Imperial College London

Programme Specification (Master's Level)

MRes Medical Device Design and Entrepreneurship

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 intended as a reference point for prospective students, current students, external examiners and academic and support staff involved in delivering the programme and enabling student development and achievement.

Programme Information				
Programme Title	Medical Device Design and Entrepreneurship			
Award(s)	MRes			
Programme Code	H673U			
Associateship	City and Guilds of London Institute			
Awarding Institution	Imperial College London			
Teaching Institution	Imperial College London			
Faculty	Faculty of Engineering			
Department	Department of Bioengineering			
Mode and Period of Study	1 calendar year, full-time			
Cohort Entry Points	Annually in October			
Relevant QAA Benchmark Statement(s) and/or other external reference points	Master's Degree in Engineering Master's Degree in Biosciences			
Total Credits	ECTS:	90	CATS:	180
FHEQ Level	Level 7			
EHEA Level	2nd cycle			
External Accreditor(s)	None			
Specification Details				
Student cohorts covered by specification	2016/17 entry			
Person responsible for the specification	Professor Martyn Boutelle, Director of Courses			
Date of introduction of programme	2013			
Date of programme specification/revision	September 2016			

Description of Programme Contents

This programme is offered as a one year full-time programme consisting of a number of elements leading to the MRes degree – these include lectures, practicals and a major research project focussed on a medical device concept.

In the first term, students will begin the programme with compulsory core modules and practical work.

In the first term students also make their choice on the medical device concept which will be the subject of their research/development project, and begin working on a market analysis and development plan. The research project would usually be supervised by Professor Moore and there would usually be a second supervisor from industry. Industry participation enhances the quality of the educational experience by providing additional input on the complex pathway encountered in pushing a medical device toward the marketplace. Industry participants have a technical background and are currently working in medical device development or business funding.

During term 2 and 3 students study some other taught modules and attend workshops. Throughout the year, students also attend Departmental seminars throughout the year, as well as the Department of Bioengineering PhD Assessment days, which are structured as mini-symposia.

Learning Outcomes

The Imperial Graduate Attributes are a set of core competencies which we expect students to achieve through completion of any Imperial College degree programme. The Graduate Attributes are available at: www.imperial.ac.uk/students/academic-support/graduate-attributes

Knowledge and Understanding of:

1. Core and specialised concepts in bioengineering entrepreneurship;
2. Business strategy planning expertise specific to medical device development;
3. Detailed knowledge and understanding of the essential facts, concepts, principles and theories relevant to the medical device that is the subject of their research/development project;
4. Management and communication skills, including problem definition, project design, decision processes, teamwork, written and oral reports, proposals and publications.

Intellectual Skills:

1. Analyse and solve problems in bioengineering using an integrated multidisciplinary approach;
2. Integrate and evaluate information;
3. Formulate an engineering-based development path for a medical device;
4. Plan, conduct, present and write-up a business plan for a medical device.

Practical Skills:

1. Use engineering analysis tools to evaluate the feasibility and likely success of a medical device concept;
2. Use laboratory methods or computer-based tools to generate data;
3. Analyse results, determine their strength and validity, and make recommendations;
4. Prepare technical and business reports;
5. Give technical and business presentations;
6. Use the literature effectively.

Professional Skills Development:

1. Communicate effectively across different scientific and business disciplines through oral presentations and written reports;
2. Apply knowledge, experimental, and modelling skills;
3. Management skills: decision processes, objective criteria, problem definition, project design and evaluation needs;
4. Integrate and evaluate information from a variety of sources;
5. Transfer techniques and solutions from one discipline to another;
6. Use Information and Communications Technology;
7. Manage resources and time;
8. Learn independently with open-mindedness and critical enquiry;
9. Learn effectively for the purpose of continuing professional development.

