

4.0 credits	45.0 h	2q
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Teacher(s) :	Legras Roger (coordinator) ; Pardoen Thomas ; Charlier Jean-Christophe ;
Language :	Français
Place of the course	Louvain-la-Neuve
Main themes :	The course is divided into 3 parts. The first part is centred on the chemical bond concept, allowing the classification of materials. In a second part, various functional properties of materials are described. At last, the third part proposes an introduction to materials engineering for metals, ceramics and polymers. The aim of the present course consists in the illustration of the link between macroscopic properties of various classes of materials and the fundamental aspect of matter, from its atomic or molecular level to its microstructure.
Aims :	Provide a description of chemical bonding in relationship with materials classes, of consequent microstructures, and of resulting structural and functional properties; Provide basic thermodynamic and kinetic concepts for materials processing. The course provides a unified picture of materials, beyond specifics associated with materials classes, while explaining the particular behavior of specific materials. <i>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".</i>
Content :	Content : 1. Introduction Historical and economical aspects, materials classes, selection of materials, plan. 2. Chemical bonding and introduction to crystallography 1. Chemical bonding Types of bonds, main polymerization reactions, tacticity, molecular architecture. 2. Introduction to crystallography 3. Crystal defects 3. Functional properties of materials 1. Bases of quantum mechanics 2. Elastic waves in solids 3. Free and quasi-free electrons 4. Electrical conductivity 5. Thermal conductivity 6. Dielectric, optical and magnetic properties 4. Materials engineering 1. Formation and evolution of microstructures 2. Strain behaviour 3. Lifetime 4. Relationships between molecular architecture/ microstructure/ properties for polymeric materials. Methods : Ex-cathedra courses, with numerous industrial and academic examples.
Other infos :	Basic notions in chemistry, physics and thermodynamics.
Cycle and year of study :	> Bachelor in Engineering > Master [120] in Biomedical Engineering
Faculty or entity in charge:	FYKI