UCLouvain

linma1510

2020

Linear Control

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	Q2

Teacher(s)	Dochain Denis ;
Language :	French
Place of the course	Louvain-la-Neuve
Main themes	Derivation of mathematical models of linear dynamical systems (state equations and transfer functions). Design of regulators and closed-loop control systems in order to satisfy specifications of stability, robustness, steady-state accuracy and transient performance. PI and PID regulation. Computer aided design.
Aims	**With respect to the referentiel AA, this courses contributes to the development, the acquisition and the evaluation of the following learning outcomes :** • AA1.1, AA1.2, AA1.3 • AA5.3, AA5.4, AA5.5 **At the end of the course, the student will be able :** 1 1. to design control systems on the basis of linear models; 2. to design control systems in closed loop aimed at meeting stability, robustness, steady-sate accuracy and transient behaviour performance requirements ; 3. to use computer-aided control design methods ; 4. to implement closed-loop control systems in laboratory conditions, in conditions close to those encountered in industrial practice; 5. to use industrial PID regulators; 6. to use discrete time controllers implemented on PLC's; 7. to perform experiments in an autonimous way, from the planning of the work until the practical implementation and the performance evaluation. - - - - *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.** Laboratory evaluation outside of the exam period and written exam, either under the format of an oral evaluation or via the use of an evaluation software for the laboratory evluation, either under an hand-written mode or via the use of an evaltaion software for the written exam. The teacher reserve the right to examine orally any student besides the laboratory evaluation and the written exam.
Teaching methods	**Due to the COVID-19 crisis, the information in this section is particularly likely to change.** Problem-based learning, laboratory experiments. The course will be given either in presence mode or in distance mode.
Content	1. Mathematical models 2. General principles of closed-loop control 3. Stability 4. Steady-state accuracy 5. Disturbance attenuation 6. Transient performance 7. Robustness 8. Regulation structures 9. Case studies: electrical machines, automotive systems, aeronautics, thermic and nuclear power plants, heat exchangers, industrial grinding and mixing processes, etc.
Inline resources	https://moodleucl.uclouvain.be/course/view.php?id=7834
Bibliography	Transparents de théorie, notices de laboratoire et d'exercices, fiches, fichiers d'exemples et d'illustration des concepts. Livre de référence : K. Astrom & R. Murray, Feedback Systems: An Introduction for Scientists and Engineers http://www.cds.caltech.edu/~murray/amwiki/index.php

Faculty or entity in charge	MAP

Force majeure

Teaching methods	In case of force majeure, the course will be given at distance by using the softwares available for the teachers.
Evaluation methods	In case of force majeure, the laboratory evaluation and the written exam will take place at distance by using the softwares available for the teachers.

Programmes containing this learning unit (UE)

Program title	Acronym	Credits	Prerequisite	Aims
Minor in Applied Mathematics	LMINOMAP	5		
Master [120] in Electrical Engineering	ELEC2M	5		
Master [120] in Chemical and Materials Engineering	KIMA2M	5		
Minor in Engineering Sciences: Applied Mathematics (only available for reenrolment)	MINMAP	5		
Specialization track in Applied Mathematics	FILMAP	5		
Minor in Engineering Sciences: Mechanics (only available for reenrolment)	MINMECA	5		
Master [120] in Mechanical Engineering	MECA2M	5		