

Programme Specification (UG)

Awarding body / institution:	Queen Mary University of London
Teaching institution:	Queen Mary University of London
Name of final award and programme title:	BEng (Hons) Biomedical Engineering with Management/BEng (Hons) Biomedical Engineering with Management with Industrial Experience/BEng (Hons) Biomedical Engineering with Management with Year Abroad
Name of interim award(s):	
Duration of study / period of registration:	3/4 years
QMUL programme code / UCAS code(s):	HBN2/H1NN/H1NY
QAA Benchmark Group:	Engineering
FHEQ Level of Award :	Level 6
Programme accredited by:	N/A
Date Programme Specification approved:	
Responsible School / Institute:	School of Engineering & Materials Science

Schools / Institutes which will also be involved in teaching part of the programme:

School of Business & Management

Institution(s) other than QMUL that will provide some teaching for the programme:

Programme outline

Biomedical Engineering is the diverse and exciting subject that covers the science and engineering responsible for many of the latest advances in medicine. It encompasses the design and development of artificial medical implants such as hip joints, heart valves and prosthetic limbs, as well as the development of wide ranging medical technologies including surgical robots, nanomedicine, tissue engineering, diagnostic tools and rehabilitation equipment. Another branch of Biomedical Engineering focuses on the physics and chemistry of how our bodies function and the biomaterials from which we are made. This might involve understanding the mechanical properties of living cells, or measuring the forces and movements of a patient walking. In all these areas, Biomedical Engineers are pushing forward the frontiers of medicine, developing new ways to diagnose and treat medical problems, diseases and injuries.

The BEng degree in Biomedical Engineering with Management comprises three years of full time study. The programme covers the essential elements of the core of Biomedical Engineering as specified in the compulsory modules and is structured to allow for some module choice in the third year of study. This programme is for students who have an interest in Biomedical Engineering and are also interested in management. It forms part of a suite of programmes which are developed to introduce

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management subjects appropriately for Science and Engineering undergraduates. The programme includes the core elements of Biomedical Engineering in addition to a grounding into the critical and pertinent elements related to management, such as the fundamentals of management and economics for business, with a particular emphasis derived from the ethos of the School of Business and Management related to social justice, sustainability and good governance in the management of private, public and voluntary organisations.

The programme will develop practical skills and experience in the use and applications of technology and relate it to management. The programme develops high levels of competence and demonstrable skills in the core technical areas. The programme has been designed uniquely to allow students to undertake more management content in year 2 in order to develop the skills and understanding in this area, whilst also progressing technically. The first two years of the programme comprises 150 credits in Biomedical Engineering and 90 credits of Management. The 3rd year will allow students to explore more specialised applications in Biomedical Engineering and to demonstrate and consolidate the skills gained in a project, which can have a management as well as technical content.

The Management elements in the programme aim to develop critical analytical skills and introduce students to the core business subjects, whilst acknowledging that the students have strength in analytical and mathematical approaches. The programmes have been designed to support the students in developing a dual approach to both subject areas.

The suite of Biomedical Engineering programmes at QMUL is one of the largest in the country, with a particularly extensive number of specialist academic staff. Key specialities in Biomedical Engineering at QMUL are as follows:

- Tissue Engineering and Regenerative Medicine
- Orthopaedic Implants
- Biomechanics and Mechanobiology: from whole patients to single cells
- Diagnostic Systems and Instrumentation
- Biofluids (Experimental and Computational)
- Biomaterials

Aims of the programme

The aim of this programme is to produce technically aware graduates with an understanding of management who are capable of making a real contribution to their new employer rapidly following graduation. The programme will equip students with key business, technology, interpersonal and project management skills that have been identified by employers and will produce graduates with:-

- a broad background of business operations, procedures and culture applicable to a career in a technical environment
- sufficient technical knowledge to play a key role in a technical environment
- personal and interpersonal skills enabling them to work closely and communicate with employees in non-technical areas of an organisation
- a set of problem-solving and modelling skills appropriate to business and project management operations
- sufficient management and business knowledge to play a management role in projects
- management experience in a project oriented environment

Graduates obtain jobs requiring technical skills in diverse areas such as business, finance, government and teaching. A graduate should be able to enter further training at MSc level or enter any of a number of other careers which use the transferable skills gained during their studies.

What will you be expected to achieve?

The aim of the programme is to equip students with the skills to operate flexibly and effectively in organisations. Students will learn to analyse, synthesise and clearly present material. They will understand the complexity of management as social practice and be capable of apposite judgement on management concerns. They will learn to apply the concepts of management to particular cases and make reasoned and substantiated judgements. The compulsory modules will ensure that all students have common skills and competencies.

