UNIVERSITY OF WARWICK

Proposal Form for New or Revised Modules (MA1 - version 7 - November 2014)

Approval information	
Approval Type	☒ New module ☐ Revised module ☐ Discontinue module
Date of Introduction/Change	01/10/2015
If new, does this module replace another? If so, enter module code and title:	N/A
If revised/discontinued, please outline the rationale for the changes:	N/A
Confirmation that affected departments have been consulted:	N/A

Module Summary	
1. Module Code (if known)	ES97G
2. Module Title	Biomaterials, Tissue Engineering and Regenerative Medicine
3. Lead department:	School of Engineering
4. Name of module leader	Prof N. Cameron
5. Level	UG: ☐ Level 4 (Certificate) ☐ Level 5 (Intermediate) ☐ Level 6 (Honours) PG: ☒ Level 7 (Masters) ☐ Level 8 (Doctoral) See Guidance Notes for relationship to years of study
6. Credit value(s) (CATS)	15 credits
7. Principal Module Aims	The module will provide the students with a sound understanding of biomaterials and their use in biomedical applications. A range of topics will be explored, including biocompatibility and the foreign body response, interfacial properties of biomaterials, and factors affecting cellular response and protein adsorption. Polymers and ceramics used in medicine are reviewed with examples including the total hip joint replacement (TFJR), heart valves, catheters and vascular grafts and hydrogels used in ophthalmology. Contemporary topics in biomaterials will be covered, such as

Module Summary	
	nanobiomaterials, nanomedicine, drug delivery, tissue engineering and regenerative medicine.
8. Principal Learning Outcomes	By the end of this module students will: • Understand the complex processes involved in biocompatibility and protein adsorption, and the importance of surfaces in advanced biomaterials applications. • Understand the different classes of modern biomaterials used in the body and be able to critically evaluate materials appropriately for a given application. • Understand nanomedicine and advanced drug delivery, and the action and use of cutting-edge smart biomaterials. • Understand and be able to apply modern techniques used to modify, characterise and systematically evaluate biomaterial surfaces. • Understand state-of-the-art techniques used in tissue engineering, including methods of scaffold manufacture. Be able to critically assess tissue engineering methods for a given scenario. • Understand the basic principles of stem cell biology, including its applications, and the importance of TERM.
9. Timetabled Teaching Activities (summary)	20 lectures, 2*3hr seminars, 2*2hr examples classes (total 30 hrs)
10. Departmental Web-link	
11. Other essential notes	
12. Assessment methods (summary)	Written examination 75 %; Assessed essays/coursework 25%

For use by Strategic Planning and Analytics Office only - Do not fill in this section

Level	JACS3 Code	Teaching Split
		If not provided in 3b above

External Credit Level		Scheme	

Module Context

13. Please list all departments involved in the teaching of this module. If taught by more than one department, please indicate percentage split.

School of Engineering

14. Availability of module

Degree Code	Title	Study Year	C/OC/ A/B/C	Credits
Example **H800**	Accounting and Finance **MSc in Biomedical Engineering**	1 **1**	C **A**	12 **15**

15. Minimum number of registered students required for module to run

1

16. Pre- and Post-Requisite Modules

N/A

Module Content and Teaching

17. Teaching and Learning Activities *(totals for module – please see guidance)*

Module duration (weeks)	**10**
Lectures	**20**
Seminars	**2*3hr**
Tutorials	
Project Supervision	
Demonstration	
Practical Class/Workshops	
Supervised time in studio/workshop	
Fieldwork	
External visits	
Work based learning	
Placement	
Year abroad	
Other activity *(please describe): e.g. distance-learning, intensive weekend teaching etc.*	**Examples Classes 2 hrs *2** **Guided self study of 120 hr**

18. Assessment Method (Standard)

Module Content and Teaching

Type of assessment	Length	% weighting
Written Examinations	3 Hours	**75**
Practical Examinations	Hours	
Assessed essays/coursework	**1 assignment (max 3500 words)**	**25**
18a. Final chronological assessment *(please see guidance*)	**Exam**	

