UCLouvain

# lgbio2040

*2020*

# Biomechanics

Due to the COVID-19 crisis, the information below is subject to change, in particular that concerning the teaching mode (presential, distance or in a comodal or hybrid format).

| 5 credits | 30.0 h + 30.0 h | Q2 |
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| Teacher(s) | Kerckhofs Greet ; |
| Language : | English |
| Place of the course | Louvain-la-Neuve |
| Main themes | • Fundamentals of the structure, function and biological performance of main biomechanical systems<br>• Biomechanics of the musculoskeletal system<br>• Biomechanics of the cardiovascular system<br>• Introduction to the biomechanics of the respiratory system<br>• Introduction to analytical and computational modelling of the systems mentioned above |
| 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 :<br>• AA1.1, AA1.2<br>• AA.2.1, AA2.3, AA2.5<br>• AA3.2, AA3.3<br>• AA4.2, AA4.3, AA4.4<br>• AA5.2, AA5.5, AA5.6<br>• AA6.3<br>After this course, the student will be able<br>1<br>• to understand the structure and function, and their link, of the main biomechanical systems,<br>• to choose between different experimental characterization techniques of the structure and function of the main biomechanical systems,<br>• to make a choice between different analytical and computational model types according to the application,<br>• to use image analysis tools to study a biomechanical problem introduced in the course.<br>Transversal learning outcomes:<br>• Introduction to image analysis<br>• Have a debate in group for peers<br>• Collaborative reporting<br>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'.<br>- - - -<br>*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 | **Due to the COVID-19 crisis, the information in this section is particularly likely to change.**<br>• Closed-book written examination<br>• Projects with written reports, video and oral debate |
| Teaching methods | **Due to the COVID-19 crisis, the information in this section is particularly likely to change.**<br>• Theoretical lectures<br>• Exercise sessions to get acquainted with experimental and analytical approaches in biomechanics<br>• Q&A sessions about the project |
| 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 |

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| | experimental characterization and computational modelling, have their place in (bio)medical practice to solve biomechanical problems.<br>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 (mini-project), as well into analytical solutions for (bio)mechanical questions.<br>For the project work, several biomechanical topics will be introduced, for which a dedicated journal paper will be provided focusing on an experimental (Group A) and a computational (Group B) solution. Per topic, Groups A and B will need to defend the strengths of their methodology in a promotional video and an orchestrated debate. |
| Inline resources | Moodle<br>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 |

## Force majeure

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| Teaching methods | Lectures: online teaching<br>TP sessions and project work: comodal (in presence when allowed, together with online teaching) |
| Evaluation methods | • Closed-book written examination<br>• Projects with written reports, video and oral debate |

## Programmes containing this learning unit (UE)

| Program title | Acronym | Credits | Prerequisite | Aims |
|---|---|---|---|---|
| Master [120] in Computer Science and Engineering | INFO2M | 5 | | |
| Master [120] in Electro-mechanical Engineering | ELME2M | 5 | | |
| Master [120] in Mathematical Engineering | MAP2M | 5 | | |
| Master [120] in Biomedical Engineering | GBIO2M | 5 | | |
| Master [120] in Mechanical Engineering | MECA2M | 5 | | |