UCL Université catholique de Louvain

LGBIO2060

2014-2015

Modelling of biological systems

5.0 credits	30.0 h + 30.0 h	1q

Teacher(s) :	Lefèvre Philippe ;
Language :	Anglais
Place of the course	Louvain-la-Neuve
Inline resources:	> http://icampus.uclouvain.be/claroline/course/index.php?cid=LGBIO2060_001
Prerequisites :	None
Main themes :	Vision and other sensory systems, the oculomotor and other motor systems and their mathematical modeling.
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, AA2.2, AA3.1, AA3.2 AA4.3, AA5.3, AA5.5, AA5.6, AA6.3 More precisely, at the end of this course, students will be able to: Disciplinary Learning Outcomes -- Understand basic knowledge about biological systems in order to model them -- Understand and be able to model different types of biological systems by using appropriate modeling tools -- Choose appropriate models and argue about these choices depending on the modeling application. -- Make a critical analysis about the relevance and interest of mathematical models of biological systems in their capacity to predict new experimental results and inspire original experimental protocols. -- Use softwares and computers to implement and simulate mathematical models of biological systems. Transversal Learning Outcomes -- Make a critical analysis of the scientific literature devoted to the development of original mathematical models of biological systems. -- Make a concise and critical presentation of a scientific article related to mathematical models of biological systems. *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 :	Students will be individually evaluated (written and/or oral examination) on the learning outcomes detailed above.
Teaching methods :	The course is made of lectures given by the teachers as well as practical exercises based on the critical analysis and presentation of scientific publications dedicated to mathematical models of biological systems.
Content :	In the field of modeling of sensory and motor physiological systems, this course will present how a mathematical model is built in the biomedical field, starting from the laws of nature. It will describe how its elaboration is always closely linked to experiment work aiming at obtaining data on which the model will be based. The model will be presented as a tool that allows explaining basic mechanisms of biological systems and making predictions of the responses of the system in new experimental conditions. The different steps of the model development will be presented: initial observations, hypotheses, model testing and validation. Different types of models will be described and illustrated, for instance: deterministic versus stochastic, static versus dynamic or chaotic, parametric versus non-parametric, lumped versus distributed. These notions will be illustrated by mathematical models in the biomedical field as for instance physiological models (Hodgkin-Huxley), compartment models or population models.
Bibliography :	Lecture notes and slides available on iCampus

Cycle and year of study :	> Master [120] in Statistics: Biostatistics > Master [120] in Mathematical Engineering > Master [120] in Biomedical Engineering > Master [120] in Electro-mechanical Engineering > Master [120] in Computer Science and Engineering > Master [120] in Electrical Engineering
Faculty or entity in charge:	GBIO