UCL Université catholique de Louvain

LMECA2802

2015-2016

Multibody system Dynamics

5.0 credits	30.0 h + 30.0 h	2q

Teacher(s) :	Fisette Paul ;
Language :	Anglais
Place of the course	Louvain-la-Neuve
Inline resources:	> http://icampus.uclouvain.be/claroline/course/index.php?cid=MECA2802
Main themes :	Definition and classification of multibody systems. Description of the various methods used by multibody softwares. Multibody formalisms for tree-like multobody systems (e.g. serial robot manipulators) and closed-loop systems (e.g. parallel manipulators, vehicles,...) : automatic computer generation of the dynamical eduations and numerical integration algorithms for differential-algebraic equations (DAE)
Aims :	In consideration of the reference table AA of the program "Masters degree in Mechanical Engineering", this course contributes to the development, to the acquisition and to the evaluation of the following experiences of learning: -- AA1.1, AA1.2, AA1.3 -- AA2.3, AA2.4, AA2.5 -- AA3.2, AA3.3 -- AA5.1, AA5.2, AA5.3 -- AA6.2, AA6.4 Give students a complementary education in the field of mechanics of systems of rigid bodies (geometry, kinematics, dynamics) bu studying the modelling aspects of complex articulted systems. Develop the sutdents capacities in designing, writing and/or using multibody modelling software for robots, vehicles, suspensions systems and other mechanisms, with a view to their geometrical, kinematical and dynamical analysis. *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 :	Exam : oral examination. The exam consist of two parts: an examination on the theory (with lecture notes available) and a discussion about the project (theory, modelling and software implementaiton). support : lecture notes and copies of the slides used during the lectures.
Content :	-- Definition and classification of multibody systems (NBS). Principal characteristics of the computer programs used in modelling and analyzing multibody systems. -- Multobody formalisms for tree-like systems (e.g. serial robots) or closed-loop mechanisms (e.g. vehicles) - definition of barycentric quantities - automatic generation of the dynamical equations using the Lagrange multipliers technique (use of the virtual power principle and Newton-Euler recursive algorithm). -- Coordinate partitioning method. -- Numerical analysis : equilibrium, modal analysis, time simulation, inverse dynamics. -- Particular applications : serial and parallel robots, road vehicles, railway vehicles, multibody systems with flexible elements. Students must choose a project (for 1 or 2 students) dealing with the modeling and analysis of a multibody system or with the reading and the synthesis of a couple of scientific publications.
Bibliography :	Basic reference : J.-C. Samin and P. Fisette : "Symbolic Modeling of Multobody Systems", Kluwer Academic Publishers, Dordrecht/Boston/London, 2003. Recommended readings : -- Parviz E. Nikravesh, Computer-Aided Analysis of Mechanical Systems, Prentice Hall Inc., 1988. -- Haug, E.-J. : Computer Aided Kinematics and Dynamics of Mechanical Systems, Allyn and Bacon, Boston, 1989.

Faculty or entity in charge:	MECA

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 Mechanical Engineering	MECA2M	5	-	
Master [120] in Electro-mechanical Engineering	ELME2M	5	-	