

PROGRAMME SPECIFICATION

Degrees:

Programme Title	Final Award	Duration of study/ years	Programme & route codes	Level
Biomedical Engineering	MSc	1	PMSF-QMENNG1-PSBMEZ	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 Accriterator (if applicable)	Institution of Mechanical Engineers, Institute of Physics & Engineering in Medicine and Institute of Materials, Minerals & Mining
Accreditation received	2018 (IMechE)
Accreditation renewal	IMechE (2024 pending)

Specification Details	
Programme Lead	Prof Julia Shelton
Student cohorts covered by specification	2024 entry
Date of introduction of programme	September 2019
Date of programme specification / amendment	1 December 2024
Approval by School	22 November 2023
Submitted to Directorate of Governance & Legal Services	11 December 2023

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 aimed at offering the possibility of choosing modules, with high flexibility within a diversified and reach offer, so as to meet specific interests and expectations, as well as career plans. Students can take advantage of a support offered by the School to receive a help on how to optimally shape their personalised curriculum of studies although every choice of modules 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 of Biomedical Engineering. This fact ensures that the programme is delivered with the highest standards in the field. The students also benefit from access to state-of-the-art facilities and instrumentation while undertaking their research projects.

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 and 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. Nanotechnology research is further supported by the facilities and expertise provided by Nanoforce, a company directly associated with the School.

The Biomedical Engineering MSc programme aims to prepare specialists with advanced skills in experimental techniques, computational modelling, and in depth 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, more traditional applications in everyday health care and orthopaedics, regulatory practice, or a combination of these areas.

The detailed aims of the programme are to:

- Teach advanced experimental, computational and analytical techniques applicable to Biomedical Engineering in order to provide an advanced 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.
- Implement 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 work place. We embed these skills in the technical modules on the programme, to ensure that the technical knowledge and understanding works 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
- An in-depth 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 fundamental 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
- Learn new theories, concepts, methods etc. in unfamiliar situations
- Develop, monitor and update a plan, to reflect a changing operating environment
- Plan and perform safe experimental work in laboratory settings
- 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

Attributes

- Be able to understand both the application and limitation of computational and experimental techniques available to biomedical engineers

- Engage critically with knowledge, and apply it in a rigorous way
- Be able to carry out a substantial piece of individual work whose structure and content is largely self-determined
- Have the ability to analyse and solve problems individually and in groups
- Have the ability to communicate knowledge and ideas verbally and in written reports
- Use communications technologies competently to engage with a range of audiences
- Critically evaluate the reliability of different sources of information
- Use information for evidence based decision making
- Use quantitative data confidently and competently.

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, 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, timetables and other activities. Projects throughout the programme are designed for you to exercise independent 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 meets twice a year. The event in October runs in parallel with the SEMS prize day where companies award prizes to more than 30 of our best students. During the October event the projects that you will tackle in the academic year are planned and the second event in March is designed to help evaluate and review the projects.

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) through 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 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, 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 organiser. 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.

QMUL's Policy on Assessment and Feedback and guidance on issuing provisional marks to students is available at:

http://www.arcs.qmul.ac.uk/media/arcs/policyzone/Code-of-Practice-on-Assessment-and-Feedback_amended-2016.01.18.pdf

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

Your Advisor will be your project supervisor.

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: full-time, part-time, undergraduate, postgraduate, UK and international at all campuses and all sites. You can access advice, guidance and support in the following areas:

- Finding out if you have a specific learning difficulty like dyslexia
- Applying for funding through the Disabled Students' Allowance (DSA)
- Arranging DSA assessments of need

- Special arrangements in examinations
- Accessing loaned equipment (e.g. digital recorders)
- Specialist one-to-one "study skills" tuition
- Ensuring access to course materials in alternative formats
- Providing educational support workers (e.g. note-takers, readers, library assistants)
- Mentoring support for students with mental health issues and conditions on the autistic spectrum

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. Details can be found at:

<https://www.welfare.qmul.ac.uk/student-advice-guides/>

3.4 Interruption of Study

The University's Policy on a student's interruption of study is available at:

[http://www.arcs.qmul.ac.uk/media/arcs/policyzone/academic/Interruption-of-Study-Policy-\(June-2020\).pdf](http://www.arcs.qmul.ac.uk/media/arcs/policyzone/academic/Interruption-of-Study-Policy-(June-2020).pdf)

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 making up the programme are presented in the table below. The indicative study programme in streams is as follows, but there is some flexibility depending on the student's background and interests.

