


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> </ul> <p>1</p> <ul style="list-style-type: none"> <li>• explain the impact of temperature, time, chemical bondings, structural defects on the mechanical and physical properties of materials.</li> </ul> <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>Written examination using open questions and/or multiple choice questionnaire live or remotely.</p> <p>Students are evaluated on their understanding of the concepts presented during the lectures. A special attention is drawn on their ability to summarize things and to make relationships between the different concepts.</p>
Teaching methods	The course consists in lectures and seminars given live, remotely, comodally, or as video clips.
Content	<p>This course is divided in two parts with the following contents.</p> <p>"Chemical Processes and Materials" part:</p> <ul style="list-style-type: none"> <li>• Industrial chemical production and feedstock.</li> <li>• Study of chemical processes in the fields of metals and inorganic materials, soaps and polymers; examples are presented to highlight the techniques in chemical processes and to illustrate the notion of flow-sheet, heat and pollution.</li> <li>• Main classes of materials (metals, ceramics, polymers); chemical bondings; crystalline and amorphous structures; structural defects; alloys and composites.</li> </ul>

	<ul style="list-style-type: none"> <li>• Mechanical properties: strain-stress relationships, elasticity, viscoelasticity, elastic modulus, yield and tensile strength, ductility, fatigue, ...</li> <li>• Physical properties: electrical conductivity, thermal capacity, thermal conductivity, ...</li> </ul> <p>"Mechanics" part:</p> <ul style="list-style-type: none"> <li>• Reminders on rational mechanics.</li> <li>• Application to simple systems.</li> <li>• Study of forces in spring, damper, friction.</li> <li>• Application to vehicle dynamics</li> <li>• Description of some mechanical transmissions (gear, Cardan, ...).</li> <li>• Elements of statics: theory, beams, applications.</li> <li>• Three or four seminars illustrating the concepts of the course.</li> </ul>
<p>Inline resources</p>	<p>"Mechanics": <a href="https://moodleucl.uclouvain.be/enrol/index.php?id=10958">https://moodleucl.uclouvain.be/enrol/index.php?id=10958</a></p> <p>"Chemical processes and materials": <a href="https://moodleucl.uclouvain.be/course/view.php?id=8984">https://moodleucl.uclouvain.be/course/view.php?id=8984</a></p>
<p>Bibliography</p>	<p><b>Support de cours</b></p> <p>Des notes de cours, des copies de transparents et, éventuellement, d'articles pour lectures complémentaires sont mises à la disposition des étudiants sur Moodle.</p> <p><b>Références bibliographiques recommandées, lectures conseillées :</b></p> <p>Des références complémentaires d'ouvrage seront données par les enseignants.</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
Bachelor : Business Engineering	<a href="#">INGE1BA</a>	4	<a href="#">LINGE1115</a> AND <a href="#">LINGE1122</a>	
Minor in Scientific Culture	<a href="#">MINCULTS</a>	4		