Programme Specification[1]

1. Programmes:

Programme Title	UCAS GU Code Code
MEng Biomedical Engineering	E5AJ571

2.1 SCQF Level:

11

2.2 Credits:

600

3. Awarding Institution:

University of Glasgow

4. Teaching Institutions:

University of Glasgow

5. College:

College of Science and Engineering

6. School:

Engineering [REG30300000]

7. Programme Accredited By:

8. Entrance Requirements:

[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.

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

9. 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 Faculty of Engineering with the excellent research and teaching activity in the Faculty of Biomedical and 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 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 penultimate year group project and final year MEng project, which is normally to be undertaken furth of the University of Glasgow in either industry or a research laboratory. 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.

The MEng programme is an integrated Masters programme in Biomedical Engineering designed as a preparation for professional practice. It provides an extended and enhanced programme of study beyond the BEng and is not simply a one year extension to the BEng. It is designed for the more able student. The programme of study is both broader and deeper than the corresponding BEng (Hons).

The MEng degree sets out to:

- To present an integrated in depth multidisciplinary programme of study which will provide the student with knowledge and understanding of Biomedical Engineering as applied throughout the body;
- To provide opportunities for the student to study in depth a choice of specialist subjects within the field of Biomedical Engineering;
- To provide an opportunity for students to develop transferable problem solving skills in Biomedical Engineering in group and large scale individual project work;
- To provide technical awareness in appropriate specialist applications of technology in the Biomedical Engineering field;
- To present professional, economic and management issues relevant to the Biomedical Engineering industry;
- To develop the student's awareness of the ethical problems within the Biomedical Engineering field.

10. 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, in depth, analytical, design or theoretical problems in the field of Biomedical Engineering;
- Apply their knowledge and understanding of physical and biological laws, mathematics and numerical analysis 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 Structural, Mechanical, Electrical and Biomedical Engineering and the Biological Sciences in order to solve problems in Biomedical Engineering including demonstrating depth and breadth to their learning;
- Apply 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 including those additional to working within the medical and patient environment;
- Consider 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 both the engineering and biomedical context;
- Design, from requirement, market need or specification, a biomedical engineering device implant or system, up to the preliminary design stage, and present this design via a series of poster, written and oral presentations from both group and individual work;
- Use laboratory and workshop equipment to generate data, including both engineering and physiological measurements, with appropriate rigour;
- Analyse experimental results in depth and determine their strength and validity;
- Assess the safety and potential efficacy of a medical device or implant;
- 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 Biomedical Engineering problems;
- Develop and update a research plan and adjust a work programme in order to conduct a major research project in academia or industry;
- Undertake a large scale 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 in depth the managerial and economic factors facing a professional engineer;
- Document their solutions to Biomedical 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 Biomedical 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 original research;
- Analyse and solve engineering problems;
- Design a Biomedical Engineering system, component or process to meet a need;
- Be creative in the solution of problems and in the development of designs;
- Integrate knowledge and understanding of other scientific, mathematical, computational or engineering disciplines in order to support their engineering specialisation;
- Formulate and test hypotheses modifying the hypotheses depending on the data obtained;
- Evaluate designs, processes and products and make improvements;
- Integrate and evaluate information and data from a variety of 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 MEng 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 in depth problem solving and analytical thinking to a diverse range of problems;
- Use appropriate multi-disciplinary skills to solve Biomedical Engineering problems, combining the biological and engineering knowledge gained through the degree;
- Demonstrate numeracy and literacy in written reports, project work and examinations.

Graduates be able to:

- Work in a group project environment and contribute effectively to the group project, including working as a member of an interdisciplinary team;
- Work on an individual project involving 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;
- Exercise team leadership;
- Learn independently in familiar and unfamiliar surroundings with open-mindedness and in the spirit of critical enquiry;
- Learn effectively for the purpose of continuing professional development and in a wider context throughout their career.

11. 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. 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 where the students write information presented to them via slide show, overhead or written by the lecturer;
- Lectures where the students have some printed notes/handouts and may annotate, or expand these during a spoken lecture;
- Lecture material placed on web-pages or other e-learning environment;
- 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.

