

MODULE DESCRIPTOR

Module Title

Biomaterials			
Reference	ENM403	Version	1
Created	March 2018	SCQF Level	SCQF 11
Approved	March 2018	SCQF Points	15
Amended		ECTS Points	7.5

Aims of Module

To develop a critical understanding of the properties and structure of the natural/synthetic materials and be able to apply them using advanced processing technologies to prepare various structures for biomedical applications.

Learning Outcomes for Module

On completion of this module, students are expected to be able to:

- 1 Demonstrate a critical understanding of the main classes of natural and synthetic polymers, their structure and their applications in biomedical technology.
- 2 Demonstrate the critical awareness of the biological interaction of the materials and various coating processes such as plasma spraying, jetting, RF sputter deposition, chemical vapour deposition, polymer coatings to solve orthopaedic, dental, ophthalmologic, respiratory and cardiological problems.
- 3 Deal with complex problems related to designing, selecting and processing material for biomedical engineering related products such as implants, prostheses and devices.
- 4 Apply critical analysis, evaluation and synthesis of the nanotechnology tools to forefront issues related to scaffold, reconstructive medicine and diagnostic device as well as nanotoxicity.

Indicative Module Content

1. Overview of properties of biological materials and its application in creating structure useful for biomedical applications; 2. Natural and synthetic polymer structure, properties, their classification and biomedical uses. 3. Advanced electro-mechanical design of the rehabilitation, artificial organ equipment and other diagnostic devices. 4. Coating/patterning of the prostheses using CVD, plasma spraying and jetting. 4. Biomaterials design, coatings, scaffold preparation and characterisation. Nanoparticle/nanocomposite role in biomedical applications, Nanoparticle/nanocomposite preparation, nanotoxicity, cell uptake of nanoparticles for the dental, ophthalmological and tissue engineering applications.

Module Delivery

This is a lecture, laboratory and tutorial based full time course, with case study work, plus private study and discussion.

Indicative Student Workload

	Full Time	Part Time
Contact Hours	30	N/A
Non-Contact Hours	120	N/A
Placement/Work-Based Learning Experience [Notional] Hours	N/A	N/A
TOTAL	150	N/A
<i>Actual Placement hours for professional, statutory or regulatory body</i>		

ASSESSMENT PLAN

If a major/minor model is used and box is ticked, % weightings below are indicative only.

Component 1

Type: Coursework Weighting: 50% Outcomes Assessed: 1, 3
 Description: Coursework assessing ability to design, process and test biomaterials, devices, and equipment for biomedical applications.

Component 2

Type: Coursework Weighting: 50% Outcomes Assessed: 2, 4
 Description: Coursework assessing ability to creatively apply nanotechnology tools for one biomedical application while considering its interaction with biological host materials.

MODULE PERFORMANCE DESCRIPTOR**Explanatory Text**

In order to pass this module, students should achieve a mark of at least 50% which is a minimum of grade D. Students should also achieve a mark of at least 40% in each individual component.

Module Grade	Minimum Requirements to achieve Module Grade:
A	Greater than or equal to 70%
B	In the range 60% to 69%
C	In the range 55% to 59%
D	In the range 50% to 54%
E	In the range 40% to 49%
F	Less than 40%
NS	Non-submission of work by published deadline or non-attendance for examination

Module Requirements

Prerequisites for Module	None.
Corequisites for module	None.
Precluded Modules	None.

INDICATIVE BIBLIOGRAPHY

- 1 RATNER, H. and SCHOEN, L., 2012. Biomaterial Science. 3rd ed. Academic Press.
- 2 TEMENOFF, M., 2008. Biomaterials. London: Pearson.
- 3 SCREEN, H.R.C. and TANNER, K.E., 2012. Structure and biomechanics of biological composites. In: NICOLAIS, L., BORZACCHIELLO, A. and LEE, S.M., eds. Encyclopedia of Composites. 2nd ed. Oxford: Wiley-Blackwell. pp. 2928-2939.
- 4 LAKES, R.S. and PARK, J., 2007. Biomaterials: An Introduction. 3rd ed. New York: Springer.
- 5 DRIVER, M., 2012. Coatings for Biomedical Applications. Cambridge: Woodhead Publishing Limited.
- 6 Biomaterials (Journal), Elsevier Publishing.