UCL Université catholique de Louvain

LINMA2361

2016-2017

Nonlinear dynamical systems

5.0 credits	30.0 h + 22.5 h	1q

Teacher(s) :	Absil Pierre-Antoine ;
Language :	Français
Place of the course	Louvain-la-Neuve
Inline resources:	> http://moodleucl.uclouvain.be/course/view.php?id=8235
Main themes :	The course is an introduction to the analysis and synthesis of nonlinear dynamical systems. The mathematical tools are illustrated on different applications, preferentially in the fields of neurodynamics, nonlinear control, and physics. Further specific illustrations are presented by the students at the end of the course.
Aims :	Contribution of the course to the program objectives : -- AA1.1, AA1.2, AA1.3 -- AA5.5, AA5.6 At the end of the course, the student will be able to: -- Make adequate use of basic mathematical tools to model, analyze, and design nonlinear dynamical systems, in areas such as neurodynamics, nonlinear control, and physics. Transversal learning outcomes : -- Use a reference book in English; -- Discuss and criticize research articles ; -- Report in writing and present the results orally. *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 :	-- Homeworks, exercices, or laboratory work during the course semester -- Written report and oral presentation of a project, including a bibliographical part (article or book chapter reading) and computer illustrations of the theory. Precisions are given in the course outline (plan de cours) available on iCampus & t; LINMA2361 & t; Documents et liens
Teaching methods :	-- Lectures. -- Homeworks, exercices, or laboratory work to be carried out individually or in small groups.
Content :	-- Introduction to nonlinear phenomena -- Multiple equilibrium points and systems in the plane -- Lyapunov functions, gradient systems, stability -- Limit cycles -- Hopf bifurcations, asymptotic methods -- Introduction to chaos Depending on the choice of the course book, some of the following themes may also be touched : -- Introduction to dynamical models in neuroscience -- Simple neural computation models, Hopfield networks -- Stabilization of equilibrium points

	-- Coupled oscillators, synchronization phenomena, and collective motions -- Input-output tools for nonlinear system analysis
Bibliography :	-- Reference book -- Complementary documents posted on Moodle Precisions are given in the course outline (plan de cours) available on Moodle.
Faculty or entity in charge:	MAP

Programmes / formations proposant cette unité d'enseignement (UE)				
Intitulé du programme	Sigle	Credits	Prerequis	Acquis d'apprentissage
Master [120] in Biomedical Engineering	GBIO2M	5	-	
Master [120] in Mathematical Engineering	MAP2M	5	-	
Master [120] in Electro-mechanical Engineering	ELME2M	5	-	
Master [120] in Physics	PHYS2M	5	-	