lbnen2011 — Radiation protection (Centre d'étude nucléaire-Mol)

2021

3.00 credits		Q1

Language :	English
Place of the course	Autre site
Prerequisites	The following BNEN course is a prerequisite: • Introduction to Nuclear Physics and Measurements It is also assumed that the students have a good background in basic physics as is usually part of the curriculum of the first two years of engineering, physics or mathematics. More in particular they should be familiar with classical theory of electromagnetism and classical mechanics. An introductory level knowledge to electronics and circuit theory is also assumed. Students should preferably also have an elementary knowledge of special relativity. The course contains a short reminder of this subject, but this is probably difficult to comprehend for students who never had an introduction to special relativity. A basic knowledge of quantum mechanics is helpful but not essential.
Learning outcomes	**At the end of this learning unit, the student is able to :** The aim of the course is: 1 • to introduce the student to the physical principles of the interaction of subatomic particles and high-energy radiation with matter • to learn how to apply the concepts of external/internal radiation dosimetry • to introduce the student to the biologic effects of ionising radiation • to learn how to apply dispersion models • to be able to calculate the effects of shielding materials • to know the concepts and legislation of radiation protection • to give an overview of the different methods for detecting and quantifying the presence of such particles and radiation • to give an introduction to the principles of particle acceleration
Evaluation methods	Written examination. Exercise part: "open book", theoretical part "closed book". Report of lab sessions account for 20% in the total mark.
Content	Part H. Thierens and K. Bacher 1: Radiological quantities and units 1.1 : Exposure and kerma 1.2 : Absorbed dose 1.3 : Equivalent dose 1.4 : Effective dose 1.5 : Operational dose quantities 2: External dosimetry 2.1 : Ionometry of low energy photon fields 2.2 : High energy photon fields: the Bragg Gray relation 2.3 : Dosimetry of neutron fields 3: Internal dosimetry 3.1 : Concept of committed dose equivalent 3.2 : Concept of specific effective energy 3.3 : Compartmental model analysis 3.4 : Dosimetric model for the respiratory system 3.5 : Dosimetric model for the gastrointestinal tract 3.6 : Dosimetric model for bone 3.7 : Metabolic data of important fission products and actinides 4: Biological effects of ionizing radiation 4.1 : Deterministic and stochastic effects 4.2 : Overview of direct effects including utero 4.3 : Overview of late effects: the UNSCEAR report 4.4 : Biological effect models used in radiation protection

	5: Engineering aspects of radiation shielding 5.1 : Build up factors 5.2 : Shielding of photon fields 5.3 : Shielding of combined neutron-photon fields 6: Dispersion of effluents from nuclear facilities 6.1 : Meteorology of dispersion 6.2 : Diffusion of effluents-Pasquill conditions 6.3 : External dose from plume 6.4 : Internal dose from inhalation 7: Legislation and regulations 7.1 : The ICRP 103 publication 7.2 : The conceptual framework of radiological protection 7.3 : The system of protection in occupational and public exposures 7.4 : The system of protection in interventions, accidents and emergencies 8: Measurement techniques in radiation protection 8.1 : Ionometry 8.2 : Film dosimetry 8.3: TLD dosimetry 8.4: OSL dosimetry
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. Hubert Thierens - Universiteit Gent Prof. Klaus Bacher ' Universiteit Gent
Faculty or entity in charge	EPL

Programmes containing this learning unit (UE)

Program title	Acronym	Credits	Prerequisite	Learning outcomes
Master [120] in Mechanical Engineering	MECA2M	3		
Advanced Master in Nuclear Engineering	GNUC2MC	3		
Master [120] in Electro-mechanical Engineering	ELME2M	3		