UCL Université catholique de Louvain

LGBIO2020

2012-2013

Bioinstrumentation

5.0 credits	30.0 h + 30.0 h	1q

Teacher(s) :	Mouraux André ; Verleysen Michel ;
Language :	Français
Place of the course	Louvain-la-Neuve
Main themes :	Biomedical instrumentation has its own requirements in terms of context complexity, needs analysis, difficulties in interfacing technical elements with the biological world, and safety issues. These fundamental principles will be approached from concrete examples of biological or medical applications described with their objectives, methods, results and limits. The analysis of collected data represents a major element in the development of biomedical instrumentation. Information can be exploited only when formatted and processed in such a way that it leads to conclusions and decisions, for example in terms of diagnosis. Data analysis, transformation, filtration, as well as machine learning are concepts closely linked to measurements themselves. The course will consist in approaching these themes, examples and concepts, situating them in their context, perceiving the meaning and impact of biomedical instrumentation, developing data and signal analysis skills, understanding fundamental methods of data acquisition, and providing the necessary basis allowing to learn more advanced methods.
Aims :	Aims - to allow students to familiarize themselves with the specific requirements of biomedical instrumentation - to introduce engineers to the main biomedical application areas, in order to allow them to apprehend each application in its context - to provide students with the necessary keys allowing them to approach the bioinstrumentation literature - to understand the basic concepts relating to information retrieval through data and signal analysis - to apply these principles by means of designing simple (linear and non-linear) data analysis algorithms - to understand and use the fundamental methods of signal processing and filtering *The contribution of this Teaching Unit to the development and command of the skills and learning outcomes of the programme(s) can be accessed at the end of this sheet, in the section entitled "Programmes/courses offering this Teaching Unit".*
Content :	Content and teaching methods - specifics of measurements and instruments in clinic and biology - electric and magnetic stimulation and recording - use of other energy types (indications, methods and interest) - safety notions (patient and user protection, asepsis and sterilization, device compatibility) - application examples, especially those requiring a mathematical analysis (ECG, EEG, evoked potentials, etc..) - descriptive methods of data analysis - single- and multi-variable analysis - linear and non-linear regression - classification - principal components analysis - frequency analysis of signals, spectrum and sampling
Other infos :	N / A
Cycle and year of study :	> Master [120] in Electro-mechanical Engineering > Master [120] in Mechanical Engineering > Master [120] in Biomedical Engineering > Master [120] in Chemical and Materials Engineering > Master [120] in Computer Science and Engineering > Master [120] in Electrical Engineering > Master [120] in Mathematical Engineering
Faculty or entity in charge:	GBIO