

Active medical devices

Lecturer

Antoine NONCLERCQ (Coordinator)

Course mnemonic

ELEC-H424

ECTS credits

5 credits

Language(s) of instruction

English

Course period

Second term

Course content

The course is divided into four parts:

- > physiological origin of bioelectricity (description of the sources and physical transmission modes that generate bioelectricity, typical patterns and interpretation)
- > biomedical signal acquisition (electrodes, electrical behavior of the body, noise and interferences, advanced medical instrumentation techniques)
- > electrical stimulation (interaction with the body, pacemaker, functional electrical stimulation, neurostimulation, etc.)
- > biomedical signal processing (biomedical modelling, pattern detection, time / frequency / space signal analysis, ...)

The course includes lectures performed by professionals or experts in this area, so that students can familiarize themselves with industrial approach.

Objectives (and/or specific learning outcomes)

Learning outcomes :

- > Designing and implementing a specific biomedical acquisition (EEG, EMG, ECG, etc.)
- > Designing and implementing a stimulator (implanted or not)
- > Designing and implementing a biomedical signal processing algorithm (computer aided diagnosis, patterns detection, etc.)
- > Plan, assess and address the specific challenges of the medical field (physiological variability, standards, etc.)

Teaching method and learning activities

Lectures, exercises and a project

Contribution to the teaching profile

This teaching unit contributes to the following competences:

- > Abstraire, modéliser et simuler des systèmes physiques complexes rencontrés dans les applications biomédicales (bioélectricité, biomécanique, écoulements, etc.)
- > Traiter et analyser des signaux de toute nature, 1D, image, vidéo, en particulier ceux issus des dispositifs médicaux
- > Se représenter les mécanismes biologiques fondamentaux depuis la biochimie de la cellule jusqu'au fonctionnement des principaux systèmes de la physiologie humaine
- > Communiquer en anglais dans le domaine de l'ingénierie

References, bibliography and recommended reading

Biomedical signal and image processing, K. Najarian and R. Splinter, Taylor and Francis, 2006

EEG signal processing, S. Sanei and JA. Chambers, Wiley, 2007

Medical Instrumentation Application and Design, John G. Webster, Wiley, 2009

Bioinstrumentation, John G. Webster, Wiley, 2009

Other information

Contact(s)

Antoine NONCLERCQ (anoncler - at - ulb.ac.be)

Evaluation method(s)

Other

Evaluation method(s) (additional information)

The evaluation is done through an oral exam and an oral project defense. The examination includes theoretical issues (restitution, development of concepts seen through examples, procedures ...) and practical questions.

Main language(s) of evaluation

English and French

Programmes

Programmes proposing this course at the Brussels School of Engineering

MA-IRCB | Master of science in Biomedical Engineering | finalité Professional/unit 1 and MA-IREM | Master of science in Electromechanical Engineering | finalité Professional/unit 2

