ELECTRONICS

Code: 10003

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

With the course of Electronics, it is intended to instruct students with a solid training in the basic devicesof electronics, circuits and analog and digital systems. The laboratory classes try to exemplify throughpractical experience the theoretical concepts taught. These consist of the realization of projects that include theanalysis, simulation and testing of electronic circuits.

Learning Outcomes

At the end of the course, students should be able to:

Understand the operation of capacitors, inductors, RC and RL circuits;
Understand the chain of production, processing and transportation of electricity;
Understand the operation of diodes and rectification circuits;
Understand, design and size of the circuits for small signal amplifiers based on operational amplifiers;
Understand, design and scale amplifier and filtering circuits.

Course Contents

1. Review of Principles of Electricity

2. Capacitances and inductances

2.1. Capacitor and concept of capacitance

2.2. Association of capacitors

2.3. RC circuits, passive filters and other applications

2.4. Principles of electromagnetism

2.5. Inductor and concept of inductance

2.6. Association of inductors

2.7. RL circuits

3. Generation, Transmission and Distribution of Electricity

3.1. Chain of generation, transmission and distribution of electricity

3.2. Review of fundamentals of Alternating Current

3.3. Diodes

3.4. Regulators and limiter circuits

3.5. Transformers

3.6. Energy transport and power supplies

4. Circuits with Operational Amplifiers

4.1. Introduction to transistors and signal amplifiers

4.2. Operational amplifiers (OpAmp)

4.3. Amplifiers with negative feedback

4.4. Linear circuits with OpAmp

4.5. Activefilters: optimal and approximate response; passive vs. active filters

Recommended Bibliography

Otavio Markus, Circuitos Elétricos: Corrente Continua e Corrente Alternada, Editora Erica, 2004.

Albert Paul Malvino, Princípios de Electrónica, Mc Graw-Hill, 2000.

Allan Robbins e Wilhelm Miller, Circuit Analysis: Theory and Practice, Delmar Cengage Learning; 3ª edição, 2003.

Learning and Teaching Methods

Students who successfully complete this course should be able to understand the chain ofproduction, transportation and processing of electric energy. Thus it is essential to address the operation of:capacitors and inductors as well as RC and RL circuits; diodes and rectification circuits; transformers; andstabilization circuits based on zener diodes.

Students should also be able to design and calculate analog circuits based on simple operational amplifier, able toprovide conditioning of small signals in medical instrumentation systems. In addition to understandingthe functioning and properly use of the oscilloscope and function generator, students must understandthe operation of: operational amplifiers, feedback amplifiers; active and passive filters; and comparator 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 grade of the curricular unit comprises a theoretical component and a practical component:

The theoretical component consists of two written tests (T1 and T2)

The practical component consists of two practical projects (TP1 and TP2) during the semester, on which students must prepare and submit a report in groups of 2-3 elements;

The UC grade (AUC) is given by the following formula:

CF = T1 * 25% + T2 * 25% + TP1 * 25% + TP2 *25%

whereT1 and T2 are the grades for the written tests, TP1 and TP2 are the grades for the practical projects.

The following restrictions must be verified:T1 > 8.0 valuesT2 > 8.0 valuesTP1 > 8.0 valuesTP2 > 8.0 valuesAUC > 9.5 valuesThe grades for the projects results from the defense at the end of the semester.

In appeal and special evaluation seasons, the written tests T1 and T2 tests are replaced by a final exam (EF) with a weight of 50% inthe final grade. The grades of TP1 and TP2 achieved in regular season are used for the final UC grade of the appeal and special seasons, according to the following formula:

CF = EF *50% + TP1 * 25% + TP2 * 25%

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.