UCLouvain

lmeca2355

2023

Mechanical design in biomedical engineering

5.00 credits	30.0 h + 30.0 h	Q1

Teacher(s)	Kerckhofs Greet ;Raucent Benoît ;Vankrunkelsven Ann (compensates Raucent Benoît) ;
Language :	English > French-friendly
Place of the course	Louvain-la-Neuve
Main themes	The purpose of the course is to initiate students to the design metholodogies involved in biomedical engineering, taking into account the specificities and constraints related to the area of medicine and surgery. The main topics are: • design methods and specificities related to the area of medicine and surgery (identification of medical requirements, risk analysis, etc.) • the constraints intrinsic to the area of medicine and surgery (biocompatibility, sterilization, accuracy and precision, ergonomics and safety, etc.) • the industrial constraints (certification, cost, etc.).
Learning outcomes	**At the end of this learning unit, the student is able to :** 1 In consideration of the reference table AA of the program " Master's degree civil engineer mechanics ", this course contributes to the development, the acquisition and the evaluation of the following learning outcomes: • AA1.1, AA1.2, AA1.3 • AA2.1, AA2.3, AA2.4 • AA3.1, AA3.2 • AA4.1, AA4.2, AA4.3, AA4.4 • AA5.1, AA5.3, AA5.4, AA5.5, AA5.6 • AA6.2, AA6.3 At the end of the course, students will be able to: • address practical, relevant problems encountered in medicine and surgery, • understand specificities related to the medical/surgical area (e.g. orthopaedics orcardiac surgery) • clarify the medical needs and formulate the technical specifications, • develop a state-of-the-art of existing devices, • design a technical solution that complies with medical constraints, • test the solution with a 3D functional prototype (3D printed, etc.), • communicate findings in an oral presentation and a summary report.
Evaluation methods	Evaluation will be continuous, based on the written reports (50%), the quality of work done during the semester (20%) and the final oral presentation (30%). An evaluation grid will be given to students.
Teaching methods	Teaching includes several sessions and seminars on main topics in the area of medicine and design methogologies, and a project to design a new medical device in collaboration with clinicians or industry.
Content	Design requires both solid methodological knowledge and many experiments in practice. With this in mind, the students will first work on new subjects such as certification, biocompatibility, risk analysis ... Then the students will realize, in small groups, a project to design a new medical device including an original thinking on a specific medical issue in collaboration with clinicians or industry. The results of the project will be presented to the audience at the end of semester. The entire project will be realised in collaboration with and using the software tool from Matrix Requirements: https://matrixreq.com/en/
Inline resources	https://moodleucl.uclouvain.be/course/view.php?id=10234
Bibliography	Ouvrage de référence **conseillé (non obligatoire)** et disponible en prêt à la BSE : RC. Juvinall and KM Marshek, Fundamentals of Machine Component Design, Wiley and Sons. Reference book (advised but not obliged) is available at the BSE : RC. Juvinall and KM Marshek, Fundamentals of Machine Component Design, Wiley and Sons.

Other infos	There is no prerequisite. This course is open to all who have followed training or not in mechanical or biomedical engineering. It is not necessary to have followed Machine Design LMECA2801 nor Introduction to life science FSAB1221, although these courses are interesting foundations.
Faculty or entity in charge	MECA

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 Electro-mechanical Engineering	ELME2M	5		