PROGRAMME SPECIFICATION

Degrees:

Programme Title	Final Award	Duration of study/ years	Programme & route codes	Level
Biomedical Engineering (conversion)	MSc	1	PMSF-QMENNG1-PSBECZ	7

Ownership	
Awarding institution:	Queen Mary University of London
Teaching institution	Queen Mary University of London
Academic Department(s) involved in programme delivery	School of Engineering and Materials Science
Main location(s) of study	Mile End Road, London
External references	
QAA Benchmark Group	Engineering
External Accreditor (if applicable)	Institute of Mechanical Engineers (IMechE), Institute of Physics & Engineering in Medicine (IPEM) and Institute of Materials, Minerals & Mining (IOM3)
Accreditation received	2022 (IMechE)
Accreditation renewal	IMechE (2024)

Specification Details	
Programme Lead	Prof Julia Shelton
Student cohorts covered by specification	2025 entry
Date of introduction of programme	September 2019
Date of programme specification / amendment	15 November 2024
Approval by School Education Committee	15 November 2024
Submitted to Directorate of Governance & Legal Services	16 November 2024

1. Programme Overview

Biomedical Engineering is a field of engineering that relies on highly inter- and multi-disciplinary approaches to research and development, in order to address biological and medical problems. Specialists in this area are trained to face scientific and technological challenges that significantly differ from those related to more traditional branches of engineering. Nevertheless, at the same time Biomedical Engineering makes use of more traditional engineering methodologies and techniques, which are adapted and further developed to meet specifications of biomedical applications.

This MSc programme aims to prepare specialists with advanced knowledge and transferable skills in the field of Biomedical Engineering with a personalised curriculum of studies that can be defined by the student. This is achieved by offering the possibility of choosing 'electives' from a prescribed diet of modules, to provide flexibility within a diversified reach offer, so as to meet specific interests and expectations, as well as career plans. This programme is aimed at students who already have a science background (e.g. biology, mathematics, chemistry, physics), and aims to convert them to engineers with unique expertise in the fundamentals of biomedical engineering. Students can take advantage of support offered by the School to receive help on how to optimally shape their personalised curriculum of studies, although every module choice combination may not be possible owing to timetable constraints.

The programme has strong roots within the well-recognised expertise of the academics that deliver the lectures, who have international standing in cutting-edge research in a diversity of topics within the discipline of Biomedical Engineering. This fact ensures that the programme is delivered with the highest standards in the field. You will also benefit from access to state-of-the-art facilities and instrumentation while undertaking research projects under their guidance.

You will be able to select a balanced combination of modules that will allow you to undertake careers in a wide range of professional areas of interest within the biomedical field, including health care services, industry based commercial, applied and basic scientific research.

A 90 credit research project is to be undertaken using our research activities and our state of the art facilities. Several high performance computing clusters owned by the university support a full spectrum of computational research. Our well equipped laboratories include a wide range of tissue engineering, human performance, mechanical testing and materials synthesis and characterisation labs.

The Biomedical Engineering MSc conversion programme aims to convert students with a science background to engineers with skills in experimental techniques, computational modelling and understanding of biomedical engineering approaches to medical and health problems. Depending on students' preferences, the programme will place particular emphasis on bioengineering approaches to either cell and tissue therapies, imaging and instrumentation, or biofluids.

The principal aim is that the students completing this programme would develop their knowledge in this new field to a level, in both experimental and computational areas that allows them to contribute to the advancement of knowledge and technology in this area.

The detailed aims of the programme are to:

- Teach advanced experimental, computational and analytical techniques applicable to Biomedical Engineering in order to provide a base of knowledge and skills

- Teach advanced biological and medical experimental techniques applicable to medicine and general healthcare.
- Teach modern biomedical techniques used in bioengineering, medical and healthcare units.
- Foster applied understanding and practical implementation of taught material through a research/design project.
- Provide students with insight into advanced developments and associated ethical and legal issues for their implementation in medical practice.
- Enable students to participate in advanced research and industrial developments in Biomedical Engineering.

2. Learning outcomes for the programme

In this degree programme we place strong emphasis not only on the technical content of our modules, but also on cross disciplinary skills vital for an engineer to be effective in the workplace. We embed these skills in the technical modules on the programme, to ensure that your technical knowledge and understanding develops together as you progress through your degree, and also to allow you to graduate with skills you can apply to a range of future careers.

