**UNIVERSITY OF WARWICK**

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

| Approval information | |
|---|---|
| **Approval Type** | ☐ New module ☒ Revised module<br>☐ Discontinue module |
| **Date of Introduction/Change** | October 2018 |
| **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:** | Revised assessment method to include a quiz component. |
| **Confirmation that affected departments have been consulted:** | Changes were made in consultations between the School of Engineering and WMG |

| Module Summary | |
|---|---|
| **1. Module Code (if known)** | ES97C |
| **2. Module Title** | Fundamentals of Biomedical Engineering |
| **3a. Lead department:** | School of Engineering |
| **3b. Teaching Split (if known):** | School of Engineering 100% |
| **4. Name of module leader** | Prof. Christopher James |
| **5. Level** | UG: ☐ Level 4 (Certificate) ☐ Level 5 (Intermediate) ☐ Level 6 (Honours)<br>PG: ☒ Level 7 (Masters) ☐ Level 8 (Doctoral)<br>See Guidance Notes for relationship to years of study |
| **6. Credit value(s) (CATS)** | 15 Credits |
| **7. Principal Module Aims** | The principal aims of this module are to:<br>i) provide engineers with a fundamental introductory understanding of the structure and function of the human body; |

| Module Summary | |
|---|---|
| | ii) provide an awareness and basic understanding of established and emerging biomedical technology for the measurement and modification of the structure and function of the human body;<br>iii) enable the participants to investigate and communicate ideas from pioneering areas in biomedical engineering research;<br>iv) provide an understanding of the biomedical engineering profession and the various roles of the biomedical engineer. |
| **8. Principal Learning Outcomes** | By the end of the module students will be able to:<br>• Appreciate and understand the role of the large array of modern biomedical engineering fields.<br>• Understand basic functions of the human body.<br>• Understand the operating principles of modern and advanced technologies in BME including: biomedical imaging, biomechanics, biomedical signal processing.<br>• Understand current trends in technological innovations in the cardiac, neural and rehabilitation fields.<br>• Understand BME as a profession and the ethical considerations considering latest developments. |
| **9. Timetabled Teaching Activities (summary)** | 27 x 1 hr lectures, 5 x 1 hr seminars, 1 x 2 hr Surgery,<br>**Total 34 hrs** |
| **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 lab exercises. |
| **12. Assessment methods (summary)** | Online Quiz 20%<br>Mini-Project Coursework (20-25 pages) 80% |

**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** | **Biomedical Engineering** | **M1** | **Core** | **15** |

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

**1 – Core module**

**16. Pre- and Post-Requisite Modules**

None

## Module Content and Teaching

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

| | |
|---|---|
| **Module duration (weeks)** | **1 (intensive module)** |
| **Lectures** | **27 x 1 hr (one of which is when the quiz takes place)** |
| **Seminars** | **5 x 1 hr (external speakers)** |
| **Tutorials** | |
| **Project Supervision** | |
| **Demonstration** | |
| **Practical Class/Workshops** | **1 x 2 hr surgery for advice on projects (per student)** |
| **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.* | **116 hrs independent learning and self-study** |

## Module Content and Teaching

**18. Assessment Method (Standard)**

| Type of assessment | Length | % weighting |
|---|---|---|
| **Written Examinations** | | |
| **Practical Examinations** | | |
| **Assessed essays/coursework** | Online Quiz<br>Mini-Project Coursework (20-25 pages) | **20%**<br>**80%** |
| **18a. Final chronological assessment** *(please see guidance*) | **Mini-Project Coursework** | |

**19. Methods for providing feedback on assessment.**

- Support through advice and feedback hours.
- 1 x 2 hr "surgery" to discuss mini-project progress.
- Summative mark and written feedback on final submission of mini-project coursework.
- Individual mark and cohort-level feedback for the online quiz.

**20. Outline Syllabus**

**Introduction** to Biomedical Engineering and an overview of the human body – basic physiology and anatomy. The major organs and how they perform.

**Biomechanics:** Bones and muscles. The skeleton, and the operation of the muscular system. Statics, force loading, measurement of motion, forces and levers.

**Cardiovascular systems:** The heart, circulatory system, and respiration, including consideration of dimensions, flow rates and forces.

**Medical Diagnostics and Medical Imaging:** The role of technology in providing early diagnostics and remote monitoring. Clinical imaging technology, including MRI, PET, CT, and ultrasound.

**DNA:** How DNA carries the genetic code, DNA sequencing, and evolution. Nanotechnology.

**Neural Engineering:** The structure and function of the brain. Accessing information from the brain through bioelectric potentials: EEG & MEG. The use of neural implants such as deep brain stimulation & cochlear implants.

**Biomedical Engineering as a profession:** various roles of the biomedical engineer, career paths, the role of ethics in BME.

**21. Illustrative Bibliography**

"Anatomy & Physiology: The Unity of Form and Function", Saladin, K.S., 2014, McGraw-Hill
"Introduction to Biomedical Engineering", Enderle, J.D., Bronzino, J., 2011, Academic Press
"Medical Instrumentation Application & Design", Webster, J.D., 2009, John Wiley & Sons
"Human Anatomy & Physiology", Marieb, E.N., 2007, Pearson Education
"Basic Biomechanics", Hall, S.J., 2011, McGraw-Hill Higher Education
"Biomedical Signal Processing: Principles and Techniques", Reddy, D.C., McGraw-Hill Education, 2005

**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** | Prof Christopher James |
| **25. Date of approval** | CMAC Chair's Action 17 May 2018 |
| **26. Name of Approving Committee (include minute reference if applicable)** | School of Engineering and WMG Course and Module Approval Committee |
| **27. Chair of Committee's signature** | Professor Gillian Cooke |
| **28. Head of Department(s) signature** | Professor David Towers |

| 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** | **20% (Online Quiz)**<br>**80% (Mini-Project Coursework)**<br>**20-25 pages** | **N/A** |
| **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<br>N/A | ☐ 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?** | **N/A** | |
| **Graph paper?** | **N/A** | |
| **Calculator?** | **N/A** | |
| **Any other special stationery requirements (e.g. Data books, tables etc)?** | **N/A** | |
| **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)** |
| Appreciate and understand the role of the large array of modern biomedical engineering fields. | Lectures, seminars, mini-project coursework | Mini-project Coursework |
| Understand basic functions of the human body. | Lectures, seminars, mini-project coursework | Mini-project Coursework, Quiz |
| Understand the operating principles of modern and advanced technologies in BME including: biomedical imaging, biomechanics, biomedical signal processing. | Lectures, seminars, mini-project coursework | Mini-project Coursework, Quiz |
| Understand current trends in technological innovations in the cardiac, neural and rehabilitation fields. | Seminars, mini-project coursework | Mini-project Coursework, Quiz |
| Understand BME as a profession and the ethical considerations considering latest developments | Seminars, mini-project coursework | Mini-project Coursework, Quiz |