UCLouvain

lmeca2854

2025

Heat and mass transfer II

The version you're consulting is not final. This course description may change. The final version will be published on 1st June.

5.00 credits	30.0 h + 30.0 h	Q2

Teacher(s)	Bartosiewicz Yann ;Duponcheel Matthieu ;
Language :	English > French-friendly
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:
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	• 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	The student's final grade is calculated on the basis of the grades of the written exam and the laboratory. If the grade of the exam is superior or equal to 10/20, the weighting is 80% for the exam and 20% for the laboratory, if it is inferior to 10/20, the weighting is 90% for the exam and 10% for the laboratory. According to art. 78 of the RGEE, the laboratory mark is acquired for all the sessions of the academic year without the possibility of repeating the laboratory and/or resubmitting the reports for the second session. The laboratory is a mandatory activity. In case of an unexcused absence from the lab (physical absence to experimental labs, non delivery of a report for experimental or numerical labs), a penalty of 4 points (-4 points) will be applied to the final grade of the 1st session.
Teaching methods	• Formal lectures • Exercise sessions • Labs (numerical or experimental)
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
Other infos	**Note on the use of generative artificial intelligence:** • The use of generative AI is tolerated for the work during the year, not at the exam, but its use must be thoughtful critical and ethical. • The student is required to systematically indicate all parts in which AIs have been used, e.g. in footnotes, specifying whether the AI was used to search for information, to write or correct the text, or to generate computer code. Sources of information must be systematically cited in accordance with bibliographic referencing standards. Students remain responsible for the content of their work, regardless of the sources used.
Faculty or entity in charge	MECA

Programmes containing this learning unit (UE)

Program title	Acronym	Credits	Prerequisite	Learning outcomes
Master [120] in Civil Engineering	GCE2M	5		
Master [120] in Mechanical Engineering	MECA2M	5		
Master [120] in Physics	PHYS2M	5		
Master [120] in Energy Engineering	NRGY2M	5		