UCLouvain

linma1510

2022

Linear Control

5.00 credits	30.0 h + 30.0 h	Q1

Teacher(s)	Bianchin Gianluca ;
Language :	English > French-friendly
Place of the course	Louvain-la-Neuve
Prerequisites	Notions of signals and systems as taught in LEPL1106.
Main themes	Development of mathematical models for linear dynamical systems (state-space representation, transfer functions) allowing to represent the dynamics in a unified way for a diversity of engineering applications (e.g. electromechanical, mechanical, electrical, chemical, biological, computer science) Design of control schemes that meet specifications related to stability, transient and steady state performance (accuracy), and robustness. PI and PID controllers, Linear Quadratic Control, Smith predictor, feedforward control, cascade control. Use of software to design controllers.
Learning outcomes	**At the end of this learning unit, the student is able to :** **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. Design control systems based on linear models; 2. Design of control schemes that meet specifications on related to stability, transient and steady state performance (accuracy), and robustness. PI and PID regulators, Linear Quadratic Control, Smith predictors, feedforward control, cascade control; 3. Use software to design controllers.; 4. Implement closed-loop control system in laboratory experiments under conditions similar to those in industrial applications.; 5. Use industrial PID controller; 6. Autonomously run automatic control experiments, from the design level to the actual implementation and performance evaluations;
Evaluation methods	As part of this course, students are assessed by: • an individual written exam; • laboratory evaluation outside of the exam period, produced individually, either under the format of an oral evaluation or a written report or via the use of an evaluation software. To constitute the final grade, the weighting given to the assessments is: • 75% to the written exam; • 25% to the laboratory evaluation.
Teaching methods	Problem-based learning, laboratory experiments. The course will be given either in presence mode or in distance mode.
Content	1. Analysis and design of continuous-time control systems using classical and state space methods. 2. Laplace transforms, transfer functions, and block diagrams. 3. Stability, dynamic response, and steady-state analysis. 4. Analysis and design of control systems using frequency domain methods. 5. Analysis and design of control systems using time domain methods.
Inline resources	https://moodleucl.uclouvain.be/course/view.php?id=7834
Bibliography	Slides, notes, and laboratory notes provided by the instructor Livres de référence : K. Åström, R. M. Murray, *Feedback systems: an introduction for scientists and engineers*. Princeton university press, 2021 (http://www.cds.caltech.edu/~murray/amwiki/) J. P. Hespanha, *Linear systems theory*. Princeton university press, 2018 (disponible en bibliothèque). K. Ogata, Modern Control Engineering, 5th Edition, Prentice Hall, 2009 (disponible en bibliothèque).

Other infos	The lectures and problem sessions are in English, and all documents are in English. Homework, exams, and project reports can be written in English or French.
Faculty or entity in charge	MAP

Programmes containing this learning unit (UE)

Program title	Acronym	Credits	Prerequisite	Learning outcomes
Specialization track in Biomedical Engineering	FILGBIO	5		
Minor in Applied Mathematics	LMINOMAP	5		
Master [120] in Chemical and Materials Engineering	KIMA2M	5		
Specialization track in Applied Mathematics	FILMAP	5		
Master [120] in Mechanical Engineering	MECA2M	5		
Master [120] in Electrical Engineering	ELEC2M	5		
Master [120] in Electro-mechanical Engineering	ELME2M	5		