UCLouvain

lmeca2840

2021

Project in Mechanical Design II

6.00 credits	30.0 h + 30.0 h	Q1 and Q2

Teacher(s)	Dehez Bruno ;Everarts Christophe (compensates Raucent Benoît) ;Raucent Benoît ;Ronsse Renaud ;
Language :	English
Place of the course	Louvain-la-Neuve
Prerequisites	Students are expected to master the following skills: basic knowledge in description and analysis of mechanisms, mechanical manufacturing, and continuum mechanics, as they are covered within the courses LMECA1210, LMECA1451, and LMECA1901.
Main themes	This course implements a global project overviewing topics that were previously covered in the courses of technical drawing and description and analyze of mechanisms. Moreover, both LMECA2801 (Machine design) and LMECA2755 (Industrial automation), being taught together with the project first phase (first quadrimester of the Master in mechanical engineering), cover topics being fundamental to achieve the project.
Learning outcomes	**At the end of this learning unit, the student is able to :** In consideration of the reference table AA of the program "Masters degree in Mechanical Engineering", this course contributes to the development, to the acquisition and to the evaluation of the following experiences of learning: • AA1.1, AA1.2, AA1.3 • AA2.1, AA2.2, AA2.3, AA2.4, AA2.5 • AA3.3 • AA4.1, AA4.2, AA4.3, AA4.4 • AA5.1, AA5.2, AA5.3, AA5.4, AA5.5, AA5.6 • AA6.1, AA6.3 The project mainly targets the acquisition of engineering skills similar to those being exploited in a mechanical design office or department. a. Disciplinary Learning Outcomes **At the end of this course, students will be able to**: 1. Analyze a problem proposed by a client from the industry, and write its corresponding specifications. E.g.: conveying of mechanical pieces, sorting and storing of coal, support for organic tissue cutting during a surgery, etc. 2. Achieve a pre-study of the device and present a pre-project to the client: finding possible solutions, comparing them based on criterions from the specs, selecting the best solution, making a pilot mock-up, preliminary dimensioning, etc. 1 3. Conduct the detailed design of the selected solution, including: the components dimensioning; the selection of standard materials and components (bearings, motors, gears); the production of a global drawing of the solution, and of detailed drawings for fabrication by using CAD software. 4. Build up a synthesis folder presenting all technical details of the selected solution (global drawing, nomenclature, calculations, ...) for the industrial client. b. Transversal Learning Outcomes **At the end of this course, students will be able to**: 5. Develop inventiveness while searching innovative solutions to an industrial problem. 6. Conduct a project in a group, requiring: · To rephrase some objectives. · To separate the basis problem into sub-tasks. · To evaluate the necessary resources for each task, and write down a working plan. · To distribute the work to be done within the group. · To maintain efficient communication within the group. · To keep the client in the loop. · To make collective decisions. · To manage interpersonal relationships within the group, and to potentially solve conflicts in a constructive way. 7. Collect documentation and look for components from suppliers (describing the need, and selecting the most relevant component). 8. Perform a convincing public presentation by arguing on the decisions.

9. Apply the standards and norms in a particular domain.

Perform a critical analysis of the functioning of the device; anticipate possible failures and out-of-service causes. Guarantee the device security, as well as users' safety.

Evaluation methods

Except exceptional situations, the evaluation takes the group performances into account. The following items will be accounted for:

- the work done by the group during the whole year;
- intermediate reports and presentations (specs, pre-project, dimensioning);
- final report;
- global and fabrication drawings;
- public presentation;
- the answers given to the questions raised by the audience.

Groups for which the project would not be advanced enough after the dimensioning step will not be allowed to perform the public presentation at the end of the second quadrimester. They will have to autonomously perform complementary work that will be evaluated within the exam session of September. Moreover, this situation will also be applicable for individual students who would not have provided a fair personal contribution within their group.

Teaching methods

a. Process organization

Early in the year, students freely make group of 4 to 6 students and select a topic within a list showcasing brief problems from the industry. Thereafter, they meet their industrial client to clarify the needs and submit a specification list, being elaborated during the first weeks of the project.

The pre-design goes on during the first quadrimester and is concluded by a presentation of the pre-project in front of the teaching staff. During the second quadrimester, students achieve the detailed design of the mechanical solution, including the full dimensioning and drawings. At the end of the year, a public overviewing presentation is organized, with the industrial clients as attendees.

b. Supports

Throughout the year, students are supported by a tutor they meet regularly. Moreover, additional resource people are available to treat specific questions, e.g. regarding the selection of a mechanical or electrical component.

Technological seminars are given by people from the industry (e.g. standards and norms, electrical entrainment, etc.).

Content

see Main themes and Learning outcomes

Inline resources

https://moodle.uclouvain.be/course/view.php?id=1051

Bibliography

Design process

Pahl, G., Beitz, W., Engineering design: a systematic approach, Springer Science & Business Median, 2007.
(Available online via the UCL intranet)

Cross N., Engineering design methods: strategies for product design, John Wiley and Sons, 1994.
(Available at the 'bibliothèque des sciences et technologies' - BST)

Raucent, B., LMECA2821 ' Machine design.
(Syllabu - in French)

Embodiment and detail design of machine parts

Juvinall, R. C., Marshek K. M., Fundamentals of Machine Design, John Wiley and Sons, 5th Edition, 2011.
(Available at the 'bibliothèque des sciences et technologies' - BST)

Ashby M. F., Materials selection in mechanical design, Butterworth-Heinemann, 4th Edition, 2010.
(Available at the 'bibliothèque des sciences et technologies' - BST)

Drawing

Jensen, C., Helsel, J. D. , Short, D. R., Engineering drawing and design, New York: Glencoe/McGraw-Hill, 2002.
(Available at the 'bibliothèque des sciences et technologies' - BST)

Ricordeau, A., Corbet, C., Hazard, C., Active method of technical drawing, Casteilla, 2003. (in French)
(Available at the 'bibliothèque des sciences et technologies' - BST)

Tous les documents nécessaires à la poursuite du projet sont disponibles sur iCampus.

Faculty or entity in charge

MECA

Programmes containing this learning unit (UE)

Program title	Acronym	Credits	Prerequisite	Learning outcomes
Master [120] in Mechanical Engineering	MECA2M	6		
Master [120] in Biomedical Engineering	GBIO2M	6		