# Programme Specification[1]

**1. Programme Title(s) and Code(s):**

| *Programme Title* | *UCAS Code* | *GU Code* |
|---|---|---|
| BEng Biomedical Engineering | J750 | J750-2200 |

**2. Academic Session:**

2018-19

**3. SCQF Level (see Scottish Credit and Qualifications Framework Levels):**

10

**4. Credits:**

480

**5. Entrance Requirements:**

Please refer to the current undergraduate prospectus at: http://www.gla.ac.uk/undergraduate/prospectus/

**6. ATAS Certificate Requirement (see Academic Technology Approval Scheme):**

ATAS Certificate not required

**7. Attendance Type:**

Full Time

**8. Programme Aims:**

Biomedical Engineering is the application of engineering concepts to the field of medicine and biomedicine. The Biomedical Engineering degree at the University of Glasgow combines the strong academic engineering education provided within the School of Engineering with the excellent research and teaching activity in the School of Life Sciences and with the international level research activity, throughout the University and its allied hospitals, in Biomedical Engineering. The blending of these multidisciplinary activities provides the basis for the development of engineers with a good knowledge of the application of engineering skills to the biomedical field. The professional Biomedical Engineer requires a sound knowledge of the engineering principles and other skills

[1] This specification provides a concise summary of the main features of the programme and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if full advantage is taken of the learning opportunities that are provided. More detailed information on the learning outcomes, content and teaching, learning and assessment methods of each course can be found in course handbooks and other programme documentation and online at www.gla.ac.uk/

The accuracy of the information in this document is reviewed periodically by the University and may be checked by the Quality Assurance Agency for Higher Education.

of engineering science in parallel with their application in the biomedical field. These engineering skills include modelling of systems, mechanical analysis, electrical and electronic circuits, medical imaging, biomaterials and biomechanics. These skills will be brought together in the design projects through the degree and in the final year BEng project. The Biomedical Engineering degree will allow the graduate to progress into a career in Biomedical Engineering or engineering or into the research field based on the knowledge developed throughout the degree. Furthermore the graduate will be equipped to develop their skills through continued personal development. BEng students will receive a broad education in Biomedical Engineering and will develop the versatility of understanding required to deal with new and unusual problems in one or more branches of engineering and to provide the basis for further development to CEng level.

**This degree programme aims to:**

- present an integrated in depth multidisciplinary programme of study which will provide the student with knowledge and understanding of Biomedical Engineering;
- provide opportunities for the student to study some specialist topics within the field of Biomedical Engineering;
- provide an opportunity for students to develop transferable problem solving skills in Biomedical Engineering and individual project work;
- provide technical awareness in appropriate specialist applications of technology in the Biomedical Engineering field;
- develop the student's mathematical rigour, accuracy and numerate skills appropriate for professional engineering;
- present some professional, ethical, economic and management issues relevant to the Biomedical Engineering industry.

**9. Intended Learning Outcomes of Programme:**

The programme provides opportunities for students to develop and demonstrate knowledge and understanding, skills, qualities and other attributes in the following areas.

**Knowledge and Understanding:**

*Graduates will be able to:*

- Use their knowledge and understanding of the appropriate mathematical, scientific and computational tools that underpin Biomedical Engineering, to solve analytical, design or theoretical problems in the field of Biomedical Engineering;
- Apply their knowledge and understanding of physical laws, mathematics, numerical analysis and other relevant information in order to model Biomedical Engineering and similar systems;
- Draw on materials from a range of courses and wider reading in Biomedical Engineering principles and in related disciplines in order to solve problems in engineering;
- Apply some business and management techniques that are relevant to Biomedical Engineering and Biomedical Engineers;
- Explain the role of Biomedical Engineers in society and the constraints within which their engineering judgement will be exercised;
- Explain the professional and ethical responsibilities of Biomedical Engineers;
- Explain the national and international role of the Biomedical Engineer and the impact of engineering solutions in a global context.

**Skills and Other Attributes:**

Graduates will be able to:

*Subject-specific/practical skills*

- Plan and execute safely a series of experiments in Biomedical Engineering;
- Design, from requirement, market need or specification, a Biomedical Engineering device or system, up to the preliminary design stage, and present this design via a series of poster, written and oral presentations;
- Use laboratory and workshop equipment to generate data from Biomedical Engineering systems with appropriate rigour;
- Analyse experimental results in depth and determine their strength and validity;
- Assess the safety and potential efficacy of a device or system;
- Prepare technical drawings and technical reports;
- Give in depth technical presentations in oral form, as posters or in written form;
- Write up experimental methods, results and conclusions, and carefully and clearly plot experimental or

computational results and interpret experimental data by the use of regression, curve fitting and filtering, applying appropriate statistical analysis;
- Use scientific literature effectively and by drawing on their knowledge from lectures and wider reading around the subject be able to solve some Biomedical Engineering problems;
- Develop and adjust a work programme in order to conduct a research project;
- Undertake a supervised research project in academia or industry and present the results of this work in a written report and oral presentation to peers and staff;
- Work effectively in both individual and group projects;
- Explain some of the managerial and economic factors facing a professional engineer;
- Document their solutions to engineering problems so that others can follow and validate their work;
- Apply professional engineering practice and judgement in project work;
- Write computer programs and use computational tools and packages, selecting the appropriate "state of the art" tools to solve engineering problems.

