UCLouvain

lelme2002

2020

Project in mechatronics

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).

6 credits	30.0 h + 30.0 h	Q1 and Q2

Teacher(s)	Dehez Bruno ;Ronsse Renaud ;
Language :	English
Place of the course	Louvain-la-Neuve
Aims	With respect to the AA referring system defined for the Master in Electro-mechanical Engineering, professional focus in Mechatronics, the course contributes to the development, mastery and assessment of the following skills: • 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 mechatronics and robotics 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 an external entity, and write its corresponding specifications 2. Achieve a pre-study of a mechatronics device and build up a pre-project: finding possible solutions, comparing them based on criterions from the specs, selecting the best solution, making a pilot mock-up, preliminary dimensioning, etc. 3. Conduct the detailed design of the selected mechatronics solution (or a mockup of the solution) including: the components dimensioning; the selection of standard materials and components (bearings, motors, gears, electronics, batteries, sensors, etc.); the production of a global drawing of the solution, and of detailed drawings for fabrication by using CAD software. 4. Integrate the elements of the design into a functional prototype, build up, and assemble this prototype. 5. Build up a synthesis dossier presenting all technical details of the selected solution (global drawing, nomenclature, calculations ') for the teaching staff. b. Transversal Learning Outcomes **At the end of this course, students will be able to**: 6. Develop inventiveness while searching innovative solutions to an external problem. 7. 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 make collective decisions. • To manage interpersonal relationships within the group, and to potentially solve conflicts in a constructive way. 8. Collect documentation and look for components from suppliers (describing the need, and selecting the most relevant component). 9. Perform a convincing public presentation by arguing on the decisions, in front of the teaching staff. 10. Perform a critical analysis of the functioning of a mechatronics device; anticipate possible failures and out-of-service causes 1 - - - - *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.** Except exceptional situations, the evaluation takes the whole group performance into account. The following items will be accounted for: • the work done by the group during the whole year; • intermediate reports and; • final report; • global and fabrication drawings; • global functioning of the fabricated robot, and matching with the specs; • to a lesser extent, performances during the "Robotix's", "Eurobot", and/or UCLouvain cups; • public presentation; • the answers given to the questions raised by the staff. Caveat: some disciplines being practiced during the project are mainly evaluated in associated courses (see the "Prior skills" section). The project evaluation mainly focus on the mechatronics design, control, and strategy.
Teaching methods	**Due to the COVID-19 crisis, the information in this section is particularly likely to change.** Early in the year, students freely make group of 4 to 6 students. Each group has to make a robot fulfilling the yearly requirements of the "Robotix's" contest, i.e. the Belgian qualifier of the international "Eurobot" robotics cup. The pre-design goes on during the first half of the first quadrimester and is concluded by a presentation of the pre-project in front of the teaching staff. Thereafter, students achieve the detailed design of the robot, including the full dimensioning and drawings. The first quadrimester is concluded with the release of a technical dossier gathering all these elements. The rest of the year (2nd quad) is devoted to the fabrication of the electromechanical devices, their mounting, and to the programming (control) and tests. Students are invited to participate to contests in order to compare their device performances to opponents: the Belgian qualifiers of the "Eurobot" cup, during or after the Eastern break, and a local UCLouvain cup, at the end of the year. A public overviewing presentation is also organized at the end of the year. Throughout the year, students are supported by tutors who they meet on a regular basis. Moreover, resource people (senior students, assistants, technical staff) are available to support for particular issues, like the selection of a mechanical, electrical or electronical part.
Content	An integrated project in robotics, carried out by groups of 4 to 6 students. The practical terms and conditions are specified in the other sections
Inline resources	Moodle http://moodleucl.uclouvain.be/course/view.php?id=1933
Bibliography	Des ouvrages de référence dans les domaines du choix des composants, de la mise en plans, et du dimensionnement électromécanique, sont disponibles à la bibliothèque. Des catalogues de composants sont mis à disposition des étudiants. Tous les documents nécessaires à la poursuite du projet sont disponibles sur le site du cours (Moodle).
Other infos	Students can occupy different rooms (the "Faraday" lab and the adjacent mechanical workshop, both in the "Maxwell" building), being equipped with standard tools and mechanical, electrical, electronic, and IT components. Borrowing this material during the academic year is secured through a financial deposit for which modalities (amount and timing) are specified at the beginning of the year. The deposit release is made only if rooms and materials are returned in a state in line with the internal rules signed by the students. The pedagogical objectives and learning outcomes are reachable by using the electromechanical components provided by the teaching staff, a budget awarded to each group, and potentially a small personal contribution from students. Additionally, students are further allowed to seek for industrial sponsorships, providing discounted components. Nevertheless, this cannot be accounted for within the hours devoted to the project
Faculty or entity in charge	ELME

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Aims
Master [120] in Electro-mechanical Engineering	ELME2M	6		