UCL Université catholique de Louvain

LGBIO2060

2015-2016

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:	Moodle > http://moodleucl.uclouvain.be/course/view.php?id=8449
Main themes :	Vision and other sensory systems, the oculomotor and other motor systems and their mathematical modeling.
Aims :	With respect to the AA referring system defined for the Master in Biomedical Engineering, the course contributes to the development, mastery and assessment of the following skills : -- 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 Moodle
Faculty or entity in charge:	GBIO

Programmes / formations proposant cette unité d'enseignement (UE)

Intitulé du programme	Sigle	Credits	Prerequis	Acquis d'apprentissage
Master [120] in Statistics: Biostatistics	BSTA2M	5	-	
Master [120] in Biomedical Engineering	GBIO2M	5	-	
Master [120] in Electrical Engineering	ELEC2M	5	-	
Master [120] in Computer Science and Engineering	INFO2M	5	-	
Master [120] in Mathematical Engineering	MAP2M	5	-	
Master [120] in Electro-mechanical Engineering	ELME2M	5	-	