

Programme Information		
Programme Title	Programme Code	HECoS Code
Medical Device Design and Entrepreneurship	H673U	For Registry Use Only

Award	Length of Study	Mode of Study	Entry Point(s)	Total Credits	
				ECTS	CATS
MRes (H673U)	1 Calendar Year (12 months)	Full time	Annually in October	90	180
PG Diploma	N/A	N/A	N/A	60	120
PG Certificate	N/A	N/A	N/A	30	60

The PG Certificate and PG Diploma are an exit awards and are not available for entry. All students must apply to and join the MRes. The PG Certificate and PG Diploma are not accredited by any professional body.

Ownership			
Awarding Institution	Imperial College London	Faculty	Faculty of Engineering
Teaching Institution	Imperial College London	Department	Bioengineering
Associateship	City and Guilds London Institute	Main Location(s) of Study	South Kensington and White City Campuses
External Reference			
Relevant QAA Benchmark Statement(s) and/or other external reference points	Master's Degree in Engineering Master's Degree in Biosciences		
FHEQ Level	Level 7 - Masters		
EHEA Level	2nd Cycle		
External Accreditor(s) (if applicable)			
External Accreditor 1:	The Institution of Engineering and Technology		
Accreditation received:	2013	Accreditation renewal:	2024
External Accreditor 2:	Institution of Mechanical Engineers		
Accreditation received:	2013	Accreditation renewal:	2024
External Accreditor 3:	Institute of Materials, Minerals & Mining		
Accreditation received:	2013	Accreditation renewal:	2024
External Accreditor 4:	Institution of Engineering Designers		

Accreditation received:	2018	Accreditation renewal:	2024
Collaborative Provision			
Collaborative partner	Collaboration type	Agreement effective date	Agreement expiry date
N/A	N/A	N/A	N/A
Specification Details			
Programme Lead		Professor Danny O'Hare	
Student cohorts covered by specification		2023-24 entry	
Date of introduction of programme		October 13	
Date of programme specification/revision		March 23	

Programme Overview
<p>The MRes in Medical Device Design and Entrepreneurship (MDDE) will prepare you for an innovative research career in Bioengineering. The programme capitalises on the strength of the Department of Bioengineering at Imperial alongside the access to a number of local hospitals through the Imperial NHS trust, London's reputation as a financial hub and the growing medical device and broader health innovation sector.</p> <p>The MRes MDDE is a one year full-time programme leading to the MRes award. As a student on this programme you will benefit from interaction with students on other programmes in the Department to help develop your interdisciplinary knowledge. The programme is taught on both the South Kensington and White City Campuses. Laboratories as part of taught modules will normally be at the South Kensington Campus.</p> <p>The programme involves lectures and practical work in the first term. In the first term you will also begin researching the medical device concept which will be the subject of your research/development project, and begin working on a market analysis and development plan. The research project would usually be supervised by an academic within the department and there may be additional input from industrial or clinical collaborators. Industry and end-user participation enhance the quality of the educational experience by providing additional input on the complex pathway encountered in pushing a medical device toward the marketplace. Industrial partners have a technical background and are currently working in medical device development or business funding.</p> <p>A variety of seminars and workshops are provided within the department to deepen and broaden your research skill-base. The MRes MDDE programme will prepare you to analyse and solve problems in MDDE using an integrated, multidisciplinary approach. Graduates from this programme typically work in industries such as the medical device industry or undertake a PhD in the UK or worldwide. A measure of the success of the graduates of this programme is the impact they have delivered, which includes the creation of start-ups and follow-on funding worth up to \$2.5 million to date.</p>
Learning Outcomes
<p>The following Learning Outcomes are in line with FHEQ level 7 and the UK-SPEC outcomes required for accreditation by professional engineering bodies.</p> <p>The Learning Outcomes are categorised into the following groups:</p> <ul style="list-style-type: none"> • Knowledge and Understanding [KU] • Intellectual Abilities [IA] • Practical and Transferable skills [PT] <p>Upon successful completion of the <i>MRes Medical Device Design and Entrepreneurship programme</i> you will be able to:</p> <p>[KU1] Assess the underlying scientific principles and models that govern the field of bioengineering entrepreneurship.</p>

[KU2] Evaluate the core concepts, principles and theories relevant to Medical Device design and entrepreneurship and how these are relevant to historical, current and future developments and technologies in the area of Bioengineering.

[KU3] Evaluate a wide range of scientific studies and case studies relevant to Medical Device design and entrepreneurship and critically discuss these examples in terms of their commercial, economic, social and sustainability implications.

