



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><b>A la fin de cette unité d'enseignement, l'étudiant est capable de :</b></p> <ul style="list-style-type: none"> <li>• To learn and understand the basic properties of a nucleus</li> <li>• To understand the role of conservation laws in decay processes and reactions</li> <li>1 • To learn the principles of neutron physics related to nuclear fission reaction.</li> <li>• To learn particles interactions with matter</li> <li>• To learn characteristics of main particles detectors</li> </ul>
Modes d'évaluation des acquis des étudiants	Written examination (closed book)
Méthodes d'enseignement	<ul style="list-style-type: none"> <li>• 2 t.m. ; 36 hours of lectures, 5 lab sessions of ½ day</li> <li>• laboratory work (SCK.CEN)</li> </ul>
Contenu	<p><b>Part S. Tavernier</b></p> <ul style="list-style-type: none"> <li>• Introduction to subatomic physics</li> <li>• Reminder on special relativity</li> <li>• Reminder on probability theory</li> <li>• Interactions of charged particles in matter</li> <li>• Interactions of X and gamma rays in matter</li> <li>• Neutrino interactions</li> <li>• Introduction to Accelerators</li> <li>• Accelerators for accelerator driven systems</li> <li>• Detectors based on ionisation in gases</li> <li>• Detectors based on ionisation in semiconductors</li> <li>• Detectors based on scintillation</li> <li>• Neutron detectors</li> <li>• Electronics for nuclear detectors</li> </ul> <p><b>Part H. Thierens and K. Bacher</b></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	<a href="https://www.sckcen.be/fbnen">https://www.sckcen.be/fbnen</a>
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

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