lgbio2040
2023

Biomechanics

5.00 credits	30.0 h + 30.0 h	Q2

Teacher(s)	Kerckhofs Greet ;
Language :	English > French-friendly
Place of the course	Louvain-la-Neuve
Prerequisites	No mandatory prerequisites
Main themes	• Fundamentals of the structure, function and biological performance of main biomechanical systems • Biomechanics of the musculoskeletal system • Biomechanics of the cardiovascular system • Introduction to the biomechanics of the respiratory system • Introduction to analytical and computational modelling of the systems mentioned above
Learning outcomes	**At the end of this learning unit, the student is able to :**

<table>
<tr><td rowspan="1">Learning outcomes</td><td></td></tr>
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At the end of this learning unit, the student is able to :

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
- AA.2.1, AA2.3, AA2.5
- AA3.2, AA3.3
- AA4.2, AA4.3, AA4.4
- AA5.2, AA5.5, AA5.6
- AA6.3

After this course, the student will be able

- to understand the structure and function, and their link, of the main biomechanical systems,
- to choose between different experimental characterization techniques of the structure and function of the main biomechanical systems,
- to make a choice between different analytical and computational model types according to the application,
- to use image analysis tools to study a biomechanical problem introduced in the course.

Transversal learning outcomes:

- Introduction to image analysis
- Have a debate in group for peers
- Collaborative reporting

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'.

1

Evaluation methods	• Closed-book written examination (55% of the final grade) • Projects with written reports, and oral evaluation (45% of the final grade)
Teaching methods	• Theoretical lectures • Exercise sessions to get acquainted with experimental and analytical approaches in biomechanics • Project work
Content	This course provides a link between the structure, function and biological performance of the main biomechanical systems: the musculoskeletal and the cardiovascular system. A brief introduction on the structure and function of these systems is provided, and the added value of both experimental characterization as well as computational modelling for a better understanding of the (mis)function of the main biomechanical systems is discussed, and examples of both are described in detail. The course aims at showing that engineering solutions, such as experimental characterization and computational modelling, have their place in (bio)medical practice to solve biomechanical problems. The course deals with cell biomechanics, the musculoskeletal system and the cardiovascular system. During the exercise sessions, an introduction will be provided into some experimental characterization techniques of the biological systems (Project 1), as well into analytical solutions for (bio)mechanical questions. Project 2 will focus on computational modelling, and will provide students with an introduction to finite element simulations of a biomechanical application.

Inline resources	Moodle https://moodleucl.uclouvain.be/course/view.php?id=9104
Bibliography	• Introductory Biomechanics : From cells to organisms; C. Ross Ethier and Craig A. Simmons (Cambridge Texts in Biomedical Engineering)
Faculty or entity in charge	GBIO

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Learning outcomes
Master [120] in Biomedical Engineering	GBIO2M	5		🔍
Master [120] in Mechanical Engineering	MECA2M	5		🔍
Master [120] in Computer Science and Engineering	INFO2M	5		🔍
Master [120] in Electro-mechanical Engineering	ELME2M	5		🔍
Master [120] in Mathematical Engineering	MAP2M	5		🔍