Programme Information		
Programme Title	Programme Code	HECoS Code
Molecular Engineering	H803	For Registry Use Only

Award	Length of Study	Mode of Study	Entry Point(s)	Total Credits	
				ECTS	CATS
MRes	1 Calendar Year	Full-Time	Annually in October	90	180
PG Certificate	N/A	N/A	N/A	30	60
The PG Certificate is an exit award and is not available for entry. You must apply to and join the MRes.					

Ownership			
Awarding Institution	Imperial College London	Faculty	Faculty of Engineering
Teaching Institution	Imperial College London	Department	Chemical Engineering – Institute for Molecular Science and Engineering
Associateship	Diploma of Imperial College (DIC)	Main Location(s) of Study	South Kensington Campus
External Reference			
Relevant QAA Benchmark Statement(s) and/or other external reference points		Master's Awards in Chemistry, Physics and Engineering	
FHEQ Level		Level 7	
EHEA Level		2nd Cycle	
External Accreditor(s) (if applicable)			
External Accreditor 1:	N/A		
Accreditation received:	N/A	Accreditation renewal:	N/A
Collaborative Provision			
Collaborative partner	Collaboration type	Agreement effective date	Agreement expiry date
N/A	N/A	N/A	N/A
Specification Details			
Programme Lead		Dr Ali Salehi-Reyhani & Dr Anna Hankin	
Student cohorts covered by specification		2024-25 entry	

Date of introduction of programme	October 22
Date of programme specification/revision	March 23

Programme Overview

The MRes will enhance your ability for collaboration and broaden your understanding of and communication in molecular science and engineering. At the beginning of the programme, bespoke introductory modules will provide a firm grounding at the interface of science and engineering (focused on mathematics, chemistry, physical sciences and engineering principles, as well as programming). Once a common basis has been achieved, you will engage in advanced activities cutting across engineering and natural sciences. Entrepreneurship and handling data, professional skills and graduate attributes will be embedded into all modules. You will be able to exercise your broadened fundamental knowledge to address a wide range of applied and industrial problems. You will hone these skills through a research project with an external partner. The programme provides education in both science and engineering reaching from molecular science to manufacturing plant optimisation. Successful students come from a variety of backgrounds in natural sciences and engineering; the essential criterion being an ability and enthusiasm for studying the whole range of skills required for successful innovation, and a good understanding of mathematics.

The programme's unique selling points are its trans-disciplinarity across science and engineering, and the exposure to broad industrial sectors. It builds on Imperial's strengths and reputation in transferring fundamental research advances into solutions to real-world problems, seeing research through to application. By coordinating Imperial's well-established links to industry, you will be provided with unprecedented access to various industrial partners from a wide range of sectors to engage in applied research projects.

The collaborative, cross-disciplinary research project forms the major part of the MRes programme. Your project will be in collaboration with an external partner (usually industrial), and will be supervised by two Imperial academics from different specialisms. A wide range of projects is offered each year, based on the cutting-edge research currently being undertaken by Imperial's researchers. Your research may be undertaken in a lab, or through computer modelling, or a combination of these approaches.

Learning Outcomes

On successfully completing this MRes programme, you will be able to:

1. Demonstrate how scientific fundamentals (molecular structure, spectroscopy and analytical techniques, thermodynamics, etc) interrelated with an engineering perspective (physical properties and processes, systems analysis and design at different scales, process modelling and optimisation, etc) can be applied to solve industrial challenges.
2. Apply computer-aided approaches to assess the relation between experiments, models and design of molecular systems.
3. Solve complex design problems utilising an evidence-based approach, applying concepts in optimisation and machine learning.
4. Critically assess selected manufacturing processes, considering the different benefits of scale-up vs scale-out, and the effect of molecular level attributes on process performance.
5. Create models of matter at different scales, from the atomic/molecular scale through to the plant process scale, by application of a variety of computer modelling techniques.
6. Critically discuss selected areas of modern synthetic chemistry, in an engineering context, with application to the production of polymeric materials.
7. Solve analysis and characterisation problems using the application of your theoretical understanding of a range of advanced spectroscopic and microscopic techniques.
8. Appraise an industrial problem and apply your knowledge of molecular science and engineering to formulate appropriate trans-disciplinary research plans to address this challenge.
9. Perform appropriately supported independent research, applying the knowledge gained in the taught modules to analyse and interpret the data that you produce.
10. Create publication-level written communication of your research and present your results through a range of different media, including oral and poster presentations, adapting your presentation to a rang of different audiences including industrial partners.

