Programme Title: MSc in Biomedical Engineering

Queen Mary, University of London

Programme Specification

Awarding Body/Institution
Queen Mary, University of London

Teaching Institution
Queen Mary, University of London

Name of Final Award and Programme Title
MSc in Biomedical Engineering

Name of Interim Award(s)
PG Certificate / PG Diploma

Duration of Study / Period of Registration
1 calendar year

QM Programme Code / UCAS Code(s)
HBS3

QAA Benchmark Group
Masters degrees

FHEQ Level of Award
Level 7

Programme Accredited by
Institution of Mechanical Engineers (pending)

Date Programme Specification Approved
31 Jul 2013

Responsible School / Institute
School of Engineering & Materials Science

Schools which will also be involved in teaching part of the programme
Centre for Commercial Law Studies

Institution(s) other than Queen Mary that will provide some teaching for the programme

Programme Outline

Biomedical engineering is a rapidly developing field of engineering that relies on an inter- and multidisciplinary approach to research and development. Specialists in this area face problems that differ significantly from the more traditional branches of engineering. However, in the same time biomedical engineering relies on methodologies and techniques developed in the more traditional engineering fields that are further developed and adapted to the particular specifications of the biomedical applications.

In the last decade biomedical engineering has come a long way in becoming a major field of new engineering developments. The area has expanded and diversified ranging from the development of micro- and nano-level medical techniques to the more traditional and well established areas such as orthopaedics and assistive technologies. While specialisation should help in acquiring the needed skills, a broad deep understanding in advanced topics is still required from a biomedical engineer. The proposed programme allows students with a strong Science/Engineering background to gain advanced and sufficiently broad knowledge in Biomedical Engineering. It also encourages students to specialise making an informed choice based on the knowledge acquired in variety of modules and practical exercises. This process is facilitated through a selection of a research project from a large number of options available to all students and the built-in flexibility in the programme structure.

The programme structure is designed to appeal to students with a science and engineering background and is modular in format. The content of the programme includes a compulsory Research Methods and Experimental Techniques module. A
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Further seven specialised optional modules will enable postgraduates to gain proficiency in highly advanced fields, such as for example Mechanics of Continua, Principles and Application of Medical Imaging, Implant Design and Technology, Clinical Measurements, Computational Fluid Dynamics, Bioengineering in Urology, Surgical Techniques & Safety, Advanced Tissue Engineering and Regenerative Medicine.

All students eligible to obtain the MSc qualification have to undertake a 60 credit research project. A range of laboratories including tissue engineering and cell mechanics suite, biochemistry, biomechanics and exercise physiology, implant testing facilities, biomaterials are available to the students. The experimental facilities are complemented by well equipped computer laboratory with specialist software products and powerful hardware.

Aims of the Programme

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. The programme places particular emphasis on bioengineering approaches to cell and tissue therapies as well as more traditional applications in everyday health care and orthopaedics. The principal aim is that the students completing this programme would develop their knowledge in this new field to an advanced level, in both experimental and computational areas, allowing them to contribute to the advancement of knowledge and technology in this area.

1. Teaching advanced experimental, computational and analytical techniques applicable to Biomedical Engineering in order to provide an advanced base of knowledge and skills
2. Teaching advanced biological and medical experimental techniques applicable to medicine and general healthcare.
3. Teaching modern biomedical techniques used in bioengineering, medical and healthcare units.
4. Implementation of taught material through a research/design project.
5. Providing students with insight into advanced developments and associated ethical and legal issues for their implementation in medical practice.
6. Enabling students to participate in advanced research and industrial developments in Biomedical Engineering.
7. Introducing the students to selected issues in commerce and law that they may encounter in industry.

What Will You Be Expected to Achieve?

Students who complete this programme will be trained to work in a wide range of industries that design, develop and maintain biomedical devices and/or use and maintain such technologies as part of general health care units. In addition students would be provided with both sufficient knowledge and skills for undertaking a PhD in a related discipline in top Universities in the UK or abroad.

Academic Content:

| A1 | Gain in-depth knowledge into finding practical solutions to medical, biological and health problems using advanced computational, experimental and theoretical methods available to biomedical engineers |
| A2 | Have in-depth understanding of the development cycle of novel biomedical technologies and be able to contribute to advancement of their further development and practical applications |
| A3 | Gain advanced knowledge and research capability in biomedical subjects of Tissue engineering, Regenerative Medicine, Medical Imaging, Clinical Measurements, Implant Design. |

Disciplinary Skills - able to:

| B1 | Undertake independent research on a topic related to Biomedical Engineering |
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<thead>
<tr>
<th>B2</th>
<th>Apply advanced Engineering methods to a range of Biomedical Engineering related applications</th>
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<tr>
<td>B3</td>
<td>Optimally select techniques for assisting medical diagnostics and interventions.</td>
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<tr>
<td>B4</td>
<td>Critically assess feasibility of analytical, computational and experimental techniques in use and propose practical approaches for their improvement.</td>
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Attributes:

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<tr>
<th>C1</th>
<th>Engage critically with knowledge.</th>
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<tr>
<td>C2</td>
<td>Be able to understand both the application and limitation of biological, mathematical, computational and experimental techniques available to a biomedical engineer.</td>
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<td>C3</td>
<td>Undertake independent research using state of the art processing, characterisation and testing facilities.</td>
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<td>C4</td>
<td>Research Capacity and Information expertise</td>
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<tr>
<td>C5</td>
<td>Understand the application and use of biomedical techniques in health science, medicine and overall wellbeing.</td>
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How Will You Learn?

