




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	<p><b>At the end of this learning unit, the student is able to :</b></p> <p>Learning outcomes:</p> <ul style="list-style-type: none"> <li>• AA1 : 1,2,3</li> <li>• AA4 : 1,2,3,4</li> <li>• AA5 : 2,3,5,6</li> </ul> <p>More specifically, at the end of the course the student:</p> <p>1</p> <ul style="list-style-type: none"> <li>• will be aware of the unifying character of the state space model concept in engineering sciences.</li> <li>• will be able to model a wide span of situations encountered in diverse engineering sciences</li> <li>• will be able to analyze the properties of those dynamical systems defined on a state space</li> </ul> <p>Transversal learning outcomes:</p> <ul style="list-style-type: none"> <li>• Using Matlab and Simulink for the modelling and simulation of dynamical systems.</li> </ul>
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

<b>Programmes containing this learning unit (UE)</b>				
Program title	Acronym	Credits	Prerequisite	Learning outcomes
Master [120] in Biomedical Engineering	<a href="#">GBIO2M</a>	5		
Master [120] in Electro-mechanical Engineering	<a href="#">ELME2M</a>	5		
Master [120] in Mathematical Engineering	<a href="#">MAP2M</a>	5		
Master [120] in Energy Engineering	<a href="#">NRGY2M</a>	5		