


4.00 credits

32.5 h + 7.5 h

Q2

Teacher(s)	Fisette Paul ;Nysten Bernard ;
Language :	French
Place of the course	Louvain-la-Neuve
Prerequisites	LINGE1122 Physics I, LINGE1115 Chemistry I, LINGE1223 Chemistry II <i>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.</i>
Main themes	<p>The course is divided in two parts.</p> <p>The first part « Materials and Processes » defines the concepts and the basic tools of materials and processing sciences. It highlights the main steps leading to a useful material objects from the natural ressources. A special emphasis is made on the relationships between the synthesis and fabrication processes and the structure and properties of the resulting materials.</p> <p>The second part « Mechanics » first reminds the basic concepts of rational mechanics of rigid bodies. The constitutive equations of the main forces practically encountered are then presented with a special emphasis on the problem of friction. Finally, domains such as cars, robotics, mechanisms, biomechanics, transmission, etc. are presented during the lectures and through seminars in order to illustrate the theoretical concepts mentioned here above.</p>
Learning outcomes	<p><b>At the end of this learning unit, the student is able to :</b></p> <p>« At the end of this course, students will be able to</p> <p>For the « Materials and Processes » part,</p> <ul style="list-style-type: none"> <li>• describe in a few words a process of the chemical industry (organic or inorganic) with the main chemical reactions;</li> <li>• using thermodynamic concepts, justify the conditions (temperature, pressure, time, ...) practically used in a chemical process;</li> <li>• caculate a simple flow sheet of an industrial process;</li> <li>• define the main classes of materials;</li> <li>• define and describe in words ans schematically the different structures encountered in materials, the different types of defects, the main mechanical and physical properties;</li> <li>• explain the impact of temperature, time, chemical bondings, structural defects on the mechanical and physical properties of materials.</li> </ul> <p>1</p> <p>For the « Mechanics » part,</p> <ul style="list-style-type: none"> <li>• explain the concepts of speed, forces, and force moment;</li> <li>• establish, solve and interpret the static or dynamic equations of simple systems ;</li> <li>• explain the behavioural laws practically encountered ;</li> <li>• apply the concepts to situation of the everyday life or in the framework of mechanical systems presented during the lectures and the seminars.</li> </ul>
Evaluation methods	<p><i>Written examination in session. The material covered by the examination corresponds to the concepts presented in the lectures and seminars.</i></p> <p><i>The examination consists of open questions for the "Mechanics" part and multiple choice questions for the "Chemical Processes and Materials" part.</i></p> <p><i>Both parts of the course are equally weighted in the calculation of the final grade (50% - 50%). In order to ensure that students master a minimum of skills in both parts, a ratchet system will be applied:</i></p> <ul style="list-style-type: none"> <li>• <i>If the mark of both parts is equal to or higher than 8/20, the final mark will be equal to the arithmetic average of the marks of the two parts.</i></li> <li>• <i>If the mark for one of the two parts is between 5/20 and 8/20, the final mark will be limited to 11/20.</i></li> <li>• <i>If the mark for one of the two parts is less than 5/20, the final mark will be limited to 8/20.</i></li> </ul>
Teaching methods	<i>The course is given in the form of lectures and seminars.</i>

<p>Content</p>	<p><i>This course is divided into two parts with the following respective contents.</i></p> <ul style="list-style-type: none"> <li>• <i>Mechanics" part:</i> <ul style="list-style-type: none"> <li>• <i>reminders of rational mechanics;</i></li> <li>• <i>application to some simple systems;</i></li> <li>• <i>study of spring, damper and friction type forces;</i></li> <li>• <i>application to the automotive field;</i></li> <li>• <i>description of some mechanical transmissions (clutch, cardan, ...)</i> ;</li> <li>• <i>elements of statics: theory, beams &amp; application ;</i></li> <li>• <i>3 or 4 seminars illustrating the subject through various fields.</i></li> </ul> </li> <li>• <i>Chemical processes and materials part:</i> <ul style="list-style-type: none"> <li>• <i>Chemical industrial production and raw material sources.</i></li> <li>• <i>Study of typical chemical processes in the sectors of metals and inorganic materials, detergents and polymers; examples will be taken up in order to highlight the tools for the elaboration of chemical processes, their recent evolution and to illustrate the notions of material and heat balances as well as the problem of pollution; basic notions on the recycling and valorisation of materials, in particular polymeric materials.</i></li> <li>• <i>Major classes of materials (metals, ceramics, polymers); inter-atomic bond strengths; arrangement of atoms (amorphous/crystalline state); structures and defects; resulting general properties; synergy of properties and alloys/composites.</i></li> <li>• <i>Mechanical properties of materials: stress-strain (elasticity and viscoelasticity), modulus of elasticity, yield and fracture limits, ductility, fatigue strength, ...</i></li> <li>• <i>Physical properties: electrical conductivity, heat capacity, thermal conductivity, ...</i></li> </ul> </li> </ul>
<p>Inline resources</p>	<p><i>Moodle site s :</i></p> <ul style="list-style-type: none"> <li>• <i>Mechanics: <a href="https://moodle.uclouvain.be/enrol/index.php?id=3024">https://moodle.uclouvain.be/enrol/index.php?id=3024</a></i></li> <li>• <i>Chemical processes and materials: <a href="https://moodle.uclouvain.be/course/view.php?id=1891">https://moodle.uclouvain.be/course/view.php?id=1891</a></i></li> </ul>
<p>Bibliography</p>	<p><i>Des notes de cours, des copies de diapos et, éventuellement, des articles pour lectures complémentaires sont mis à la disposition des étudiants sur Moodle.</i>  <i>Lecture notes, copies of slides and possibly articles for further reading are made available to students on Moodle.</i></p>
<p>Faculty or entity in charge</p>	<p>ESPO</p>

<b>Programmes containing this learning unit (UE)</b>				
Program title	Acronym	Credits	Prerequisite	Learning outcomes
Minor in Scientific Culture	<a href="#">MINCULTS</a>	4		
Bachelor : Business Engineering	<a href="#">INGE1BA</a>	4	<a href="#">LINGE1115</a> AND <a href="#">LINGE1122</a>	