Subject Description Form

Subject Code	HTI5002
Subject Title	Radiation Therapy Physics
Credit Value	3
Level	5
Pre-requisite / Co-requisite/ Exclusion	Nil
Objectives	This subject aims to teach the students the physics principles and practices of radiation therapy, including construction and calibration of linear accelerator, dosimetry and treatment planning, special radiotherapy procedures such as brachytherapy and stereotactic radiosurgery. Students will also acquire the knowledge and skill of dose calibration, dose calculation, photon and electron treatment planning.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Understand physics principles of radiotherapy machines and equipment b. Understand physics principles of dose calibration and dose calculation c. Demonstrate understandings of photon and electron treatment planning and dosimetry measurement using physics principles. d. Discuss principles of special radiotherapy procedures (brachytherapy, SBRT/SRS, TSI/TBI).
Subject Synopsis/ Indicative Syllabus	**Classical Radiotherapy** ■ Medical linear accelerators, TRS-398 and TG51 dose calibration ■ Dose calculation: PDD, TMR, SAD/SSD, hand calculation, TPS ■ QA for Linacs and Tx process **Modern Radiotherapy** ■ Photon Treatment Planning ■ Electron Beam Therapy ■ Dosimetry measurement ■ Dose calculation algorithms **Specially Radiotherapy Topics** ■ Brachytherapy ■ SRS and SBRT ■ TSI and TBI ■ Proton and heavy ion therapy

<table>
<tr><td>Teaching/Learning Methodology</td><td>This subject provides an in depth knowledge on the physics principles and clinical practices of the major radiotherapy methodologies.

Lectures aim to cover the physical concepts of linear accelerator, dose calibration, dose calculation, treatment planning, and specialized radiotherapy techniques. Tutorial sessions will be used to reinforce the theoretical learning and enhance the application of the knowledge in clinical environments. The students will acquire the knowledge and skills of dose calibration, dose calculation, and treatment planning through a series of lectures and practical sessions.</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes</td><td>
<table>
<tr><td rowspan="2">Specific assessment methods/tasks

100% continuous</td><td rowspan="2">% weighting</td><td colspan="4">Intended subject learning outcomes to be assessed</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td></tr>
<tr><td>1. Assignments</td><td>40%</td><td>√</td><td>√</td><td>√</td><td></td></tr>
<tr><td>2. Presentation</td><td>20%</td><td></td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>3. Written test</td><td>40%</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>Total</td><td>100 %</td><td colspan="4"></td></tr>
</table>
Homework: There are 4 homeworks in this subject. The homeworks assess students' learning and mastery of physics principles of radiotherapy.

Practical report: There are 1 practical in this subject. The practical assesses students' knowledge and skill in performing photon and electron treatment plans, which also include the skill of plan evaluation and reporting.

Written test: The written test assesses students' integration and application of the knowledge and concepts in the physics principles and clinical practices of dose calibration, dose calculation, photon and electron treatment planning, and special radiotherapy procedures.</td></tr>
<tr><td>Student Study Effort Expected</td><td>
<table>
<tr><td>Class contact:</td><td></td></tr>
<tr><td>■ Lecture</td><td>30 Hrs.</td></tr>
<tr><td>■ Practical & Tutorial</td><td>9 Hrs.</td></tr>
<tr><td>Other student study effort:</td><td></td></tr>
<tr><td>■ Self Study</td><td>49 Hrs.</td></tr>
<tr><td>■ Practical Work & Reports</td><td>20 Hrs.</td></tr>
<tr><td>Total student study effort</td><td>108 Hrs.</td></tr>
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Reading List and References	*The Physics of Radiation Therapy.* Fifth Edition, by Faiz Kahn and John P. Gibbons, Lippincott Williams and Wilkins, 2014 *The Modern Technology of Radiation Oncology, Volume 3: A Compendium for Medical Physicists and Radiation Oncologists.* Edited by Jacob Van Dyk, Medical Physics Publishing Corporation, 2013 *Principles and Practice of Radiation Oncology.* Fourth Edition, by Charles M. Washington and Dennis T. Leaver, Elsevier - Health Sciences Division, 2015 *Applied Physics for Radiation Oncology*. Second Edition, by By Robert Stanton and Donna Stinson, Medical Physics Publishing Corporation, 2009 The Physics & Technology of Radiation Therapy. Second Edition, by Patrick McDermott and Colin Orton, Medical Physics Publishing Corporation, 2019