13. Relevant QAA Subject Benchmark Statements and Other External or Internal Reference Points:

The programme specification is informed by the QAA benchmark Statement for Engineering
http://www.qaa.ac.uk/academicinfrastructure/benchmark/statements/Engineering06.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.

14. Programme Structure and Features:

Year 1

Course Code	Course Name	Semester	Credits
9ESU	Applicable Mathematics 1A	1&2	20
9ETU	Applicable Mathematics 1B	1&2	20
NSSU	Biomedical Engineering Skills 1	1&2	10
0FVU	Analogue Electronics 1	1	10
NUGU	Introduction to Biomedical Engineering 1	1	10
KEWU	Materials M1	1	10
3FBU	Applied Mechanics 1	2	20
JFZV	Cells and Tissues in Health and Disease	2	10
9PDU	Fluid Dynamics M1F	2	10

Early Exit Award: Certificate of Higher Education

Year 2

Course Code	Course Name	Semester	Credits
9EUV	Applicable Mathematics 2A	1&2	10
9EVV	Applicable Mathematics 2B	1&2	10
NVWV	Biomedical Engineering Skills 2	1	10
3KJV	Engineering Electromagnetics 2	1	10
1LGP	Human Form and Function 2	1	10
JGWV	Human Physiology 2	1	10
8ROU	Elements of Law for Engineers	1	10
3FBV	Applied Mechanics 2	2	20
7LRU	Analogue Electronics 2	2	10
NSNV	Biomaterials 2	2	10
2KXP	Physical Principles of Biological Processes 2	2	10

Early Exit Award: Diploma of Higher Education

Year 3

Course Code	Course Name	Semester	Credits
9FGV	Design and Manufacture 2A	1&2	10

9FSV	Design and Manufacture 2B	1&2	10
NWMW	Statistics for Biomedical Engineering 3	1	10
7NWV	Immunology	1	10
9SDW	Instrumentation and Data Systems 3	1	10
NUFW	Microscopy and Optics 3	1	10
NTDW	Signal Processing of Biosignatures 3	1	10
NVUW	Biological Fluid Mechanics 3	2	10
9EWW	Dynamics, Control and Fluid Power 3	2	20
87UT	Medical Imaging 3	2	10
JGZV	Neuroscience and Behaviour	2	10

Early Exit Award: BSc(Ordinary)

Year 4

Course Code	Course Name	Semester	Credits
KKNX	Group Design Project 4	1&2	20
NHYX	Professional Practice 4	1	20
87EH	Tissue and Cell Engineering 4	1	20
88TF	Bioethics	2	20
86SX	Biosensors and Diagnostics 4	2	10
86SU	Rehabilitation Engineering 4	2	10
86SS	Medical Imaging and Therapy 4	2	10

10 credits are to be selected from the following options:

90ZT	Applied Engineering Mechanics 4	1	10
0ECX	Microelectronics in Consumer Products 4	1	10

Year 5

Course Code	Course Name	Semester	Credits
9FKY	Industrial Project M5	1	60
NHXY	Professional Practice 5	2	20
0DQY	Applied Design Systems 5	2	20
NTBS	Bioinformatics and Systems Biology 5	2	10
NVBS	Applications of Biomedical Engineering 5	2	10

15. Additional Relevant Information:

Being a new programme Engineering accreditation cannot be sought as yet. However once in progress it is intended that the programme will be accredited by one or more of the following institutions: Institution of Mechanical Engineers (IMechE), Institution of Engineering and Technology (IET) and Institution of Physics and Engineering in Medicine (IPEM).

Support for students is provided by the Postgraduate/Undergraduate Adviser(s) of Studies supported by University resources such as the Effective Learning Adviser located in the Student Learning Service (http://www.gla.ac.uk/services/tls/sls/), the University Heath Service (http://www.gla.ac.uk/services/health/), the Student Counselling and Advisory Service (http://www.gla.ac.uk/services/counselling/), the Student Disability Service (http://www.gla.ac.uk/services/studentdisability/) and the Careers Service (http://www.gla.ac.uk/services/careers/).

16. Academic Session:

2010-11

Additional Administrative Information to be completed:

17. Fee Type:

Standard

18. Attendance Type:

Full Time

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