Measuring Instrumentation

Academic Year: (2024 / 2025) **Review date: 19-12-2023**

Department assigned to the subject: Electronic Technology Department

Coordinating teacher: MARTIN MATEOS, PEDRO

Type: Compulsory ECTS Credits : 6.0

Year : 3 Semester : 1

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Electronic Technology in Biomedicine

SKILLS AND LEARNING OUTCOMES

RA3: Be able to carry out conceptual designs for bioengineering applications according to their level of knowledge and understanding, working in a team. Design encompasses devices, processes, protocols, strategies, objects and specifications broader than strictly technical, including social awareness, health and safety, environmental and commercial considerations.
RA4: Be able to use appropriate methods to carry out studies and solve problems in the biomedical field, commensurate with their level of knowledge. Research involves conducting literature searches, designing and carrying out experimental practices, interpreting data, selecting the best approach and communicating knowledge, ideas and solutions within their field of study. May require consultation of databases, safety standards and procedures.
CB1: Students have demonstrated possession and understanding of knowledge in an area of study that builds on the foundation of general secondary education, and is usually at a level that, while relying on advanced textbooks, also includes some aspects that involve knowledge from the cutting edge of their field of study.
CB2: Students are able to apply their knowledge to their work or vocation in a professional manner and possess the competences usually demonstrated through the development and defence of arguments and problem solving within their field of study.
CB3: Students have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgements which include reflection on relevant social, scientific or ethical issues.
CB4: Students should be able to communicate information, ideas, problems and solutions to both specialist and non-specialist audiences.
CG2: Ability to design, draft and develop scientific-technical projects in the field of biomedical engineering.
CG4: Ability to solve problems with initiative, decision-making, creativity, and to communicate and transmit knowledge, skills and abilities, understanding the ethical, social and professional responsibility of the biomedical engineer's activity. Capacity for leadership, innovation and entrepreneurial spirit.
CG7: Drafting, representing and interpreting scientific-technical documentation.
CG9: Ability to analyse and conceptually design electronic devices to solve problems in biology and medicine.
ECRT26: Understanding of existing signal processing techniques to obtain information from them.
CT1: Ability to communicate knowledge orally and in writing to both specialised and non-specialised audiences.
CT2: Ability to establish good interpersonal communication and to work in multidisciplinary and international teams.
CT3: Ability to organise and plan their work, making the right decisions based on the information available, gathering and interpreting relevant data in order to make judgements within their area of study.

OBJECTIVES

Ability to analize and conceptually design electronic devices that permit to solve problems in biology and medicine. Moreover, the student has to be able to select electronic devices to implement an electronic function.

It will be especially emphasized that the student understands the posibilities offered by actual electronic technology, and the associated problematic in the developement of new electronic technologies of interest in biology and medicine.

DESCRIPTION OF CONTENTS: PROGRAMME

Block 1: Analog Electronics for Biomedical Instrumentation
- Amplification
- Frequency Response
- Feedback Amplifiers

Block 2: Aplication Circuits for Biomedical Instrumentation
- Active Filters
- Oscillators and waveform generators.
- Sample&Hold Circuits. Sampling.
- A/D and D/A converters.

Block 3: Digital Systems for Biomedical Instrumentation
- Digital System basic scheme (Computer)
- Microprocessors. Arduino
- Measuring system integration in biomedical Engineering

LEARNING ACTIVITIES AND METHODOLOGY

- Theory classes (large group), problem resolutions classes (small groups), individual tutorials and student personal homework; oriented to theoretical knowledge acquisition.

- Laboratory practices and problems resolution classes in small groups, individual tutorials and student personal homework; oriented to practical knowledge related with the fields of the course.

- Computer sessions in small groups using CAD tools for electronics circuits¿ simulations. The goal of these sessions is to encourage the use of the CAD tools to complement the theoretical-practical learning during the course.

ASSESSMENT SYSTEM

% end-of-term-examination:	50
% of continuous assessment (assigments, laboratory, practicals…):	50

The tests of first and second blocks in the continuing assesment are valued 30% of total mark. Lab exercises also are valued 20%. The final examination has a value of the remaining 50%. The last course block is evaluated together with the final examination. For the students not following continuing evaluation, the general rules of the university apply.

BASIC BIBLIOGRAPHY

- Thomas L. Floyd Digital Fundamentals, Pearson Prentice Hall , 2009

- Thomas L. Floyd Principles of Electric Circuits, Pearson Prentice Hall , 2007

- Thomas L. Floyd Electronic Devices, Pearson Prentice Hall , 2008

ADDITIONAL BIBLIOGRAPHY

- null https://www.arduino.cc/, Arduino LLC.