UCL Université catholique de Louvain

LGBIO2040

2016-2017

Biomechanics

5.0 credits	30.0 h + 30.0 h	2q

Teacher(s) :	Henrotte François ;
Language :	Anglais
Place of the course	Louvain-la-Neuve
Inline resources:	Moodle > http://moodleucl.uclouvain.be/course/view.php?id=9104
Prerequisites :	No mandatory prerequisites
Main themes :	- Fundamentals of fluid and solid biomechanics, - Biomechanics of tissues, - Biomechanics of the cardiovascular system, - Biomechanics of the lung system, - Numerical and analytical modeling of biomechanical systems.
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 -- AA.2.2, AA2.3, AA2.4 -- AA3.2, AA3.3 -- AA4.2, AA4.4 -- AA5.3, AA5.5, AA5.6 After this course, the student will be able - to understand and model the main biomechanical systems, - to use simulation tools (finite elements) to study the biomechanical models problems introduced in the course, - to make a documented choice between different model types according to the application. Transversal learning outcomes: - Finite element simulations - Use of open-source scientific software and of the Linux OS - Collaborative reporting and oral presentation *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 :	- open-book written examination (55 % of final mark) - project by groups of 3 students, with written report and oral presentation (45 % of final mark)
Teaching methods :	- Theoretical lectures - Practical works devoted to getting acquainted with the simulation tools used for the project - Q& mp;A sessions about the project
Content :	This course covers applications of biomechanics on living organisms and in medicine. The usefulness of mathematical modeling in better understanding physiological systems (cardiovascular system, blood system, ...) and in developing measurement/diagnostic apparatus and dedicated therapeutic devices is discussed. The course aims at showing that mathematical modeling has its place in medical practice and may give access to information that could not be obtained with traditional methods. The first part of the course deals with transfer and flow problems in biological systems. The second part deals with the biomechanics of tissues (ligaments, muscles, bone') The third part introduces the main mechanical aspects of the cardiovascular system. During the practical works, application examples are solved from the numerical and mathematical modeling point of view. A number of sessions are dedicated to getting acquainted with and using finite element simulation tools to solve a real-life biomechanical project work by groups of 3 students.

Bibliography :	"Biomechanics", F. Henrotte, E. Marchandise, 2017
Other infos :	The needed simulation tools are provided to the students in the form of a platform independent virtual machine. This virtual machine is run on the students' personal computers.
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 Mathematical Engineering	MAP2M	5	-	
Master [120] in Electrical Engineering	ELEC2M	5	-	
Master [120] in Biomedical Engineering	GBIO2M	5	-	
Master [120] in Electro-mechanical Engineering	ELME2M	5	-	
Master [120] in Mechanical Engineering	MECA2M	5	-	
Master [120] in Computer Science and Engineering	INFO2M	5	-	