BIOINSTRUMENTATION

Code: 10005

Main Scientific Area: Electronics and Instrumentation

Lecturer: Nuno Sérgio Mendes Dias

Language of Instruction: Portuguese

Regime: S2

Contact Hours: 60h Total Workload: 100h

ECTS: 6,0

Objectives

The curricular unit of Bioinstrumentation aims at providing students with the knowledge necessary for theimplementation of biomedical instrumentation, as the entry point for information on a system of clinical decisionsupport. During this course, it will also be studied medical instruments and electronic equipment for acquisition,monitoring and analysis of biomedical signals.

Learning Outcomes

At the end of the curricular unit, students should be able to:

Know biosensors and main bioelectricity techniques;

Know and implement the electronic circuits implemented on medical instrumentation;

Know and apply biosignal acquisition techniques;

Know main electrical safety measures applied on medical instrumentation.

Course Contents

Basic Concepts of Bioinstrumentation

Principles and Basic Sensors; Biosensors

Wheatstone Bridge

Passive, Active and Second Order Filters

Bioinstrumentation Circuits: noise reduction and electrical safety

Biosignal Acquisition Systems

Recommended Bibliography

J. G. Webster, Medical instrumentation: application and design, John Wiley Sons, Inc., 4th edition, 2010.

Robert B. Northrop, Introduction to Instrumentation and Measurements, CRC Press; 2nd edition, 2005.

Learning and Teaching Methods

Once the course of bioinstrumentation intends to provide to the students the skills to identify, design and implementbiomedical instruments for clinical application, it should address the various components of a system for acquiringand processing biological signal. Thus, the initial topic focuses on biosensors and biopotential electrodes as thetransducers responsible for the transformation of physiological quantities into an electrical signal. Next, focus onthe major bioinstrumentation circuits for biological signal conditioning. The patient-computer interfaces andcomputational methods are studied as the last stage of biosignal processing. This unit also studies various clinicalapplications that implement bioinstrumentation techniques. Finally, the course approaches the basic safetymeasures for electric bioinstrumentation circuits.

Assessment Methods

The evaluation comprises two aspects, practical and theoretical, each with a weight of 50% in the final classification (CF):

2 evaluation tests (TE1 and TE2) to be carried out during the school year, each with 25% of weight on the CF or a global test (PG) with a 50% weight on the CF;

1 practical work (TP), with the respective final report.

The final classification of students is obtained by the following formula:

CF = (1/4) * TE1 + (1/4) * TE2 + (1/2) * TP

or

CF = (1/2)*PG + (1/2)*TP

Minimum requirements for approval:

9.5 points in the final standings

8.0 values in the mean of the 2 tests;

10.0 values in the practical work.In appeal and special evaluation seasons, T1 and T2 tests, or PG, are replaced by a final exam (EF) with a weight of 50% in the CF. The TP score achieved in normal season remains in the final classification of the appeal and special seasons, according to the following formula:

CF = EF / 2 + TP / 2