UCLouvain

lbnen2023

2022

Advanced Fuel Cycle/Dismantling/ Radiochemistry/MOX/Th (Centre d'étude nucléaire-Mol)

3.00 credits		Q2

Language :	English
Place of the course	Autre site
Prerequisites	The following BNEN courses are a prerequisite • Nuclear Energy: Introduction • Nuclear Fuel Cycle
Main themes	**MOX and Th fuel** • Comparison of the physical properties of Pu and Th • Possible core designs with Th based fuel with high conversion factors • Pu-MOX fuel fabrication (MIMAS process) and fuel rod thermal-mechanical behaviour under irradiation • Pu-MOX impact on reactivity coefficients and safety issues • Th-MOX impact on reactivity coefficients and overview of the possible safety issues • **Radiochemistry** • Applied radiochemistry (complementary to the course under "Nuclear Fuel cycle"): chemical process technology: radiochemical separation techniques, radiochemical analysis, production of radionuclides • Radionuclide migration through a clay host rock ' geochemistry and underlying phenomena: impact on the Safety Case; geochemistry in Boom Clay; role of organic matter; radionuclide speciation, sorption and transport; modelling. **Dismantling, decommissioning** • Introduction: definitions, objectives, levels, regulatory aspects, radioprotection, ALARA • Radionuclide inventory, characterization and measurements • Strategy for decontamination of buildings, concrete pieces and structures, metals • Dismantling of a nuclear reactor (the BR3 case): the experience, materials management • Other types of installations to be decommissioned, REX from other projects • Strategies and planning of decommissioning
Learning outcomes	**At the end of this learning unit, the student is able to :** **MOX and Th fuel** To get a global understanding of the utilization of Pu and Th based fuel in light water reactors: • The challenges of the U-Pu-MOX fuel regarding the fuel fabrication, the core and fuel neutronic aspects and fuel behaviour • The Th-Pu-MOX used in LWR for its breeding capabilities, or more realistically as matrix for Pu utilization. 1 **Radiochemistry and Dismantling** • To get an understanding of radiochemistry, as it is a basic discipline to understand the various stages and activities in the nuclear fuel cycle, including the safe disposal of the radioactive waste. • To get acquainted with the principles and practice of dismantling and decommissioining of nuclear materials, as this is becoming an activity of increasing importance in nuclear engineering.
Evaluation methods	Oral examination; written preparation
Inline resources	https://www.sckcen.be/fbnen
Bibliography	**The PowerPoint presentations of the lectures are available on the BNEN website.**

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. Pierre Van Iseghem** ' Université de Liège **Prof. Hubert Druenne** ' Université de Liège
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		