On successfully completion of PG Cert, you will be able to:

1. Demonstrate how scientific fundamentals (molecular structure, spectroscopy and analytical techniques, thermodynamics, etc) interrelated with an engineering perspective (physical properties and processes, systems analysis and design at different scales, process modelling and optimisation, etc) can be applied to solve industrial challenges.
2. Apply computer-aided approaches to assess the relation between experiments, models and design of molecular systems.
3. Solve complex design problems utilising an evidence-based approach, applying concepts in optimisation and machine learning.
4. Critically assess selected manufacturing processes, considering the different benefits of scale-up vs scale-out, and the effect of molecular level attributes on process performance.
5. Create models of matter at different scales, from the atomic/molecular scale through to the plant process scale, by application of a variety of computer modelling techniques.
6. Critically discuss selected areas of modern synthetic chemistry, in an engineering context, with application to the production of polymeric materials.
7. Solve analysis and characterisation problems using the application of your theoretical understanding of a range of advanced spectroscopic and microscopic techniques.

The Imperial Graduate Attributes are a set of core competencies which we expect students to achieve through completion of any Imperial degree programme. The Graduate Attributes are available at: www.imperial.ac.uk/about/education/our-graduates/

Entry Requirements	
Academic Requirement	A UK Bachelor's Degree with Honours at 2:1 (or equivalent) in an engineering or physical sciences discipline.
Non-academic Requirements	N/A
English Language Requirement	Standard requirement (PG) Please check for other Accepted English Qualifications
Admissions Test/Interview	Shortlisted applicants will be invited to an online interview with two staff members. In the interview, the applicant will be asked to summarise their motivation for applying to this programme, answer technical questions on their previous research and/or a research article provided in advance, and discuss their research aspirations.

The programme's competency standards documents are available from the department.

Learning & Teaching Approach

Learning and Teaching Delivery Methods

You will be introduced to core knowledge primarily through full class sessions, ranging in format from traditional lectures to more active learning sessions, where you are required to self-study assigned materials ahead of the session and build on that knowledge in subsequent reinforcement and guided problem-solving sessions. You will also be expected to spend significant further time (approximately 3-4 hours for every timetabled contact hour) working independently and with peers, reviewing lecture notes, lecture video recordings, books, journal papers, e-learning materials and solving problem sets. This programme features several practical exercises designed to encourage active learning, where you will explore possible options, consider constraints and develop your own knowledge, supported by the teaching staff and/or graduate teaching assistants. You will also work under the guidance and supervision of at least two members of the academic staff and an industrial supervisor to complete your MRes Research Project. Professional skills, such as technical report writing and presenting, are cultivated throughout the degree in various individual and group-based coursework, and through the bespoke, timetabled professional skills development sessions.

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 for an average student. We expect you to allocate approximately 4 hours in self-study for every hour spent in lectures for a typical lecture-based module. You can expect to spend about 125 hours in lectures and tutorials with a further 1350 hours being devoted to self-directed research work for your MRes Research Project from the Spring term.

Assessment Strategy

Assessment Methods

This MRes programme aims to employ assessment both to test your achievement of module learning outcomes, referred to as summative assessment, and as a method of enhancing learning, developing skills and applying knowledge through assessment, referred to as formative assessment. A variety of formative and summative assessment methods are utilised in this programme.

Written examinations are utilised for modules where theoretical knowledge and its application within a disciplinary setting is introduced. In addition to a summative assessment, all modules will typically offer opportunities for you and your instructors to assess your level of understanding and progress.

Some modules are also summative assessed solely in the form of a coursework such as:

- Individual reports
- Problem sheets
- Research article

and practical assessment such as:

- Oral and poster presentations

The exact balance of the summative assessment through the programme is:

Coursework	64.25%
Practical	22.42%
Written exam	13.33%

To achieve a pass in a particular module, candidates must gain a weighted overall mark of 50% or greater.