19. Methods for providing feedback on assessment.

Coursework marked with detailed comments

20. Outline Syllabus

- Introduction to biomaterials
- Materials for biomaterials applications: polymers, metals and ceramics
- Characterization of biomaterials properties
- Bio-interfaces
- Protein adsorption and cell-surface interactions
- Surface modification and characterisation
- Mechanical properties of biomaterials for design
- Responsive biomaterials
- Nanobiomaterials
- Nanomedicine
- Scaffold design
- Tissue Engineering and Regenerative Medicine (TERM)

21. Illustrative Bibliography

1. Biomaterials Science: An Introduction to Materials in Medicine (3rd ed.), Ed. Buddy D. Ratner, et al., Elsevier, 2013.
2. Principles of Tissue Engineering (3rd ed.), Ed. Robert P. Lanza, Robert Langer, Joseph Vacanti, Elsevier, 2007.

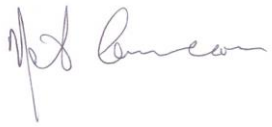
22. Learning outcomes

Successful completion of the module leads to the learning outcomes. The learning outcomes identify the knowledge, skills and attributes developed by the module.

Learning Outcomes should be presented in the format "By the end of the module students should be able to..." using the table at the end of the module approval form:

Resources

23. List any additional requirements and indicate the outcome of any discussions about these.

Approval	
24. Module leader's signature	
25. Date of approval	19 March 2015
26. Name of Approving Committee (include minute reference if applicable)	School of Engineering Teaching Policy Committee. Approved by Chair's Action 19 March 2015.
27. Chair of Committee's signature	
28. Head of Department(s) Signature	

Examination Information		
A1. Name of examiner (if different from module leader)		
A2. Indicate all available methods of assessment in the table below		
% Examined	**% Assessed by other methods**	**Length of examination paper**
75	**25**	**3hr**
A3. Will this module be examined together with any other module (sectioned paper)? If so, please give details below.		
No		
A4. How many papers will the module be examined by?	☒ 1 paper	☐ 2 papers
A5. When would you wish the exam take place (e.g. Jan, April, Summer)?	**Summer**	
A6. Is reading time required?	☐ Yes	☒ No
A7. Please specify any special exam timetable arrangements.		
A8. Stationery requirements		
No. of Answer books?	**1**	
Graph paper?	**Y**	
Calculator?	**Y**	
Any other special stationery requirements (e.g. Data books, tables etc)?	**Engineering Data Book**	
A9. Type of examination paper		
Seen?	☐ Yes	☒ No
Open Book?	☐ Yes	☒ No
Restricted?	☐ Yes	☒ No
If restricted, please provide a list of permitted texts:		

LEARNING OUTCOMES		
(By the end of the module the student should be able to....)	**Which teaching and learning methods enable students to achieve this learning outcome? (reference activities in section 15)**	**Which summative assessment method(s) will measure the achievement of this learning outcome? (reference activities in section 16)**
Understand the complex processes involved in biocompatibility and protein adsorption, and the importance of surfaces in advanced biomaterials applications.	Formal lectures and example classes	Exam/coursework
Understand the different classes of modern biomaterials used in the body and critically evaluate materials appropriately for a given application.	Formal lectures and example classes	Exam/coursework
Understand nanomedicine and advanced drug delivery, and the action and use of cutting-edge smart biomaterials.	Formal lectures and example classes	Exam/coursework
Understand and apply modern techniques used to modify, characterise and systematically evaluate biomaterial surfaces.	Formal lectures and example classes	Exam/coursework
Understand state-of-the-art techniques used in tissue engineering, including methods of scaffold manufacture. Be able to critically assess tissue engineering methods for a given scenario.	Formal lectures and example classes	Exam/coursework
Understand the basic principles of stem cell biology, including its applications, and the importance of TERM.	Formal lectures and example classes	Exam/coursework