideal fluids. Archimedes' principle. Stationary flow. Bernoulli's theorem. Gravity of flow. Viscous fluid flow. Viscosity. Laminar flow. Turbulent flow Circulatory system flow

Block IV. BIOELECTRICITY

Chapter 10. Bioelectricity. Electrical and magnetic phenomena. The nerve impulse.

5. TEACHING-LEARNING METHODOLOGIES

The following are the types of teaching-learning methodologies to be applied:

- Masterclass.
- Simulation Environments.
- Cooperative Learning.
- Autonomous Learning.

6. TRAINING ACTIVITIES

The following identifies the types of training activities to be carried out and the student's dedication in hours to each of them:

Type of training activity	Number of hours
Tutorials	10
Analysis of practical cases	15
Master Classes	30
Self-study	50
Laboratory practical activity	25
Virtual seminars	15
TOTAL	**145 h**

Integrated learning

The capacity for integration in the basic subjects (biochemistry, genetics, biology, biophysics, histology, physiology and anatomy) taught during the first years of science degrees is fundamental for progressing towards the specialization of each degree. Integration can be

understood as the interdisciplinary grouping of basic subjects and aims to break with the separation of knowledge into individual subjects. In this way, the student will establish global relations with the real world. This fact favours very positively the planning of subjects in teaching teams of lecturers from different areas of knowledge (horizontal integration) and even in joint teams of basic and clinical lecturers (vertical integration).

7. EVALUATION

The following is a list of the assessment systems and their weighting in the total grade for the course:

Evaluation system	Weight
Knowledge test	60%
Assessable questionnaires	10%
Evaluation sheets	10%
Flipped classroom	10%
Integrated activity	10%

On the Virtual Campus, when you access the course, you will be able to consult in detail the assessment activities to be carried out, as well as the delivery dates and the assessment procedures for each one of them.

Attendance and attendance

According to Art. 1.4 of the Evaluation Regulations of the Official Undergraduate Degrees of the Universidad Europea de Madrid (on continuous assessment): "It is compulsory to justify at least 50% of class attendance, as a necessary part of the evaluation process and to comply with the student's right to receive advice, assistance and academic monitoring by the professor. To this end, students must use the technological system provided by the University to accredit their daily attendance at each of their classes. This system will also serve to guarantee objective information on the student's active role in the classroom. Failure to accredit 50% attendance by the means proposed by the university will entitle the lecturer to grade the subject as a fail in the ordinary exam".

7.1. Ordinary call

In order to pass the course in the ordinary exam, the **continuous assessment process** of the different training activities must be passed. The general evaluation scheme, divided by blocks, is as follows:

Assessable block	EVALUATION SYSTEMS	WEIGHT (%)
1	Objective knowledge tests	60
2	Assessable activities	40

The student's final mark will be obtained from the weighting of the partial marks of each of the blocks, as indicated in the table and detailed below. In the case of **failing** any of the examinable blocks, the grade in the minutes will always be that of the block with the lowest score. The marks published on the virtual campus will be **provisional** until the revision of the test has been carried out.

The assessment methodology for the two assessable blocks may be based on: multiple-choice questions, short questions, open questions with and without limitations of length, correspondence questions, questions with embedded answers, information synthesis tables, assignments, oral presentations, etc.

In the event of a **change in the date** of assessment, according to the application of the regulations for changing the date of assessable tests, the format of the test may vary with respect to that of the general examination.

- Evaluation of objective knowledge tests (60%):

There will be **two** objective tests. The **first** has a weight of 40% and the **second** has a weight of 60%. Students may sit the second test regardless of whether or not they have passed the first.

In order to maintain the integrative capacity of the students and the continuous assessment, the second test will contain 10% of the basic contents included in the first test.

The objective tests may include questions on concepts studied in the evaluable activities and laboratory practicals. This is particularly relevant for integrated activities.

In each of the two objective tests the student must obtain a mark of at least 5.0 to pass the block. Once the objective knowledge tests have been passed, the grade for this block will be the weighted average of the first and second part (40% + 60% respectively).

