UCL Université catholique de Louvain

LMAPR2010

2010-2011

Polymer Materials

5.0 credits	45.0 h + 15.0 h	1q

Teacher(s) :	Bailly Christian (coordinator) ; Legras Roger ; Nysten Bernard ;
Language :	Anglais
Place of the course	Louvain-la-Neuve
Main themes :	The course is divided in seven chapters (with varying emphasis depending on teaching year): 1 Crystallization of polymers 2 Major viscoelastic and rheological properties of polymer materials 3 Mechanical properties of polymer materials 4 Polymers at surfaces and interfaces 5 Functional properties of polymer materials 6. Morphology and properties of multiphasic polymer materials 7. Fundamentals of polymer composites and nanocomposites
Aims :	The objective of the course is to familiarize the students with the structure, behaviour and major properties of polymer materials. At the end of their classes, students will be able to understand and explain: 1. the structure of polymer materials; 2. the resulting viscoelastic, mecanical and functional properties. *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".*
Content :	Methods: Ex cathedra course completed by invited seminars and seminars prepared and presented by the students. Illustration of concepts by concrete exemples taken from industrial practice and the experience of the teachers. Contents: 1 Polymer crystallization 1.1 kinetics 1.2 thermodynamics 2. Main viscoelastic and rheological properties 2.1 Mechanical models and relaxation processes 2.2 Relaxation and retardation spectra 2.3 Time-temperature equivalence 2.4 Time-frequency equivalence 2.5 Viscosity and diffusion of entangled polymers 2.6 Non-linear viscoelasticity : an introduction 3 Mechanical properties 3.1 Young's modulus and stress at break : influence of crystallinity and orientation 3.2 Plasticity : shear bands, crazes 3.3 Impact strength and impact modification 3.4 Other mechanical properties: creep, fatigue, environmental stress cracking 4 Functional properties of polymers 5 Polymers at surfaces and interfaces 6 Morphology and properties of multiphasic polymer systems 6.1 Reminders about polymer blends thermodynamics 6.2 Phase separation mechanisms 6.3 Out of equilibrium morphologies of polymer blends 6.4 Thermo-mechanical properties of polymer blends 6.5 Advanced systems : an introduction (block copolymers, compatibilized blends, thermoset-thermoplastic blends) 7 Fundamentals of polymer composites and nanocomposites 7.1 Mechanical properties of polymer composites 7.2 Major reinforcing agents for polymer composites 7.3 Fibre-matrix interface 7.4 Nanocomposites
Other infos :	Prerequistes: MAPR2019 or equivalent. Written support : reference books and lecture notes.

Cycle and year of study :	> Master [120] in Chemical and Materials Engineering > Master [120] in Mechanical Engineering > Master [120] in Chemistry and Bio-industries > Master [120] in Biomedical Engineering > Master [120] in Physical Engineering
Faculty or entity in charge:	FYKI