UCLouvain

lmeca2854

2021

Heat and mass transfer II

5.00 credits	30.0 h + 30.0 h	Q2

Teacher(s)	Bartosiewicz Yann ;Duponcheel Matthieu ;
Language :	English
Place of the course	Louvain-la-Neuve
Prerequisites	Students are expected to master the following skills: the basics of Continuum mechanics, as they are covered within the course LMECA1901, the basics of Thermodynamics, as they are covered within the course LMECA1855, and the basics of Fluid mechanics and heat transfer, as they are covered within the course LMECA1321
Main themes	This course presents the physics of heat and mass transfer phenomena and the tools used by engineers to compute transfers in practical applications. The course complements to the prerequisite knowledge of conductive and convective heat transfer and presents the basis of radiative heat transfer and of mass transfer. The heat exchanger application is presented because of its importance in engineering and because it allows to familiarize the students with more complex heat transfer problems with combined heat transfer mechanisms.

Learning outcomes	**At the end of this learning unit, the student is able to :**
	In view of the LO frame of reference of the "Master Mechanical Engineering", this course contributes to the development, acquisition and evaluation of the following learning outcomes:
	LO1.1; LO1.2; LO1.3
	L02.1; LO2.2; LO2.4; LO2.5
	LO3.2
	LO4.2; LO4.4
	LO5.3; LO5.4; LO5.5
	LO6.1; LO6.3
	Specific learning outcomes of the course
	At the end of this learning unit, the student is be able to:
	1
	• Identify the different heat transfer modes in complex situations
	• Understand the physics of heat and mass transfer phenomena
	• Establish thermal/mass balance equations
	• Compute**,** in simple geometries using analytical solutions or correlations, heat transfer
	  • by conduction
	  • by convection; including phase change
	  • by radiation between surfaces
	• Compute, in simple geometries using analytical solutions or correlations, mass transfers in binary mixtures and related energy exchanges
	• Consider the use of numerical tools for complex geometries
	• Assess or design devicescombining different heat and mass transfer mechanisms

Evaluation methods	• Written examination (85%) • Lab (15%) The laboratory is a mandatory activity. In accordance with article 72 of the Re#glement ge#ne#ral des e#tudes et examens, the teachers will be allowed to propose to the jury to cancel the inscription to the June or September exam for any student who would not have participated to the mandatory laboratory.
Teaching methods	• Formal lectures • Exercise sessions • Labs
Content	• Advanced topics in Convection and Conduction • Heat exchangers • Boiling and Condensation • Radiative heat transfer • Mass transfer
Inline resources	https://moodle.uclouvain.be/user/index.php?id=4976

Bibliography	• T. Bergman, A. Lavine, F. Incropera, D. Dewitt, Incropera's principles of heat and mass transfer, 8th Edition, Global Edition, 2017 • M. N. O'zisik, Heat Transfer, a Basic Approach, McGraw-Hill, 1985 • Y. Cengel, Heat Transfer, a Practical Approach, 2nd Edition, McGraw-Hill, 2003 • A. Bejan, "Heat transfer", Wiley, 1993. • R.B. Bird, W.E. Stewart., E.N. Lighfoot , "Transport phenomena", Wiley int. ed., 1960. • N. Todreas & M. Kazimi, Nuclear Systems, Volume 1, Thermal Hydraulics Fundamentals, 2nd Edition, CRC Press, 2011 • M. F. Modest, Radiative Heat Transfer, 2nd Edition, Academic Press, 2003
Faculty or entity in charge	MECA

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Learning outcomes
Master [120] in Mechanical Engineering	MECA2M	5		
Master [120] in Electro-mechanical Engineering	ELME2M	5		
Master [120] in Physics	PHYS2M	5		
Master [120] in Civil Engineering	GCE2M	5		