UCLouvain

linma2370

2024

Modelling and analysis of dynamical systems

5.00 credits	30.0 h + 22.5 h	Q1

Teacher(s)	Delvenne Jean-Charles ;
Language :	English > French-friendly
Place of the course	Louvain-la-Neuve
Prerequisites	Basic calculus and linear algebra, such as taught in LEPL1101 (Mathématiques I) et LEPL1102 (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.
Learning outcomes	**At the end of this learning unit, the student is able to :** Learning outcomes: • AA1 : 1,2,3 • AA4 : 1,2,3,4 • AA5 : 2,3,5,6 1 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.
Evaluation methods	The project during the semester amounts to 25% of the final grade (in Jan and, unchanged, in Aug). The (written and sometimes oral, depending on the circumstances) exam amounts to 75% of the final grade.
Teaching methods	Ex cathedra, and reading by the students of the documents provided to them
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, periodic solutions, limit cycles, bifurcations - stability analysis : Lyapunov methods - controllability and stabilisation of linear and nonlinear systems
Inline resources	Moodle page of the course
Faculty or entity in charge	MAP

Programmes containing this learning unit (UE)

Program title	Acronym	Credits	Prerequisite	Learning outcomes
Master [120] in Biomedical Engineering	GBIO2M	5		
Master [120] in Electro-mechanical Engineering	ELME2M	5		
Master [120] in Mathematical Engineering	MAP2M	5		
Master [120] in Energy Engineering	NRGY2M	5		