Students who complete this programme will have developed skills to work in a wide range of industries that develop, design, and maintain Biomedical Engineering systems from full systems to component design and analysis. You will develop their knowledge in this new field to an advanced level, in both experimental and computational areas, allowing you to contribute to the advancement of knowledge and technology. In addition, you will have been given an ideal preparation for undertaking a PhD in a related discipline.

2.1 Academic Content

- Knowledge of the scientific and engineering principles necessary to underpin their education in the field of Biomedical Engineering
- Ability to critically evaluate existing analytical and experimental techniques and propose practical methods for their improvement
- Gain knowledge of the field of Biomedical Engineering, so as to be able to find practical solutions to biomedical engineering problems
- Sufficient knowledge of the fundamentals of physiology and to be able to apply these to biomedical engineering applications
- An understanding of how engineers and clinicians interface within the medical and biological sectors and the technological requirements of those sectors
- Knowledge of the regulatory framework governing the development of new Biomedical Engineering products.

2.2 Discipline specific

- Understand appropriate fundamental engineering principles related to applications in Biomedical Engineering
- Apply engineering principles to a range of medically- or biologically-related applications
- Recognise the responsibilities of the professional biomedical engineer
- Use knowledge to evaluate new and emerging medically- or biologically-related technologies
- Use appropriate technical and non-technical language to effectively communicate and interface with clinicians or biologists to formulate medical or biological problems from an engineering viewpoint.

- Plan and perform safe experimental work in laboratory settings, including biosaftey where relevant
- Work effectively with computing tools for data analysis and processing, as well as modelling, simulation and design
- Exercise professional judgement in medically- or biologically-related problem solving, considering functional, ethical and economic issues
- Apply initiative and competence to the design, development and analysis/characterisation of biomedical materials, devices and systems

2.3 Attributes

- Engage critically with knowledge, and apply it in a rigorous way
- Be able to assess both the application and limitation of mathematical, computational and experimental techniques available to an engineer.
- Be able to carry out a substantial piece of individual work whose structure and content is largely self-determined
- Demonstrate rounded intellectual development

3 Learning and teaching approaches

Teaching methods are tailor-made to suit the size of classes and the nature of the subject. Each module has a combination of methods including lectures, seminars tutorials, laboratory sessions, industrial visits, workshops and group work. QMUL degrees combine face to face teaching and practical experiences with supported and structured on-line learning. Our virtual learning platform is referred to as QMplus. Through this platform you will be able to find details about your modules, assessments, additional resources, timetables and other guided learning activities.

Projects throughout the programme are designed for you to exercise independent and critical thinking, research and problem-solving skills. Group work enhances your communication, organisational as well as technical skills.

3.1 Employers Links

The school has an active Industrial Liaison forum (ILF). This forum has a direct impact on the programmes by encouraging employers to sponsor and support the students and to provide real design case studies to engage the students throughout the curriculum. Recent case studies that have been taught and assessed were delivered by Bridgestone, DePuys, Baxter, Artis, Corus, BAe, DSTL, Rolls Royce. The ILF takes place twice a year, in Autumn and Spring.

3.2 Assessment methods

You can expect a variety of different types of assessment methods:

Written assessment

- Examinations
- Progress tests
- Online assignments and quizzes
- Report and other writing
- Peer assessment

Practical assessment

- Laboratory/workshop practicals
- Design work

- Programming tests
- CAD & simulation tool tests

Oral assessment

- Oral presentations
- Poster presentations
- Group presentations
- Design presentations

Assessments allow you to demonstrate that you have met the intended learning outcomes for each module and contribute towards your achievement of the programme learning outcomes. There are summative (formal) assessments during and/or at the end of each module and well as ongoing formative (informal – no marks) assessment throughout the degree. Examinations are intended to assess understanding rather than recall. Group assessments may incorporate peer marking.

Assessments operate in accordance with QMUL Regulations and established procedures. Feedback is provided through a number of formats, including:

- Oral (e.g. face to face during or after timetabled face-to-face sessions, video)
- Personal (e.g. discussion with staff)
- Interactive (e.g. Team Based Learning, peer-to-peer, online quizzes)
- Written (e.g. solutions, model answers, cohort level and individual comments on work)

You will receive feedback on intermediate, developmental assessments such as project plan and progress reports and on coursework assessments. This feedback may be summarised for the whole cohort or be directed towards your work individually.

The final project thesis will be assessed in September and the student will also complete a presentation as well as an oral examination.

Feedback is intended to help you learn and you are encouraged to engage with it, reflect upon it and discuss it with your module organisers. Feedback will be provided on coursework and practical assessments within an appropriate time. Feedback on examination performance is available upon request from the module leader and overall class performance feedback on a question-by-question basis may also be provided.

