

Physics

Code: 100810
ECTS Credits: 6

Degree	Type	Year	Semester
2500250 Biology	FB	1	2

Contact

Name: David Jou Mirabent
Email: David.Jou@uab.cat

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

Prerequisites

It is recommended to take the Propedeutic course on Physics offered by the Faculty, that makes more accessible the understanding of the matter. The main requirement is a strong will of learning and a commitment to work; to know addition, subtraction, multiplication, division, writing and working with logarithms and exponential functions. Having a genuine interest on biological systems. In fact, the course requires only a very elementary knowledge of Physics, and it is focused on illustrating the application of simple physical concepts to the understanding of biological problems.

Objectives and Contextualisation

To achieve an understanding of the utility of physics as a way of exploration and comprehension of biological systems, and of the devices used to observe it.

To identify some topics in biophysics and in medical physics in order to get a true appreciation of the relation between physics and biology as one of the most active current frontiers of knowledge.

To introduce some quantitative elements in the analysis of several biological situations, as for instance nervous signals, vision, audition, cellular motion, circulatory system, membrane transport, biological effects of radiations, ...

Content

Physics of the biological cell

1. Review of elementary concepts of mechanics. Application to molecular machines.
2. Scaling laws. Size and form. Some physiological and evolutionary consequences.
3. Hydrostatics. Fluids at rest. Pressure distribution and circulatory system.
4. Viscous fluids. Stokes law. Sedimentation. Motion of organisms in fluids.
5. Poiseuille equation. Blood flow. Membrane permeability.
6. Diffusion. Fick's law and Brownian motion. Membrane transport.
7. Electric potential and field. Membranes as capacitors.
8. Ohm's law. Ionic channels. Membrane depolarization.
9. Membrane ionic transport. Nernst potential. Active transport. Molecular pumps.
10. Nervous current. Physics of action potential: form, duration and speed. Synapses. Neural networks.

Biofísica de los sentidos

1. Propagation waves. Standing waves.
2. Acoustics. Speed of sound. Intensity of sound. Decibelic scale.
3. Audition. External, medial and internal ear.
4. Physical optics. Interference. Diffraction. Polarization.
5. Geometrical optics. Refraction. Lenses. Microscopes.
6. Vision. The eye: focusing; defects; visual acuteness.

Ionizing radiations

1. Quantum physics. Einstein-Planck and de Broglie relations. Energy levels.
2. Physical and biological dosimetry. Biological effects of ionizing radiations.
3. Radiative decay. Half life
4. Elementary ideas on nuclear physics: bond energy, nuclear levels, nuclear decays.