FÍSICA APLICADA

Code: 12310

Main Scientific Area: Mathematics and Statistics

Lecturer: Daniel António da Silva Miranda

Language of Instruction: Portuguese

Regime: S2

Contact Hours: 60h Total Workload: 100h

ECTS: 6,0

Objectives

The objective of the discipline is to develop an understanding of the basic physical phenomena, through the study of theory, followed by applications to concrete situations, using appropriate methodologies, so that the student understands complex problems for later courses. Develop scientific thinking, including critical thinking and varied skills to prepare students to deal with new problems involving their interpretation, mobilization of knowledge and practical resolution. A great deal of emphasis will be placed on the ability to manipulate concepts and solve problems, with particular focus on applications in health sciences. The student should acquire knowledge of classical mechanics, fluid mechanics, wave motion and its application to the study of sound waves, radioactive phenomena and geometric optics, with a main focus of application in the health sciences.

Learning Outcomes

The contents cover the main topics and theoretical-practical applications of the physics fundamentals applied to health. In Applied Physics aims to give students the ability to understand and apply basic concepts of classical physics to problems of dynamic and mechanical energy conservation, hydrostatic and hydrodynamic (fluid mechanics), oscillatory movement and wave propagation, sound waves, elements of radioactivity and geometric optics. Thus, it is intended to equip students with tools and professional attitudes to enable it to address the Physics concepts that involved in multiple therapeutic techniques in the health field.

Course Contents

1. PARTICLE AND SYSTEM MECHANICS:

Newton's laws

Friction forces

Conservative forces and potential energy

Mechanical energy conservation

Nonconservative forces

2. FLUID MECHANICS

Basic principles of hydrostatics and applications to the human body.

Surface tension and capillarity

Dynamics of nonviscous

fluids. Bernoulli equation applications

to the human body

Viscous fluids

3. OSCILLATORY MOVEMENT AND WAVE PROPAGATION

Simple harmonic motion

Wave properties (energy transport and images)

4. ELEMENTS OF RADIOACTIVITY

Production of radioisotopes

Radioactive decay

Square Inverse Law

5. SOUND WAVES

Speed of soun waves

Progressive Soundwaves

Intensity of periodic sound waves

Functioning of the human ear

6. GEOMETRIC OPTICS

Reflection and Refraction of Light. Laws of Snell and Decartes

Total Reflection of the Light

Diffraction of Light. Example of Xrays

Medical Applications of Refraction of Light. Convex and Convex Lenses

Functioning of the human eye

Recommended Bibliography

- Physics in Biology and Medicine(2001) Paul Davidovits, 2nd edition, Harcourt, Academic Press.

- Physics for Scientists and Engineers with Modern Physics(1996) Raymond A. Serway, 4th edition, Sauders College Publishing.

- Fundamentals of Physics(1993) David Halliday, Robert Resnick, Jearl Walker, 4th edition, John Wiley Sons, Inc.

Learning and Teaching Methods

The contents cover the main topics and theoreticalpractical applications of the physics fundamentals applied to health, allowing the student to review and deepen background knowledge, as well as acquire new knowledge useful to his activity as a medical engineering professional, Through autonomous research activities. The training will include the presentation of theoretical bases and examples of application, asking the students, both the study of concepts and theoretical models, and the resolution of application exercises.

The topics presented cover the main basic concepts involved in the multiple therapeutic techniques, providing bases and understanding for modern medical technologies and establishing criteria for the use of physical agents in the health area.

Assessment Methods

The student performance will be evaluated through two written tests that are intended to assess the knowledge retention. The minimum grade of each test is 8 values in a 0-20 scale. It is also considered two optional theoretical-practical evaluations and one compulsory bibliographic work.

The final classification of the students is obtained based on the following evaluation elements:

- 1st test - 35% (minimum grade 8 values)

- 2nd test - 35% (minimum grade 8 values)

- Two theoretical-practical works (optional) - 15% (with a weight of 7.5% for each work).

- One bibliographic work (compulsory) - 15%

The student will be approved when the average of the three evaluation components is greater or equal to 9.5 values, otherwise the students can always submit to the respective exam seasons, this exam have a weight of 100% in final grade with a minimum grade of 9.5 values.

In the first test, if the student does not obtain the minimum grade of 8 values, the student can realize one global test (with a weight in final evaluation of 70% or 85% if not to do the two optional theoretical-practical works). The global test will have a minimum grade of 8 values). This global test is performed on the same date as the second test.

The student approved in the first test can always choose to perform the global test (the global test is performed on the same date as the second test), since he abdicates of the classification obtained in the first exam.