Queen Mary University of London

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:	Intercalated BSc Biomedical Engineering and Clinical Materials
Name of interim award(s):	
Duration of study / period of registration:	1 academic year
QMUL programme code / UCAS code(s):	B9MU
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 Engineering & Materials Science

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

Programme outline

The intercalated BSc will provide students with the opportunity to increase their knowledge of both engineering and material-based technologies applied within the clinical environment. Indeed, state of the art tools involving engineering and materials are increasingly important in many aspects of clinical care for both medical and dental interventions. The success or failure of clinical procedures depends on the interaction between the engineered material and the patient which, in turn, will be influenced by the physiological environment. For example, several clinical problems may be overcome by tissue engineering where engineers work with biologists and material scientists to create new tissues for implantation and repair. In cardiovascular surgery, heart valves and vascular prostheses are now in routine use, but recent advances including shape memory alloys for expandable stents delivered by non-invasive techniques are examples of the ongoing development of these devices. In urology, non-fouling catheters are urgently required. Taken together, many branches of medicine and surgery rely on devices made of materials. The programme is academically rigorous and students will take four taught courses at level 6 [50% of the credits] during the academic year involving multi-disciplinary modules. In addition, students will have an opportunity to join research teams involved in cross-disciplinary research in biomedical engineering and clinical materials and undertake an extensive research project worth four units, alongside leading staff at the Institute of Bioengineering. The research project [also at Level 6; and 50% of the credits] is highly likely to contribute to a publication. Furthermore, the Institute has an international reputation

for high quality research and benefits from brand new state-of-the-art facilities developed at a cost in excess of £5 million.

Aims of the programme

The iBSc programme aims to provide undergraduate medical students with the necessary learning skills to exhibit a critical understanding in the fields of biomedical engineering and clinical materials for successful developments in clinical applications. Students will benefit from a multi-disciplinary engineering and clinical materials research driven programme that identifies clinical problems evaluated with the use of engineering and material-based technologies. Students will undertake an extensive experimental research project that examines questions alongside leading research teams involved in cross-disciplinary research at the Institute of Bioengineering and acquire specialist knowledge and expertise in addition to development of transferable and practical skills. This programme builds on the strength and experience in teaching and learning at the Institute of Bioengineering.

What will you be expected to achieve?

On successful completion of the iBSc programme, students will be able to:

- Critically assess and appraise existing and sate of the art research in bioengineering and clinical materials
- Generate and apply an integrated approach to the study of multi-disciplinary themes in biomedical engineering and clincial materials using innovative approaches in these fields.
- Appraise and design experimental protocols to the specific context of the research project.
- Demonstrate critical analysis of the academic literature including the ability to distinguish analysis grounded in evidence, by selecting scientific findings and their reinterpretation and meta-analyses.
- Create, evaluate, defend and disseminate scientific information in a clear, concise and accurate manner.

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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	Critical understanding of theories in biomedical engineering and clinical materials.
A 2	Knowledge of approaches to and methods of measurement in the technologies in biomedical engineering and clinical materials.
A 3	Identify appropriate data sources and apply a range of methods commonly used for summarising different types of quantitative data.
A 4	Articulate the strengths and weaknesses of different study designs commonly encountered in biomedical engineering and clinical materials research.
A 5	Communicate complex scientific ideas, concisely, accurately and informatively.

Disciplinary Skills - able to:	
B 1	Critically appraise research papers and interpret results in the light of this appraisal.

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B 2	Critically analyse papers and appraise the effectiveness of the approaches in biomedical engineering and clinical materials research.
B 3	Critically plan, organise, execute and deliver a substantial research project, drawing valid conclusions and demonstration of effective transferable and practical skills.
B 4	Demonstrate initiative and originality in proglem-solving.

Attributes:	
C 1	Use quantitative data confidently and competently to assimilate and synthesise a large body of information following advance and feedback during the research project.
C 2	Demonstrate autonomy in self-directed learning and realise their scope of practice.
C 3	Ability to write and advanced communication expertise in an academic and professional manner.
C 4	Demonstrate a mature and collaborative approach when planning research projects.
C 5	Effective demonstration of appropriate and comprehensive practical and theoretical skills with a reflective and scholarly approach.

QMUL Model Learning Outcomes - Level 4:	
D 1	Identify and demonstrate the perspectives or problem solving techniques of different disciplines

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	

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QMUL Model Learning Outcomes - Level 7:	
G 1	

How will you learn?

Each topic will be taught using a range of methods, varying according to the subject and learning objectives of the module. All modules will include lectures, small group tutorials and independent study. most modules will follow a format of structured preparatory work (reading and reflection exercise), a weekly interactive lecture, group seminars, lab based practicals, and topic discussions via the virtual lab or forum on QM_+. Visiting speakers will describe research, clinical or state of the art developments in different countries and settings involving industry or academia. Some modules will focus on review articles on hot topics involving biomedical engineering and clinical materials.

