| **Programme Information** | | |
|---|---|---|
| Programme Title | Programme Code | HECoS Code |
| Catalysis: Chemistry & Engineering | F1Y5 | For Registry Use Only |

| Award | Length of Study | Mode of Study | Entry Point(s) | Total Credits | |
|---|---|---|---|---|---|
| | | | | ECTS | CATS |
| MRes | 12 months | Full-time | Annually in October | 90 | 180 |

| **Ownership** | | | |
|---|---|---|---|
| Awarding Institution | Imperial College London | Faculty | Faculty of Natural Sciences |
| Teaching Institution | Imperial College London | Department | Chemistry |
| Associateship | Diploma of Imperial College (DIC) | Main Location(s) of Study | White City campus |
| **External Reference** | | | |
| Relevant QAA Benchmark Statement(s) and/or other external reference points | | Master's Degree in Chemistry | |
| 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 | | Professor George Britovsek<br>Dr Silvia Diez-Gonzalez | |
| Student cohorts covered by specification | | 2026-27 entry | |
| Date of introduction of programme | | October 22 | |
| Date of programme specification/revision | | August 23 | |

## Programme Overview

Catalysis underpins a huge range of modern chemical transformations. From the megaton scale production of acetic acid to the polymers we use for plastics, and from automotive catalytic converters to key steps in pharmaceutical synthesis, the impact of catalysis upon our everyday life is enormous. It has been estimated that around 90% of all chemical products produced on a commercial scale involve catalysis, and that catalytic processes lead to approximately £500 billions of products. It is embraced as a 'green technology' as it can limit waste and improve selectivity as well as provide re-use of the catalytic agent itself.

Since the landmark achievements of Nobel laureate Sir Geoffrey Wilkinson in catalysis, Imperial has been known internationally as a centre for catalysis research, and this tradition continues today with over 30 members of the Chemistry and Chemical Engineering departments active in the area. Global companies such as BP, INEOS, Sasol, Johnson Matthey, BASF, Pfizer and AstraZeneca all have catalysis research and development facilities in the UK.

Catalysis has traditionally been divided into homogenous (solution-based), heterogeneous (solid- liquid, solid-gas interface) and (reaction) engineering disciplines. However, this distinction is becoming increasingly blurred, so this MRes course aims to provide you with a coherent overview of all these areas.

Students will graduate from the programme with a solid knowledge base in the area of catalysis, and they will be challenged to develop their own ideas on how to focus academic and industrial research to meet the pressing challenges in catalysis. Upon graduation, students will be equipped with the practical and theoretical skills needed to join academic or industrial research labs involved in catalysis research and development. The training offered by this course will open a variety of international career options to our students, either within the framework of a PhD programme or within industry.

## Learning Outcomes

The programme will enable **you** to:

1. **Demonstrate** a deep understanding of the core concepts in catalysis associated to your chosen research area, with the ability to **conceptualise** and **explore** theories, data and methods relevant to the field.
2. **Employ** research and prototyping techniques, including information retrieval, experimental design and statistics, modelling, sampling, physical/chemical/engineering techniques and laboratory safety.
3. **Independently evaluate** and **apply** the essential facts, concepts, principles and theories relevant to your project.
4. **Perform** research within a multi-disciplinary environment, **developing** management and communication skills, including problem definition, project design, decision processes, teamwork, written and oral reports, scientific publications.
5. **Critically evaluate** your own and others' work, including an appreciation of novelty and significance.
6. **Recognise and critically appraise** broader issues in catalytic research including scale-up and commercialisation, as well as environmental impact of tools and technologies relevant to the research area.
7. **Compose and deliver** written, oral and visual science communications, which are effective at conveying the message to a variety of audiences.
8. **Demonstrate** laboratory and/or computational **skills** required to perform research in the field of catalysis.
9. **Design** a novel research project and **compose** a corresponding research proposal, appropriate for submission to an academic funding body.
10. **Propose** tractable research objectives for your research project.

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: https://www.imperial.ac.uk/about/education/our-graduates/

## Entry Requirements

| | |
|---|---|
| Academic Requirement | The minimum requirement is normally a 2:1 UK Bachelor's Degree with Honours or higher in Chemistry, Chemical Engineering or a related subject |

| | |
|---|---|
| | (or a comparable qualification recognised by the university). A basic level of background chemistry or engineering knowledge is assumed.<br><br>For further information on entry requirements, please go to PG: www.imperial.ac.uk/study/apply/postgraduate-taught/entry-requirements/accepted-qualifications/ |
| Non-academic Requirements | None |
| English Language Requirement | Standard requirement (PG)<br>Please check for other Accepted English Qualifications |
| Admissions Test/Interview | Candidates will be invited for interview in person or online. |

The programme's competency standards documents can be found at: www.imperial.ac.uk/chemistry/postgraduate/mres/

## Learning & Teaching Approach

**Learning and Teaching Delivery Methods**

The course's aim is to teach the practice of science with the learning and teaching strategy being constructively aligned with the knowledge, skills and abilities required by professional scientists in academia, government, industries, and NGOs.

