Universitat Autònoma de Barcelona

2022/2023

Biophysics and Biomechanics

Code: 103008
ECTS Credits: 6

Degree	Type	Year	Semester
2500892 Physiotherapy	FB	1	1

Contact

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Use of Languages

Principal working language: catalan (cat)
Some groups entirely in English: No
Some groups entirely in Catalan: Yes
Some groups entirely in Spanish: No

Other comments on languages

The subject will be taught in the two official languages, Catalan and Spanish, according to the teacher of each topic.

Teachers

Ramón Barnadas Rodriguez
Èric Catalina Hernández
Alex Peralvarez Marin
Maria Isabel Marin Garcia
Nuria Benseny Cases

Prerequisites

Basic knowledge is required on thermodynamics, mechanics, wave theory, electricity, electromagnetic waves, radiation as well as math and basic trigonometry.

Objectives and Contextualisation

The subject of Biophysics and Biomechanics is within the first year of the degree of Physiotherapy and is part of the basic training subjects.

The general objective is to deepen in the knowledge of various aspects of the human body function and instrumentation in the field of physiotherapy, in relation to the laws of physics.

Competences

- Analyse and synthesise.
- Display knowledge of the sciences, models, techniques and instruments around which physiotherapy is structured and developed.

- Make changes to methods and processes in the area of knowledge in order to provide innovative responses to society's needs and demands.
- Solve problems.
- Take account of social, economic and environmental impacts when operating within one's own area of knowledge.
- Take sex- or gender-based inequalities into consideration when operating within one's own area of knowledge.

Learning Outcomes

1. Analyse a situation and identify its points for improvement.
2. Analyse and synthesise.
3. Apply the anthropometric principles.
4. Communicate using language that is not sexist.
5. Consider how gender stereotypes and roles impinge on the exercise of the profession.
6. Determine the physical bases of the different physical agents and their applications to physiotherapy.
7. Determine the principles and applications of physiotherapy measurement procedures used in biomechanics and electrophysiology.
8. Explain the principles and theories of physics, biomechanics and kinesiology applicable to physiotherapy.
9. Identify situations in which a change or improvement is needed.
10. Propose new methods or well-founded alternative solutions.
11. Propose new ways to measure success or failure when implementing innovative proposals or ideas.
12. Propose projects and actions that incorporate the gender perspective.
13. Propose viable projects and actions to boost social, economic and environmental benefits.
14. Propose ways to evaluate projects and actions for improving sustainability.
15. Solve problems.
16. Weigh up the risks and opportunities of suggestions for improvement: one's own and those of others.

Content

Contents

Part 1 / Biomechanics I

Part 2 / Biomechanics II

Part 3 / Mechanical waves and ultrasounds

Part 4 / Electricity and Electrophysiology

Part 5 / Electromagnetic waves and radiation

Part 6 / Thermodynamics

PRACTICAL SESSIONS

Practicum 1. Ankle biomechanics.

Practicum 2. Sound waves and ultrasounds.

Practicum 3. Indirect calorimetry.

Methodology

- The master classes with audiovisual support will be carried out in a single group of students. The group will be divided into four for laboratory practices (PLAB) and for classroom practices (seminars, SEM).

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
CLASSROOM PRACTICES (PLAB)	8.5	0.34	2, 7, 15
SEMINARS (SEM)	11	0.44	2, 3, 7, 15
Theory (TE)	26	1.04	3, 7, 6, 8
Type: Supervised			
ORAL PRESENTATION/EXPOSITION OF WORKS	7	0.28	
Type: Autonomous			
SELF-STUDY	89.5	3.58	

Assessment

The subject will be evaluated during the course in two eliminatory examinations of subject matter (80% of the final mark) and through the qualifications obtained in the sessions of laboratory practices (10% of the final grade) and the deliveries carried out during the development of the course (10% of the final grade).

To pass the subject for continuous assessment through the average of the assessment tests (the 2 eliminatory exams and the qualifications of the practical sessions), you must:

a) Have obtained a minimum score of 4.5 in each of the two eliminatory exams of subject matter

b) Have attended at least 66% of the practical sessions and delivered the corresponding reports.

Students who have not passed the subject by means of the continuous assessment may submit to a final exam, which will consist of the parts not passed, if it is satisfied that:

c) They have been submitted to both eliminatory exams (which correspond to more than 66% of the final score).

d) At least 66% of the laboratory practices have been submitted and have submitted the corresponding reports.

Students who do not meet the two previous points (c, and d) will be qualified as "Not evaluable."

The students that have passed the subject by means of the continuous evaluation can appear to the final examination to raise note. The exam will consist of the two parts of the subject and the note that is obtained will be the definitive one.

The minimum score required to pass any exam will be 5.0.

Students on second call or further:

From the second call, the assessment of the subject may consist of a single test that will include the entire subject where theoretical knowledge, specialized seminars and practices will be assessed. This test will be done on the same day as the recovery tests programmed in the calendar of the faculty.

Configuration of the tests

Regarding the two eliminatory examinations ofmatter (80% of the assessment activities), each one of them will consist of two types of exercises:

e) A test type with 40-50 theory questions and short problems to solve without a calculator (65% of the exam's mark).

f) A written question with questions related to the laboratory practices and with numerical problems to be solved with a calculator (35% of the exam mark).

In this typology, revisions of the marks in the optical recognition template, errors in the selection of answers or an

Regarding the evaluation of the laboratory practice session, it will be done based on the work and the results obtained, which will be presented in a report at the end of each session (10% of the final grade).

Regarding the evaluation of the student's deliveries, a maximum of one delivery per part will be established, which will be delivered to the teaching staff during the course development (10% of the final grade).

Final grade

Weighted sum of the evaluation of theoretical and practical knowledge. To pass the subject the overall mark should be 5.0 or higher.

Numeric expression: note with a decimal, from 0.0 to 10.0.

Qualification: not evaluable, suspense, approved, remarkable, excellent, excellent with honors.

If you do not pass the subject, the notes of the practices will be preserved, but when you enroll again, the student who wishes can do them and obtain a new score.

Exams review system

The review of the exams will be done individually with the student.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Evaluation of deliverables	10%	0	0	2, 1, 3, 4, 7, 6, 8, 9, 16, 14, 10, 11, 12, 13, 15, 5
Evaluation of practical sessions	10%	0	0	2, 7
Two multiple-choice exams	55%	5	0.2	2, 1, 3, 4, 7, 6, 8, 9, 16, 10, 11, 15
Two short-answer test	25%	3	0.12	2, 1, 8, 9, 16, 10, 11, 15

Bibliography

BIOFÍSICA

A.S. Frumento (1995). Mosby/Doyma Libros

ELECTROTERAPIA EN FISIOTERAPIA [Recurso electrónico de las bibliotecas de la UAB]

J. M. Rodríguez Martín (2014). Ed. Médica Panamericana. FÍSICA

J. N .Kane y M. M. Sternheim (1994). Ed. Reverté. FÍSICA

P.A. Tipler. (1992). Ed. Reverté.

BIOMECÁNICA BÁSICA DEL SISTEMA MUSCULOESQUELÉTICO

M. Nordin y V. H. Frankel (2004). McGraw-Hill Interamericana.

FÍSICA PARA CIENCIAS DE LA VIDA

D. Jou, J. E. Llebot y C. Pérez-García. (1994) Ed. McGraw-Hill.

Recursos de Internet

http://www.asbweb.org (web de la American Society of Biomechanics)

http://ww3.haverford.edu/physics-astro/course_materials/phys320/biophysicsCourses.html

https://ocw.mit.edu/

Software

No specific software is required.