

3.00 credits

Q1

Language :	English
Place of the course	Autre site
Prerequisites	The following BNEN courses are a prerequisite <ul style="list-style-type: none"> <li>• Nuclear Energy: Introduction</li> <li>• Introduction to Nuclear Physics and Measurements</li> </ul> Basic chemistry material behaviour
Learning outcomes	<b>At the end of this learning unit, the student is able to :</b> <ul style="list-style-type: none"> <li>1 • To familiarise students with the basic aspects of material science as they apply to nuclear systems</li> <li>• To learn the basic processes of material degradation and ageing due to the nuclear environment (esp. radiation effects and fatigue).</li> </ul>
Evaluation methods	Oral examination; written preparation.
Content	<ul style="list-style-type: none"> <li>• Brief review of most important mechanical properties of materials                             <ul style="list-style-type: none"> <li>o stress-strain relationship</li> <li>o ductile and brittle fracture; ductile-brittle transition</li> <li>o fatigue failure</li> <li>o creep</li> </ul> </li> <li>• Stress analysis: stress intensity, thermal stresses</li> <li>• Functional requirements of materials in a nuclear environment</li> <li>o 'nuclear' materials: fuel, fuel cladding, moderator/reflector, coolant</li> <li>o structural materials: reactor internals and vessel, piping, valves</li> <li>• Degradation mechanisms of materials in a nuclear environment</li> <li>o radiation effects: general principles, atomic displacements, embrittlement, swelling fatigue: due to thermal stresses and stratification</li> <li>o corrosion: p.m. (to be developed in course 'Nuclear Materials II')</li> <li>• Introduction on treatment of important materials in a nuclear environment (especially nuclear-mechanical interactions and relationships)</li> <li>o fuel and cladding</li> <li>o moderator/reflector                             <ul style="list-style-type: none"> <li>o structural materials (incl reactor internals, reactor vessel).</li> </ul> </li> </ul>
Inline resources	<a href="https://www.sckcen.be/fbnen">https://www.sckcen.be/fbnen</a>
Other infos	This course is part of the Advanced Master programme in nuclear engineering organized by the Belgian Nuclear Higher Education Network (BNEN). BNEN is organised through a consortium of six Belgian universities and the Belgian Nuclear Research Centre, SCK-CEN and takes place at the SCK-CEN in Mol. <b>Prof. Jacqueline Lecomte-Beckers</b> ' Université de Liège <b>Prof. Eric van Walle</b> ' Katholieke Universiteit Leuven <b>Prof. Walter Bogaerts</b> - Katholieke Universiteit Leuven
Faculty or entity in charge	EPL

<b>Programmes containing this learning unit (UE)</b>				
Program title	Acronym	Credits	Prerequisite	Learning outcomes
Advanced Master in Nuclear Engineering	<a href="#">GNUC2MC</a>	3		