



5 credits

30.0 h + 30.0 h

Q2

Teacher(s)	Coyette Jean-Pierre ;Delannay Laurent ;
Language :	English
Place of the course	Louvain-la-Neuve
Main themes	<ul style="list-style-type: none"> <li>• Mathematical modelling of discrete and continuous systems, degrees of freedom, (non)linearity, stiffness, damping.</li> <li>• Eigenvalue problems for discrete and continuous linear systems</li> <li>• Forced response : frequency response functions, resonance, antiresonance.</li> <li>• Specific investigation of vibration isolation and measurement devices.</li> </ul>
Aims	<p>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:</p> <ul style="list-style-type: none"> <li>• AA1.1, AA1.2, AA1.3</li> <li>• AA2.1, AA2.2, AA2.3</li> <li>1 • AA3.1, AA3.2</li> <li>• AA5.1, AA5.3, AA5.4</li> <li>• AA6.2, AA6.4</li> </ul> <p>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.</p> <p>-----</p> <p><i>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".</i></p>
Teaching methods	Variational approach : approximative methods in modal analysis (Rayleigh, Rayleigh-Ritz).
Content	<p>The mathematical models studied follow a gradually increasing complexification, both as regards number of degrees of freedom and physical terms involved.</p> <p>The course is subdivided into three main parts :</p> <ul style="list-style-type: none"> <li>• Linear 1-degree-of-freedom systems : undamped free vibrations, harmonic oscillator, damped vibrations, forced vibrations, applications, vibration transmission to foundations, vibration isolation, measurement devices.</li> <li>• 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, ')</li> <li>• Continuous systems : eigenvalue problem, boundary conditions, free vibrations of strings, shafts, beams, membranes, plates.</li> </ul>
Inline resources	<a href="http://icampus.uclouvain.be/claroline/document/document.php?cidReset=true&amp;cidReq=LMECA2410_001">http://icampus.uclouvain.be/claroline/document/document.php?cidReset=true&amp;cidReq=LMECA2410_001</a> Lecture notes written in English by the teachers are available on icampus
Bibliography	<ul style="list-style-type: none"> <li>• Meirovith, Analytical methods in Vibrations</li> <li>• Tse, Morse, Hinkle, Mechanics Vibrations.</li> <li>• Lalanne, Berthier, Der Hagopian, Mechanical Vibrations for Engineers.</li> <li>• Craig R.R., Structural Dynamics.</li> <li>• Dimaragonas, Vibration for Engineers.</li> <li>• Geradin, Rixen, Théorie des Vibrations. Matière : Dynamique appliquée : 50.14.</li> <li>• Les notes de cours (syllabus et transparents) écrites par les enseignants sont disponibles sur icampus</li> </ul>
Faculty or entity in charge	MECA

<b>Programmes containing this learning unit (UE)</b>				
Program title	Acronym	Credits	Prerequisite	Aims
Master [120] in Electro-mechanical Engineering	<a href="#">ELME2M</a>	5		
Master [120] in Civil Engineering	<a href="#">GCE2M</a>	5		
Master [120] in Mechanical Engineering	<a href="#">MECA2M</a>	5		