Students successfully completing this programme will be expected to have:

QMUL Model

The QMUL Model is an innovative teaching and learning initiative that will broaden opportunities for Queen Mary undergraduates within and beyond higher education, supporting them to plan and manage their ongoing professional development. The Model is firmly grounded in the core QMUL values of respect for, and engagement with, the local area and communities, with a distinctive focus on enabling students to make a positive societal impact through leadership in their chosen field. The Model is organised around the key themes of:

- networking
- multi- and inter-disciplinarity
- international perspectives
- enterprising perspectives.

Students are required to study QMUL Model modules to the value of at least 10 credits at each year of undergraduate study. Model modules may be 5, 10 or 15 credits. Model modules are indicated within this programme specification.

In your first year of study, the Model module will be core or compulsory and will be situated within your home School or Institute. In subsequent years, students will be strongly encouraged to study at least one Model module beyond their home discipline(s), which could, for example, be in another School / Institute or area of QMUL or undertaken as a module outside of QMUL.

If Model module information is not provided on this programme specification for all subsequent years of study, this will be identified as your studies continue.

Where a Model module elective can be selected from an approved group of Model modules, no guarantee can be provided that your first choice of Model module will be available.

Academic Content:	
A 1	acquired a core knowledge of biomedical engineering
A 2	understanding of mathematical principles underpinning biomedical engineering in addition to the mathematical methods, tools and notations used in the analysis of biomedical engineering problems.
A 3	acquired essential skills in the use of computers for word-processing and spreadsheet computing and the acquisition, manipulation and analysis of data.
A 4	acquired essential skills in measurement and the analysis of uncertainties of observation.
A 5	An awareness of developing technologies related to biomedical engineering
A 6	developed knowledge of the regulatory, ethical, economic and environmental issues underpinning the biomedical engineering profession, and how a biomedical engineer must operate within these.
A 7	developed knowledge of business and project management techniques

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Disciplinary Skills - able to:	
B 1	deliver scientific report-writing and the oral presentation of technical material
B 2	apply analytical and computational technologies in the design or analysis of engineering systems and in the solution engineering problems.
B 3	Use fundamental knowledge to investigate new and emerging technologies /Learn new theories, concepts, methods etc.
B 4	acquire an understanding of the workings of the physical world
B 5	understand the application of core biomedical engineering to specialised areas of study
B 6	appreciate the role of science in general, and of biomedical engineering in particular, within a broader range of human cultural activity.
B 7	work effectively with computing tools for data analysis and processing, as well as modelling, simulation and design
B 8	understand the principles of business transformations
B 9	utilise financial awareness for effective decision making in business and management
B 10	develop a business and management perspective informed by an ethos of social justice, corporate social responsibility and equality and diversity
B 11	appreciate the strategic importance of business analytics and data to derive business knowledge and of business processes with an ability to document and understand them
B 12	master basic management skills demonstrating timeliness and focus
B 13	master basic business functions, organisational structures including an international dimension
B 14	utilise team working and project management skills to effectively work with colleagues on engineering projects.

Attributes:	
C 1	To engage critically with knowledge, and apply it in a rigorous way.
C 2	To connect information and ideas within their fields of study
C 3	To adapt their understanding and to apply their analytical skills to new and unfamiliar settings and problems
C 4	To use quantitative data confidently and competently
C 5	To develop knowledge and analytical skills that are transferable to employment including negotiation and communication skills
C 6	To develop effective spoken and written English and to be able to communicate acquired knowledge
C 7	To use information for evidence-based decision-making and creative thinking

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C 8	To make concise, engaging and well-structured verbal presentations and explanations
C 9	To be creative, self-motivated and self-aware and able to reflect on successes, failures and their own progress
C 10	To understand how to gain insight into and utilise the preferences, motivations, strengths of others
C 11	To be competent in active listening and in leading others
C 12	Be able to give and receive feedback constructively
C 13	Be able to conduct effective research into technical and management related topics
C 14	Appreciate the role and value of collaborative and team working

QMUL Model Learning Outcomes - Level 4:

D 1	Identify and demonstrate the perspectives or problem solving techniques of different disciplines
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QMUL Model Learning Outcomes - Level 5:

E 1	Evaluate and demonstrate their own attitudes, values and skills for being enterprising on their programme, in the wor
E 2	Evaluate and demonstrate evidence of their enterprise skills and how this has influenced their practice, their subject d
E 3	Evaluate perspectives from different disciplines

QMUL Model Learning Outcomes - Level 6:

F 1	Apply a critically analytical approach to their own enterprise skills and how they can help to shape and influence their
F 2	Apply a critically analytical approach to an appropriate range of multi-disciplinary and/or inter-disciplinary approache
F 3	

QMUL Model Learning Outcomes - Level 7:

G 1	
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How will you learn?

