

## Module Specification

### Module Summary Information

<b>1</b>	<b>Module Title</b>	Applied Radiotherapy Tech and Radiobiology
<b>2</b>	<b>Module Credits</b>	40
<b>3</b>	<b>Module Level</b>	5
<b>4</b>	<b>Module Code</b>	RAD5048

<b>5</b>	<b>Module Overview</b>
<p><b>Rationale</b></p> <p>In this module you will cover the principles of radiobiology and the effects of ionising radiation. In addition, you will gain a detailed understanding of the implications of the delivery of therapeutic radiation. This will enable you to have a deep appreciation of the implications of treatment delivery on successful outcomes based upon the equipment and patient related factors. You will also study the range of radiotherapy equipment used in modern clinical practice and the operation and applications of the radiotherapy technology employed in a clinical radiotherapy department. This content is essential for you to integrate your practical knowledge alongside your theoretical understanding of the operation of the equipment and how that equipment is employed in the treatment of patients with radiotherapy. Your understanding of the precision in delivery of radiation will ensure a high quality treatment to patients. Your understanding of the capabilities, operation and limitations of the equipment from a technological perspective will enable you make appropriate decisions in its use and how to manage the challenges that arise from its use on patients.</p> <p><b>Alignment with Philosophy and Aims</b></p> <p>The content is essential for applications to safe clinical practice which will enable you to apply your knowledge in any radiotherapy setting throughout the world. As a future qualified radiotherapy radiographer potentially working in any country you will be operating complex equipment on a day to day basis which has to be of a high standard to ensure accurate and safe treatment to patients.</p> <p><b>Learning and Teaching Strategy</b></p> <p>In this module you will develop your understanding of the principles of radiobiology and radiobiological implications of the effects of ionising radiation. This will be through a series of key note lectures and exercises used to develop your understanding and appreciation of the capabilities of the equipment used within the radiotherapy clinic. There will be an opportunity to undertake a presentation with your peers to explore a specific aspect of the module content.</p> <p><b>Assessment Strategy</b></p> <p>The assessment will consist of two items</p> <ol style="list-style-type: none"> <li>1) A 3000 word assignment which will assess the depth your critical understanding of radiobiology and its applications.</li> </ol>	

- 2) A 1 ½ hour examination which will assess your breadth of understanding of radiotherapy technology and its applications.

## 6 Indicative Content

Radiation attenuation and dose deposition  
 Carcinogenesis, Deterministic, stochastic, somatic and genetic effects.  
 Cell kinetics - Tumour growth (Potential and actual doubling time) modelling and Cell kill per Gy  
 5 R's of radiotherapy,  
 Linear energy Transfer, Radiobiological Effect (RBE),  
 Modelling of Radiation Effects in Treatment and radiobiological and dose considerations  
 Fractionation and dose determination in radiotherapy  
 Dose response curves  
 The Bystander effect.  
 Dose correction calculations - Corrections for errors and gaps in treatment  
 Whole Body Radiation Syndromes, Low dose and Environmental Effects of Radiation  
 Acute radiation syndromes and prodromal effects  
 Environmental exposure, Radiation hormesis and adaptive responses  
 In utero effects, epigenetics.  
 Accelerator technology variant design and operation  
 Machine design and operation,  
 Intensity modulated RT (IMRT), principles and applications.  
 Cyberknife and tomotherapy including Volumetric Arc Therapy (VMAT)  
 Dosimetry equipment, equipment checks and common faults.  
 Machine dosimetry, Patient dosimetry  
 Verification systems and applications.  
 KV and MV imaging  
 Particle beam equipment and applications  
 Kilovoltage (100 KV - 300KV) and sealed source teletherapy equipment (Co60) and applications.  
 Brachytherapy equipment and applications  
 Radionuclide therapeutic unsealed sources and applications.

## 7 Module Learning Outcomes

**On successful completion of the module, students will be able to:**

- |          |                                                                                                                                                  |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b> | Critically apply the principles of radiobiology, which are supported by evidence from the relevant literature and which underpins safe practice. |
| <b>2</b> | Demonstrate a critical understanding of the operation and applications of technological equipment used in radiotherapy.                          |

## 8 Module Assessment

Learning Outcome			
	Coursework	Exam	In-Person
<b>1</b>	<b>X</b>		
<b>2</b>		<b>X</b>	

<b>9 Breakdown Learning and Teaching Activities</b>	
<b>Learning Activities</b>	<b>Hours</b>
<b>Scheduled Learning (SL)</b> includes lectures, practical classes and workshops, peer group learning, Graduate+, as specified in timetable	28
<b>Directed Learning (DL)</b> includes placements, work-based learning, external visits, on-line activity, Graduate+, peer learning, as directed on VLE	122
<b>Private Study (PS)</b> includes preparation for exams	250
<b>Total Study Hours:</b>	400 (Including 38 hours for assessment preparation)