wrdth3160t
2022

Technology, Dosimetry and Treatment Planning in Radiotherapy

3.00 credits	20.0 h	Q1

Teacher(s)	Sterpin Edmond (coordinator) ;
Language :	English > English-friendly
Place of the course	Bruxelles Woluwe
Main themes	A. Production of radiotherapy beams : - Cobalt-60, - linear accelerators, - neutron beams, proton beams, heavy ion beams. B. Definition of dosimetry quantities for radiotherapy: - PDD, RTM, RTA, OAR, isodoses, BSF, PSF. C. Quality assurance in radiotherapy : - definition and importance - recommendations - quality control in radiotherapy -quality control of CT scanners - quality control of linear accelerators - quality control of treatment planning systems - in-vivo dosimetry D. Calculation methods for external beam therapy - matrix system in TPS - separation of scatter and primary beam - pencil beam methods - Monte Carlo calculations E. Dosimetry for Brachy therapy
Learning outcomes	
Evaluation methods	Laboratories account for 40% of the mark. For each project, the evaluation focuses on the quality of the programming and the report provided. Reports must be given back two weeks after the last lab session of each project. If the deadline is not respected there is a 2 point penalty every 48 hours after the deadline. It is NOT possible to give the reports or to improve their score during the second session in August The final exam counts for 60% of the mark and is essentially theoretical. This consists of a written part and an oral part. The written part is done with open notebook and accounts for 70%. The oral part (closed notebook) accounts for 30%.
Teaching methods	The course is essentially given in lecture format. Laboratory sessions (computer simulations) are also planned. The student will have to complete two projects for which he / she will have to provide a report each time. Coding is performed in Python
Content	The principle is to teach students the essential theoretical concepts underlying the practice of radiotherapy, both to prepare the student for a possible internship in a radiotherapy department, or to provide a solid knowledge of the field appreciated by companies working in the field. The course is structured around the following objectives 1. Acquire the principles of reference dosimetry and small fields dosimetry 2. Teach students the basic algorithmics of dose calculation engines. The student will have to implement a pencil beam dose calculation algorithm as a lab work. 3. To transmit the general principles underlying the delineation of volumes in radiotherapy (mainly GTV - CTV - PTV), as well as their specificities according to the localizations. The concept of PTV safety margins will be detailed, and illustrated with a lab. 4. Introduce recent developments in the radiotherapy field: probabilistic planning, robust planning, adaptive radiotherapy, automatic planning with artificial intelligence,
Inline resources	All slideshows and most appendices are on Moodle
Bibliography	Slides and lectures make exclusively the exam materialTheoretical aspects are covered in • Handbook of Radiotherapy Physics (Mayles, Nahum, Rosenwald) • The physics of proton therapy (Neuwhauser and Zhang, Physics in Medicine and Biology 2015) • Fundamentals of Ionizing Radiation Dosimetry by Andreo P, et al (2017 edition). We strongly recommend for students following also the course on fundamentals of dosimetry to acquire this book.
Other infos	The course is integrally given in English
Faculty or entity in charge	MED

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Learning outcomes
Certificat universitaire en physique d'hôpital	RPHY9CE	3		🔍
Master [120] in Physics [professional focus of Medical Physics : UCLouvain-KULeuven]	PHYS2M	3		🔍