Most of the weighting of the course is focussed on the research component- e.g. via a proposal writing exercise and research project – which reflect the major activities undertaken by modern scientists. In addition, the taught component exposes the students to fields outside their immediate project area, including sustainability credentials within a circular economy and the skills of designing equipment relevant to this research area.

Across the programme, a range of teaching methods are used including: laboratory work, computational work, seminars, lectures, workshops, group discussions and online material. It may be possible for projects to be carried out partly or wholly at an external organisation and requests will be considered on a case by case basis.

**Overall Workload**

The overall workload consists of face-to-face sessions and independent learning. While the actual contact hours may vary according to the optional modules a student may choose to study, the following gives an indication of how much time will need to be allocated 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 2250 hours per year comprising approximately 375 hours for the Advanced Current Catalysis & Sustainable Chemistry modules, 185 hours for the Engineering for Catalysis module, 250 hours of planning and designing the research project guided by the project supervisors, and 1500 hours of individual research project work.

## Assessment Strategy

Assessment Methods

Each assessment is designed to test your appropriate acquisition of separate skills required for the furthering of a career in catalysis research and associated professional paths (all assessments are linked to the intended learning outcomes listed above as indicated in brackets).

The taught components will enable you to develop an in-depth understanding of the field of Catalysis in its broadest sense (Learning outcomes 1, 3, and 6). The Engineering for Catalysis assessment contains two written exams, which will test your understanding of the reactor design requirements relevant to catalysis and your general understanding of catalytic processes in the chemical industry (Learning outcomes 1, 2 and 6). The presentation sessions in the Advanced Current Catalysis module will assess your ability to condense a body of knowledge from a literature subject and orally present this summary clearly with the help of visual tools (Learning outcomes 1, 2, and 5-7) and your ability to critically evaluate published catalysis research during discussions (Learning outcomes 5-7). The Sustainable Chemistry assessment involves the writing of a 1500 word essay, which will test your understanding and critical evaluation and application of green principles and metrics to industrially relevant processes (Learning outcomes 1, 2, and 5-7).

The Project proposal will assess your aptitude to critically analyse published scientific literature, plan the work packages necessary to complete the research project and reflect on ethical, safety and commercial/societal aspects of your work (Learning outcomes 1,3, 5-7, 9 and 10).

The Research Project will be judged through a manuscript, a presentation, and an oral examination. The manuscript will evaluate your skills at presenting, describing and critically discussing your own experimental data in the format typical of an article published in peer-reviewed journals. At the presentation, you will be assessed on your ability to present your research to your examiners with the help of visual tools in a clear, concise fashion, summarising your findings and their relevance. You will also be tested on your ability to answer questions directly relevant to your project. Your viva will probe your knowledge and general understanding of the relevant literature, methodology and research outcomes, including theoretical and practical knowledge of the subject area, of the experimental techniques used and their limitations as well as the proposed follow-on work (Learning outcomes 1-8 and 10).

| Academic Feedback Policy |
|---|
| With the exception of the major research project module, you will receive feedback within 2 weeks of submission and where this is not possible, students will be advised. This feedback should inform learning and performance in subsequent modules.<br><br>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. | | |
| Description | Mandatory/Optional | Approximate cost |
| Laptop with camera and microphone | Mandatory | £400-600 |

**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**<br>**You will study all core and compulsory modules.**<br>**Note - Engineering for Catalysis is a Level 6 module** | | | | | |
| Code | Module Title | Core/ Compulsory | Group | Term | Credits |
| CHEM70033 | Advanced Current Catalysis | Compulsory | N/A | Autumn-Summer | 7.5 |
| CHEM70010 | Sustainable Chemistry | Compulsory | N/A | Autumn | 5 |
| CHEM60016 | Engineering for Catalysis (Level 6) | Compulsory | N/A | Autumn-Summer | 7.5 |
| CHEM70036 | Proposal for Catalysis Research Project | Core | N/A | Autumn | 10 |
| CHEM70037 | Catalysis Research Project | Core | N/A | Spring-Summer | 60 |
| | | | | 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 Masters Degree (including MRes)**

To qualify for the award of a 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

**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%.

Your classification will be determined through the Programme Overall Weighted Average 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 upon enrolment. |
| Imperial's entry requirements for postgraduate programmes can be found at:<br>www.imperial.ac.uk/study/pg/apply/requirements |
| Imperial's Quality & Enhancement Framework is available at:<br>www.imperial.ac.uk/registry/proceduresandregulations/qualityassurance |
| Imperial's Academic and Examination Regulations can be found at:<br>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".<br>www.imperial.ac.uk/admin-services/secretariat/university-governance-structure/charters/ |
| Imperial College London is regulated by the Office for Students (OfS)<br>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. |