

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"> • Nuclear Energy: Introduction • Introduction to Nuclear Physics and Measurements Basic chemistry material behaviour
Learning outcomes	At the end of this learning unit, the student is able to : <ul style="list-style-type: none"> 1 • To familiarise students with the basic aspects of material science as they apply to nuclear systems • To learn the basic processes of material degradation and ageing due to the nuclear environment (esp. radiation effects and fatigue).
Evaluation methods	Oral examination; written preparation.
Content	<ul style="list-style-type: none"> • Brief review of most important mechanical properties of materials <ul style="list-style-type: none"> o stress-strain relationship o ductile and brittle fracture; ductile-brittle transition o fatigue failure o creep • Stress analysis: stress intensity, thermal stresses • Functional requirements of materials in a nuclear environment <ul style="list-style-type: none"> o 'nuclear' materials: fuel, fuel cladding, moderator/reflector, coolant o structural materials: reactor internals and vessel, piping, valves • Degradation mechanisms of materials in a nuclear environment <ul style="list-style-type: none"> o radiation effects: general principles, atomic displacements, embrittlement, swelling fatigue: due to thermal stresses and stratification o corrosion: p.m. (to be developed in course 'Nuclear Materials II') • Introduction on treatment of important materials in a nuclear environment (especially nuclear-mechanical interactions and relationships) <ul style="list-style-type: none"> o fuel and cladding o moderator/reflector <ul style="list-style-type: none"> o structural materials (incl reactor internals, reactor vessel).
Inline resources	https://www.sckcen.be/fbnen
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. Prof. Jacqueline Lecomte-Beckers ' Université de Liège Prof. Eric van Walle ' Katholieke Universiteit Leuven Prof. Walter Bogaerts - Katholieke Universiteit Leuven
Faculty or entity in charge	EPL

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Learning outcomes
Advanced Master in Nuclear Engineering	GNUC2MC	3		