3.3 Support of students

We aim to support all students throughout their time with us. We encourage students to develop independently but this does not mean that you need to be alone. We know that support and encouragement from staff and fellow students is very important throughout your degree.

The Student Support Officer for SEMS is the first contact for any personal support; they can be contacted by email: sems-office@qmul.ac.uk with any questions or to arrange an appointment.

3.3.1 Advisor arrangements

You will be allocated an Advisor when you register. You will meet with your Advisor at least twice per semester, but can always book more meetings if you need help.

3.3.2 Central support services Disability and Dyslexia Service

QMUL has a central Disability and Dyslexia Service (DDS) that offers support for all students with disabilities, specific learning difficulties and mental health issues. The DDS supports all QMUL students.

Advice and Counselling

QMUL offers a wide range of advice, guidance and self-help material. These free and confidential professional services are available to all students.

4 Programme structure

45 credits of taught modules will be taught in the first semester from September until December plus an additional 15 credits of taught material associated with the research project. A further 45 credits of taught modules will be taught in the second semester from January until April. All taught module examinations will be in the standard examination periods during January and May. The 90 credit Extended Research Project will be completed over 3 semesters.

The modules available within the programme diet are presented in the table below.

Module	Semester	Title		Credit
EMS715P	A,B,C	Extended Research Project	Core	90
EMS762P	A	Clinical Bioengineering: Applications in Urology	Compulsory	15
EMS421P	A	Essential Mathematics Skills for Engineers	Compulsory	0
EMS738P	A	Interpretation and Analysis in Biomedical Imaging*	Compulsory	15
EMS706P	A	Clinical Sensors and Measurements	Compulsory	15
EMS719P	B	Medical Ethics and Regulatory Affairs	Compulsory	15
2 from:				
EMS736P	B	Clinical Applications in Regenerative Medicine*	Elective	15
EMS701P	B	Medical Robotics and Surgical Techniques	Elective	15
EMS735P	B	Biocompatibility Evaluation for Clinical Innovation*	Elective	15
EMS737P	B	Experimentation and Modelling in Cell and Tissue Biomechanics*	Elective	15
EMS732P	B	Digital Manufacture for Healthcare Innovations	Elective	15
EMS707P	B	Digital Signal Acquisition and Processing	Elective	15

* Students **may not** select: Interpretation and Analysis in Biomedical Imaging, Clinical Applications in Regenerative Medicine; Biocompatibility Evaluation for Clinical Innovation, Experimentation and Modelling in Cell and Tissue Biomechanics, if they have been studied previously at undergraduate level, EMS620U, EMS617U, EMS615U, EMS618U respectively.

Note: The modules, structure and assessments presented in this Programme Specification are correct at time of publication but might change as a result of student and staff feedback and the introduction of new or innovative approaches to teaching and learning. You will be consulted and notified in a timely manner of any changes to this document.

5 Entry requirements

Students will be admitted according to the entry requirements found at:

https://www.sems.qmul.ac.uk/pgadmissions/

6 Quality assurance

6.1 Student Voice Committee (SVC) meetings

The School has a Student Voice Committee and students on this programme are represented on this committee. The committee meets twice during each semester and is made up of the following members:

- Academic Lead for Student Experience (Chair)
- Student Support Officer (Secretary)
- Directors of the relevant programmes
- At least one student representing the relevant programmes

The elections for the postgraduate representatives are organised through the Student Union. SVC agendas and minutes are found on the SEMS QMplus landing page. Relevant items on the minutes are referred to the appropriate School committees for consideration and feedback.

6.2 Evaluating and improving the quality and standards of teaching and learning

We assess our provision of teaching by:

- Module review by means of student experiance questionnaires and module organisers' reports.
- Annual staff appraisal.
- Peer observation of teaching.
- External examiners' reports.
- Periodic Programme Review by the University.

The Committees within SEMS that have responsibility for monitoring and evaluating quality and standards are

- Education Committee
- Student Experience Committee
- Academic Standards Committee
- Student Voice Committee
- Subject Examination Boards
- Degree Examination Boards

The ways we receive student feedback on the quality of teaching and your learning experience are:

- Annual Postgraduate Taught Experience Survey (PTES)
- Student Voice Committee
- Student Questionnaire evaluation for each of your modules
- Student forums on QMplus, including module and programme specific forums as well as ones covering more general topics
- Discussions with Advisors.

6.3 Staff development

Our staff are continuously engaging with professional development activities, including courses and workshops related to teaching and learning.