UCL Université catholique de Louvain

LMECA2410

2016-2017

Dynamics of elastic systems

5.0 credits	30.0 h + 30.0 h	2q

Teacher(s) :	Coyette Jean-Pierre ; Delannay Laurent ;
Language :	Anglais
Place of the course	Louvain-la-Neuve
Inline resources:	> http://icampus.uclouvain.be/claroline/document/document.php?cidReset=true&cidReq=LMECA2410_001 Lecture notes written in English by the teachers are available on icampus
Prerequisites :	Student must master basic skills in the mechanics mechanics of deformable solids as taught in the course LMECA1100. In particular, they must be able to compute the static deflexion of elastc beams (beam theory).
Main themes :	-- Mathematical modelling of discrete and continuous systems, degrees of freedom, (non)linearity, stiffness, damping. -- Eigenvalue problems for discrete and continuous linear systems -- Forced response : frequency response functions, resonance, antiresonance. -- Specific investigation of vibration isolation and measurement devices.
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 -- AA2.1, AA2.2, AA2.3 -- AA3.1, AA3.2 -- AA5.1, AA5.3, AA5.4 -- AA6.2, AA6.4 Introduceh students to the specific techniques of mechanical vibrations, via simplified models. Apply these techniques to important basic applications : suspensions, vibration isolation, measurement devices, vehicles, structures. *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".*
Teaching methods :	Variational approach : approximative methods in modal analysis (Rayleigh, Rayleigh-Ritz).
Content :	The mathematical models studied follow a gradually increasing complexification, both as regards number of degrees of freedom and physical terms involved. The course is subdivided into three main parts : -- Linear 1-degree-of-freedom systems : undamped free vibrations, harmonic oscillator, damped vibrations, forced vibrations, applications, vibration transmission to foundations, vibration isolation, measurement devices. -- Linear N-degree-of-freedom systems : undamped free vibrations, eigenvalue problem, normal modes of vibration, modal analysis, orthogonality, damped free vibrations, forced vibrations, anti-resonance, vibration absorbers, modal truncation, approximative methods in modal analysis (Rayleigh, Rayleigh-Ritz, ') -- Continuous systems : eigenvalue problem, boundary conditions, free vibrations of strings, shafts, beams, membranes, plates.

Bibliography :	-- Meirovitch Analytical Methods in Vibrations -- Craig, R.R. Structural Dynamics -- Dimaragonas Vibration for Engineers -- Geradin, Rixen Vibration Theory -- Lecture notes written in English by the teachers are available on icampus
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 Mechanical Engineering	MECA2M	5	-	
Master [120] in Electro-mechanical Engineering	ELME2M	5	-	
Master [120] in Civil Engineering	GCE2M	5	-	