UCL Université catholique de Louvain

LMECA2141

2014-2015

Rheology.

5.0 credits	30.0 h + 30.0 h	1q

Teacher(s) :	Legat Vincent ; Van Ruymbeke Evelyne ;
Language :	Français
Place of the course	Louvain-la-Neuve
Inline resources:	> http://icampus.uclouvain.be/claroline/course/index.php?cid=MECA2141
Main themes :	Phenomenology of rheologically-complex flow behaviour. Mathematical modelling based on continuum mechanics. Mathematical modelling based on molecular kinetic theory. Analytical solution of simple flow problems. Computer simulation methods for complex industrial flows. Introduction to modern research topics in the field.
Aims :	In consideration of the reference table AA of the program " Master's degree civil engineer mechanics ", this course contributes to the development, to the acquisition and to the evaluation of the following experiences of learning: -- AA1.1, AA1.2, AA1.3 -- AA2.2, AA2.3, AA2.5 -- AA3.1, AA3.2 -- AA5.4, AA5.5, AA5.6 -- AA6.2, AA6.3 Introduce the student to the multidisciplinary topics of rheology and non-Newtonian fluid mechanics: phenomenology of rheologically-complex fluids, mathematical modelling based on continuum mechanics and molecular kinetic theory, analytical solution of simple problems, approaches to computer simulation of industrial flows, introduction to current research in the field. *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 :	Exam: oral and open book (50% of final mark); individual work during semester (e.g. to read, report, and present orally a scientific paper) counts for the other 50%.
Content :	Phenomenology of rheologically-complex flow behaviour: observed experimental linear and non-linear viscoelastic behaviour in shear and elongational flows. Mathematical modelling based on continuum mechanics: conservation laws and a hierarchy of constitutive rheological equations (generalized Newtonian fluid, linear viscoelastic models, differential and integral models). Mathematical modelling based on molecular kinetic theory: how to obtain constitutive equations from molecular models of statistical mechanics, detailed consideration of dilute and concentrated polymer solutions ("Rouse" and "tube" models). Simple flow problems: analytical solutions using the macroscopic and "molecular"constitutive equations listed above, comparison with experimental data and critical evaluation. Complex industrial flows: discussion of the basic macroscopic and micro-macro approaches to computer simulation in non-Newtonian fluid mechanics, illustration of modern techniques and recent results. Introduction to research topics in the field: illustration of current themes based on the lecturer's research activities.
Cycle and year of study :	> Master [120] in Physics > Master [120] in Mathematical Engineering > Master [120] in Mechanical Engineering > Master [120] in Electro-mechanical Engineering > Master [120] in Chemical and Materials Engineering
Faculty or entity in charge:	MECA