Academic Feedback Policy

Feedback is an essential part of learning and this MRes programme gives high priority to the timeliness and quality of feedback offered to you on all modules. The primary purpose of feedback is to assist learning and the development of skills, by highlighting strengths and weaknesses on one hand, and by identifying actions for improvement on the other. It is not meant to exclusively provide justification for assessment results. It is important to recognise that: 1) feedback comes in various forms and 2) feedback requires your active engagement.

Feedback will be provided for all assessments carried out as part of this programme. Our policy is that all students receive feedback on assessed work normally within 2 weeks of submission. In the case of unforeseen circumstances where a 2-week turnaround is not possible, students will be advised at the earliest opportunity and provided with a revised date for feedback. All modules will further aim to provide you with the opportunity to receive feedback ahead of any major summative assessment. Such feedback may be provided in the form of in-class progress tests, online self-assessment exercises, tutorial sheets, etc. Where possible, as in the case of in-class tutorial sessions, oral examinations and poster sessions, oral feedback will be provided immediately by tutors or assessors.

You should keep in mind that not all feedback is structured, and important feedback may be obtained from self-reflection on your progress to date, from peers when studying or working together in a team, in dialogue with a lecturer or teacher in or outside of a tutorial, class or laboratory, or by email.

Imperial'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
Imperial's Policy on Re-sits is available at: www.imperial.ac.uk/about/governance/academic-governance/academic-policy/exams-and-assessment/
Mitigating Circumstances Policy
Imperial's Policy on Mitigating Circumstances is available at: www.imperial.ac.uk/about/governance/academic-governance/academic-policy/exams-and-assessment/

Additional Programme Costs		
This section should outline any additional costs relevant to this programme which are not included in students' tuition fees. Note that laptops are loaned to students for the duration of the programme, and all software is provided without additional charge.		
Description	Mandatory/Optional	Approximate cost
N/A	N/A	N/A

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]					
Year 1 - FHEQ Level 7 **You will study all core and compulsory modules.**					
Code	Module Title	Core/ Compulsory	Group	Term	Credits
CENG70014	Underpinning Molecular Science	Core		Autumn	5
CENG70015	Fundamentals of Molecular Engineering	Core		Autumn	5
CENG70016	Machine Learning and Optimisation for Molecular Design	Core		Autumn	5
CENG70017	Multiscale Modelling – Understanding, Visualising, and Predicting	Core		Autumn	10
CENG70018	Making - Synthesis of Polymeric Systems	Compulsory		Autumn	5
CENG70019	Measuring - Analysis and Characterisation	Compulsory		Autumn	5
CENG70020	Advanced Manufacturing	Compulsory		Autumn	5
CENG70021	Molecular Science and Engineering Research Project	Core		Spring-Summer	50
				Credit Total	90

[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 you must have a minimum of 30 credits at Level 7.

Award of a Masters Degree (including MRes)
To qualify for the award of this postgraduate degree, you must have:

1. accumulated credit to the value of no fewer than 90 credits at level 7;
2. and no more than 15 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

The university sets the class of Degree that may be awarded as follows:

1. Distinction: 70.00% or above.
2. Merit: 60.00% or above but less than 70.00%.
3. Pass: 50.00% or above but less than 60.00%.

For a Masters, your classification will be determined through the Programme Overall Weighted Average and the designated dissertation or final major project module meeting the threshold for the relevant classification band.

Your degree algorithm provides an appropriate and reliable summary of your performance against the programme learning outcomes. It reflects the design, delivery and structure of your programme without unduly over-emphasising particular aspects.

Programme Specific Regulations

N/A

Supporting Information
The Programme Handbook is available from the department.
The Module Handbook is available from the department.
Imperial's entry requirements for postgraduate programmes can be found at: www.imperial.ac.uk/study/pg/apply/requirements
Imperial's Quality & Enhancement Framework is available at: www.imperial.ac.uk/registry/proceduresandregulations/qualityassurance
Imperial's Academic and Examination Regulations can be found at: www.imperial.ac.uk/about/governance/academic-governance/regulations
Imperial College London 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 Imperial's Centenary, 8th July 2007, established Imperial 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 you may reasonably be expected to achieve and demonstrate if you take 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.