lmeca2755

2023

UCLouvain

Industrial automation

5.00 credits	30.0 h + 30.0 h	Q1

Teacher(s)	Dehez Bruno ;Fisette Paul ;Ronsse Renaud ;
Language :	English > French-friendly
Place of the course	Louvain-la-Neuve
Prerequisites	Students are expected to master the following skills: basic knowledge in description and analysis of mechanisms, and linear control, as they are covered within the courses LMECA1210 and LINMA1510
Main themes	• 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, principes and programming • GRAFCET : functional programming and implementation

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
	  • AA3.3
	  • AA5.3, AA5.4, AA5.5
	  • AA6.1
	
	More precisely, at the end of this course, students will be able to
	
	1 • State the working principle and the main properties ofIndustrial sensors, pneumatic and electropneumatic systems, industrialrobotics, 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

Evaluation methods	Written exam covering the content of the lectures, the laboratories and the homework.
Teaching methods	Courses (13 lectures) Laboratories: 4 (electro)pneumatics, 1 in robotics and 2 on a Programmable Logic Controller Homework on the selection and implementation of an industrial sensor
Content	The course covers the various topics listed in the "Main themes" section. It is an introductive 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.
Inline resources	https://moodle.uclouvain.be/course/view.php?id=1099
Bibliography	Slides, Syllabus et notices de laboratoires sur Moodle *Pour la partie "robotique" du cours, les deux références principales sont les livres:* • *Robot Modeling and Control (https://www.wiley.com/en-us/Robot+Modeling+and+Control%2C+2nd+Edition-p-9781119524045) de Mark W. Spong et al. Des exemplaires de ce livre sont disponibles à la bibliothèque (BST).* • *Robotics (http://www.springer.com/us/book/9789048137756) de T. Bajd, M. Mihelj, J. Lenar#i#, A. Stanovnik, et M. 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

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		🔍