

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	Q1
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Teacher(s)	Dehez Bruno ;Fisette Paul ;Ronsse Renaud ;
Language :	English
Place of the course	Louvain-la-Neuve
Main themes	<ul style="list-style-type: none"> • Introduction to industrial sensors : physical principles and practical development • Pneumatic and electropneumatic systems : technology and sequential logic • Industrial Robotics : kinematic structures and models, manipulators, trajectory planning and control. • Programmable Logic Controllers : technology, principles and programming • GRAFCET : functional programming and implementation
Aims	<p>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:</p> <ul style="list-style-type: none"> • AA1.1 • AA3.3 • AA5.3, AA5.4, AA5.5 • AA6.1 <p>More precisely, at the end of this course, students will be able to</p> <ol style="list-style-type: none"> 1 <ul style="list-style-type: none"> • State the working principle and the main properties of industrial sensors, pneumatic and electropneumatic systems, industrial robotics, Programmable Logic Controllers (PLC), and of production line management. • Select and implement an industrial sensor within a production process • Apply notions of sequential programming, by working on didactical benches et programming an industrial conveyor. • Derive direct and inverse geometric models of an industrial robot, derive the Jacobian matrix of this robot, and use it to identify the singularities. • Develop a simple method for trajectory planning of an industrial robot, and for controlling the position along this trajectory <p>-----</p> <p><i>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".</i></p>
Evaluation methods	<p>Due to the COVID-19 crisis, the information in this section is particularly likely to change.</p> <p>Written exam.</p> <p>Depending on the health situation, the exam can be organized remotely. In this particular case, if a problem is noted in an exam copy (suspicion of fraud or technical problem) or when it is submitted (when downloading or equivalent), an oral exam may be organized in addition and/or in replacement of the written assessment.</p>
Teaching methods	<p>Due to the COVID-19 crisis, the information in this section is particularly likely to change.</p> <p>Courses (13 lectures)</p> <p>Laboratories: 4 (electro)pneumatics, 1 in robotics and 2 on a Programmable Logic Controller</p> <p>Homework on the selection and implementation of an industrial sensor</p> <p>Depending on the health situation, the lectures can be organized partially or entirely remotely, via videoconference.</p>
Content	<p>The course covers the various topics listed in the "Main themes" section. It is an introductory course in the field of industrial automation, where both sensors and actuators are covered (mainly pneumatic and electropneumatic actuators, such as industrial robots), and where the coordinating "system" is overviewed. This "system" is restricted to a sequential approach: hard-wired and programmable logics are covered and practiced in practical laboratories. Students will perform these labs by groups of 2 people, on didactic benches for pneumatic and electropneumatic systems, and on an industrial conveyor. They will further manipulate an industrial robot.</p>
Inline resources	http://moodleucl.uclouvain.be/course/view.php?id=7755

Bibliography	<p>Slides, Syllabus et notices de laboratoires sur Moodle</p> <p>Pour la partie "robotique" du cours, les deux références principales sont les livres:</p> <ul style="list-style-type: none"> • <i>Robot Modeling and Control</i> (http://eu.wiley.com/WileyCDA/WileyTitle/productCd-EHEP000518.html) de Mark W. Spong et al. Des exemplaires de ce livre sont disponibles à la bibliothèque (BST). • <i>Robotics</i> (http://www.springer.com/us/book/9789048137756) de Tadej Bajd, Matja' Mihelj, J. Lenar'i, A. Stanovnik, et Marko Munih. Ce livre est disponible en ligne (depuis le réseau de l'UCLouvain).
Other infos	One or several industrial seminar(s) is/are organized
Faculty or entity in charge	MECA

Force majeure

Evaluation methods	<p>The evaluation will be in the form of a written exam covering all the material covered in the lectures, for the 3 parts. This exam will include open and closed questions (for example: short answers, numerical answers, multiple choice questions, ...). This year, the exam will take place remotely.</p>
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Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Aims
Master [120] in Electro-mechanical Engineering	ELME2M	5		
Master [120] in Biomedical Engineering	GBIO2M	5		
Master [120] in Mechanical Engineering	MECA2M	5		