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	October 2017
If new, does this module replace another? If so, enter module code and title:	
If revised/discontinued, please outline the rationale for the changes:	Revised as part of the curriculum refresh
Confirmation that affected departments have been consulted:	Changes have been made in consultation between the School of Engineering and WMG.

Module Summary	
1. Module Code (if known)	ES97F
2. Module Title	Healthcare Technology Engineering: design, maintenance and assessment
3a. Lead department:	School of Engineering
3b. Teaching Split (if known):	School of Engineering – 100%
4. Name of module leader	Dr L. Pecchia
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

Module Summary	
7. Principal Module Aims	To develop a firm understanding of the principles of modern design, maintenance and assessment of healthcare technologies, including: medical devices, novel treatment and therapeutic technologies, technologies for a healthy life-course, systems and environments for care delivery. This module will provide the student with a firm grounding in methods and tools for design, management and assessment of health technologies for prevention, diagnosis, treatment and rehabilitation.
8. Principal Learning Outcomes	At the end of the module, students will be able to • Understand the physical and physiological principles that underpin complex medical devices for prevention, diagnosis, treatment and rehabilitation. Compare and contrast the main aims, principles and components of these four categories of medical devices • Characterize, describe, explain, identify, locate and recognize the main components of the principal healthcare technologies for prevention, diagnosis, treatment and rehabilitation using functional diagrams and block diagrams. • Apply methods to systematically evaluate, design and manage advanced healthcare technologies • Critically assess the appropriateness of innovative health care technologies by reading a health technology assessment report. • Participate in multidisciplinary studies aiming to critically evaluate the technological feasibility and cost-effectiveness of a new medical device. Identify, classify, prioritize medical or epidemiological needs and participate in studies aiming to identify the most suitable technological solutions to satisfy those needs • Participate in multidisciplinary working group for the systematic design and development of innovative medical devices
9. Timetabled Teaching Activities (summary)	20 lectures (4 using eLearning platform), 6x1hr seminars, 1x2hr site visit, 2x1hr examples classes (total 30 hrs), 1 hr project supervision per group
10. Departmental Web-link	http://www2.warwick.ac.uk/fac/sci/eng/eso/modules/year4/
11. Other essential notes	Advice and feedback hours are available for answering questions on the lecture material (theory and examples).
12. Assessment methods (summary)	The module will be assessed as following: 1. 40% Coursework (Report 28%, presentation 12%) 2. 60% Group Project including peer assessment (Interim report 10%, presentation 18%, final report 32%) Students must pass the group project and the coursework overall.

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
H800	**MSc Biomedical Engineering**	**1**	**C**	
H107	**MEng Engineering (and electives)**	**4**	**A**	
H109	**MEng Engineering with Intercalated Year**	**5**	**A**	
H110	**MEng Engineering with a Year in Research**	**5**	**A**	**15**
HH63	**MEng Systems Engineering (and electives)**	**4**	**A**	
HH64	**MEng Systems Engineering with Intercalated Year**	**5**	**A**	
HH65	**MEng Systems Engineering with a Year in Research**	**5**	**A**	

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

1 (core)

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	**16**
Seminars	**6x1hr**
Tutorials	
Project Supervision	1 hour per project group
Demonstration	
Practical Class/Workshops	
Supervised time in studio/workshop	
Fieldwork	
External visits	1x2hr
Work based learning	
Placement	

Module Context	
Year abroad	
Other activity *(please describe): e.g. distance-learning, intensive weekend teaching etc.*	**Guided independent learning 119 hr** 2x1hr example classes 4x1hr distance-learning

18. Assessment Method (Standard)		
Type of assessment	**Length**	**% weighting**
Written Examinations		
Practical Examinations		
Assessed essays/coursework	Coursework Individual Essay Max 2000 words excluding figures Oral Presentation on Individual Essay Interim Group Project Report Max 6000 words excluding figures, including peer assessment Final Group Project Report Max 6000 words excluding figures , including peer assessment Group Project Oral Presentation including peer assessment	28% 12% 10% 32% 18%
18a. Final chronological assessment *(please see guidance*)	Group Project Oral Presentation	
19. Methods for providing feedback on assessment.		
Coursework and Group Project marked with detailed comments Face-to-face feedback in seminars		
20. Outline Syllabus		
The module will be organized in 3 parts: • ***Part 1: health technology design***		