This programme is constructed within a modular programme structure in which each student takes 120 credits of taught

modules per year.

Our overall strategy is to achieve a balance, appropriate to the aims of each module between teaching (lectures; practical laboratory work; small-group tutorials) and learning by students (peer discussion; exercise / problem solving classes; coursework and reports; independent work in laboratories and computer studies; teach-yourself computer packages and the Internet; videos; textbooks and supplementary reading).

You will undertake a major individual research project in the third year, designed to assimilate and utilise knowledge gained throughout the degree towards approaching a real problems. This project allows you to participate in the specialist internationally-recognised research taking place within the School. It provides a valuable insight into real life research and project management and is used to develop students' investigative and communication skills.

How will you be assessed?

Assessment is by a mixture of continuous assessment and formal written examinations at the end of each year. We use a variety of in-course assessments to enable students to get rapid feedback as to their performance. These include weekly coursework, mid-term tests, performance in exercise classes and tutorials, laboratory and project reports. The in-course assessments are combined with formal final written examinations and oral examinations (on project modules) to produce the final mark for each module.

The precise ratio of in-course and final exam marks to give the overall mark varies between different modules and is specified in the detailed module description given in the Student Handbook and on the relevant QMplus module web page

How is the programme structured?

Please specify the full time and part time programme diets (if applicable). Please also outline the QMUL Model arrangements for each year of study. The description should be sufficiently detailed to fully define the structure of the diet.

The programme consists of compulsory and elective modules, taken over three years.

All undergraduate students at Queen Mary take 120 credits a year.

A BEng degree consists of 360 credits. Most modules are worth 15 credits which means that students normally take 8 modules a year. In your third year students normally study for a project worth 30 credits. Students are required to take all modules marked as 'compulsory'. Where modules are indicated as "elective" or "suggested" or "optional" students may choose whether or not to take the module.

The range of modules available each year can vary from year to year.

We also offer a BEng degree 'with Industrial Experience' where you would take a year working in a Biomedical Engineering related industrial position either after your second or third years of study. You are paid by the company during this year which also counts towards your degree. If you are not registered on a 'with Industrial Experience' programme you can opt into it at any stage prior to taking your placement. You would extend your studies by a year as you undertake a structured programme at one of our many partner companies. To support this activity we employ a full time Industrial Placement Manager in the School, who supports you through the application process and then manages the programme whilst you are on the placement. Recent placement employers include: DSTL, RollsRoyce, DePuy, Alcoa, Microsoft, ARTIS, GE, Caterham F1 & Philips. This exciting opportunity gives you a valuable insight into future careers and enhances employability.

The "with Year Abroad" version of the programme enables students to study the full degree at QMUL with an additional year abroad with one of our internationally excellent partner universities. Between the second and third years of of your QMUL programme you will spend a year at a partner university abroad. A total equivalent to 120 credits of study should be completed during this year, and you should pass at least 90 credits to have this study recognised. You can only take part in this version of the programme if after your second year your weighted 1:3 average over years 1 and 2 is at least 60% and you haven't failed any modules.

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Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester	QMUL Model
Fundamentals of Management (for Science and Engineering)	BUS024	15	4	Compulsory	1	Semester 1	<input type="checkbox"/> Yes
Engineering Design Methods	MAT4002	15	4	Compulsory	1	Semester 1	<input type="checkbox"/> No
Mechanics of Fluids 1	DEN4101	15	4	Compulsory	1	Semester 1	<input type="checkbox"/> No
Mathematics and Computing for Engineers 1	DEN4122	15	4	Compulsory	1	Semester 1	<input type="checkbox"/> No
Economics for Business	BUS017	15	4	Compulsory	1	Semester 2	<input type="checkbox"/> No
Engineering Mechanics: Statics	DEN4102	15	4	Compulsory	1	Semester 2	<input type="checkbox"/> No
Engineering Mechanics: Dynamics	DEN4108	15	4	Compulsory	1	Semester 2	<input type="checkbox"/> No
Mathematics and Computing for Engineers 2	DEN4123	15	4	Compulsory	1	Semester 2	<input type="checkbox"/> No