Entry Requirements	
Academic Requirement	Minimum upper second class honours (2:1) degree in a Physical, Engineering, Mathematical, or Life/Biomedical Sciences-based subject from an UK academic institution or an equivalent overseas qualification.
Non-academic Requirements	None
Applicants may be invited to attend an interview with one or more members of academic staff.	
English Language Requirement	IELTS 6.5 with a minimum of 6.0 in each element or equivalent.
The programme's competency standards document can be found at: http://www.imperial.ac.uk/bioengineering/admin/msc/essential-information/	
Learning & Teaching Strategy	
Scheduled Learning & Teaching Methods	• Lectures • Guided practical classes / laboratory work, and demonstrations • Seminars • Workshops • Group exercises • Presentations • Individual research project
E-learning & Blended Learning Methods	• Virtual Learning Environment: Blackboard • Lecture material and recordings via Panopto • Online groups/discussions • Online quizzes and interactive content
Project and Placement Learning Methods	• Group and individual project work

Assessment Strategy	
Assessment Methods	• Written examinations • Oral presentations • Coursework including multiple choice progression test, problem sheets and quizzes • Written reports, including a research thesis **Note: Assessment for MSc modules may not be via the method described in the module descriptors on DSS for MRes students.**

Academic Feedback Policy

Feedback will be provided on coursework within two weeks of submission. Feedback may be provided in one of a number of formats, including:

- Oral (during or after lectures)
- Personal (discussion with academics during office hours)
- Interactive (problem solving tutorials with GTAs & study groups)
- Written (solutions/model answers to coursework)

In line with College policy, feedback will not be provided on written examinations.

Preliminary results will be provided to students as alpha-grades. Numerical results will be published after the meeting of the final Board of Examiners.

Re-sit Policy

The College's Policy on Re-sits is available at: www.imperial.ac.uk/registry/exams/resit

Mitigating Circumstances Policy

The College's Policy on Mitigating Circumstances is available at: www.imperial.ac.uk/registry/exams

Assessment Structure

Marking Scheme

Assessment Rules and Degree Classification:

1. Minimum standards (i.e. 50%) in each of the three assessed elements (coursework, written research/development project and presentations) will be required with an overall pass mark of 50%. To achieve pass with distinction a minimum of 69.9% is required in each of the three elements. To achieve pass with merit a minimum of 60%, i.e. no fail, is required in each of the three elements.
2. To qualify for the award of MRes, students must complete all the course requirements, including the participation in mandatory extra curriculum events, and must achieve an overall pass mark in the combined examinations.

3. Students will be given two marks, one for each marked element. There will also be an overall mark used to decide whether a student obtains a Merit or Distinction. For this overall mark, the weighting of the individual marks is 10% for the taught element (1/4 each for the written examination, seminar essay and report), and 90% for the research/development project element (10% for the marketing analysis and development path, 10% for the elevator pitch, 50% for the written research/development project and 20% for the oral viva). The two independent viva examiners provide internal marks for the oral exam (about 45min) and the research report. Both viva examiners will finally provide an agreed mark. The final mark for the research project, conduct, and viva is the average of the marks from the supervisors and the agreed mark from the viva examiners. The external examiners will moderate the final mark if necessary.

The Pass Mark for all postgraduate taught course modules is 50%. Students must pass all elements in order to be awarded a degree.

Module Weightings

Element	Module	% Module Weighting
Taught Element (25%)	Medical Device Entrepreneurship	60%
	Statistics and Data Analysis	0% (P/F)
	Computational Methods for Bioengineering	20%
	Seminars	20%
	1 - 4 x elective modules (Bioengineering modules from MSc or MRes or Business School MBA/MSC Innovation modules) to the value of at least 6 ECTS	0% (P/F)
Research Element (75%)	Research Project	100%

Indicative Module List											
Code	Title	Core/ Elective	L&T Hours	Ind. Study Hours	Place-ment Hours	Total Hours	% Written Exam	% Course-work	% Practical	FHEQ Level	ECTS
BE9-MDEVEN	Medical Device Entrepreneurship	CORE	30	70	0	100	0%	100%	0%	7	4
BE9-MSTDA	Statistics and Data Analysis	CORE	30	70	0	100	100%	0%	0%	7	4
BE9-MRNCM	Computational Methods for Bioengineering	CORE	30	70	0	100	0%	100%	0%	7	4
BE9-MRS	Seminars	CORE	20	30	0	50	0%	100%	0%	7	2
BE9-MRTMB	Techniques in Molecular Bioengineering	ELECTIVE	13	87	0	100	0%	0%	100%	7	4
BE4-MBMX	Biomechanics	ELECTIVE	28	72	0	100	95%	5%	0%	7	4
BE9-MBIMG	Biomedical Imaging	ELECTIVE	28	72	0	100	100%	0%	0%	7	4
BE9-MSPHYS	Systems Physiology	ELECTIVE	30	70	0	100	100%	0%	0%	7	4
MSE315	Biomaterials	ELECTIVE	24	76	0	100	100%	0%	0%	7	4
BE9-MHASP	Hearing and Speech Processing	ELECTIVE	27	73	0	100	100%	0%	0%	7	4
BE3-HPFM	Physiological Fluid Mechanics	ELECTIVE	26	74	0	100	70%	30%	0%	7	4
BE9-MCBMX	Cellular Biomechanics	ELECTIVE	28	72	0	100	80%	20%	0%	7	4
BE9-MHNCL	Human Neuromechanical Control and Learning	ELECTIVE	28	72	0	100	80%	20%	0%	7	4

