

## Module Specification

### Module Summary Information

<b>1</b>	<b>Module Title</b>	Biomaterials and Tissue Engineering
<b>2</b>	<b>Module Credits</b>	20
<b>3</b>	<b>Module Level</b>	6
<b>4</b>	<b>Module Code</b>	ENG6082

<b>5</b>	<b>Module Overview</b>
<p><b>Rationale:</b></p> <p>This module will build upon the common engineering science / 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; the material science and apply the concepts underpinning the interaction of substances, engineered for medical applications, with biological system.</p> <p>This involves being able to:</p> <ul style="list-style-type: none"> <li>• Explain the characteristics of various materials used in the field of biomedical engineering for medical purposes.</li> <li>• Apply such principles while establishing a relationship between the human anatomy and physiological systems</li> <li>• Justify or rationalise any decisions related to your application of knowledge in Biomaterials while investigating biocompatibility / biodegradable issues and engaging in the research and development of medical implants.</li> </ul> <p><b>Alignment with Programme Philosophy and Aims</b></p> <p>This programme aims to enrich both your technical and transferrable skills to address the upcoming challenges in the design and development of medical implants, biomaterials or artificial organs commonly used in the field of interventional science / regenerative medicine. As part of professional development and /or with a keen interest in research and development, you as a biomedical engineer may engage in a collaborative partnership working with professionals from a rehabilitation unit within a health care or a medical device sector. Therefore, undertaking this module at level 6 will not only enable you to engage as part of the multidisciplinary team, trying to evaluate the suitability of appropriate biomaterial for use in medical applications, but will also allow you to apply appropriate technological solutions to assess the performance of these materials, in-vivo or in-vitro, based on a knowledge of structure and property relationships. This module has therefore been carefully designed to allow you to enhance your knowledge base / technical skills and prepare yourself to meet such demands in a work setting in a global market.</p> <p>Despite being a specialised module, the module will facilitate inter-professional teaching and specialist or guest lectures from potential employers on various occasions to enhance you knowledge and to enable you apply your problem-solving skills which will certainly be a part of your profession in your near future.</p>	

### Learning and Teaching Strategy

This Biomaterials module will have its own Moodle page which you will have to access to. This page will contain resources that are specific to the module such as the key note lectures; supporting materials and activities; assessment details and important notices. It is important that you access the site regularly as part of your learning will be to undertake sessional preparatory activities for each session followed by attempting short online formative activities to help with your learning. As part of this module, various workshops will be facilitated to encourage peer –learning or group activities and example exam questions will be used during these sessions.

### Assessment Strategy

Assessment will be via a closed book examination.

### 6 Indicative Content

1. Module and Assessment Launch - 1 Hour
2. Biomaterials for Healthcare - Properties - Lecture: 2 hours & Workshop on some of the common properties of materials used in health care applications. This will be based on input from specialist engineers and our industrial partners which will then feed appropriately into the subsequent workshop sessions: 2 hours
3. Biomaterials for Healthcare – Classification 1 - Lecture: 2 hours & Workshop: 2 hours
4. Biomaterials for Healthcare – Classification 2 - Lecture: 2 hours & Workshop: 2 hours
5. Plenary / Consolidation - 2 hours
6. Applied Biomaterials: Hard Tissue Applications - Lecture: 2 hours & Simulation / Workshop: 2 hours
7. Applied Biomaterials: Soft Tissue Applications including wound healing: Lecture: 2 hours
8. Simulation / Workshop: 2 hours
9. Biomaterial response and interaction - Lecture: 2 hours & Simulation / Workshop: 2 hours
10. Plenary / Consolidation - 2 hours
11. Introduction to Artificial organs 1: Biocompatibility / Regulatory requirements - Lecture: 2 hours
12. Introduction to Artificial organs 2: Material testing - Lecture: 2 hours & Simulation / Workshop: 2 hours
13. Research and development in the field of Biomaterials followed by Consolidation - Workshop: 2 hours
14. Tutorials – 2 hours Feedback – 30 minutes

### 7 Module Learning Outcomes

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

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|----------|---|
| <b>1</b> | Explain the technical and scientific principles underpinning the characteristics and properties of various biomaterials, including artificial organs, commonly used in the field of interventional science and regenerative medicine. |
| <b>2</b> | Identify and appraise the correlation between properties of biomaterials and their structural design used for various applications including biomechanics.  |
| <b>3</b> | Quantify the deformations induced by biomaterials, including composite materials, on the soft tissues, bones and implants thereby rationalising any potential for refinement.   |
| <b>4</b> | Explain the concept of biocompatibility and evaluate the methods used for testing the biomaterials.   |

8 Module Assessment			
Learning Outcome			
		Coursework	Exam
1,2,3,4			X

9 Breakdown Learning and Teaching Activities	
Learning Activities	Hours
<b>Scheduled Learning (SL)</b> includes lectures, practical classes and workshops, peer group learning, Graduate+, as specified in timetable	39
<b>Directed Learning (DL)</b> includes placements, work-based learning, external visits, on-line activity, Graduate+, peer learning, as directed on VLE	n/a
<b>Private Study (PS)</b> includes preparation for exams	161
<b>Total Study Hours:</b>	200