UCLouvain

# wrdth3160

*2022*

# Technology, Dosimetry and Treatment Planning in Radiotherapy

| 5.00 credits | 20.0 h + 60.0 h | Q1 |
|---|---|---|

| | |
|---|---|
| Teacher(s) | . SOMEBODY ;Geets Xavier ;Kirkove Carine ;Sterpin Edmond (coordinator) ; |
| Language : | English |
| 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.<br>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<br>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.<br>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.<br>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.<br>The course is structured around the following objectives<br>1. Acquire the principles of reference dosimetry and small fields dosimetry<br>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.<br>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.<br>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<br>• Handbook of Radiotherapy Physics (Mayles, Nahum, Rosenwald)<br>• The physics of proton therapy (Neuwhauser and Zhang, Physics in Medicine and Biology 2015)<br>• 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 |
| Master [120] in Biomedical Engineering | GBIO2M | 5 | | |
| Advanced Master in Radiotherapy-Oncology | RDTH2MC | 5 | | |