Through a wide range of different interactions including lectures, tutorials, laboratory classes, exercise classes and project supervisions. It is expected that the programme will demand between 1800 and 2000 hours in total to complete. About 10% of this time will be in scheduled lectures. A significant amount of independent personal study is anticipated as part of this programme.

How Will You Be Assessed?

The taught modules will be assessed through both coursework and examinations. The details are as outlined in the individual module specifications. The examinations will all take place in the standard college examination period in May. The final project thesis will be assessed in September and the student will also complete a presentation as well as an oral examination.

How is the Programme Structured?

60 credits of taught modules will be taught in the first semester from September until December and a further 60 credits of taught modules will be taught in the second semester from January until April. Overall 120 credits of taught modules have to be
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All taught module examinations will be in the standard examination period during May. An A 60 credit Biomedical Engineering research project will be completed after the examination period in semester 3 (from June - September). Preparation for this research project will begin in the module on Research Methods taken in the first semester.

<table>
<thead>
<tr>
<th>Academic Year of Study</th>
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<tbody>
<tr>
<td><strong>Module Title</strong></td>
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</tr>
<tr>
<td>Research Methods and Experimental Techniques in Engineering</td>
<td>DENM014</td>
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<tr>
<td>Mechanics of Continua</td>
<td>DENM008</td>
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<tr>
<td>Advanced Tissue Engineering and Regenerative Medicine</td>
<td>MTRM064</td>
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<tr>
<td>Surgical Techniques &amp; Safety</td>
<td>MELM003</td>
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<tr>
<td>Bioengineering in Urology</td>
<td>DENM016</td>
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<tr>
<td>Data Acquisition &amp; Processing</td>
<td>DEN6007</td>
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<tr>
<td>Introduction to Law for Scientists</td>
<td>IPLM701P</td>
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<tr>
<td>Principles and Applications of Medical Imaging</td>
<td>DENM029</td>
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<tr>
<td>Computational Fluid Dynamics</td>
<td>DENM010</td>
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<tr>
<td>Implant Design and Technology</td>
<td>DENM020</td>
</tr>
<tr>
<td>Biomedical Research Project</td>
<td>DENM006</td>
</tr>
<tr>
<td>Clinical Measurements</td>
<td>DENM024</td>
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<tr>
<td>Foundations of Intellectual Property Law and Management</td>
<td>IPLM702P</td>
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**What Are the Entry Requirements?**

The entry requirement is that the student to have secured at least a high 2ii (>55%) BEng degree or equivalent qualification in engineering, science or an equivalent academic programme and supporting references. A minimum of IELTS 6.5 or equivalent is required for non-native English speakers.

**How Do We Listen and Act on Your Feedback?**

The Staff-Student Liaison Committee provides a formal means of communication and discussion between schools/institutes and its students. The committee consists of student representatives from each year in the school/institute together with appropriate representation from staff within the school/institute. It is designed to respond to the 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. Student 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/institute’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.

**Academic Support**

During induction the students will be welcomed to the college by the programme leader. Early on in the programme the students will select an project supervisor based upon a wide choice of different project areas. This academic will then also act as a personal tutor. Many of the modules are taught to small classes and so a high level of personal support will also be available from the module organiser in the majority of the taught modules.

**Programme-specific Rules and Facts**

The programme follows the standard QMUL guidelines for MSc delivery.

**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.
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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

The school has an active Industrial Liaison forum (ILF). This forum has a direct impact on our programmes by encouraging employers to sponsor and support both the students and to provide real design case studies to engage the students throughout the curriculum.

The ILF meets twice a year. The event in October runs in parallel with the SEMS prize day where prospective employers attend the event, meet MSc and final year undergraduate students discussing opportunities and tips for applications. We regularly host employer representatives from the Aerospace sector including Airbus, Alcoa, Astrium, B/E Aerospace, Eaton Aerospace, Marshal Aerospace, Ministry of Defence, Mott McDonald, Price Induction, Rolls Royce and Selex. The new MSc students are encouraged to attend the October event to discuss their projects with industry to forge further ties, where our industrial liaison partners are regularly involved in some of the projects that are of applied research nature. The second industrial forum day takes place in March, where the MSc students are encouraged to meet industrial representatives to discuss potential future employment.

Programme Specification Approval

| Person completing Programme Specification | Dr Peter Dabnichki |
| Person responsible for management of programme | Dr Peter Dabnichki |
| Date Programme Specification produced/amended by School Learning and Teaching Committee | 31 Jul 2013 |
| Date Programme Specification approved by Taught Programmes Board | 31 Jul 2013 |