UCL Université catholique de Louvain

LMECA2648

2012-2013

Nuclear Thermal-Hydraulics

6.0 crédits	40.0 h + 7.5 h	2q

Enseignants:	Bartosiewicz Yann ;
Langue d'enseignement:	Anglais
Lieu du cours	Louvain-la-Neuve
Thèmes abordés :	-- Reactor heat generation -- Transport equations (single-phase & mp; two-phase flow) -- Thermal analysis of fuel elements -- (Single-phase fluid mechanics and heat transfer)'usually already known -- Two-phase flow dynamics -- Two-phase heat transfer -- Single heated channel; steady state analysis -- Single heated channel; transient analysis -- Flow loops -- Utilisation of established codes and introduction to advanced topics (modelling and thermalhydraulics for GEN4 reactors)
Acquis d'apprentissage	-- To be familiarised with various reactor types and their main design and operational characteristics -- To learn how to estimate the volumetric heat generation rate in fission reactor cores under normal operation and shutdown conditions -- To learn how to analyse the thermal performance of nuclear fuel elements -- To learn the basic fluid mechanics of single phase reactor cooling systems -- To learn to calculate pressure drop in reactor systems, including tube bundles, and spacer grids -- To learn to analyse the heat transfer characteristics of single phase reactor cooling systems -- To learn the basic fluid mechanics of two-phase systems, including flow regime maps, void-quality relations, pressure drop, and critical flow -- To learn the fundamentals of boiling heat transfer, and its implications for reactor design -- To learn the fundamentals of core thermal design, with attention to design uncertainty analysis and hot channel factors. *La contribution de cette UE au développement et à la maîtrise des compétences et acquis du (des) programme(s) est accessible à la fin de cette fiche, dans la partie « Programmes/formations proposant cette unité d'enseignement (UE) ».*
Modes d'évaluation des acquis des étudiants :	Closed book - oral
Méthodes d'enseignement :	-- 2 t.m.: 40h teaching + seminar and 15h practical works in classroom -- SCK.CEN guidance for demonstrations with codes -- SCK.CEN + UCL TA for practical works The course takes place at the Nuclear Research Centre of Belgium (SCK.CEN) in gthe framework of the BNEN interuniversity programme (see: http://www3.sckcen.be/bnen/). One makes use of the software available at the research centre.
Contenu :	-- Reactor heat generation -- Transport equations (single-phase & mp; two-phase flow) -- Thermal analysis of fuel elements -- (Single-phase fluid mechanics and heat transfer)'usually already known -- Two-phase flow dynamics -- Two-phase heat transfer -- Single heated channel; steady state analysis -- Single heated channel; transient analysis -- Flow loops -- Utilisation of established codes and introduction to advanced topics (modelling and thermalhydraulics for GEN4 reactors)
Bibliographie :	REFERENCE BOOKS ON THE CONTENT -- Todreas, N.E. and Kazimi, M.S. Nuclear System I: Thermal Hydraulic Fundamentals, Hemisphere Publishing Corp., New York, 1990 -- Todreas, N. E. and Kazimi, M.S. Nuclear Systems II: Elements of Thermal Hydraulic Design, Hemisphere Publishing Corp., New York, 1990.

Autres infos :	Yann BARTOSIEWICZ yann.bartosiewicz@uclouvain.be Professor at the Université Catholique de Louvain (UCL ' Louvain-la-Neuve) Master in Turbulence modeling and Transfer Phenomena, Ecole Nationale Polytechnique de Grenoble, France, 1998. PhD in Mechanical engineering, Université de Sherbrooke, Canada, 2003: Modeling of supersonic plasma jets in non-Local Thermodynamics Equilibrium Research fields: Fluid mechanics, heat transfer, compressible flows, two-phase flows, thermodynamics, computational fluid dynamics Teaching duties in BNEN: Nuclear Thermal Hydraulics Other research activities: scientific leader for UCL in European projects in nuclear thermal-hydraulics: NURESIM: CFD Simulation of instabilities in a stratified two-phase flows relevant to PTS scenario NURISP: Simulation of two-phase chocked flows during LOCA: implementation of non-equilibrium models in CATHARE 3 THINS: Direct and Large Eddy Simulation (DNS/LES) of convective heat transfer for low Prandtl fluids (Liquid metals) UCL Promotor of other projects in energy Other duties: Member of the CFD group at OECD, Member of the European Nuclear Engineering Network (ENEN) SCK REFERENCE PERSONS Simon Vanmaercke: simon.vanmaercke@sckcen.be
Cycle et année d'étude: :	> Master [120] : ingénieur civil électromécanicien > Master [120] : ingénieur civil mécanicien
Faculté ou entité en charge:	MECA