UCL Université catholique de Louvain

LINMA2370

2013-2014

Modelling and analysis of dynamical systems

5.0 credits	30.0 h + 22.5 h	1q

Teacher(s) :	Dochain Denis (coordinator) ; Delvenne Jean-Charles ;
Language :	Français
Place of the course	Louvain-la-Neuve
Inline resources:	> http://icampus.uclouvain.be/claroline/course/index.php?cid=LINMA2370
Prerequisites :	Basic calculus and linear algebra, such as taught in LFSAB1101 (Mathématiques I) et LFSAB1102 (Mathématiques II)
Main themes :	First part : presentation of the modelling principles and methods in various areas of engineering sciences : electricity, mechanics, chemical and biochemical processes, environment. Second part : presentation of the major methods for the analysis of the structural properties of state space models : state transformations, equilibria, stability and attractors, controllability, singular perturbations.
Aims :	Learning outcomes: -- AA1 : 1,2,3 -- AA4 : 1,2,3,4 -- AA5 : 2,3,5,6 More specifically, at the end of the course the student: -- will be aware of the unifying character of the state space model concept in engineering sciences. -- will be able to model a wide span of situations encountered in diverse engineering sciences -- will be able to analyze the properties of those dynamical systems defined on a state space Transversal learning outcomes: -- Using Matlab and Simulink for the modelling and simulation of dynamical systems. *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 :	Project during the semester, with oral and written report. Written exam.
Teaching methods :	Ex cathedra, with reading of notes by the students previously to the course.
Content :	MODELING - mechanical, electrical, electromechanical systems - compartmental systems - reactional systems - systematic applications in various areas ANALYSIS - state transformations - equilibria - qualitative analysis of trajectories in the plane, periodical solutions, limited cycles, bifurcations - stability analysis : Lyapunov methods - controllability and stabilisation of linear and nonlinear systems
Bibliography :	Notes available on iCampus.
Cycle and year of study :	> Master [120] in Chemical and Materials Engineering > Master [120] in Mathematical Engineering > Master [120] in Statistics: General > Master [120] in Electro-mechanical Engineering > Master [120] in Biomedical Engineering
Faculty or entity in charge:	MAP