module	semester	title		credit
EMS715P	A,B,C	Extended Research Project	core	90
EMS762P	A	Clinical Bioengineering: Applications in Urology	compulsory	15
EMS719P	B	Medical Ethics and Regulatory Affairs	compulsory	15
2 from:				
EMS706P	A	Clinical Sensors and Measurements	elective	15
EMS740P	A	Machine Learning and Artificial Intelligence for Engineering	elective	15
EMS738P	A	Interpretation and Analysis in Biomedical Imaging*	elective	15
EMS718P	A	Nanotechnology and Nanomedicine	elective	15
EMS736P	A	Clinical applications in regenerative medicine*	elective	15
EMS714P	A	Modern robotics: fundamentals and applications	elective	15
2 from:				
EMS732P	B	Digital Manufacture for Healthcare Innovations	elective	15

EMS707P	B	Digital Signal Acquisition & Processing	elective	15
EMS709P	B	Computational Fluids	elective	15
EMS735P	B	Biocompatibility Evaluation for Clinical Innovation*	elective	15
EMS741P	B	Deep Learning for Data and Image Analysis	elective	15
EMS737P	B	Experimentation and Modelling in Cell and Tissue Biomechanics*	elective	15
EMS729P	B	Cognitive robotics	elective	15
EMS701P	B	Medical Robotics & Surgical Techniques	elective	15

* Students **may not** select: Interpretation and Analysis in Biomedical Imaging, *Clinical applications in regenerative medicine*; Biocompatibility Evaluation for Clinical Innovation, or *Experimentation and Modelling in Cell and Tissue Biomechanics*, if they have previously studied at undergraduate level EMS620U, EMS617U, EMS615U, or 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 Progression and Classification

The MSc follows QMUL's Academic Regulations which can be found at:

<https://arcs.qmul.ac.uk/policy/>. However, please note that to receive an accredited degree programme, students must meet the Engineering Council's regulations which are outlined below. If a student does not meet the EngC requirements below but meets Queen Mary's award requirements, they will graduate with a different degree programme title to distinguish that the programme is not accredited.

5.1 To be eligible for an EngC-accredited MSc masters award, a student must meet all of the following requirements:

- i. take 180 credits, including a minimum 150 credits at level 7. Any credits below level 7 must be at levels 5 or 6; a maximum 15 may be taken at level 5.
- ii. pass a minimum 165 credits where the mark in any failed module is at least 40%.
- iii. achieve a Classification Mark of 50.0 or higher.

5.2 Exit awards

An exit award is an award at a lower level than that for which a student initially registered. An exit award may be recommended where a student meets the requirements for the lower-level award and where the student has either withdrawn or been deregistered. Exit awards for the postgraduate programmes have the following hierarchy. A student will be awarded the highest linked award for which they meet all requirements: i Master of Science (MSc). ii Postgraduate Diploma (PgDip). iii Postgraduate Certificate (PgCert).

6 Entry requirements

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

<https://www.sems.qmul.ac.uk/pgtadmissions/entry/>

7 Quality assurance

7.1 Student-Staff Liaison Committee (SSLC) meetings

The School has a Student-Staff Liaison 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:

- Director of Student Support (Chair)
- Student Support Officer (Secretary)
- Directors of the relevant programmes
- At least one student representing the relevant programmes

The elections for the undergraduate representatives are organised through the Student Union. SSLC agendas and minutes are found on the SEMS QMplus landing page

(<https://qmplus.qmul.ac.uk/course/view.php?id=13091>). Relevant items on the minutes are referred to the appropriate School committees for consideration and feedback.

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

We assess our provision of teaching by:

- Module review by means of student feedback questionnaires and course organisers' reports.
- Annual staff appraisal.
- Peer observation of teaching.
- External examiners' reports.
- Periodic Internal Review by the College involving external panel members.
- Periodic Institutional Audit of the College by the Quality Assurance Agency.

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

- Education Committee
- Education Coordination Group
- Student Experience Committee
- Academic Standards Committee
- Teaching Development and Scholarship Committee
- Student-Staff Liaison Committee
- Subject Examination Boards – meet in January, June and September to confirm marks and prizes, and to consider progression and awards
- Degree Examination Boards – meet in July to confirm progression and awards
- Science and Engineering Faculty Board
- University Quality Enhancement Committee.

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

- Annual National Student Survey
- Student-Staff Liaison Committee
- Student feedback questionnaire evaluation
- Student forums on the School's website, including module and programme specific forums as well as ones covering more general topics
- Discussions with Academic Advisors.

7.3 Staff development

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

8 Supporting Information

QMUL's Academic Regulations, Assessment Handbook and Admission policies can be found at:

<https://arcs.qmul.ac.uk/policy/>

QMUL is regulated by the Office for Students (OfS) www.officeforstudents.org.uk/advice-and-guidance/the-register/

This document provides a definitive record of the main features of the programme and the learning outcomes that a typical student may reasonably be expected to achieve and demonstrate if s/he takes full advantage of the learning opportunities provided. This programme specification is primarily intended as a reference point for prospective and current students, academic and support staff involved in delivering the programme and enabling student development and achievement, for its assessment by internal and external examiners, and in subsequent monitoring and review.