BIOINSTRUMENTATION

Code: 10005

Main Scientific Area: Electronics and Instrumentation

Lecturer: José Henrique de Araújo Silveira de Brito

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 forthe implementation of biomedical instrumentation, as the entry point for information on a system of clinicaldecision support. During this course, it will also be studied medical instruments and electronic equipment foracquisition, 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

In the PBL 50-10 methodology of the Degree in Medical Informatics Engineering, the assessment is divided into:

UC grade: 85%
PBL Project grade: 15%The UC grade comprises two aspects, practical and theoretical.

The theoretical component consists of 2 tests (TE1 and TE2) to be carried out in classes during the semester (minimum grade: average of the 2 tests 10 points).

The practical component consists of a laboratory project (TP) related to the course (minimum grade: TP 10 points). Attendance at practical laboratory classes is mandatory.TheUC grade is obtained through the following formula:

CF =(TE1/3+TE2/3+TP/3)

The student passes the course if CF 10 points.

Otherwise, the student can take the appeal exam, but the practical component cannot be assessed in an appeal exam.It is not possible to do the practical projects during the appeal period or in the special period.

Students with special status who fail the continuous assessment must contact the professor, until the beginning of the exam period in which they wish to be assessed. They will be graded during the exam period in the same way as the assessment carried out during the continuous assessment period.

For students who do not fit into the PBL 50-10 methodology, the Global grade will be the same as the UC grade.