[IA1] Critically select and apply engineering principles and tools for the analysis and solution of familiar and unfamiliar problems in the field of medical device design, including investigation of new and emerging technologies

[IA2] Apply diagnostic skills, technical knowledge and understanding of engineering design processes to analyse, evaluate and refine experimental processes

[IA3] Extract, analyse and critically evaluate information and data gathered from experimentation, academic and technical resources to determine their strength and validity, interpret conclusions and make recommendations for future experimental studies.

[IA4] Work with information that may be incomplete or uncertain, quantify the effect of this on the design or development of an engineering solution and, where appropriate, use theory or experimental research to mitigate deficiencies through the generation of new data

[IA5] Formulate an engineering-based development path for a medical device using your knowledge of core and specialised business and engineering concepts.

[PT1] Work effectively with all members of a research team including students and academics, demonstrating good interpersonal and communication skills that show an appreciation for the different roles within a team

[PT2] Exercise initiative and judgement in a range of situations, identifying areas for self-learning and development, and accepting accountability for decisions made and the quality of outcomes produced.

[PT3] Work individually to plan and conduct a business plan for a medical device, working in a safe and ethical manner.

[PT4] Professionally communicate results and technical details through a variety of means including the preparation and/or delivery of presentations, technical and business reports and scientific papers.

Upon successful completion of the *PG Diploma Medical Device Design and Entrepreneurship programme* you will be able to:

[KU1] Assess the underlying scientific principles and models that govern the field of bioengineering entrepreneurship.

[KU2] Evaluate the core concepts, principles and theories relevant to Medical Device design and entrepreneurship and how these are relevant to historical, current and future developments and technologies in the area of Bioengineering.

[KU3] Evaluate a range of scientific studies and case studies relevant to Medical Device design and entrepreneurship and critically discuss these examples in terms of their commercial, economic, social and sustainability implications.

[IA1] Critically select and apply engineering principles and tools for the analysis and solution of familiar and unfamiliar problems in the field of medical device design, including investigation of new and emerging technologies

[IA2] Extract, analyse and critically evaluate information and data gathered from experimentation, academic and technical resources to determine their strength and validity, interpret conclusions and make recommendations for future experimental studies.

[IA3] Work with information that may be incomplete or uncertain, quantify the effect of this on the design or development of an engineering solution and, where appropriate, use theory or experimental research to mitigate deficiencies through the generation of new data

[IA4] Formulate an engineering-based development path for a medical device using your knowledge of core and specialised business and engineering concepts.

[PT1] Work effectively with all members of a research team including students and academics.

[PT2] Exercise initiative and judgement in a range of situations, identifying areas for self-learning and development.

[PT3] Work individually to plan and conduct a business plan for a medical device, working in a safe and ethical manner.

[PT4] Professionally communicate results and technical details through a variety of means including the preparation and/or delivery of presentations, technical and business reports.

Upon successful completion of the *PG Certificate Medical Device Design and Entrepreneurship programme* you will be able to:

[KU1] Assess the underlying scientific principles and models that govern the field of bioengineering entrepreneurship.

[KU2] Evaluate the core concepts, principles and theories relevant to Medical Device design and entrepreneurship and how these are relevant to historical, current and future developments and technologies in the area of Bioengineering.

[KU3] Evaluate a wide range of scientific studies and case studies relevant to Medical Device design and entrepreneurship and critically discuss these examples in terms of their commercial, economic, social and sustainability implications.

[IA1] Critically select and apply engineering principles and tools for the analysis and solution of familiar and unfamiliar problems in the field of medical device design

[IA2] Extract, analyse and critically evaluate information and data gathered from academic and technical resources to determine their strength and validity

[IA3] Work with information that may be incomplete or uncertain, and where appropriate, use theory to mitigate deficiencies through the generation of new data

[IA4] Formulate an engineering-based development path for a medical device using your knowledge of core and specialised business and engineering concepts.

[PT1] Work effectively with all members of a research team including students and academics

[PT2] Exercise initiative and judgement in a range of situations, identifying areas for self-learning and development

[PT3] Work individually to develop a business plan for a medical device, working in a safe and ethical manner.

[PT4] Professionally communicate technical and business information through a variety of means including the preparation and/or delivery of presentations, technical and business reports.

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

Entry Requirements

Academic Requirement	You are expected to have at minimum a 2.1 UK Honour's degree in an engineering discipline, physical science or mathematical subject or equivalent.
Non-academic Requirements	N/A
English Language Requirement	Standard requirement (PG)
Admissions Test/Interview	Applicants may be invited to attend an interview with one or more members of academic staff, in person or virtually.

