UCL Université catholique de Louvain

LMECA2160

2015-2016

Combustion and fuels

5.0 credits	30.0 h + 30.0 h	1q

Teacher(s) :	Papalexandris Miltiadis ;
Language :	Anglais
Place of the course	Louvain-la-Neuve
Inline resources:	> http://moodleucl.uclouvain.be/enrol/index.php?id=6783
Main themes :	Origins, nature, and conditioning of fuels. Mass and energy balance laws of combustion. Physical chemistry and chemical kinetics of combustion: reacting schemes and phenomenology of the modes of combustion. Fuel combustion technologies: conception and design of combustion heat transfer equipment.
Aims :	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 -- AA1.1, AA1.2, AA1.3 -- AA2.3, AA2.4, AA2.5 -- AA3.1, AA3.3 -- AA4.1, AA4.2, AA4.3, AA4.4 -- AA5.2, AA5.4, AA5.5 -- AA6.1, AA6.4 Specific learning outcomes of the course To provide the theoretical and practical background in the use of fuels via a physico-chemical approach to combustion and to present the technological aspects relative to fuel combustion. *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 exam, with closed books and notes. The score on the laboratory report counts for 25% of the overall score. The score on the theoretical questions of the exam counts for 50% of the overall grade. The score of the exercises of the exam counts for 25% of the overall score.
Teaching methods :	Course lectures Session of exercises Laboratory: Operation of a domestic natural-gas boiler and analysis of its combustion efficiency.
Content :	1.Energetic study of fuels and their use. Origins and formation of fuels. Conditioning and specification of fuels. Global mass and energy balance laws in combustion. Control and diagnostic techniques. 2. Thermochemistry. Chemical kinetics of combustion. Chain-branching mechanisms. Explosivity and flammability limits, flame temperature. Chemical reaction rates. Pollutant formation. Measurement techniques. 3. Combustion and heat transfer technologies. Laminar premixed flames. Introduction to turbulent flows. Turbulent premixed flames and their applications. Introduction to detonations. 4. Use of heat: Heat transfer basics. Conduction, free and forced convection. Applications to combustion-related problems. The balance laws of mass and of energy and the physico-chemical calculations are the objects of exercises and laboratory experiments. In these experiments emphasis is placed upon the phenomenology of combustion, control methods and diagnostics and upon operating methods
Bibliography :	Lecture notes of the course LMECA2160 (in French). Compulsory, available on the i-campus site of the course and at SICI. Instructions of use for the laboratory of the course (in French). Compulsory, available on the i-campus site of the course. List of exercises and theoretical questions (in French). Recommended, available on the i-campus site of the course . S.R. Turns, Introduction to Combustion, Mc Graw Hill, 2000. Recommended. K.K. Kuo, Principles of Combustion, Wiley, 2005. Recommended. T. Poinsot & mp; D. Veynante, Theoretical and Numerical Combustion, Edwards. Recommended

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	-	