Module Specification

Module Summary Information

1	**Module Title**	Introduction to Medical Physics in Biomedical Engineering
2	**Module Credits**	20
3	**Module Level**	5
4	**Module Code**	ENG5106

5	**Module Overview**

Rationale

This module will enable you to build upon the knowledge and skills that you have developed earlier as part of this programme. It is intended that by engaging in this module, you will be able to develop a sound understanding of application of physics in medicine and thereby its application in the field of medical imaging.

This involves being able to:

- Understand and apply the fundamental principles of atomic physics, radiation principles and interaction process.
- Explain the concepts underpinning electromagnetic radiation and nuclear magnetic resonance and thereby its application in medicine.
- Understand the concepts of acoustic waves and its generation and thereby its application in medical imaging.
- Appraise the physical / radiation principles in the generation of 2D / 3D images.
- Have awareness to health and safety and professional code of conduct when dealing with electromagnetic / radiation waves.

Alignment with Programme Philosophy and Aims

This programme aims to enrich your problem-solving skills to address the upcoming challenges within the application of medical physics in the field of Biomedical Engineering. The module will enable you to understand the principles of physics underpinning the generation of medical images widely used by allied health professionals and medical consultants within the health care sector. Undertaking this module at level 5 will enable you to become proficient in further applying these fundamental concepts in processing and enhancing medical images using digital and computer algorithms to be delivered as part of a module on medical image processing at level 6. The module will also cover the nitty-gritty of health and safety aspects when dealing with radiations and provide further insight on your professionalism and adherence to the essential code of conduct while engaging in practice-led education due to the likelihood of coming across various confidential information or data within a health care sector.

This module has been carefully designed and developed to allow you to enhance your sound knowledge in medical physics, its principle and applications and thereby prepare yourself for a technical, research or development role within medical physics or imaging systems.

Learning and Teaching Strategy

In this module you will be attending lectures, workshops and seminars. You will also participate in classroom and small group discussions. Each of these activities is supported by pre and post-session, directed self-study such as Moodle questions and quizzes or reading. Moodle is the University virtual learning environment and contains the module learning resources; it is also the main tool for communication between students and module lecturers. Moodle will be used to support the module. This module develops your understanding of imaging in biomedical engineering and will use examples of how physics is applied to image formation in a variety of modalities.

Assessment Strategy

The assessment is a 3000 word written assignment which encourages you to develop your understanding in a focused area of biomedical imaging. You will apply the principles of physics and its applications to your area of interest in imaging.

6	Indicative Content

1. Atomic Structure – Lecture.
2. Magnetism and Electricity – basic concepts.
3. Electromagnetic radiation and x-ray spectrum.
4. Principles, applications and safety of Magnetic Resonance Imaging systems.
5. Ionising radiation production & Attenuation of Radiation.
6. Key note lecture and activity (formation of the image).
7. Principles and applications of digital Imaging.
8. Workshop in PACs lab, windowing, contrast, 2D and 3D visualisation, image integration, beam absorption, patterns.
9. Radioactivity and decay, Radionuclides.
10. Computer Tomography and 3D imaging.
11. Manufacturer seminar.
12. Principles and applications of Nuclear Medicine.
13. Principles and applications of Ultrasound. Lab work with U/S kit.
14. Radiotherapy Imaging Technologies and applications 1.
15. Professionalism, Health and Safety for medical technology.

7	Module Learning Outcomes On successful completion of the module, students will be able to:	
	1	To explain the physics concepts related to imaging in biomedical engineering.
	2	To discuss the professional responsibility and health and safety implications in biomedical imaging.

8	Module Assessment			
Learning Outcome				
	Coursework	Exam	In-Person	
1,2	X			

9	Breakdown Learning and Teaching Activities
Learning Activities	**Hours**
Scheduled Learning (SL) includes lectures, practical classes and workshops, peer group learning, Graduate+, as specified in timetable	30
Directed Learning (DL) includes placements, work-based learning, external visits, on-line activity, Graduate+, peer learning, as directed on VLE	0
Private Study (PS) includes preparation for exams	170
Total Study Hours:	200