UCLouvain

lbnen2002

2023

Introduction to Nuclear Physics & Measurements (Centre d'étude nucléaire-Mol)

3.00 crédits		Q1

Langue d'enseignement	Anglais
Lieu du cours	Autre site
Préalables	Bachelor level lectures on physics, mechanics, mathematics.
Acquis d'apprentissage	**A la fin de cette unité d'enseignement, l'étudiant est capable de :** 1 • To learn and understand the basic properties of a nucleu • To understand the role of conservation laws in decay processes and reactions • To learn the principles of neutron physics related to nuclear fission reaction. • To learn particles interactions with matter • To learn characteristics of main particles detectors
Modes d'évaluation des acquis des étudiants	Written examination (closed book)
Méthodes d'enseignement	• 2 t.m. ; 36 hours of lectures, 5 lab sessions of ½ day • laboratory work (SCK.CEN)
Contenu	**Part S. Tavernier** • Introduction to subatomic physics • Reminder on special relativity • Reminder on probability theory • Interactions of charged particles in matter • Interactions of X and gamma rays in matter • Neutrino interactions • Introduction to Accelerators • Accelerators for accelerator driven systems • Detectors based on ionisation in gases • Detectors based on ionisation in semiconductors • Detectors based on scintillation • Neutron detectors • Electronics for nuclear detectors **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
Ressources en ligne	https://www.sckcen.be/fbnen
Bibliographie	The PowerPoint presentations of the lectures are available on the BNEN website. Other useful references: Krane, K.S. 'Introductory Nuclear Physics', Wiley, 1987. Tavernier, S. 'Experimental techniques in nuclear and particle physics', Springer-Verlag, 2010. Knoll, G.F. 'Radiation detection and measurement', 4 ed., Wiley, 2010.
Autres infos	Prof. Nicolas Pauly ' Université Libre de Bruxelles Course location: SCK-Cen (Mol)
Faculté ou entité en charge:	EPL

Programmes / formations proposant cette unité d'enseignement (UE)

Intitulé du programme	Sigle	Crédits	Prérequis	Acquis d'apprentissage
Master [120] : ingénieur civil mécanicien	MECA2M	3		
Master de spécialisation en génie nucléaire	GNUC2MC	3		
Master [120] : ingénieur civil électromécanicien	ELME2M	3		
Master [120] : ingénieur civil en génie de l'énergie	NRGY2M	3		