


5 credits

30.0 h + 30.0 h

Q2

Teacher(s)	Papalexandris Miltiadis ;
Language :	English
Place of the course	Louvain-la-Neuve
Main themes	<ul style="list-style-type: none"> <li>• Governing equations of compressible flows</li> <li>• Steady and unsteady compressible flows in one dimension</li> <li>• Steady compressible flows in two and three dimensions</li> <li>• Supersonic combustion, detonations</li> <li>• Subsonic combustion - deflagrations, explosions</li> <li>• Introduction of multiphase compressible flows.</li> </ul>
Aims	<p>With respect to the reference AA of the programme of studies "Masters degree in Mechanical Engineering", this course contributes to the development and acquisition of the following skills</p> <ul style="list-style-type: none"> <li>• AA1.1, AA1.2, AA1.3</li> <li>• AA2.2, AA2.4, AA2.5</li> <li>• AA3.2, AA3.3</li> <li>• AA4.1, AA4.2, AA4.3, AA4.4</li> <li>• AA5.1, AA5.4, AA5.6</li> <li>• AA6.1, AA6.4</li> </ul> <p>Study of compressible gaseous flows, including supersonic flows. Study of reacting flows in which compressibility effects are deemed important. Presentation of industrial and technological applications</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>
Evaluation methods	<ul style="list-style-type: none"> <li>• Written exam, with open books and notes. The score on the exam counts for 70% of the overall score on the course.</li> <li>• 3 homework assignments. The score on each assignment counts for 10% of the overall score on the course</li> </ul>
Teaching methods	<ul style="list-style-type: none"> <li>• Course lectures</li> <li>• Session of exercices</li> </ul>
Content	<ul style="list-style-type: none"> <li>• Steady and unsteady compressible flows in one dimension Euler equations, characteristic decomposition, boundary conditions.</li> <li>• Simple waves, shock waves. Rankine-Hugoniot relations.</li> <li>• Steady compressible flows in two and three dimensions. Prandtl-Meyer expansion. Supersonic flow around projectiles. Method of characteristics. Oblique shocks.</li> <li>• Unsteady flows. Shock formation, Riemann problem. Piston-induced flow. Wave interactions. Viscosity effects. Introduction to numerical methods.</li> <li>• Detonations. Introduction. Chapman-Jouguet theory. ZND theory. Stability analysis. Multi-dimensional structure. Applications.</li> </ul>
Inline resources	<a href="http://moodleucl.uclouvain.be/enrol/index.php?id=6803">http://moodleucl.uclouvain.be/enrol/index.php?id=6803</a> Homework announcements.
Bibliography	<ul style="list-style-type: none"> <li>• P.A. Thompson, Compressible Fluid Dynamics, 1988. <b>Obligatoire.</b></li> <li>• Notes additionnelles du cours LMECA2195. <b>Obligatoire</b>, disponible sur le site moodle du cours.</li> <li>• Enoncés des devoirs. <b>Obligatoire</b>, disponible sur le site moodle du cours.</li> <li>• H.W. Liepmann &amp; A. Roshko, Elements of Gas dynamics, Dover Edition, 1993. <b>Conseillé.</b></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	ELME2M	5		
Master [120] in Mechanical Engineering	MECA2M	5		