Academic Year of Study FT - Year 2

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester	QMUL Model
Financial Accounting	BUS021	15	5	Compulsory	2	Semester 1	<input type="checkbox"/> No
Entrepreneurship	BUS025	15	5	Compulsory	2	Semester 2	<input type="checkbox"/> Yes
Business Analytics	BUS026	15	5	Compulsory	2	Semester 2	<input type="checkbox"/> Yes
Project Management	BUS027	15	5	Compulsory	2	Semester 2	<input type="checkbox"/> Yes
Design for Manufacture	DEN5101	15	5	Compulsory	2	Semester 1	<input type="checkbox"/> No
Engineering Instrumentation	DEN5109	15	5	Compulsory	2	Semester 1	<input type="checkbox"/> No
Clinical Problems in Biomedical Engineering and Materials	MAT4003	15	4	Compulsory	2	Semester 1	<input type="checkbox"/> No

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Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester	QMUL Model
Clinical Solutions in Biomedical Engineering and Materials	MAT4004	15	4	Compulsory	2	Semester 2	<input type="checkbox"/> No

Academic Year of Study FT - Year 3

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester	QMUL Model
The Management of Human Resources	BUS324	15	6	Elective	3	Semester 1	<input type="checkbox"/> No
Strategy	BUS204	15	6	Elective	3	Semester 2	<input type="checkbox"/> No
Individual Project	DEN318	30	6	Core	3	Semesters 1 & 2	<input type="checkbox"/> Yes
Control Systems	ECS601U	15	6	Compulsory	3	Semester 1	<input type="checkbox"/> No
Neuromuscular Bioelectricity and Biomechanics	DEN5302	15	5	Elective	3	Semester 1	<input type="checkbox"/> No
Tissue Engineering and Regenerative Medicine	MAT311	15	6	Elective	3	Semester 1	<input type="checkbox"/> No
Implant Design	DEN6437	15	6	Compulsory	3	Semester 2	<input type="checkbox"/> No
Fluid Mechanics of the Cardiovascular System	DEN5300	15	6	Elective	3	Semester 2	<input type="checkbox"/> No
Medical Robotics Techniques	DEN6409	15	6	Elective	3	Semester 2	<input type="checkbox"/> No
Principles and Applications of Medical Imaging	DEN324	15	6	Elective	3	Semester 2	<input type="checkbox"/> No

What are the entry requirements?

Minimum Entry Requirements with A-levels are:

AAB or 340 points 3 A-levels

Must include maths A-level and at least one science A-level (physics, biology, or chemistry).

Maths A-level must be a B or above

International Baccalaureate: 34 points overall with 3 subjects at HL with 6,6,5 points

European Baccalaureate: 80 % overall including maths and science.

French Baccalaureate: 14/20 overall, with 14/20 in maths and science.

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We consider applicants who offer BTEC Extended Diploma. Applicants will be considered from the following subjects only: BTEC Extended Diploma in Engineering, Engineering Science, Aerospace Engineering and Mechanical Engineering. Students must offer a maths A-level in addition to their BTEC. The offer will be D*D*D in the BTEC and A in the A-level.

We consider applicants who offer Access to HE diploma (level 3) which are Physics and Mathematics based. These qualifications will be considered on a case by case basis. Students should be achieving very high grades in their studies. All applications should be made before the UCAS deadline of the 15th of January. The typical offer is 'Pass with a minimum of 45 level 3 credits including 33 credits at Distinction and 12 at Merit'. There may be additional requirements on specific subjects. Before a decision is made applicants will be invited to a Maths test at Queen Mary, normally in April (as late as possible in the UCAS cycle). This Maths test is to assess whether the applicant's ability in maths is at the right level. Applicants are contacted shortly after the test with a decision on their application.

How will the quality of the programme be managed and enhanced?

The School operates an Education Board, which advises the School's Director of Taught Programmes on all matters relating to the delivery of taught programmes at School level, including monitoring the application of relevant QM policies and reviewing all proposals for module and programme approval and amendment before submission for approval to Taught Programmes Board.

All Schools operate an Annual Programme Review (APR) of their taught undergraduate and postgraduate provision. APR is a continuous process of reflection and action planning which is owned by those responsible for programme delivery; the main document of reference for this process is the Student Experience Action Plan (SEAP) which is the summary of the School's work throughout the year to monitor academic standards and to improve the student experience. Students' views are considered in this process through analysis of the NSS and module evaluations.

Every 5-6 years the School undergoes a Periodic Review of its teaching provision, by a panel consisting of experts external to the School.

How do we listen to and act on your feedback?