*Intellectual skills*

*Graduates will be able to:*

- Apply appropriate quantitative mathematical, scientific and engineering tools to the analysis of problems;
- Apply rigour in mathematics;
- Plan, conduct and report a programme of research;
- Analyse and solve engineering problems;
- Design a system, component or process to meet a need;
- Integrate knowledge and understanding of other scientific, mathematical, computational or engineering disciplines in order to support their engineering specialisation;
- Formulate and test hypotheses;
- Evaluate designs, processes and products and make improvements;
- Integrate and evaluate information and data from certain sources;
- Take a holistic approach in solving problems and designing systems, applying professional judgements to balance risks, costs, benefits, safety, reliability, aesthetics and environmental impact.

*Transferable/key skills*

The skill set of the Biomedical Engineer graduating from the BEng programme will be of use in a wide range of applications because of the multi-disciplinary nature of the subject. Their skills will be, by definition, transferable.

*Graduates will be able to:*

- Apply problem solving and analytical thinking to a range of problems;
- Demonstrate numeracy and literacy in written reports, project work and examinations;
- Work in a group project environment and contribute effectively to the group project;
- Work on an individual project involving some self-directed research;
- Communicate effectively (in writing, verbally and through drawings);
- Apply mathematic skills (algebra, geometry, modelling, analysis);
- Transfer techniques and solutions from one field of engineering to another and to the Biomedical field;
- Use information and communications technology;
- Manage resources and time effectively;
- Learn independently in familiar surroundings with open-mindedness and in the spirit of enquiry;
- Learn effectively for the purpose of continuing professional development throughout their career.

**10. Typical Learning and Teaching Approaches:**

Staff involved in the degree programme utilise a wide range of teaching methods that they deem the most appropriate for a particular course. These include:

- Lectures;
- External lectures from industry or clinicians;
- Feedback given to students during tutorials;
- Small group and large group tutorial sessions;
- Question and answer sessions during lectures or staff Office Hours;
- Guided reading of texts, journal articles etc., for individual and group projects;

- Completion of web-based exercises or computer based laboratory sessions;
- Laboratory sessions.

**11. Typical Assessment Methods:**

*Assessment Methods to be used are:*

- Written examinations (Summative assessment);
- Oral presentations of individual and group work;
- Individual written project report(s) of both individual and group projects;
- Group written project report(s) of group projects;
- Interview of group project manager and assessment of group project minutes;
- Poster presentation of group project work;
- Practical skills will be assessed through laboratory experiments, write-ups, coursework reports, project reports and presentations;
- Experimental, research and design skills will be assessed through laboratory experiments write-ups, coursework reports, project reports and presentations;
- Presentation skills through group presentations and poster presentations.

**12. Programme Structure and Features:**

BEng J750-2200

## *BEng Year 1*

### Compulsory Courses

| Course Code | Course | Credits | Semester |
|---|---|---|---|
| ENG1071 | Biomolecular Processes in Bioengineering 1 | 10 | 2 |
| ENG1003 | Analogue Electronics 1 | 10 | 1 |
| ENG1026 | Engineering Skills 1 | 10 | 1 & 2 |
| ENG1031 | Introduction to Biomedical Engineering 1 | 10 | 1 |
| ENG1033 | Materials 1 | 10 | 1 |
| ENG1062 | Dynamics 1 | 10 | 2 |
| ENG1063 | Engineering Mathematics 1 | 40 | 1 & 2 |
| ENG1065 | Statics 1 | 10 | 1 |
| ENG1066 | Thermodynamics 1 | 10 | 2 |
| | | **120** | |

## *BEng Year 2*

### Compulsory Courses

| Course Code | Course | Credits | Semester |
|---|---|---|---|
| ENG2087 | Engineering in Biology 2 | 20 | 1 & 2 |
| ENG2016 | Mechanical Design 2 | 10 | 2 |
| ENG2004 | Analogue Electronics 2 | 10 | 2 |
| ENG2011 | Biomaterials 2 | 10 | 2 |
| ENG2012 | Biomedical Engineering Skills 2 | 10 | 2 |
| ENG2015 | Design and Manufacture 2 | 10 | 2 |
| ENG2081 | Mechanics of Structures 2A | 10 | 1 |
| ENG2084 | Dynamics 2 | 10 | 2 |
| ENG2085 | Fluid Mechanics 2 | 10 | 1 |
| ENG2086 | Engineering Mathematics 2 | 20 | 1 |
| | | **120** | |

