UCLouvain

lmeca2160

2020

Combustion and fuels

Due to the COVID-19 crisis, the information below is subject to change, in particular that concerning the teaching mode (presential, distance or in a comodal or hybrid format).

5 credits	30.0 h + 30.0 h	Q1

Teacher(s)	Papalexandris Miltiadis ;
Language :	English
Place of the course	Louvain-la-Neuve
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 1 • AA6.1, AA6.4 **Specific learning outcomes of the course** More specifically, by the end of the course, the student will be able i) to apply the main concepts of the thermo-chemistry of combustion to the evaluation of the quality of combustion in energy systems, including thermal engines. ii) to perform calculations of combustion equipment and associated heat-transfer devices. iii) to understand the environmental aspects of fossil 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	**Due to the COVID-19 crisis, the information in this section is particularly likely to change.** Written exam, with open books and notes. • The score on the laboratory report counts for 25% of the overall score. • The score on the written exam counts for 75% of the overall grade. • We maintain the right to ask a student for an oral exam in case of technical problems or suspicion of fraude.
Teaching methods	**Due to the COVID-19 crisis, the information in this section is particularly likely to change.** • Course lectures • Session of exercises • Laboratory: Operation of a domestic natural-gas boiler and analysis of its combustion efficiency. • Lectures in the classroom or mixed (classrooms with simultaneous broadcasting on Teams) depending on the pandemic conditions
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 of combustion.** 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. Use of heat generated by combustion. Introduction to detonations 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

Inline resources	http://moodleucl.uclouvain.be/enrol/index.php?id=6783
Bibliography	• M.V. Papalexandris, *Combustion and Fuels*, Presses Universitaires de Louvain, 2020. **Mandatory**. Available at DUC, Grand-Rue 2/14, 1348 Louvain-la-Neuve • S.R. Turns, *Introduction to Combustion*, Mc Graw Hill, 2000. **Recommended** • K.K. Kuo, *Principles of Combustion*, John Wiley & Sons Ltd., 2005. **Recommended**
Faculty or entity in charge	MECA

Force majeure

Teaching methods	If, due to a force majeure, the classes cannot take place in the campus, then the classes will take place on line via the platform Teams.
Evaluation methods	If, due to a force majeure, the examination cannot take place in the campus, then it will take place online, via the platform Teams. The material for the exam will consist of all the material that was covered in class (either in campus or online). It will be a written exam with exercises and open questions, with open notes and books. The students will be asked to turn on their webcams for purposes of sureyance. Reminder. • The score on the laboratory report counts for 25% of the overall score. • The score on the written exam counts for 75% of the overall grade. • We maintain the right to ask a student for an oral exam in case of technical problems or suspicion of fraud.

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Aims
Master [120] in Electro-mechanical Engineering	ELME2M	5		
Master [120] in Mechanical Engineering	MECA2M	5		