The Staff-Student Liaison Committee provides a formal means of communication and discussion between the School and its students. The committee consists of student representatives from each year of the programmes, together with appropriate representation from staff within the School. It is designed to respond to both the general needs of students, and subject specific concerns, as well as act as a forum for discussing programme and module developments. Staff-Student Liaison Committees meet regularly throughout the year.

The chair of the SSLC sits on the School's Education Board and ensures that student feedback is fed into the review of modules and programmes. Student views are also incorporated in the Boards's work in other ways, such as through student membership, the National Student Survey (NSS), student module evaluations and module forums. We also use the online forums, suggestion boxes and a dedicated Student Voice email address to listen to student feedback on an individual module basis and develop materials and support classes to address comments or requests suggested in the forum.

What academic support is available?

Academic support for individual modules is the responsibility of the module organiser and co-organiser(s). These are supported by Teaching Associates and post-graduate students, many of whom will have studied the modules themselves as undergraduates in the School. In addition there is technician support available for practical sessions.

Academic support for the programme as a whole, including choosing optional modules and possible transfer between programmes is provided in the first instance by the Personal Tutor, with further guidance available from the Senior Tutor and Programme Director, the latter having overall responsibility for the programme structure. The Programme Director in turn reports to the relevant Division in the School, the Education Head of which is a member of the School's Education Board. We additionally have a School Office, with many student facing staff available to support student learning and one full time Student Support Officer. These staff members will help with coursework submission, time tabling concerns and other general

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administration as well as providing pastoral support and further guidance on dealing with extenuating circumstances. We also have staff designated to support students in achieving industrial placements and providing careers advice.

Programme-specific rules and facts

This programme follows the standard QM progression criteria and degree classification algorithm. The final degree classification is determined by the college mark which is a weighted average of the first, second and third year averages in the ratio 1:3:6 respectively.

Specific support for disabled students

Queen Mary 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 Queen Mary students: full-time, part-time, undergraduate, postgraduate, UK and international at all campuses and all sites.

Students 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 (e.g. Braille)
- 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.

Links with employers, placement opportunities and transferable skills

We place a strong emphasis on supporting our students in achieving quality graduate positions at the end of their degrees. In the first year, all students take a transferable skills module, designed to both support them through the transition to university life, and also introduce the important employability skills they will need in later life. We run an extensive range of employability training events, with weekly timetabled careers slots and field trip visits to more than 20 collaborating companies. Our relationships with both the Careers Group and Student Services are strong in SEMS, and we co-deliver our training in study skills and career development for maximum benefit.

Since 2011 we have had a placement officer working in the school dedicated to supporting our "with Industrial Experience" programmes which have grown immensely in popularity in the last few years.

The School has run Industrial Liaison Forums (ILFs) each academic year since the School was formed in 2007. Since 2010, the Autumn event is focused on encouraging more industrial participation in our research programmes, rewarding excellence by allowing companies to present student prizes for academic excellence across the School and also as a way of allowing companies and our students to interact through themed panel sessions and a careers fair. The Spring event aims to showcase our best third year project students and all of our group MEng projects. This event again allows extensive networking opportunities between employers and placement providers with all of our students in SEMS. Typically these events are attended by over 50 companies including our regular student prizes sponsors: Tata Steel, Eaton Industries, JRI, GSK, RollsRoyce, Apatech, Morgan Crucible, ARTIS, NPL, TWI, Becker Coatings; Advanced Healthcare Ltd & Apatech. Many of these companies are also actively engaged in student projects and in addition to these our events are also attended by additional companies that also collaborate with projects such as: Jaguar Land Rover, Alcoa, Perryman, DSTL, BAe, Airbus, Corin, DePuy, Baxter's Healthcare, Norman Foster Partners and many others. In recent times we have extended these events to encourage participation from our more recent alumni as well.

These forums have a direct impact by encouraging employers to sponsor and support the student projects and to provide real engineering case studies to engage the students throughout the curriculum. Many of these companies also support our lecture programme in individual modules. Recent case studies that have been taught and assessed were delivered by companies

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including Tata, Gillette, Sugru, JRI, DuPuy, Apatech, Artis, BAe, DSTL, Rolls Royce, Perryman and Advanced Healthcare Ltd.

Programme Specification Approval

Person completing Programme Specification:

Henri Huijberts

Person responsible for management of programme:

TBC

**Date Programme Specification produced / amended by
School / Institute Learning and Teaching Committee:**

25 Oct 2017

**Date Programme Specification approved by Taught
Programmes Board:**