UCLouvain

lmeca2854

2022

Heat and mass transfer II

5.00 crédits	30.0 h + 30.0 h	Q2

Enseignants	Bartosiewicz Yann ;Duponcheel Matthieu ;
Langue d'enseignement	Anglais
Lieu du cours	Louvain-la-Neuve
Préalables	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
Thèmes abordés	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.

Acquis d'apprentissage	**A la fin de cette unité d'enseignement, l'étudiant est capable de :**
	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

Modes d'évaluation des acquis des étudiants	La note finale de l'étudiant est calculée sur base des notes de l'examen écrit et du laboratoire. Si la note de l'examen est supérieure ou égale à 10/20, la pondération est de 80% pour l'examen et 20% pour le laboratoire, si elle est inférieure à 10/20, la pondération est de 90% pour l'examen et 10% pour le laboratoire. En vertu de l'art. 78 du RGEE, la note du laboratoire est acquise pour l'ensemble des sessions de l'anne#e acade#mique sans possibilité de refaire le laboratoire et/ou de resoumettre les rapports pour la seconde session. Le laboratoire est une activité obligatoire. En cas d'absence non-justifiée au laboratoire, un malus de 4 points (-4 points) sera appliqué à la note finale de la 1ere session.
Méthodes d'enseignement	• Cours magistraux • Séances d'exercices • Laboratoire
Contenu	• Eléments avancés de transfert de chaleur convectif et conductif • Echangeurs de chaleur • Ebullition et condensation • Transfert de chaleur radiatif • Transfert de masse
Ressources en ligne	https://moodle.uclouvain.be/user/index.php?id=4976

Bibliographie	• 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
Faculté ou entité en charge:	MECA

Programmes / formations proposant cette unité d'enseignement (UE)				
Intitulé du programme	Sigle	Crédits	Prérequis	Acquis d'apprentissage
Master [120] : ingénieur civil mécanicien	MECA2M	5		🔍
Master [120] : ingénieur civil électromécanicien	ELME2M	5		🔍
Master [120] en sciences physiques	PHYS2M	5		🔍