## *BEng Year 3*

### Compulsory Courses

| Course Code | Course | Credits | Semester |
|---|---|---|---|
| BIOL2043 | Human Biological Sciences 2 | 30 | 2 |
| Compsci3005 | Software Engineering M3 | 10 | 2 |

| | | | |
|---|---|---|---|
| ENG3011 | Biological Fluid Mechanics 3 | 10 | 1 |
| ENG3015 | Control EE3 | 10 | 2 |
| ENG3034 | Instrumentation and Data Systems 3 | 10 | 2 |
| ENG3036 | Simulation of Engineering Systems 3 | 10 | 1 |
| ENG3038 | Microscopy and Optics 3 | 10 | 1 |
| ENG3084 | Biomechanics 3 | 10 | 1 |
| PHYS4013 | Medical Imaging | 10 | 2 |
| STATS3002 | Statistics for Biomedical Engineering 3 | 10 | 1 |
| | | **120** | |

## *BEng Year 4*

### Compulsory Courses

| Course Code | Course | Credits | Semester |
|---|---|---|---|
| ENG4036 | Biosensors and Diagnostics 4 | 10 | 2 |
| ENG4110P | Individual Project 4 | 30 | 1&2 |
| ENG4113 | Rehabilitation Engineering 4 | 10 | 2 |
| ENG4189 | Bioethics for Biomedical Engineering 4 | 10 | 2 |
| ENG4191 | Signal Processing of Biosignatures 4 | 10 | 1 |
| MGT5068 | Professional Practice 5 | 20 | 2 |

### Optional Courses (choose 30 credits)

| Course Code | Course | | |
|---|---|---|---|
| BIOL4124 | Tissue and Cell Engineering 4 | 20 | 1 |
| ENG4004 | Materials Engineering 4 | 10 | 2 |
| ENG4025 | Finite Element Analysis 4 | 10 | 1 |
| ENG4053 | Digital Signal Processing 4 | 20 | 2 |
| ENG4098 | Microelectronics in Consumer Products 4 | 10 | 1 |
| ENG4122 | Structural Analysis 4 | 10 | 2 |
| ENG4042 | Control 4 | 20 | 1 |
| ENG4195 | Control System Analysis and Design 4 | 10 | 1 |
| ENG4193 | Ultrasound Technology and Applications 4 | 10 | 2 |

**Regulations**

This programme will be governed by the relevant regulations published in the University Calendar. These regulations include the requirements in relation to:

(a) Award of the degree
(b) Progress
(c) Early exit award

http://www.gla.ac.uk/services/senateoffice/calendar/

**13. Programme Accredited By:**

**14. Location(s):**

Glasgow

**15. College:**

College of Science and Engineering

**16. Lead School/Institute:**

Engineering [REG30300000]

**17. Is this programme collaborative with another institution:**

No

**18. Awarding Institution(s):**

University of Glasgow

**19. Teaching Institution(s):**

University of Glasgow

**20. Language of Instruction:**

English

**21. Language of Assessment:**

English

**22. Relevant QAA Subject Benchmark Statements (see Quality Assurance Agency for Higher Education) and Other External or Internal Reference Points:**

This Programme Specification is informed by the QAA Benchmark Statement for Engineering

http://www.qaa.ac.uk/en/Publications/Documents/Subject-benchmark-statement-Engineering-.pdf

It is also informed by the Engineering Council Publication "UK Standard for Professional Engineering Competence (UK-SPEC)"

http://www.engc.org.uk/engcdocuments/internet/Website/UK-SPEC third edition (1).pdf

In addition the programme has been developed with regard to the reports on the development of Biomedical Engineering degrees of the Whitaker Foundation in the USA and the Royal Academy of Engineering report "First Degrees in Medical Engineering – A Positive Step for Engineering?" , Report for the UK Focus on Biomedical Engineering, http://www.raeng.org.uk/policy/ukfocus/publications.htm. Also the Special Issue on Biomedical Engineering Education in Proceedings of the Institution of Mechanical Engineers Part H: Journal of Engineering in Medicine Vol 223(H4) 2009

**23. Additional Relevant Information (if applicable):**

Support for students is provided by the Postgraduate/Undergraduate Adviser(s) of Studies supported by University resources such LEADS (www.gla.ac.uk/myglasgow/leads/), Counselling & Psychological Services (www.gla.ac.uk/services/counselling/), the Disability Service (www.gla.ac.uk/services/studentdisability/) and the Careers Service (www.gla.ac.uk/services/careers/).

**24. Online Learning:**

No

| | |
|---|---|
| **25. Date of approval:** | 07/08/2018 |