

Fundamentals of Biophysics

Calendar: 4th semester

Contact Hours: T:30,0; PL:15,0; PL: 7,5; OT:7,5

Intended learning outcomes of the curricular unit:

Students are expected to acquire solid knowledge about some important areas of physics and about the applications of those areas to the fields of biology and medicine. The significant practical component of this UC will allow students to complement knowledge acquired during theoretical classes and further study, in a practical approach, some concepts only superficially discussed in the theoretical classes. At the end of the UC it is expected that students are able to:

1. Understand concepts in areas of physics with applications to biology and medicine: physics of sound, eletromagnetism, analysis of force and movement, nuclear physics and thermodynamics; 2. Understand how the aforementioned concepts are important in understanding how biological systems work; 3. Understand how several medical devices, typically used in clinical applications, work, and know the instrumentation associated with each device and their specific applications; 4. Understand the main applications, limitations and health risks associated with the use of the medical devices discussed in class; 5. Measure in a laboratory some of the parameters discussed in the theoretical classes, correctly handling the appropriate medical devices.

Syllabus:

Theoretical classes: 1. Nuclear medicine: Radiation physics. Physiologic effects of radiation. Nuclear medicine imaging techniques. Radiotherapy. Magnetic Resonance Imaging; 2. Bioeletromagnetism. Revision of eletromagnetism. Generation, propagation and transmission of nerve impulses. Measurement of biomagnetic and bioelectric potentials. Neuronal stimulation techniques; 3. Lasers and ultrasounds: Physics of sound. Imaging with ultrasound. Applications of ultrasounds. Definition and properties of lasers. Applications and security; 4. Biomechanics: Revision of forces and movement. Composition and mechanical properties of connective tissue. Therapeutic applications of forces

Practical classes: 1.Pulse oximetry; 2. Eletrocardiography; 3. Ultrasonography; 4. Cinematic analysis of motion

Teaching methodologies (including evaluation):

Evaluation is considered as a whole, integrating both a theoretical component and a practical one. Theoretical classes follow a participatory-expository teaching methodology, encouraging the participation of students. Theoretical-practical classes will serve to increase the students' capacity to work independently in solving problems related to the themes discussed in the theoretical classes. In the laboratory classes students will be asked to perform experiments covering syllabus and focus on providing students with skills for hands-on competences on the field. The theoretical / theoretical-practical component will be evaluated by a series of tests done during the semester. Laboratory evaluation includes reports from each experience using current references as basis. The theoretical and theoretical-practical components account for 70% of the final grade, whereas the practical component accounts for the remaining 30%.