UCL Université catholique de Louvain

LGBIO2020

2014-2015

Bioinstrumentation

5.0 credits	30.0 h + 30.0 h	1q

Teacher(s) :	Mouraux André ; Verleysen Michel ;
Language :	Anglais
Place of the course	Louvain-la-Neuve
Inline resources:	> http://moodleucl.uclouvain.be/course/view.php?id=86
Prerequisites :	None
Main themes :	Biomedical instrumentation has its own requirements in terms of problem complexity, requirement analysis, difficulties to interface technical parts to biological systems, and security problems. These fundamental principles will be addressed through concrete examples of medical or biological applications described in terms of objectives, methods, results and limitations. Data analysis represents a major aspect in the development of biomedical instrumentation. The information can be exploited only if it is processed to lead to conclusions and decisions, for example in terms of diagnosis and prognosis. Data analysis, transformation, filtering and machine learning are concepts that are strongly linked to the measure itself. The course covers these principles, examples and concepts, situates them in their context, helps perceiving the significance and impact of biomedical instrumentation, develops basic skills in data and signal analysis and gives the fundamental to help developing more advanced skills
Aims :	Regarding the learning outcomes of the programme of "Master in Biomedical Engineering", this course contributes to the development and the acquisition of the following learning outcomes : - AA1.1, AA1.2, AA1.3, - AA2.1, AA2.2, AA2.3, AA2.4 - AA3.2, - AA6.1, AA6.2, AA6.3 More precisely, at the end of this course, students will be able to: -- understand the specific requirements of biomedical instrumentation -- consider each medical application in its context -- read the scientific literature about bioinstrumentation -- use basic principles of information extraction with data and signal analysis -- apply these principles with simple linear and nonlinear data analysis algorithms -- understand and use fundamental methods in signal analysis 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".*
Evaluation methods :	Closed book oral examination
Teaching methods :	Lectures, exercices on computers, meetings with biomedical instrument users and manufacturers (hospitals, pharmacology industry, and instrument manufacturers).
Content :	-- 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
Bibliography :	The slides used for lectures, and some scientific papers, ara available on the Moodle website of the course.
Other infos :	/
Cycle and year of study :	> Master [120] in Biomedical Engineering > Master [120] in Mathematical Engineering > Master [120] in Computer Science and Engineering > Master [120] in Electrical Engineering > Master [120] in Chemical and Materials Engineering
Faculty or entity in charge:	GBIO