UCL Université catholique de Louvain

# LELME2003

*2016-2017*

# Project in energy

| 6.0 credits | 30.0 h + 30.0 h | 1 + 2q |
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| Teacher(s) : | De Jaeger Emmanuel ; Bartosiewicz Yann ; Jeanmart Hervé ; |
| Language : | Anglais |
| Place of the course | Louvain-la-Neuve |
| Inline resources: | Moodle<br><br>https://moodleucl.uclouvain.be/course/view.php?id=8357 |
| Prerequisites : | This course implements a global project overviewing topics that were previously covered in the courses LFSAB1501 (Project 1 - principles of technical drawing) and LMECA1210 (Description and analyze of mechanisms). Moreover, many courses are taught in parallel to the project (during the Master in electromechanical engineering, mainly during the first quadrimester), and cover topics being fundamental to achieve the project. These courses are considered as prerequisites for students coming from other fields than the first year of this master. |
| Main themes : | --<br>Detailed sizing of a district energy system including the production, conversion and storage units;<br>--<br>Dynamical study of an energy system behavior throughout several years based on existing wind and irradiation data;<br>--<br>Detailed study of the local grid and district heating;<br>--<br>The economic cost of an energy system per installed per kWh (LCOE). |
| Aims : | The project mainly targets the acquisition of engineering skills similar to those being exploited in a mechatronics, robotics, or energy conversion systems design office or department<br>a. Disciplinary Learning Outcomes<br>--<br>A.A. 1.1. 1.2. 1.3.<br>--<br>A.A. 2.1. 2.2. 2.3. 2.4.<br>--<br>A.A. 3.2. 3.3.<br>--<br>A.A. 4.1. 4.2. 4.4.<br>--<br>A.A. 5.3. 5.4. 5.5. 5.6.<br>--<br>A.A. 6.1. 6.3. 6.4.<br>At the end of this course, students will be able to:<br>1. Analyze a problem proposed by an external entity, and write its corresponding specifications<br>2. Achieve a pre-study of an electromechanical 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.<br>3. Conduct the detailed design of the selected electromechanical solution (or a mockup of the solution) including: the components dimensioning; the selection of standard materials and components (bearings, motors, gears, electronics, batteries, thermal engines, sensors, etc.); the production of a global drawing of the solution, and of detailed drawings for fabrication by using CAD software.<br>4. Integrate the elements of the design into a functional prototype, build up, and assemble this prototype.<br>5. Build up a synthesis dossier presenting all technical details of the selected solution (global drawing, nomenclature, calculations ') for the teaching staff.<br>b. Transversal Learning Outcomes<br>At the end of this course, students will be able to:<br>1. Develop inventiveness while searching innovative solutions to an external problem.<br>2. Conduct a project in a group, requiring:<br>--<br>To rephrase some objectives.<br>--<br>To separate the basis problem into sub-tasks.<br>--<br>To evaluate the necessary resources for each task, and write down a working plan. |

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| | --<br>To distribute the work to be done within the group.<br>--<br>To maintain efficient communication within the group.<br>--<br>To make collective decisions.<br>--<br>To manage interpersonal relationships within the group, and to potentially solve conflicts in a constructive way.<br>3. Collect documentation and look for components from suppliers (describing the need, and selecting the most relevant component).<br>4. Perform a convincing public presentation by arguing on the decisions, in front of the teaching staff.<br>5. Perform a critical analysis of the functioning of an electromechanical device; anticipate possible failures and out-of-service causes. Guarantee the device security, as well as users' safety.<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 : | Except exceptional situations, the evaluation takes the whole group performances into account. The following items will be accounted for:<br>--<br>the work done by the group during the whole year;<br>--<br>intermediate reports and presentations (specs, pre-project, dimensioning, control, etc.);<br>--<br>final report;<br>--<br>global and fabrication drawings;<br>--<br>global functioning of the fabricated robot, and matching with the specs;<br>--<br>to a lesser extent (and if relevant) performances during the 'Eurobot' and UCL cups;<br>--<br>public presentation;<br>--<br>the answers given to the questions raised by the audience.<br>Students for whom the project would not be advanced enough after the UCL cup will not get a 'pass' mark for the exam session of June. They will have to autonomously perform complementary work that will be evaluated within the exam session of September.<br>Caveat: some disciplines being practiced during the projects are mainly evaluated in associated courses (see the 'Prerequisites' folder). The project evaluation mainly focus on the electromechanical design, control, and strategy. |
| Teaching methods : | 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 'Eurobot' robotics cup. Firstly, each group draft a specification list during the first weeks of the project, based from the documents provided by the cup organizing staff.<br>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)<br>If relevant, Students are invited to participate to contests in order to compare their device performances to opponents: for example, the Belgian set of the 'Eurobot' cup, during the Eastern break, and a local UCL cup, at the end of the year.<br>A public overviewing presentation is also organized at the end of the year. |
| Content : | Group work on an autonomous energy system for a district, a village, etc. combining skils from both mechanical (thermal engines) and electrical (power systems) engineering. |
| Bibliography : | Throughout the year, students are supported by an academic tutor they regularly meet. Moreover, additional resource people (teaching students, assistants, and technical staff) are available to treat specific questions, e.g. regarding the selection of a mechanical, electrical, or electronic component.<br>Reference manuscripts about the selection of components, drawings, and electromechanical dimensioning are available at the library. Catalogs of standard components are available. All documents related to the project are available on Moodle. |
| Other infos : | Students can occupy different rooms (the 'Faraday' lab and the adjacent mechanical workshop, both in the 'Maxwell' building, LEFT laboratory), being equipped with standard tools and mechanical, electrical, electronic, and IT components. Borrowing this material during the academic year is secured through a financial guarantee for which modalities (amount and timing) are specified at the beginning of the year. The guarantee release is made only if rooms and materials are returned in a state in line with the internal rules signed by the students.<br>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 either financial support or discounted components. Nevertheless, this cannot be accounted for within the hours devoted to the project. |
| Faculty or entity in charge: | ELME |

| Programmes / formations proposant cette unité d'enseignement (UE) | | | | |
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| Intitulé du programme | Sigle | Credits | Prerequis | Acquis d'apprentissage |
| Master [120] in Electro-mechanical Engineering | ELME2M | 6 | - | |