UCL Université catholique de Louvain

LMAPR2018

2016-2017

Rheometry and Polymer Processing

5.0 credits	30.0 h + 22.5 h	2q

Teacher(s) :	Bailly Christian ; Van Ruymbeke Evelyne ;
Language :	Anglais
Place of the course	Louvain-la-Neuve
Inline resources:	Moodle website : > https://moodleucl.uclouvain.be/course/view.php?id=8851
Prerequisites :	*The prerequisite(s) for this Teaching Unit (Unité d'enseignement – UE) for the programmes/courses that offer this Teaching Unit are specified at the end of this sheet.*
Main themes :	I. Introduction : industrial polymer processing, non Newtonian fluids, continuum mechanics refresher II. Shear viscosity, normal forces and elongational viscosity: observations and phenomenological models III. Flow through a channel IV. Capillary rheometry and extrusion defects V. Origin of viscoelastic effects; notions of rheological models; introduction to processing flow simulation VI. Cone-plate and plate-plate rheometric flow; Elongational flow VII Major industrial polymer processing operations : rheological aspects, technology and applications
Aims :	Contribution of the course to the program objectives With respect to the LO of the programme KIMA, this activity contributes to the development and acquisition of the following LO: -- LO 1 : 1.1, 1.2 -- LO 3 : 3.1, 3.3 -- LO 4 : 4.1, 4.2, 4.4 -- LO 5 : 5.1, 5.3, 5.4, 5.5, 5.6 Specific learning outcomes of the course At the end of this course, the student will be able to -- LO1.1. : Understand and explain the scientific concepts underpinning polymer processing and rheometry -- LO1.1. : Understand and explain the functioning of major polymer processing operations and rheometry techniques -- LO1.2. : use relevant models and theories described in literature to predict the functioning of major polymer processing operations and corresponding rheometric measurements -- LO3.1 : document and summarize the scientific, technological and industrial state of the art for a particular class of polymer processing operations or rheometric measurement method -- LO3.3 : prepare a report on the state of the art and current challenges/perspectives for a particular class of of polymer processing operations or rheometric measurement method -- LO4. : work in team to analyze an issue and prepare a seminar + a report for a given class of polymer of polymer processing operations or rheometric measurement method -- LO5. : present and defend a seminar and a report on polymer processing or rheometry in a rigorous, up to date and attractive way, with the right balance between the parts on scientific, technological and industrial practice aspects. *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 :	The students will be individually graded based on the objectives indicated above. More precisely, the evaluation involves the grading of : -- The presentation of a project in groups of two or three on a scientifically challenging and industrially relevant issue linked to the course content. This project will carry 1/3 of the total mark. -- A report on a laboratory and/or a simulation projet on polymer processing or rheometry. This report will carry 1/6 of the total mark. -- An oral exam based on a list of synthetic questions prepared by the teachers and given during the year. The exam will carry 50% of the mark -- The teachers have the right to reduce the weight of one part of the mark if a deep deficiency (& t;8/20) is found for the other.
Teaching methods :	A combination of : -- Ex cathedra courses : concepts are illustrated by concrete exemples taken from industrial practice and the experience of the teachers. -- Rheometry laboratory and/or processing simulation project -- seminars prepared and presented by the students -- Laboratory and plant visits
Content :	I. Introduction : industrial polymer processing, non Newtonian fluids, continuum mechanics refresher II. Shear viscosity, normal forces and elongational viscosity: observations and phenomenological models III. Flow through a channel IV. Capillary rheometry and extrusion defects V. Origin of viscoelastic effects; notions of rheological models; introduction to processing flow simulation VI. Cone-plate and plate-plate rheometric flow; Elongational flow VII Major industrial polymer processing operations : rheological aspects, technology and applications
Bibliography :	Lecture notes on Moodle, books from library according to subjects
Other infos :	This course requires basic knowledge of polymer science and continuum mechanics
Faculty or entity in charge:	FYKI

Programmes / formations proposant cette unité d'enseignement (UE)

Intitulé du programme	Sigle	Credits	Prerequis	Acquis d'apprentissage
Master [120] in Biomedical Engineering	GBIO2M	5	-	🔍
Master [120] in Chemical and Materials Engineering	KIMA2M	5	-	🔍
Master [120] in Chemistry and Bioindustries	BIRC2M	5	LMAPR2019	🔍