- Physical and physiological principles, block diagrams and ordinary maintenance issues of the following medical devices will be presented: electrocardiography, vectorcardiography, ecocardiotochography, medical devices for radiology unit, ultrasound imaging, assistive technologies, point of care devices, diagnostics, active implantable devices (pacemakers and defibrillators), monitors and medical devices for intensive care units or surgery units, principal medical devices for surgery and minimally invasive surgery.
- Block diagrams and ordinary maintenance issues of the following care plants or settings: hospital wards; heating, ventilation and air conditioning; electrical power plant; surgery units, emergency units.
- Information and communication technologies for healthcare
- Human centred design
- User need elicitation to inform the design of medical devices

- ***Part 2: clinical engineering***
  - The medical device life cycle
  - Requirement Analysis and Strategic planning
  - European legislation for medical devices and comparison with the USA Food and Drugs Administration (FDA) standards
  - Medical software as medical device: implications
  - Risk management in hospital: patient and healthcare professionals safety
  - Maintenance of medical devices
  - Healthcare technology replacement planning
  - Healthcare technology procurement process
- ***Part 3: health technology assessment***
  - Introduction to the evidence based medicine
  - Methods for systematic literature reviews
  - Standard methods to measure the impact of medical devices: the quality of life
  - Cost minimization analysis
  - Cost-utility, cost-effectiveness and cost-benefit assessment

21. Illustrative Bibliography

1. Iadanza, Miniati, Dori, Clinical Systems Engineering, Elsevier (to be published in September 2015)
2. Tony Easty, "Human Factors for Health Technology Safety: Evaluating and improving the use of health technology in the real world" (to be published in June 2014)
3. J. F. Dyro "Clinical Engineering Handbook", Elsevier Academic Press, 2004
4. Y. David et al., "Clinical Engineering", CRC Press, 2003
5. Selected articles from scientific journals, including:
   a. Annual review of biomedical engineering, ISSN: 1523-9829
   b. The Health Technology Assessment Journal, ISSN: 2046-4924 (Online)

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.
Practical Session 1- requires access to the "Applied Biomedical Signal Processing and Intelligent eHealth Lab" in order to perform measurement using medical devices. Practical Session 2- requires access to a project room, with PC, to simulate a HTA study.

Approval	
24. Module leader's signature	Dr Leandro Pecchia
25. Date of approval	Teaching Policy Committee Chair's Action 27 April 2017
26. Name of Approving Committee (include minute reference if applicable)	School of Engineering and WMG Teaching Policy Committee
27. Chair of Committee's signature	Professor Gillian Cooke
28. Head of Department(s) Signature	Professor Nigel Stocks

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**
0	40% Coursework 60% Group Project including peer assessment	
A3. Will this module be examined together with any other module (sectioned paper)? If so, please give details below.		
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)?		
A6. Is reading time required?	☐ Yes	☐ No
A7. Please specify any special exam timetable arrangements.		
A8. Stationery requirements		
No. of Answer books?		
Graph paper?		
Calculator?		
Any other special stationery requirements (e.g. Data books, tables etc)?		
A9. Type of examination paper		
Seen?	☐ Yes	☐ No
Open Book?	☐ Yes	☐ No
Restricted?	☐ Yes	☐ No

Examination Information	
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 physical and physiological principles that underpin complex medical devices for prevention, diagnosis, treatment and rehabilitation. Compare and contrast the main aims, principles and components of these four categories of medical devices	Formal lectures and example classes	Coursework report and presentation
Characterize, describe, explain, identify, locate and recognize the main components of the principal healthcare technologies for prevention, diagnosis, treatment and rehabilitation using functional diagrams and block diagrams	Formal lectures, example classes, practical sessions	Coursework report and presentation
Apply methods to systematically evaluate, design and manage advanced healthcare technologies	Formal lectures, example classes	Project report and presentation
Critically assess the appropriateness of innovative health care technologies by reading a health technology assessment report	Formal lectures, example classes, seminaries, practical sessions, group project	Project report and presentation
Participate in multidisciplinary studies aiming to critically evaluate the technological feasibility and cost-effectiveness of a new medical device. Identify, classify, prioritize medical or epidemiological needs and participate in studies aiming to identify the most suitable technological solutions to satisfy those needs	Formal lectures, example classes, practical sessions, group project	Project report and presentation

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)**
Participate in multidisciplinary working group for the systematic design and development of innovative medical devices	Formal lectures, example classes, practical sessions, working group	Coursework/group project