




3.00 crédits

Q1

Langue d'enseignement	Anglais
Lieu du cours	Autre site
Préalables	Bachelor level lectures on physics, mechanics, mathematics.
Acquis d'apprentissage	<p>A la fin de cette unité d'enseignement, l'étudiant est capable de :</p> <ul style="list-style-type: none"> • To learn and understand the basic properties of a nucleus • To understand the role of conservation laws in decay processes and reactions 1 • 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	<ul style="list-style-type: none"> • 2 t.m. ; 36 hours of lectures, 5 lab sessions of ½ day • laboratory work (SCK.CEN)
Contenu	<p>Part S. Tavernier</p> <ul style="list-style-type: none"> • 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 <p>Part H. Thierens and K. Bacher</p> <p>1: Radiological quantities and units</p> <p>1.1 : Exposure and kerma</p> <p>1.2 : Absorbed dose</p> <p>1.3 : Equivalent dose</p> <p>1.4 : Effective dose</p> <p>1.5 : Operational dose quantities</p> <p>2: External dosimetry</p> <p>2.1 : Ionometry of low energy photon fields</p> <p>2.2 : High energy photon fields: the Bragg Gray relation</p> <p>2.3 : Dosimetry of neutron fields</p> <p>3: Internal dosimetry</p> <p>3.1 : Concept of committed dose equivalent</p> <p>3.2 : Concept of specific effective energy</p> <p>3.3 : Compartmental model analysis</p> <p>3.4 : Dosimetric model for the respiratory system</p> <p>3.5 : Dosimetric model for the gastrointestinal tract</p> <p>3.6 : Dosimetric model for bone</p> <p>3.7 : Metabolic data of important fission products and actinides</p> <p>4: Biological effects of ionizing radiation</p> <p>4.1 : Deterministic and stochastic effects</p> <p>4.2 : Overview of direct effects including utero</p> <p>4.3 : Overview of late effects: the UNSCEAR report</p>

	<p>4.4 : Biological effect models used in radiation protection</p> <p>5: Engineering aspects of radiation shielding</p> <p>5.1 : Build up factors</p> <p>5.2 : Shielding of photon fields</p> <p>5.3 : Shielding of combined neutron-photon fields</p> <p>6: Dispersion of effluents from nuclear facilities</p> <p>6.1 : Meteorology of dispersion</p> <p>6.2 : Diffusion of effluents-Pasquill conditions</p> <p>6.3 : External dose from plume</p> <p>6.4 : Internal dose from inhalation</p> <p>7: Legislation and regulations</p> <p>7.1 : The ICRP 103 publication</p> <p>7.2 : The conceptual framework of radiological protection</p> <p>7.3 : The system of protection in occupational and public exposures</p> <p>7.4 : The system of protection in interventions, accidents and emergencies</p> <p>8: Measurement techniques in radiation protection</p> <p>8.1 : Ionometry</p> <p>8.2 : Film dosimetry</p> <p>8.3: TLD dosimetry</p> <p>8.4: OSL dosimetry</p>
Ressources en ligne	https://www.sckcen.be/fbnen
Bibliographie	<p>The PowerPoint presentations of the lectures are available on the BNEN website.</p> <p>Other useful references:</p> <p>Krane, K.S. 'Introductory Nuclear Physics', Wiley, 1987.</p> <p>Tavernier, S. 'Experimental techniques in nuclear and particle physics', Springer-Verlag, 2010.</p> <p>Knoll, G.F. 'Radiation detection and measurement', 4 ed., Wiley, 2010.</p>
Autres infos	<p>Prof. Nicolas Pauly ' Université Libre de Bruxelles</p> <p>Course location: SCK-Cen (Mol)</p>
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		