UCL Université catholique de Louvain

LMECA2195

2013-2014

Gasdynamics and reacting flows

5.0 credits	30.0 h + 30.0 h	2q

Teacher(s) :	Papalexandris Miltiadis ;
Language :	Français
Place of the course	Louvain-la-Neuve
Inline resources:	> http://icampus.uclouvain.be/claroline/course/index.php?cid=LMECA2195
Prerequisites :	-- Fluid Mechanics I (MECA2321). -- Additionally, the students must have taken or take at the same time Fluid Mechanics II (MECA2322).
Main themes :	Steady and unsteady compressible flows in one dimension Steady compressible flows in two and three dimensions Supersonic combustion - detonations, Subsonic combustion - deflagrations, explosions, Introduction of multiphase compressible flows.
Aims :	Study of compressible gaseous flows, including supersonic flows. Study of reactingflows in whichcompressibilityeffects are deemed importants. Presentation of industrial and technological applications. *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 :	Written, with open books and notes. The course involves 3 homework assignments that count for 30% of the total grade, if the results of the written exam is 10/20 or higher
Content :	- Steady and unsteady compressible flows in one dimension Euler equations, characteristic decomposition, boundary conditions. Simple waves, shock waves. Rankine-Hugoniot relations, shcok formation, Riemman problem. Piston-induced flow. Wave interactions. Viscosity effects. Introduction to numerical methods. - Steady compressible flows in two and three dimensions Prandtl-Meyer expansion. Supersonic flow around projectiles. Method of characteristics. Oblique shocks. Supersonic combustion -Detonations. Introduction. Chapman-Jouguet theory. ZND theory. Stability analysis. Multi-dimensional structure. Applications. Subsonic combustion -Deflagrations. Introduction, balance equations, review of chemical kinetics. Structure of laminar premixed flames. Structure of laminar diffusion flames. Explosions Temperature distribution une a closed domain. Explosion theory and explosivity limits. Octane index. Accident prevention. Introduction of multiphase compressible flows Presentation and analysis of continuum models for fluid-solid mixtures. Industrial applications and applications in aerospace propulsion.
Bibliography :	1) P.A. Thompson, Compressible Fluid Dynamics, 1988. 2) H.W. Liepmann & mp; A. Roshko, Elements of Gas dynamics, Dover Edition, 1993.
Cycle and year of study :	> Master [120] in Mechanical Engineering
Faculty or entity in charge:	MECA