- Evaluation of assessable activities (40%):

Attendance at the activities, and the preparation of reports or work requested is compulsory in order to pass this block. The assessment of the activities will be carried out by demonstrating the knowledge and skills acquired during the activities. The assessment method for each of these activities will be detailed on the virtual campus before they are carried out.

The block grade will correspond to a weighted measure of all the activities included. It is necessary to obtain a minimum grade of 5 in this block to pass this section and to be able to average it with the other block of the subject.

7.2. Extraordinary call

In order to pass the course in the Extraordinary Examination, all the requirements set out above for the Ordinary Examination must be met.

- Objective knowledge tests (60%):

There will be a test of the theoretical contents explained throughout the course, which may consist of multiple-choice questions, short questions, problems, diagrams, images, etc.

This test will have 2 blocks corresponding to each of the mid-term exams of the ordinary exam. Only the block or blocks failed in the ordinary exam will be made up. The weight of each block is the same as in the ordinary exam.

- Assessable activities (40%):

The evaluation of the training activities will be carried out by means of activities that will be proposed for this purpose and must be solved individually.

8. TIMETABLE

In this section you will find the timetable with dates for the delivery of evaluable activities of the subject:

DATE	EVALUABLE ACTIVITIES		
Week 2 and 3	Questionnaire evaluable	Evaluation sheet	
Week 4 and 5	Assessable questionnaire	Evaluation sheet	Thermodynamics activity
Week 6	Flipped Classroom		
Week 7	Integrated Activity		
Week 8	**Objective assessment test (First part)**		
Week 9 and 10	Assessable questionnaires	Evaluation sheet	Wave activity
Week 11 and 12	Assessable questionnaires	Evaluation sheet	Activity Therapeutic application
Week 13	Assessable questionnaires		
Week 14 and 15	Assessable questionnaires		
Week 15	Evaluation sheet	Fluids Activity	
Week 17	**Objective assessment test (Final Test)**		

This timetable may be subject to modifications for logistical reasons. Any modification will be notified to the student in due time and form.

9. BIBLIOGRAPHY

Recommended bibliography is given below:

- Physics. J.W. Kane. Ed. Reverté 2nd ed.
- Physics for the life sciences. A.H. Cromer. Ed. Reverté.2nd ed.

- Physics applied to health sciences. ML de Pedraza Velasco. Ed. Masson.
- Physics applied to health sciences. G.K. Strother. Ed. McGraw-Hill Latinoamericana, S.A.
- Physics for life sciences. D. Jou; J.E. Llebot; C. Pérez García. Ed. McGraw-Hill.
- Manual of Physical Medicine. Martínez Morillo, M. Ed. Harcourt.

10. DIVERSITY CARE UNIT

From the Educational Guidance and Diversity Unit (ODI) we offer accompaniment to our students throughout their university life to help them achieve their academic achievements. Other pillars of our action are the inclusion of students with specific educational support needs, universal accessibility in the different campuses of the university and equal opportunities.

From this unit students are offered:

1. Accompaniment and follow-up through the realization of advice and personalized plans to students who need to improve their academic performance.

2. In terms of attention to diversity, non-significant curricular adjustments are made, that is, at the level of methodology and evaluation, in those students with specific educational support needs, thereby pursuing equal opportunities for all students.

3. We offer students different extracurricular training resources to develop various skills that will enrich them in their personal and professional development.

4. Vocational guidance through the provision of tools and advice to students with vocational doubts or who believe that they have made a mistake in the choice of the degree.

Students with specific educational support needs should contact: orientacioneducativa@universidadeuropea.es.

11. SATISFACTION SURVEYS

Your opinion matters!

Universidad Europea encourages you to participate in the satisfaction surveys to detect strengths and areas for improvement about the teaching staff, the degree and the teaching-learning process.

Surveys will be available in the survey area of your virtual campus or through your email.

Your assessment is necessary to improve the quality of the degree.

Thank you very much for your participation.