Indicative Module List											
Code	Title	Core/ Elective	L&T Hours	Ind. Study Hours	Place-ment Hours	Total Hours	% Written Exam	% Course-work	% Practical	FHEQ Level	ECTS
BE9-MOBMX	Orthopaedic Biomechanics	ELECTIVE	28	72	0	100	60%	40%	0%	7	4
BE9-MBMIME	Biomimetics	ELECTIVE	26	74	0	100	100%	0%	0%	7	4
BE9-MHEDM	Health Economics and Decision Making	ELECTIVE	27	73	0	100	100%	0%	0%	7	4
MSE417	Advanced Biomaterials	ELECTIVE	24	76	0	100	100%	0%	0%	7	4
MSE418	Advanced Tissue Engineering	ELECTIVE	24	76	0	100	100%	0%	0%	7	4
BE9-MAPMDA	Advanced Physiological Monitoring and Data Analysis	ELECTIVE	30	70	0	100	100%	0%	0%	7	4
BE3-HIPR	Image Processing	ELECTIVE	38	62	0	100	100%	0%	0%	7	4
BE9-MAMI	Advanced Medical Imaging	ELECTIVE	30	70	0	100	100%	0%	0%	7	4
BE4-MCNS	Computational Neuroscience	ELECTIVE	28	72	0	100	100%	0%	0%	7	4
BE9-MRADP	Radiotherapy Physics and Radiobiology	ELECTIVE	30	70	0	100	100%	0%	0%	7	4
BE9-MNMED	Nuclear Medicine	ELECTIVE	30	70	0	100	100%	0%	0%	7	4
BE9-MBMI	Brain Machine Interfaces	ELECTIVE	27	73	0	100	80%	20%	0%	7	4
BS0806	Entrepreneurship	ELECTIVE	20	80	0	100	30%	70%	0%	7	4

Indicative Module List											
Code	Title	Core/ Elective	L&T Hours	Ind. Study Hours	Place-ment Hours	Total Hours	% Written Exam	% Course-work	% Practical	FHEQ Level	ECTS
BE9-MMDC	Medical Device Certification	ELECTIVE	22	78	0	100	0%	100%	0%	7	4
BE9-MRBJC	Journal Club	ELECTIVE	20	30	0	50	0%	0%	100%	7	2
BE9-MITR	Introduction to Robotics	ELECTIVE	30	70	0	100	80%	20%	0%	7	4
	Research Project	CORE	41	1709	0	1750	0%	73%	27%	7	70

Supporting Information
The Programme Handbook is available at: http://www.imperial.ac.uk/bioengineering/study/postgraduate-research/mrs-med-device-design/
The Module Handbook is available at: http://www.imperial.ac.uk/bioengineering/study/postgraduate-research/mrs-med-device-design/
The College's entry requirements for postgraduate programmes can be found at: www.imperial.ac.uk/study/pg/apply/requirements
The College's Quality & Enhancement Framework is available at: www.imperial.ac.uk/registry/proceduresandregulations/qualityassurance
The College's Academic and Examination Regulations can be found at: http://www3.imperial.ac.uk/registry/proceduresandregulations/regulations
Imperial College is an independent corporation whose legal status derives from a Royal Charter granted under Letters Patent in 1907. In 2007 a Supplemental Charter and Statutes was granted by HM Queen Elizabeth II. This Supplemental Charter, which came into force on the date of the College's Centenary, 8th July 2007, established the College as a University with the name and style of "The Imperial College of Science, Technology and Medicine". http://www.imperial.ac.uk/admin-services/secretariat/college-governance/charters-statutes-ordinances-and-regulations/
Imperial College London is regulated by the Higher Education Funding Council for England (HEFCE) http://www.hefce.ac.uk/reg/of/