The programme's competency standards documents can be found at: www.imperial.ac.uk/media/imperial-college/faculty-of-engineering/bioengineering/public/student/Competency-Standards---Bioengineering-UG-PG--June-2016-Final.pdf

Learning & Teaching Approach

Learning and Teaching Delivery Methods

You will be taught through a combination of lectures, study groups and tutorials, computing labs, guest lectures and presentations. Study groups and tutorials will enable you to discuss and develop your understanding of topics covered in lectures whilst in smaller groups of around 30 students. These are usually based around problem sheets, questions or computational tasks set by the module lecturers. You will be expected to solve these either individually or as part of a small group. Study groups and tutorials are supported by graduate teaching assistants. Timetabled sessions may be delivered online or in person, or in a hybrid format.

The Virtual learning environment Blackboard will be used as a repository for teaching materials including recordings of all lectures, lecture notes and problem sheets. Learning technologies will be used to support teaching activities including in-class polling with Mentimeter, online self-diagnostic quizzes and online class forums.

Independent Learning

You are expected to spend significant time on independent study outside of timetabled learning and teaching sessions. From our experience students that undertake independent learning have improved academic performance, increased motivation and confidence in themselves and their abilities. By undertaking independent learning, you are also preparing yourself for professional practice where it is expected that you will manage your own continued professional development. Independent learning activities that you will be expected to undertake will typically include accessing online resources, completing problem sheets, reading journal articles and books, undertaking research in the library, reviewing lecture notes and watching lecture recordings, working on individual and group projects, working on coursework assignments and revising for exams.

Bioengineering uses flipped teaching for some modules, meaning that you need to actively engage with on-line resources ahead of attending timetabled sessions. This independent learning is followed by sessions led by the teacher where all students work in small groups to apply that knowledge to more practical examples. This helps you to further consolidate and enhance your understanding of the topics you study and allows us the time to focus on more challenging concepts in the taught sessions. These taught sessions are normally in the place of study groups for a flipped module

Research Project

A key part of our MRes programme is the Research Project. Within this project you will have the opportunity to demonstrate advanced knowledge, write extensively on an emerging research theme and apply developing entrepreneurial skills. Your Research Project is an opportunity for you to develop cutting edge research and entrepreneurial capabilities under the close supervision of an academic and usually an industrial supervisor. Industry participation enhances the quality of your educational experience by providing additional input on the complex pathway encountered in pushing a medical device toward the marketplace.

Your initial application will be reviewed by the programme director who will support you in identifying a potential project and supervisor prior to the start of term, so please indicate if you have any particular area of interest within Bioengineering in your personal statement as part of your initial application.

You will be expected to engage with your project supervisor during your first week of term and begin the background research and planning for your project. You begin full-time project work in the spring term, working on the project for 9 months.

Overall Workload

Your overall workload consists of face-to-face sessions and independent learning. While your actual contact hours may vary according to the optional modules you choose to study, the following gives an indication of how much time you will need to allocate to different activities at each level of the programme. At Imperial, each ECTS credit taken equates to an expected total study time of 25 hours. Therefore, the expected total study time is 2,250 hours per year.

Taught modules on this programme will be held mainly during the Autumn term. You will typically spend 90 hours in lectures and tutorials, with around 410 hours of individual study. Your research project accounts for 1750 hours of additional individual study.

Assessment Strategy

Assessment Methods

A variety of assessment methods will be used to test your understanding. Assessments are grouped as formative and summative.

Formative assessments do not contribute to the module mark but provide information on your progress as an individual and in the context of the class. This allows you to learn by using your new skills to solve problems and receive feedback on your performance to guide your future learning. This supports you to achieve a better performance in the summative assessments which do count towards your module marks. Formative assessments also provide feedback to the teaching staff which allow us to adapt our teaching.

Summative assessments are used to assess your learning against the intended module learning outcomes and contribute towards your achievement of the programme learning outcomes, detailed above. There is summative assessment during and/or at the end of each module and these assessments will contribute towards your mark for the year.

The design of our programme will allow you to test your understanding of the subject using formative assessments such as problem sheets, on-line diagnostic tests, practice presentations and mock/past examinations before you complete the summative assessments that count towards your final mark.

The taught modules will be assessed using a combination of:

- Written examinations
- Oral presentations
- Written reports, including a dissertation
- Coursework including progression tests, problem sheets
- Practical training elements

The research modules will be assessed at regular intervals throughout the degree using a combination of:

- Written Reports & Final Thesis
- Oral presentations & Business pitches
- Poster Presentations

The typical breakdown of assessments for this programme is:

Practical	50%
Coursework	45 %
Exams	5 %

Academic Feedback Policy

Feedback may be provided in one of a number of formats, including (but not limited to):

- Oral (during or after lectures, personally or as a group feedback session)

- Personal (discussion with academics during office hours, meetings with cohort and academic tutors)
- Interactive (problem solving tutorials with GTAs & study groups, peer feedback)
- Written (solutions/model answers to coursework, electronic feedback online)

Deadlines for submission of assessments and to receive feedback are indicated in the coursework calendars normally provided at the start of the teaching year. You will usually be provided with feedback within 10 working days although on occasions they may be informed of a different time scale (e.g. if the submitted work is particularly complex and will take a long time to mark).