Practical skills will be learned from activities involving extensive laboratory sessions, associated with the research project and some f the modules. This training in practical skills will build towards the completion of a substantive research project which should coalesce theoretical, practical and transferable skills.

How will you be assessed?

The various modules will be assessed differently depending on the learning objectives. Assessment methods will include traditional examination (with essays or short answer questions) and tutor-marked assignments. The compulsory research project is assessed by a report (20%), dissertation (40%), a student presentation (10%) and a viva (30%).

Statistical interpretation is assessed by a written report, and project / study design and implementation are assessed by the dissertation which should be written in the style of a scientific paper.

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.

Students studying for the iBSc will complete four 15 credit modules and a 60 credit intercalated research project.

Students will be given the option to follow a biomedical engineering or clinical materials strand or a combination of both. We will guide students through the three routes with the 15 credit modules available to all intercalating student as optional units, subject to timetabling constraints. A maximum of two modules at level 7 can be selected.

In the first semester, iBSc students will focus on developing key concepts and research methods and analysis for understanding biomedical engineering and clinical materials. The specialist elective modules will be chosen depending on the type of research project the student is undertaking. Students will either A) choose 2 elective modules in Sem 1and 2 elective modules in sem 2, or B) 3 elective modules in Sem 1 and 1 elective module in sem B2

All students will conduct an extensive research project worth 60 credits alongside world-leading research teams at the Institute of Bioengineering. Students will be encouraged to publish their work in a journal or conference abstract.

Academic Year of Study FT - Year 1

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester	QMUL Model

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Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester	QMUL Model
Intercalated Research Project	EMS616U	60	6	Compulsory	1	Semesters 1 & 2	No
Medical Ethics and Regulatory Affairs	EMS719U	15	7	Elective	1	Semester 2	No
Medical robotics and surgical techniques	EMS701U	15	7	Elective	1	Semester 2	No
Clinical bioengineering: applications in urology	EMS762U	15	7	Elective	1	Semester 1	No
Tissue Engineering and Regenerative Medicine	EMS617U	15	6	Elective	1	Semester 1	No
Nanotechnology and Nanomedicine	EMS718U	15	7	Elective	1	Semester 1	No
Macromolecular engineering	EMS712U	15	7	Elective	1	Semester 2	No
Biocompatability	EMS615U	15	6	Elective	1	Semester 2	No
Cell and Tissue Mechanics	EMS618U	15	6	Elective	1	Semester 2	No
Clinical sensors and measurements	EMS706U	15	7	Elective	1	Semester 2	No
Computational Fluid Dynamics	EMS709U	15	7	Elective	1	Semester 2	No
Processing and analysis in biomedical imaging	EMS620U	15	6	Elective	1	Semester 1	No
Machine learning and artificial intelligence for engineering	EMS740U	15	7	Elective	1	Semester 1	No
Modern robotics: fundamentals and applications	EMS714U	15	7	Elective	1	Semester 1	No
Digital signal acquisition and processing	EMS707U	15	7	Elective	1	Semester 2	
Cognitive robotics	EMS729U	15	7	Elective	1	Semester 2	No
Deep learning for data and image analysis	EMS741U	15	6	Elective	1	Semester 2	
Digital Manufacture for Healthcare Innovations	EMS732U	15	7	Elective	1	Semester 2	

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What are the entry requirements?

Applications from students who have not passed either A level maths or physics will not normally be considered.
Students will have completed year 3 or above in the MBBS programme.
Good personal statement.

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

Each School/institute operates a Learning and Teaching Committee, or equivalent which advises the School/Institute 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 to Taught Programmes Board. Students views are incorporated in the committee's work in a number of ways, such as through student membership, or consideration of student surveys.

All Schools/institutes operate an Annual Programme Review 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 Taught Programmes Action Plan (TPAP) which is the summary of the school/ insititue'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.

What academic support is available?

The team running the programmes has experience of UG teaching. All students will meet their academic adviser at the start of the programme and will be expected to meet regularly. Progress through the programme, for instance via elective and project choices, will be made in discussion with the academic adviser. Students will be allocated a project supervisor relevant to their chosen field of research.

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Programme-specific rules and facts

N/A

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

Students will attend workshops that specially support development in acquiring a range of personal and professional transferable skills in project design and management, team-working, report writing, communication and presentation and IT skills. For examples, students will attend weekly presentations by seminal researchers held at the Institute of Bioengineering. The seminars are presented by world-renowned researchers from either academia or industry. Students will be encouraged to attend weekly research meetings organised by the team leader and participate in presentations, journal cub, technical developments or substantive research project which should coalesce theoretical, practical and transferable skills.

Programme Specification Approval

Person completing Programme Specification:	Dr Tina Chowdhury
Person responsible for management of programme:	Dr Tina Chowdhury
Date Programme Specification produced / amended by School / Institute Learning and Teaching Committee:	
Date Programme Specification approved by Taught Programmes Board:	

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