The College's Policy on Academic Feedback and guidance on issuing provisional marks to students is available at:

www.imperial.ac.uk/about/governance/academic-governance/academic-policy/exams-and-assessment/

Re-sit Policy

The College's Policy on Re-sits is available at: www.imperial.ac.uk/student-records-and-data/for-current-students/undergraduate-and-taught-postgraduate/exams-assessments-and-regulations/

Mitigating Circumstances Policy

The College's Policy on Mitigating Circumstances is available at: www.imperial.ac.uk/student-records-and-data/for-current-students/undergraduate-and-taught-postgraduate/exams-assessments-and-regulations/

Additional Programme Costs

This section should outline any additional costs relevant to this programme which are not included in students' tuition fees.

Description	Mandatory/Optional	Approximate cost
Textbooks	Mandatory	£150
Personal Protective Equipment	Mandatory	Provided

Important notice: The Programme Specifications are the result of a large curriculum and pedagogy reform implemented by the Department and supported by the Learning and Teaching Strategy of Imperial College London. 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.

Programme Structure ¹					
FHEQ Level 7 Students study all core and compulsory modules.					
*This module is considered as pass/fail and will not contribute to the overall weighted average used for classification of the programme					
Code	Module Title	Core/ Compulsory/ Elective	Group	Term	Credits
BIOE70014	Medical Device Entrepreneurship	Compulsory	N/A	Autumn	5 ECTS
BIOE70037	Computational and Statistical Methods for Research	Compulsory	N/A	Autumn	5 ECTS
BIOE70042	Topics in Biomedical Engineering and Business*	Compulsory	N/A	Autumn & Spring	10 ECTS
BIOE70044	Planning for Medical Device Entrepreneurship	Core	N/A	Spring	10 ECTS
BIOE70041	Medical Device Design and Entrepreneurship Research Project	Core	N/A	Spring-Summer	60 ECTS
Credit Total					90 ECTS

¹ **Core** modules are those which serve a fundamental role within the curriculum, and for which achievement of the credits for that module is essential for the achievement of the target award. Core modules must therefore be taken and passed in order to achieve that named award. **Compulsory** modules are those which are designated as necessary to be taken as part of the programme syllabus. Compulsory modules can be compensated. **Elective** modules are those which are in the same subject area as the field of study and are offered to students in order to offer an element of choice in the curriculum and from which students are able to select. Elective modules can be compensated.

Progression and Classification

Award of a Postgraduate Certificate (PG Cert)

To qualify for the award of a postgraduate certificate a student must have a minimum of 30 credits at Level 7.

Award of a Postgraduate Diploma (PG Dip)

To qualify for the award of a postgraduate diploma a student must have a minimum of 60 credits at Level 7 with no more than 10 credits as a compensated pass.

Award of a Postgraduate Degree (including MRes)

To qualify for the award of a postgraduate degree a student must have:

1. accumulated credit to the value of no fewer than 90 credits at level 7
2. and no more than 10 credits as a Compensated Pass;
3. met any specific requirements for an award as outlined in the approved programme specification for that award.

Classification of Postgraduate Taught Awards

1. Distinction: The student has achieved an overall weighted average of 70.00% or above across the programme.
2. Merit: The student has achieved an overall weighted average of above 60.00% but less than 70.00%.
3. Pass: The student has achieved an overall weighted average of 50.00% but less than 60.00%.
 - a. For a Masters, students must normally achieve a distinction (70.00%) mark in the Medical Device Design and Entrepreneurship Research Project in order to be awarded a distinction
 - b. For a Masters, students must normally achieve a minimum of a merit (60.00%) mark in the Medical Device Design and Entrepreneurship Research Project in order to be awarded a merit

Programme Specific Regulations

As an accredited degree, students on this MRes programme are subject to the standards set by the Engineering Council in relation to compensation. A maximum of 10 ECTS credits can be compensated across the programme.

Supporting Information

The Programme Handbook is available at: www.imperial.ac.uk/bioengineering/admin/research/mres/

The Module Handbook is available from the department.

The College's entry requirements for postgraduate programmes can be found at:
www.imperial.ac.uk/study/apply/postgraduate-taught/entry-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:
www.imperial.ac.uk/about/governance/academic-governance/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".
www.imperial.ac.uk/admin-services/secretariat/college-governance/charters/

Imperial College London 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.

Modifications

Description	Approved	Date	Paper Reference
Curriculum Review	Programmes Committee	29/03/22	PC.2021.83
PG Diploma Exit Award	Programmes Committee	29/11/22	PC.2022.15